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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

ALBERT C. L. G. GÜNTHER, M.A., M.D., Ph.D., F.R.S.,  
WILLIAM CARRUTHERS, F.R.S., F.L.S., F.G.S.,  
AND  
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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."—BUCKNER, *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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# THE ANNALS

AND

## MAGAZINE OF NATURAL HISTORY.

[SEVENTH 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 conchylia succo.”  
*N. Parthenii Giannettusi, Ecl. 1.*

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No. 91. JULY 1905.

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I.—*Report on the Schizopods collected by Mr. George Murray, F.R.S., during the Cruise of the ‘Oceana’ in 1898.* By E. W. L. HOLT and W. M. TATTERSALL, B.Sc.

[Plates I. & II.]

THE material dealt with in the following paper was collected in November 1898 during the cruise of the ‘Oceana’ in deep water off the west coast of Ireland some 200 miles west of Valentia. The area in which the collections were made lies between lat.  $52^{\circ} 4' 5''$  N. and  $52^{\circ} 27' 6''$  N., and long.  $12^{\circ} 27'$  W. and  $15^{\circ} 53' 9''$  W., the depth of water varying from 453 to 1835 fathoms. This region is thus partly within and partly without the British Area as defined by Norman.

The method of collecting was by open serial tow-nets fished horizontally at known depths and hauled, still fishing, to the surface. It is obvious therefore that part of the catch of any net may have been made during its descent or ascent. We have thus no reliable guide as to the exact depth at which a species was caught, though a reasonable inference of the inhabitants of the various zones of water can be obtained

by comparisons of the contents of the different nets in each vertical series.

The classification and terminology used in the present report are the same as those recently used by us in dealing with Schizopods from the Atlantic slope\*.

The species of Schizopods taken by the 'Oceana' number nine, as follows:—

Division EUCARIDA, Calman.

Order EUPHAUSIACEA, Boas.

Family **Euphausiidæ**, Dana.

Subfamily EUPHAUSINÆ, H. & T.

Genus *Euphausia*, Dana.

*E. pellucida*, Dana.

Genus *Meganyctiphanes*, H. & T.

*M. norvegica* (M. Sars).

Subfamily NEMATOSCELINÆ, H. & T.

Genus *Thysanoessa*, Brandt.

*T. longicaudata*, Krøyer.

*T. gregaria*?, G. O. Sars.

Genus *Stylocheiron*, G. O. Sars.

*S. Suhmii*, G. O. Sars.

*S. abbreviatum*, G. O. Sars.

Division PERACARIDA, Calman.

Order MYSIDACEA, Boas.

Family **Mysidæ**, Dana.

Subfamily LEPTOMYSINÆ, Norman.

Genus *Katerythrops*, H. & T.

*K. Oceanæ*, H. & T.

Family **Lophogastridæ**, G. O. Sars.

Genus *Gnathophausia*, Willemoes-Suhm.

*G. drepaneophora*, H. & T.

Family **Eucopiidæ**, G. O. Sars.

Genus *Eucopia*, Dana.

*E. australis*, Dana.

---

\* 'Report Inland and Sea Fisheries of Ireland for 1902 and 1903,' pt. ii. App. iv. [1905].

Of these species two were found to be new to science, viz. *Katerythrops Oceanæ* and *Gnathophausia drepanephora*. Descriptions and figures of these have already appeared (H. & T. *loc. cit.*), but it has been thought advisable to give brief diagnoses in the present report as well.

Three of the above species were taken by the 'Oceana' for the first time in British waters, viz. :—

*Euphausia pellucida*.

*Thysanoessa gregaria*.

*Stylocheiron Suhmii*.

*Stylocheiron abbreviatum* and *Eucopia australis* were only taken in those hauls made outside the British Area, and so cannot be admitted to the British list on the evidence of the 'Oceana' collections, though both species have since been met with in British waters (H. & T. *loc. cit.*).

Schizopods occurred in thirty out of a total of forty\* hauls with the tow-nets—a very fair proportion. It is interesting to note that no Schizopods occurred in the surface-hauls at any of the stations, nor in any net fished at less than 230 fathoms, while seven of the nine species were taken only in those nets towed at greater depths than 500 fathoms. Very few hauls were made, however, at less depths than 500 fathoms, which, in so far as Schizopods are concerned, is to be regretted, since many of the species captured have been shown to belong essentially to the upper strata by the collections made in the Bay of Biscay in July 1900 by Dr. Fowler. It would have been interesting to have seen whether this holds for the same species in November, in so far as it may be legitimate to compare July of 1900 with November of 1899. It is possible that the absence of Euphausians from the surface and upper waters may be explained by the consideration that most of the 'Oceana' hauls were made during the daytime, and we have evidence from Dr. Fowler's collections that certain Euphausians, such as *Euphausia pellucida*, rise to the upper strata by night and sink by day; or, if this be not admitted as fully proven, it is at least certain that the more active forms are exceedingly difficult to catch in the upper strata during daylight, especially in ordinary fine mesh silk tow-nets, such as were used by the 'Oceana.' We are unable to conclude that the absence of Schizopods from the nets fished from 230 fathoms or less furnishes material evidence of the distribution of

\* Including some hauls made at St. 1, soundings 89 fath., in which no Schizopods were taken.

Table showing the Occurrence of

N.B.—(a) *l.* denotes larva.(b) Larvæ not identified occurred in the following hauls:—4 a, 2 *Furcilia*; 4 b, 1 *Furcilia*.

(c) The numbers given under the heading "Fathoms" indicate the depth at which the net

Date.	Station.	Net.	Fathoms.	<i>Euphausia pellucida.</i>	<i>Meganyctiphanes norvegica.</i>	<i>Thysanoessa longicaudata.</i>
Nov. 19th, 1898.	Lat. 52° 4' 5" N. Long. 12° 27' 0" W.	2b	270	1. 7 mm.	.....	.....
		2c	270	.....	.....	.....
		2d	374	3. { 8.5 mm. 10.0 mm. 14.0 mm.	} .....	.....
		2e	464	1. 5.5 mm.		.....
		2f	620	2. 4 & 11 mm.	.....	.....
		2g	650	1. 15 mm.	2. 23 & 26 mm.	{ 1. 6 mm. 2 <i>l.</i>
		Nov. 20th, 1898.	Lat. 52° 27' 6" N. Long. 15° 40' 0" W.	4b	790	2. 6 & 9 mm.
4c	920			1. 10 mm.	.....	6. 6-9 mm.
4d	1065			2. 8 & 13 mm.	.....	7. 7-10 mm.
4e	1170			10. 6-15 mm.	.....	13. 7-10 mm.
4f	1275			4. { 3. 7-10 mm. 1. 18 mm.	} .....	21. 7-10 mm.
4g	1370			2. 6.5 & 8.5 mm.		.....
4h	1470			2. 14 mm.	.....	{ 8. 8-10 mm. 1 <i>l.</i>
4j	1570			3. { 2. 10 mm. 1. 7 mm.	} .....	7. 8-9 mm.
4k	1670			7. { 6. 7-10 mm. 1. 18 mm.		} .....
4l	1770			1. 11.5 mm.	.....	
Nov. 21st, 1898.	Lat. 52° 18' 1" N. Long. 15° 53' 9" W.	5b	500	8. 6-16 mm.	.....	1. 8 mm.
		5c	810	2. { 1. 15 mm. 1. 5 mm.	} .....	2. 9 mm.
		5d	950	1. 15 mm.		.....
		5e	1070	3. 8-15 mm.	.....	14. 6-9 mm.
		5f	1190	.....	.....	9. 7-9 mm.
		5g	1300	1. 11 mm.	.....	6. 8-10 mm.
		5h	1410	.....	.....	15. 7-9 mm.
		5j	1510	8. 8-15 mm.	.....	12. 7-9 mm.
		5k	1610	.....	.....	12. 7-10 mm.
		5l	1710	4. 7-19 mm.	.....	4. 8-9 mm.
		Nov. 22nd, 1898.	Lat. 52° 20' 0" N. Long. 15° 7' 9" W.	6b	230	.....
6d	375			1. 7 mm.	.....	.....
6f	510			7. 6-14 mm.	.....	1. 8 mm.
6g	560			2. { 1. 15 mm. 1. 5 mm.	} .....	{ 21. 8-10 mm. 2 <i>l.</i>



Schizopoda in the several Hauls.

1 k, 1 *Calyptopsis*; 6 d, 1 *Calyptopsis*.

was towed, though not necessarily the depth at which the contained organisms were captured.

<i>Thysanoessa gregaria.</i>	<i>Stylochiron Sukumii.</i>	<i>Stylochiron abbreviatum.</i>	<i>Katerythrops Oceanae.</i>	<i>Gnathophausia dreypanophora.</i>	<i>Eucopia australis.</i>
.....	1. 6 mm.	.....	.....	.....	.....
.....	2. 5 & 7 mm.	.....	.....	.....	.....
.....	1 l.	.....	.....	.....	.....
.....	2 l.	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	{ 8. 8 mm.	.....	.....	.....	.....
}	1 l.	}	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	{ 2. 6 mm.	.....	.....	.....	.....
.....	4 l.	.....	.....	.....	.....
.....	4 l.	.....	.....	.....	1. 33 mm.
.....	1. 7 mm.	.....	.....	.....	.....
1. 10 mm.	{ 1. 8 mm.	.....	.....	.....	.....
.....	2 l.	.....	.....	.....	.....
.....	2 l.	.....	.....	.....	.....
.....	{ 1. 6.5 mm.	.....	1. 6 mm.	.....	.....
.....	1 l.	.....	.....	.....	.....
.....	{ 1. 7 mm.	.....	.....	.....	.....
.....	1 l.	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	1 l.	.....	.....	1. 39 mm.	.....
.....	.....	.....	.....	.....	.....
3. 5-8 mm.	{ 9. 6-8 mm.	.....	.....	.....	1. 15 mm.
.....	1 l.	.....	.....	.....	.....
.....	{ 1. 6.5 mm.	.....	.....	.....	.....
.....	1 l.	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	{ 3. 4.5-6 mm.	.....	.....	.....	.....
.....	1 l.	.....	.....	.....	.....
.....	{ 1. 6 mm.	.....	.....	.....	.....
.....	1 l.	.....	.....	.....	.....
.....	{ 3. 6-8 mm.	.....	.....	.....	1. 12 mm.
.....	2 l.	.....	.....	.....	.....
.....	2 l.	1. 20 mm.	.....	.....	.....
3. 5-7 mm.	{ 4. 5-7 mm.	.....	.....	.....	.....
.....	2 l.	.....	.....	.....	.....
2. 7-8 mm.	1 l.	.....	.....	.....	.....
3. 7-8 mm.	2. 6 & 7 mm.	.....	.....	.....	1. 12 mm.
.....	.....	.....	.....	.....	.....
.....	1 l.	.....	.....	.....	.....
.....	1. 7 mm.	.....	.....	.....	.....
.....	{ 3. 6-7 mm.	.....	.....	.....	.....
2. 7 & 8 mm.	1 l.	.....	.....	.....	.....
.....	{ 3. 6-8 mm.	.....	.....	.....	.....
.....	3 l.	.....	1. 4 mm.	.....	.....
.....	.....	.....	.....	.....	.....

these forms in the upper strata. In the work of the 'Helga' the only net which has been found really efficient for their capture at or near the surface, even at night, has an opening of about 16 square feet (about eight times that of an ordinary ring tow-net), with a mesh of mosquito-netting or the largest size of grit-gauze, which permits of hauling at a speed which would burst fine bolting-silk.

The details of each haul in which Schizopods occurred, together with the total number and size of the examples taken, are set forth in the table (pp. 4-5).

#### *Euphausia pellucida*, Dana.

This species occurred in twenty-five out of thirty hauls in which Schizopods were taken. None of the specimens reached the full size of the species. The 'Oceana' collections first demonstrated the existence of *E. pellucida* in British waters. *E. bidentata*, Sars, is probably the name most strictly applicable to the North Atlantic form of *E. pellucida*.

#### *Meganyctiphanes norvegica* (M. Sars).

Only two specimens of this rather common form were taken by the 'Oceana.' They occurred in net 2*g* fishing from 650 fathoms to the surface. Station 2 was the station nearest land, and the absence of this species from the hauls at the more westerly stations suggests that the latter were beyond the most seaward limit of its distribution at the time. It is, however, an active form which might well avoid small tow-nets.

We have found this species common off the west coast of Ireland.

#### *Thysanoessa longicaudata* (Kröyer).

Synon. *T. tenera*, G. O. Sars.

This was by far the most abundant Schizopod taken by the 'Oceana' in point of numbers, though in the number of hauls in which it occurred it is surpassed by both *Euphausia pellucida* and *Stylocheiron Suhmii*. All the specimens were more or less badly damaged, and out of a total of 150 not one had a perfect leg of any kind left. It occurred in twenty out of thirty hauls, fishing from 500-1770 fathoms to the surface.

*Thysanoessa gregaria*?, G. O. Sars.

Specimens occurred in nine hauls, in nets fishing between 500–1700 fathoms and the surface. We have noted (*loc. cit.*) that the specimens diverge slightly from Sars's description of the type. Probably they will prove referable to Hansen's *T. parva*.

*Stylocheiron Suhmii*, G. O. Sars.

Synon. See Hansen, Bull. Mus. Ocean. Monaco, no. 30 (1905).

*S. Suhmii* occurred in twenty-five out of thirty hauls, in nets fishing between 270–1770 fathoms and the surface. It was one of the commonest Schizopods taken by Mr. Murray, who collected it in British waters for the first time. Several larvæ of this species in all stages of development were also captured during the cruise.

*Stylocheiron abbreviatum*, G. O. Sars.

Synon. *S. chelifer*, Chun.

A single male example of this species, measuring 20 mm., occurred in net 5 h, fishing from 1410 fathoms to the surface. This is much larger than Chun's specimens, which measured only 14 mm., but examples of nearly equal size were captured by Dr. Fowler in the Bay of Biscay.

*Katerythrops Oceanae*, H. & T.

This is one of the new species taken by the 'Oceana.' Descriptions and figures which have already appeared (H. & T. *loc. cit.*) are reproduced, and brief diagnoses of the genus and species are repeated below.

## KATERYTHROPS, H. &amp; T.

Characters of the pleopods in the adult male uncertain; pleopods of the female unknown. Other characters as in *Meterythrops*, S. I. Smith, except:—

*Antennal scale considerably reduced in length in proportion to peduncles of antenna and antennule, narrow and feeble, its outer margin naked, entire, terminating in a small spine, setæ few, confined to the apex and distal third (approximately) of the inner margin.*

*Telson possibly without the median setæ.*

*Katerythrops Oceanae*, H. & T. (Pl. I.)

*Form* robust. *Carapace* much wider than the pleon, almost entirely covering the thoracic segments; anterior margin obtusely rounded; cephalic region inflated and posteriorly defined by a well-marked cervical sulcus. *Pleon* with the last segment almost as long as the two preceding segments taken together. *Eyes* small, remote from each other, subpyriform, the proximal part the broader; visual area restricted to less than the distal half; cornea not so wide as the last joint of the antennular peduncle; pigment after preservation in formalin reddish buff. *Peduncle of antennule* at least a fifth longer than the last segment of the pleon, proportionally stout, its last joint about equal to the two preceding, beset dorsally between the insertions of the flagella with a bidentate tubercle, of which the denticles are nearly in the same dorso-ventral plane. *Antennal scale* very short, narrow, and somewhat outwardly curved; outer margin entire, naked, terminating in a feeble spine; apex produced considerably beyond the spine, subacute, setæ confined to the apex and to about the distal third of the inner margin; length of scale more than four times (about  $\frac{14}{3}$ ) the greatest width, slightly less than the combined length of the last two joints of the antennal peduncle, and but little exceeding the length of the last joint of the antennular peduncle. *Antennal peduncle* long and proportionally stout, combined length of the last two joints greater than that of the last joint of the antennular peduncle.

*Exopodites of the thoracic limbs* very well developed, with unusually large flagella. *Endopodites* of the first four pairs moderately long and stout; the tarsus in the third and fourth pairs consisting of three joints, and succeeded by a well-developed dactylus; setæ not more plumose than in *Parerythrops* &c. *Pleopods* of all five pairs biramous in the male, the inner ramus bifid. *Telson* subtriangular, shorter than the last segment of the pleon by about two sevenths of the length of the latter, its sides entire and slightly inflected; apex narrowly truncate, armed with two pairs of rather slender spines, of which the inner are considerably the longer and stouter; a median pair of setæ possibly present. *Outer uropod* the longer, its length including basal articulation slightly greater than the combined length of the fifth and sixth segments of the pleon. *Length* of the type specimen (an immature male) 6 mm., including antennular peduncles and uropods.

A single specimen of this species occurred in each of two hauls—6 *g*, fishing from 560 fathoms to the surface, and 4 *h*, fishing from 1470 fathoms to the surface. It is evidently one of the few known oceanic or strictly pelagic Mysids.

*Gnathophausia drepanephora*, H. & T.

This is the second of the new forms discovered by Mr. Murray. Descriptions and figures of this species have already appeared. The figure is reproduced and a brief diagnosis is given below. It belongs to a new section of the genus *Gnathophausia*, which may be described as follows:—

GENUS GNATHOPHAUSIA, Willemoes-Sulim.

(Trans. Linn. Soc. Lond. ser. 2, Zool. vol. i.)

Section 4\*.

Infero-posterior corners of carapace produced into a spine. Dorsal keel interrupted anteriorly. Supraorbital spine small. Antennal scale not jointed at apex. First thoracic legs with distinctly developed exopodites. Epimeral plates of last segment not united on the ventral face.

*Gnathophausia drepanephora*, H. & T. (Pl. II.)

*Form of body* slender. *Carapace* not very large; dorsal spine about as long as first segment of pleon; infero-posterior corners produced into a spine, bluntly serrulate on ventral edge, nearly reaching fourth segment of pleon; upper lateral keel present; dorsal keel unarmed; cervical sulcus rather distinct; rostrum elongate and slender, as long as the carapace without the infero-posterior spines, distinctly denticulate on all three edges; supraorbital and antennal spines well defined, but small. Branchiostegal projections of moderate proportions, but distinctly pointed. Anterior segments of *pleon* without dorsal spines; epimeral plates produced posteriorly into pointed lappets. *Eyes* very narrow, cornea scarcely at all expanded, pigment (as preserved in formol) rather pale brown. Outer flagellum of *antennule* in male expanded and flattened at the base, which is beset on the inner side with a brush-like fringe of fine curling setæ. *Antennal scale* of moderate size, about four times as long as broad, tapering distally and very obliquely truncate; inner angle produced into a sharp point, outer edge with (about) three denticulations distally. *Telson* large and massive,

\* In sequence to Sars's Sections 1-3.

with the terminal spines crescent-shaped and denticulate along the upper face; lateral margins armed for the usual distance with large spines, separated from each other by intervals occupied by a few smaller spines. *Uropods* shorter than telson; the proximal joint of outer uropod terminating externally in a spine about one fourth as long as distal joint. *Colour* red. *Length* 39 mm.

The only known specimen was taken in net 41, fished at 1770 fathoms and thence to the surface.

*Eucopeia australis*, Dana.

A single specimen was taken in each of four hauls, in nets working between 500–1710 fathoms and the surface. One of the examples measured 33 mm. in length, which is not, however, quite the full size of the species, since it is known to reach at least 50 mm.

Previous to the 'Oceana' cruise the only record of this species from near our coasts is one by Calman, who records its capture by the R. I. A. expedition in 1888 off the west coast of Ireland in 1020 fathoms. We have since recorded it from soundings of less than 1000 fathoms.

EXPLANATION OF THE PLATES.

PLATE I.

*Katerythrops Oceanae*, H. & T.

- Fig. 1.* Immature male. Dorsal view.  
*Fig. 2.* Immature male. Lateral view.  
*Fig. 3.* Antennal scale with peduncle.  
*Fig. 4.* Endopodite of the leg of the first pair.  
*Fig. 5.* Pleopod of the first pair, ventral view.  
*Fig. 6.* Telson.

PLATE II.

*Gnathophausia drepanephora*, H. & T.

- Fig. 1.* Male. Lateral view.  
*Fig. 2.* Base of antennular flagellum of male.  
*Fig. 3.* Antennal scale.

[The Plates are reproduced from the 'Report on the Sea and Inland Fisheries of Ireland,' pt. ii. Appendix iv., 1905.]

*Note added in Press.*—Hansen's Preliminary Report on the Schizopoda of the 'Princess Alice' appeared while this paper was in the press. In correcting proofs we have adopted his view of the synonymy of the species mentioned.

II.—*Descriptions of new Coleoptera of the Family Cetoniidae from British New Guinea.* By OLIVER E. JANSON, F.E.S.

THE Coleoptera recently brought home by Mr. A. Pratt and his son from British New Guinea mainly consisted of a very fine series of Cetoniidae, which I have been fortunate in obtaining. The collection was made on the ascent of the Owen Stanley range between Ekeikei (1500 feet) and Mafalu (8000 feet), chiefly in the vicinity of the village of Babooni, at an elevation of about 3600 feet. Besides the novelties now described the collection also contained the following species:—*Ischiopsopha gagatina*, Hell.; *Lomaptera lineæ*, Gest., *Anncæ*, Hell., *satanas*, Hell., *iridescens*, Hell., *fulvicornis*, Hell.; *Mycterophallus viridula*, Kz.; and several others at present undetermined. Prof. Dr. Heller has kindly verified the determination of several species for me by a comparison with his types in the Dresden Museum.

MOROKIA, gen. nov.

Gen. *Lomapteræ* affine. Corpus robustum, ovatum, valde convexum. Clypeus profunde incisus, lateribus elevatis. Thorax lateribus regulariter rotundatis, marginatis. Scutellum lobo postico thoracis haud obtectum, apice acuminatum. Elytra profunde punctato-sulcata. Pygidium transversum, depressum. Mesosterni processus valde productus, oblique directus, apice compressus, obtusus. Pedes breves, tibiis anticis in utroque sexu bidentatis.

*Morokia Meeki*, sp. n.

Nigra, nitida, capite punctato, prothorace lateribus crebre punctato: elytris in dorso profunde sex-sulcatis, sulcis catenato-punctatis, apice conjunctim rotundatis.

Long. 35-38 mm.; lat. 19-21 mm.

♂. Abdomine longitudinaliter sulcato, pygidio subter vix impresso.

♀. Pygidio subter late profunde impresso.

British New Guinea, Morok (*A. S. Anthony*); Upper Aroa River (*A. S. Meek*); Babooni (*A. E. Pratt*).

Of an ovate form, the body convex and strongly arched above, the thorax and head being much depressed, deep shiny black. Head not very closely punctured, slightly convex in the centre, side margins of the clypeus raised. Thorax

broadly rounded and margined at the sides, basal angles rounded and leaving the epimera largely exposed; basal lobe large, broadly rounded and slightly emarginate at its apex, sparsely punctured on the disk and much more coarsely so towards the sides; besides this punctuation the whole surface when examined under a lens is seen to be very densely and minutely punctured. Elytra narrowed behind and conjointly rounded at the apex, the apical sutural angles in some specimens a little rounded, the disk of each with six deep furrows bearing chain-like rows of coarse semicircular punctures, the interstices very convex and smooth, the sides with three rows of very coarse punctures merging into a coarse transverse strigosity towards the apex. Pygidium transverse, depressed, and coarsely strigose, the underside slightly impressed in the centre in the male, in the female rather more obtuse at the apex and with a large deep central impression on the underside. Beneath coarsely strigose and punctured at the sides; mesosternal process very large, obliquely divergent, slightly curved and almost vertical towards the apex, which is a little compressed and obtuse; in some specimens there is a more or less distinct tooth or keel on the inner edge near the apex. Legs short, femora strigose and lightly fringed with short black hairs; anterior tibiæ with two lateral teeth, which are more or less obsolete in the male, but large and very acute in the female.

I received a specimen of this remarkable and distinct insect some years back from Mr. Anthony, but considered it inadvisable to describe it as new upon a single example. Messrs. Meek and Pratt have since met with it sparingly. The strongly arched body, ovate form, deeply sulcate elytra, short legs, &c. will readily distinguish it from *Lomaptera*. In one female specimen the pygidium is only slightly impressed, as in the male.

*Lomaptera Pratti*, sp. n.

Viridis, nitida, capite subtus, coxis femoribusque anterioribus rufescentibus et rufo pilosis; prothorace lateribus punctatis; elytris seriatim punctatis et transverse strigosis, area basali fere lævi, in apice productis.

Long. 33-36 mm.

♂. Pygidio subter medio subplano, abdomine sulcato, tibiis anticis muticis.

♀. Pygidio subter profunde late impresso, tibiis anticis dente parvo armatis.



British New Guinea, Babooni (*A. E. Pratt*); Mount Victoria (*A. S. Anthony*).

Dark green, in some specimens more or less tinged with olivaceous; underside of the head with the palpi and antennæ, anterior coxæ and femora, intermediate coxæ, and in some specimens the hinder part of the prosternum rufous, tinged with green. Head finely punctured, and more sparsely so at the base; clypeus long, very deeply cleft, and without any raised margin. Thorax coarsely punctured at the sides, more finely and very sparsely punctured on the disk, strongly widened at the base, the basal angles being produced, depressed, and obtuse, the side margins rather strongly raised on the basal three fourths, the basal lobe long, narrow, and rounded at its apex. Elytra with two slightly indicated discal costæ and some rows of coarse punctures, which become obsolete towards the base and merge into the coarse transverse strigosity with which the apical half is closely covered; sides a little dilated at the shoulders, where the marginal line is deeply impressed, the apex rather strongly produced towards the suture and slightly emarginate at the sutural angle. Pygidium transverse, subconical, coarsely strigose, the underside a little flattened towards the apex in the male, and in the female with a large central depression, having a strongly raised semicircular apical border. Underside coarsely strigose and sparsely pubescent at the sides; mentum, prosternum, and anterior coxæ and femora with long rufous hairs; mesosternal process long, obliquely divergent, and sharply keeled on the underside near the apex; abdomen obliquely strigose, the fifth segment with very coarse setiferous punctures, and in the male with a strong central furrow; anterior tibia simple in the male, and with a slight subapical tooth in the female.

This fine species is very distinct from any with which I am acquainted, but from the description of *L. Beccari*, Gest., it would appear to be allied to that species. The colour is very similar to that of *L. virens* and *Latreillei*, but rather more metallic.

*Lomaptera lutea*, sp. n.

Lutea vel testacea, nitida, prothorace elytrisque opalino-iridescentibus; capite postice, prothorace macula magna M-formi, metasterno in parte mediana, femoribus apice, tibiis anticis et intermediis, posticis apice tarsisque omnibus nigris; abdomine

rufo-testaceo vel piceo; elytris transversim aciculatis, area basali fere lævi.

Long. 30-32 mm.

♂. Abdomine sulcato, pygidio depressiusculo, subconico, tibiis anticis simplicibus.

♀. Pygidio late producto, apice truncato, tibiis anticis ante apicem subdentatis.

British New Guinea, Upper Aroa River (*A. S. Meek*); Babooni (*A. E. Pratt*).

Very like *L. Annæ*, Hell., but smaller and of a narrower form, the colour and markings similar, but with a very distinct opalescent iridescence on the thorax and elytra; the head is very much more sparsely and finely punctured, especially towards the apex of the clypeus; the thorax is also less punctured and narrower at the base (the angles being less divergent); the elytra are a little emarginate at the apex, with the sutural angle slightly produced; the pygidium of the male is similar to that of *Annæ*, but in the female it is less produced than in that species, much broader and almost truncate at the apex; it is also more coarsely aciculated on the upperside and more deeply impressed on each side beneath. The male forceps of the two species are also very different.

The extent of the black markings varies considerably in the series before me; the margin of the clypeus and the basal portions of the sides of the thorax and elytra are generally narrowly edged with black, and in some specimens this narrow black edging also extends to the apical and basal margins of the thorax and the basal and sutural margins of the elytra; there is often a more or less distinct black spot on each side of the thorax and on the shoulders, and sometimes two small linear marks on the forehead; in several specimens there are rows of dark punctiform spots on the elytra. On the underside the black coloration frequently extends to the prosternum, coxæ, abdomen, and other parts, whilst the tibiæ in some are almost entirely black and in others only partially so.

Mr. Pratt obtained a rather large series of both this species and *Annæ*, the latter also showing considerable variation in the extent of the black markings.

#### *Lomaptera semicastanea*, Kz.

Besides a considerable series of the New Guinea form of this species named var. *pseudorufa* by Dr. Heller, there are

also in Mr. Pratt's collection several others differing so widely in coloration as to have the appearance of being distinct species; but upon careful examination I am unable to find any other characters to separate them, and must therefore treat them as varieties; and although I am generally opposed to the giving of distinctive names to mere varieties, I do so in this instance, as they are well-marked forms of which no intermediate variations connecting them occur in the collection.

Var. *signata*, nov.

Var. *pseudorufe* simillima, sed clypeo utrinque rufo-notato, prothorace macula magna **M**-formi nigra. ♂.

Var. *rufipennis*, nov.

Nigra, elytris rufis. ♂ ♀.

Var. *plagiata*, nov.

Nigra, elytris macula magna basali rufa. ♂ ♀.

Var. *unicolor*, nov.

Tota aterrima. ♂ ♀.

*Lomaptera rubens*, sp. n.

Nigra, nitida; prothorace (lateribus antice exceptis) elytrisque rufo-castaneis, subopalino-iridescentibus; corpore subtus femoribusque parce fulvo-pilosis; elytris transverse aciculatis, area basali remote punctata; tibiis anticis simplicibus.

Long. 30-32 mm.

♂. Pygidio subconico, depressiusculo, strigoso, abdomine late sulcato.

♀. Pygidio obtuse conico producto, subter impresso, lævi, in medio leviter carinato.

Babooni, British New Guinea (*A. E. Pratt*).

Allied to *L. rufa*, Kz.; very similar in coloration, but the thorax and elytra of a darker or more castaneous red; it is also larger and of a broader form; the clypeus is more dilated in front, making the apical lobes less acute; the thorax is proportionately broader at the base, rather sparsely punctured, and not strigose at the sides; the elytra are more strongly sinuate behind the shoulders and not so closely aciculate: the pygidium in the male is similar in form, but

more coarsely and less closely strigose; in the female it is more broadly rounded at the apex than in this sex of *rufa*, and is impressed and smooth on the underside, and with a slight but distinct narrow, longitudinal, central carina, becoming obsolete towards the apex: the mesosternal process is longer and more incurved, and the anterior tibiæ of both sexes are without any indication of lateral teeth.

From var. *pseudorufa*, Hell., which it is also like in coloration, it may be distinguished by the incurved mesosternal process, and the different structure of the pygidium and scarcely emarginate sixth abdominal segment in the female; the male forceps are also very distinct.

*Lomaptera pulchella*, sp. n.

Rufo-castanea, subviridescens, nitida; capite basibus et prothorace disco viridi-aneis; elytris flavo-virescentibus, sutura late viridimarginatis, transversim aciculatis, lateribus subinflexis; pygidio subconico. ♂ ♀.

Long. 19-21 mm.

Babooni, British New Guinea (*A. E. Pratt*).

Front of head and the clypeus, sides and front of thorax, pygidium, underside, antennæ, and legs brownish red, with a greenish reflection; base of head, the disk and a small spot on each side of the thorax, and the centre of the body beneath brassy green; elytra pale yellow, with a greenish reflection; a broad sutural band, commencing at the base and gradually narrowed to the apex, dark green; a small humeral spot and the anterior half of the extreme outer margin black. Head very closely punctured on the clypeus, more sparsely so between the eyes, and smooth at the base. Thorax very sparsely punctured on the disk, more coarsely and closely punctured towards the sides, and rugose near the margin; basal lobe large, almost impunctate, and slightly notched at its apex; lateral margins a little reflexed; the basal angles slightly produced and depressed. Elytra sparsely punctured at the base and in the scutellary region, the rest of their surface finely transversely aciculated, subcostate at the sides; the apex a little rounded, with the sutural angles very slightly produced and acute. Pygidium transverse, subconical, aciculated both above and below. Underside finely strigose and with rather sparse grey pubescence; mesosternal process long, almost cylindrical, a little curved and obtuse at the apex; apical margin of the sixth abdominal segment a

little sinuous. Legs strigose and punctured; femora fringed with long grey pubescence. In the female the pygidium is more produced and impressed on each side underneath, the fifth abdominal segment is more strongly punctured and pubescent, and the anterior tibiæ have a distinct subapical tooth which is not present in the male.

A small series of this pretty species was contained in Mr. Pratt's collection; in coloration it would seem to most nearly resemble *L. macrophylla*, Gest., a species only known to me by description; but the antennal club is of normal size in both sexes. In some specimens the elytra present rows of small dark punctiform spots and a greenish mark on the apical callosities.

*Lomaptera cupriceps*, sp. n.

Ænea vel viridi-metallica, iridescens; clypeo igneo-cupreo, apice rufo-piceo; elytris omnino transverse aciculatis; pygidio conico, supra non carinato; pedibus rufo-piceis, femoribus intermediis posticisque cupreis. ♂ ♀.

Long. 20–21 mm.

Upper Aroa River, British New Guinea (*A. S. Meek*).

Very like *L. pygmæa*, Kz., but with the clypeus more sparsely punctured, bright coppery red, and piceous towards the apex; the thorax more broadly rounded at the sides and more punctured on the disk; the elytra more finely aciculated and with the apical sutural angles in the male acute and a little more produced, and the mesosternal process rather smaller and less curved. The pygidium is nearly smooth and without any longitudinal carina on the upper side; in the female it is slightly laterally compressed and more pointed at the apex than in the male. The legs are reddish or piceous, with the four posterior femora coppery.

In *L. pygmæa*, of which I have a series from Goldie River, the female has a strong saw-tooth-shaped keel on the upper side of the pygidium.

*Trichaulax sericea*, sp. n.

Nigra, nitida, prothorace sericco-subopaca; elytris trisulcatis, sulcis marginibusque flavo-pilosis. ♂ ♀.

Long. 33–35 mm.

Babooni, British New Guinea (*A. E. Pratt*).

Very similar to *T. Macleayi*, Kz., but of a narrower form,  
*Ann. & Mag. N. Hist.* Ser. 7. Vol. xvi. 2

the head less shiny, the clypeus narrower and more parallel-sided and more closely and shallowly punctured; the thorax silky and subopaque and more sparsely punctured, the basal lobe narrower and more deeply emarginate; the scutellum distinctly narrower and more acutely produced at its apex; the hairs in the sulci and at the margins of the elytra longer and of a yellow colour; the pygidium only sparsely pilose at the base and apex; the underside is also more sparsely pubescent, and the centre of the abdomen is impunctate and entirely without hairs.

This genus has hitherto been known only from Australia, and it is interesting to find a species so closely allied from the mountains of New Guinea.

### III.—*A new Noctuid from Sierra Leone.*

By W. J. HOLLAND.

THROUGH the kindness of Mr. William Schaus, the Carnegie Museum in Pittsburgh has received a number of interesting African moths. One of these, representing a new genus and species, has been singled out because of its apparent rarity and rare beauty to bear as its specific designation the name of the donor of the collection.

I must thank Sir George F. Hampson for saving me the labour of preparing the following diagnoses of the genus and species. With that courtesy which marks all his intercourse with scientific men visiting the British Museum, he, knowing that my time was taken up with affairs of greater magnitude, such as the *Diplodocus*, kindly wrote the description both of the genus and the species and handed them to me to be employed in this paper.

#### NOCTUES.

#### QUADRIFINÆ.

#### AUCHENISA, gen. nov.

The genus is apparently near *Trisula*, and is characterized as follows:—

Proboscis fully developed; palpi obliquely upturned, rather short, thickly clothed with hair; frons smooth; eyes smooth; antennæ of the female bipectinate, with rather long

branches, the apical third simple, the basal joint with a large tuft of hair; head and thorax clothed with hair overlying the scales; the prothorax and metathorax with crests; tibiæ fringed with hair; abdomen with large spreading dorsal crests of hair on the first three segments. Fore wing with veins 3 and 5 from close to the angle of the cell; 6 from the upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hind wing with veins 3-4 from angle of the cell; 5 from above angle; 6-7 from angle; 8 anastomosing with the cell near the base only.



*Auchenisa Schausi*, sp. n.

♀. Head and thorax pale olive-green; palpi blackish at the sides; antennæ with the shaft whitish towards the base; the branches black, the tufts on the basal joint crimson; tegulæ tipped with crimson; patagia with black spots at base; prothorax with the crests black; metathorax with black spot; tibiæ with some black hair; tarsi blackish; abdomen whitish, dorsally tinged with olive-brown and with some fuscous in the dorsal crests and on the anal segment; there are two lateral series of small black spots. Fore wing olive-green, irrorated with white; some white at the base and two black spots; a subbasal black bar extends from the subcostal nervure to the submedian fold. There is a broad antemedial black band, irrorated with white, and with some green below the cell and above the inner margin. The edges of this band are irregularly defined by wavy white lines, the band expanding at the inner margin, and with a black bar beyond the outer white line; reniform green, irrorated with white, and with the black annulus defined by white, except above, upright oblong in shape, and with some diffused



black beyond its lower extremity; postmedial line strong, black, defined by white on the inner side, obliquely waved to vein 4, then incurved, dentate at veins 3 and 2 and strongly recurved to the inner margin, at costa expanding into a patch with some green upon it; there is an ill-defined, irregularly waved, white subterminal line, with somewhat dentate black spots beyond it, above and below veins 4 and 2; a terminal series of black spots defined by white, increasing in size towards tornus. Hind wing white, the terminal area suffused with fuscous, narrowing to a point near tornus; two waved greenish and black subterminal lines from vein 2 to above tornus; a terminal series of black spots slightly defined by white. Underside of fore wing fuscous brown, the inner area white; both wings with a round black discoidal spot, which on the fore wing is defined by whitish.

Expanse 90 mm.

*Hab.* Sierra Leone (*Clements*). Type in the Carnegie Museum, Pittsburgh, U.S.A.

IV.—*A new Genus and Species of Cynipidæ from South Africa, representing a new Subfamily.* By P. CAMERON.

PYCNOSTIGMUS, gen. nov.

♀. Fore wings with a subcostal nervure ending in a thick, pyriform, large, horny stigma, more than twice longer than thick counting from the costa to the hinder part of the wing, and slightly narrowed and rounded behind; shortly beyond the middle an oblique transverse nervure runs from shortly below the middle to the subcostal nervure. Hind wings with a subcostal nervure extending from the base to shortly beyond the middle; its apex is distinctly thickened. Antennæ 18-jointed, not much thickened towards the apex. Second abdominal segment very large, the apical ones short, the fourth shorter than the others. Ovipositor straight, slightly projecting. Malar space large, longer than the eyes, which are placed on the top, are apparently bare and parallel. Clypeus not separated from the face in the middle, its sides above bordered by a large deep fovea; the apex of the clypeus (or it may be the labrum) is narrowed, hollowed, transverse, with the sides rounded. Parapsidal furrows complete, deep. Scutellum large, rugose, gradually roundly narrowed towards the apex, where there are two foveæ or depressions; at its base are two large foveæ; the mesonotum is separated from



it by a transverse furrow. Head and thorax shining, sparsely punctured and haired.

The legs are moderately long and stout; the hind coxæ are about three times longer than wide; the fore calcaria curved, slender, simple. The hypopygium is large, but does not project much; above it is a short stumpy projection—the apex, apparently, of the penultimate segment. The abdomen is sessile, the basal segment being very short and smooth.

The species on which *Pycnostigmusinae* is founded cannot well be placed in any of the subfamilies hitherto recognized. The alar structure is very peculiar; there is neither radius nor cubitus, the place of these being taken by the large horny pyriform stigma, or stigmal branch (if that is a more appropriate term). This character, with the larger number of antennal joints, should readily separate it from the *Figitinae* and *Eucœlinae*, with which it is otherwise most nearly allied. There is no known Hymenopteron with such a peculiar horny structure on the wings.

*Pycnostigmus rostratus*, sp. n.

Black, shining, the knees testaceous; the head, antennæ, and legs thickly covered with white pubescence; wings hyaline, the nervures testaceous, the stigma darker, more piceous in tint. Face with scattered punctures in the centre, the sides aciculated; clypeus smooth and shining. Pronotum finely rugose, the apex with pitted punctures; the mesonotum with scattered shallow punctures. Scutellum coarsely, irregularly, rugosely punctured. Metanotum with two stout keels in the centre, which is irregularly transversely striated; the apical half on either side of these stoutly obliquely striated, almost reticulated. Propleuræ above coarsely rugosely punctured; the lower part, especially at the base, striated. Base and lower part of mesopleuræ irregularly punctured-striated, the rest smooth and shining. Metapleuræ coarsely aciculated and irregularly striated. Abdomen smooth and shining. Wings hyaline, iridescent; the apex ciliated. ♀.

Length 3 mm.

Cape Town, September (South African Museum).

The antennæ are as long as the body, are not much thickened towards the apex; the pedicle is twice longer than broad; the third and fourth joints are about equal in length; the last is conical and twice the length of the penultimate. Cheeks margined. The eyes appear to be slightly hairy; they are probably rubbed.

V.—*Rhynchotal Notes*.—XXXIII. By W. L. DISTANT.

Fam. Cicadidæ (continued from vol. xv. p. 486).

Subfam. *TIBICININÆ* (continued).Division *TIBICINARIA*.

In this division the abdomen is more or less cylindrical and attenuated posteriorly; anal appendages usually very prolonged and prominent, their lower plate, as a rule, more longly porrect than their upper one; pronotum generally more or less distinctly narrowed anteriorly\* ; tegmina somewhat talc-like and obscurely wrinkled, their greatest breadth always more than one third of their length, both tegmina and wings always prominently sanguineous or reddish ochraceous at base.

The genera in this division are of a very homogeneous character and possess a common facies.

*Synopsis of Genera.*

- A. Pronotum about as long as head.
- a. Head (including eyes) about as broad as base of mesonotum.
  - b. Head (including eyes) as broad or broader than length of mesonotum (including cruciform elevation).
  - c. Front of head shorter than vertex . . . . . *Tibicina*.
  - aa. Head (including eyes) considerably narrower than base of mesonotum.
  - bb. Head (including eyes) equal or almost equal in breadth to length of mesonotum (including cruciform elevation).
  - cc. Front of head shorter than vertex, its apex more or less emarginate.
  - d. Basal cell of tegmina about or almost twice as long as broad . . . . . *Okavagana*.
  - ccc. Front of head almost as long as vertex, its apex not emarginate.
  - dd. Basal cell of tegmina but little longer than broad. . . . . *Ahomana*.
- B. Pronotum much longer than broad. . . . . *Pahuria*.

Genus *TIBICINA*.*Tibicina*, Amyot, Ann. Soc. Ent. Fr. 1847, pp. 154 & 350.Type, *T. hæmatodes*, Scop. (*Cicada*).

\* Except in *Tibicina septemdecim*, a species which possesses several aberrant characters.

*Tibicina chinensis*, sp. n.

♀. Body and legs black, somewhat thickly greyish pilose; lateral margins of face, longitudinal fasciæ to femora, apical areas of tibiæ, margins of acetabulæ, apices of coxæ, abdominal segmental margins beneath, and the same confined to lateral areas above, testaceous; a central, basal, indented spot to head, two central longitudinal spots to pronotum, two discal spots to mesonotum, and the cruciform elevation (excluding centre) dull ochraceous; tegmina and wings hyaline, their extreme bases testaceous, venation fuscous, tegmina with the costal membrane testaceous, the claval area sanguineous; wings with the claval area and margins of anal area fuscous; head about as broad as base of mesonotum; lateral pronotal margins distinctly concavely sinuate; rostrum reaching the intermediate coxæ.

Long., excl. tegm., ♀ 25 mm.; exp. tegm. 62 mm.

*Hab.* N. China: Ta-chien-lu (Brit. Mus.).

This description is based on two female specimens; in one the transverse veins at the bases of second and third apical areas to tegmina are slightly infuscated, in the second specimen they are not.

## OKANAGANA, gen. nov.

Head (including eyes) considerably narrower than base of mesonotum and almost equal to its length (including cruciform elevation); front shorter than vertex, its apex more or less emarginate, vertex centrally sulcate; pronotum about as long as head, its anterior angles in a line with eyes, its posterior angles dilated; abdomen in male longer, in female about as long as space between apex of head and base of cruciform elevation; tympana completely exposed, tympanal coverings entirely absent; face more or less centrally sulcate; rostrum reaching the intermediate coxæ; opercula small, transverse; abdomen beneath with the lateral margins broadly recurved; tegmina and wings hyaline; tegmina with the basal cell, about or almost twice as long as broad, apical areas eight; wings with six apical areas.

Type, *O. rimosa*, Say (*Cicada*).

## AHOMANA, gen. nov.

Head (including eyes) considerably narrower than base of mesonotum and about equalling its length (including cruciform elevation), front of head slightly shorter than vertex, its apex not emarginate; pronotum about as long as head, its lateral

margins concavely sinuate; abdomen in male about as long as space between apex of head and base of cruciform elevation; tympana entirely exposed, tympanal coverings completely absent; opercula in male small, broad, transverse; tegmina and wings hyaline or semihyaline; tegmina with the basal cell broad, only a little longer than broad, apical areas eight; wings with six apical areas.

Type, *A. neotropicalis*, Dist.

*Ahomana neotropicalis*, sp. n.

Body above black, somewhat thickly greyishly pilose; head with a central fascia to front, pronotum with the anterior and posterior margins (narrowly) and the lateral margins (broadly), posterior margins of meso- and metasterna, and cruciform elevation (excluding anterior angles), ochraceous; body beneath piceous, thickly pilose; a central longitudinal fascia to face, rostrum, coxæ, and legs ochraceous; anterior and intermediate coxæ pale castaneous, their apices ochraceous; anterior tibiæ and tarsi, apices of intermediate tibiæ and the tarsi, piceous; tegmina and wings semihyaline, talc-like, the venation ochraceous; tegmina with the costal membrane ochraceous, the venation on apical area fuscous.

Long., excl. tegm., ♂ 19, ♀ 22 mm.; exp. tegm., ♂ ♀, 52-55 mm.

*Hab.* Peru: Callao (Brit. Mus.); Paraguay (Brit. Mus.).

*Ahomana chilensis*, sp. n.

♂. Body black; sternum, opercula, and legs ochraceous; abdomen finely greyishly pilose, sternum longly thickly pilose; apical areas of intermediate and posterior femora, posterior tibiæ (excluding bases and apices), and apical area of rostrum castaneous, intermediate tibiæ piceous, their bases ochraceous (anterior legs mutilated in specimen described); lateral margins of face ochraceous; head with a short longitudinal, basal, ochraceous fascia; pronotum with the lateral areas castaneous, its margins, a central longitudinal fascia, and two central basal spots ochraceous; mesonotum with two curved discal linear spots, a spot on each lateral area, and the cruciform elevation with two central spots and its anterior angles ochraceous; tegmina and wings semihyaline, venation ochraceous or fuscous, extreme bases of both ochraceous; tegmina with costal membrane and claval area ochraceous, the transverse veins at bases of second and third apical areas slightly infuscate.

Long., excl. tegm., ♂ 22 mm.; exp. tegm. 68 mm.

*Hab.* Chili (Reed, Brit. Mus.).

## PAHARIA, gen. nov.

Head moderately narrow, its breadth (including eyes) narrower than base of mesonotum and about equal to its length (including cruciform elevation), front prominent, as long as vertex; pronotum much longer than head, convex, laterally depressed, obliquely narrowed anteriorly, its posterior angles strongly lobately produced; mesonotum strongly deflected on each side; abdomen (♀) about as long as space between apex of head and base of cruciform elevation; tympana completely exposed, tympanal coverings entirely absent; abdomen beneath with the lateral margins strongly recurved and very prominent; anterior femora robust and strongly spined beneath; posterior tibiæ spined on each side for about half their length; rostrum reaching the intermediate coxæ; tegmina and wings talc-like in type, the first broad, with the apical areas somewhat short and eight in number, the basal cell about twice as long as broad, narrower at apex than at base; wings with six apical areas.

Type, *P. lacteipennis*, Walk. (*Cephaloays*).

My knowledge of this genus extends to three species, all represented by female specimens only.

## Division TAPHURARIA.

Eyes projecting beyond the anterior angles of the pronotum; pronotum subquadrate, not distinctly narrowed anteriorly, as (with few exceptions) in the Tibicinaria; abdomen about as long as space between apex of head and base of cruciform elevation\*; a more or less distinct posterior metasternal process visible in males between or at the base of the opercula.

*Synopsis of Genera.*

## A. Wings with six apical areas.

- a. Head (including eyes) about as broad as base of mesonotum.
- b. Head with front subprominent, in breadth about equal to length of lateral margins of vertex; space between eyes very much narrower than anterior margin of pronotum.
- c. Tegmina less than three times longer than broad.
- d. Tegmina with lower veins of radial and fourth ulnar areas at base widely separated.

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\* Except in *Malagasia* and *Kanakia*.

- e. Tegmina with transverse vein at base of second apical area oblique.
- f. Head with vertex longer than front; eyes normal ..... *Abrieta*.
- ee. Tegmina with transverse vein at base of second apical area vertical.
- ff. Head with front about as long as vertex; eyes oblique, their inner margins amplified and laminately produced inwardly ..... *Dorachosa*.
- dd. Tegmina with lower veins of radial and fourth ulnar areas at base contiguous, but not touching..... *Ueana*.
- cc. Tegmina long and slender, more than three times longer than broad ..... *Parnakalla*.
- bb. Head with front prominent, in breadth considerably narrower than lateral margins of vertex; space between eyes only slightly narrower than anterior margin of pronotum ..... *Burbunga*.
- au. Head (including eyes) broader than base of mesonotum.
- g. Tegmina with transverse vein at base of second apical area oblique.
- h. Front of head about as long as vertex, their margins continuous.
- i. Metasternum in male posteriorly, narrowly, subtriangularly produced between the opercula, and occupying basal space between them.
- j. Greatest breadth of tegmina about one third their length ..... *Trismarcha*.
- hh. Front of head slightly longer than vertex, their margins not continuous, but almost at right angles to each other.
- ii. Metasternum in male posteriorly, broadly, longly, convexly produced between the opercula, and occupying space between them.
- ii. Greatest breadth of tegmina more than one third their length ..... *Monomatapa*.
- iii. Metasternum in male not produced between the opercula ..... *Selymbria*.
- hhh. Front of head considerably shorter than vertex, their margins continuous.
- iii. Metasternum in male not posteriorly produced nor occupying space between opercula, which are small, wide apart, and not reaching basal abdominal segment.
- k. Abdomen beneath globose ..... *Malagasia*.
- kk. Abdomen beneath with the lateral marginal areas strongly recurved..... *Kanakia*.
- gg. Tegmina with transverse vein at base of second apical area nearly vertical.
- l. Tegmina with the first and second ulnar areas about as long as, or longer than, remaining ulnar areas.
- m. Head shorter than space between eyes.

- n. Front of head a little shorter than vertex, their margins continuous, the front not produced, and about, or nearly, twice broader than long ..... *Abroma*.
- nn. Front of head about as long or a little shorter than vertex, their margins discontinuous and almost at right angles to each other; the front prominent, not nearly twice as broad as long ..... *Lemuriana*.
- mm. Head about as long as space between eyes. *Taphura*.
- ll. First and second ulnar areas to tegmina shorter than remaining ulnar areas ..... *Ligymlpa*.
- B. Wings with five apical areas.
- o. Front of head about twice as broad as either lateral margin of vertex.
- p. Vertex and front of head strongly longitudinally sulcate; basal margin of face strongly transversely incrassate ..... *Auta*.
- oo. Front of head about as wide or little wider than length of either lateral margin of vertex.
- pp. Vertex and front of head not strongly longitudinally sulcate; basal margin of face not strongly incrassate ..... *Panka*.
- C. Wings with four apical areas ..... *Neleynnda*.

## Genus ABRICTA.

*Tibicen*, subgen. *Abricta*, Stål, Hem. Afr. iv. p. 26 (1866).

Type, *A. brunnea*, Fabr. (*Tettigonia*).

*Abricta castanea*, sp. n.

Body brownish ochraceous, with castaneous markings; head with the margins of front and the vertical area more or less castaneous; pronotum with the anterior and posterior margins and two central lines widely angulated at base castaneous (in some specimens the space included in these lines is wholly castaneous); mesonotum with two short central obconical and two long sublateral spots, and a large spot in front of cruciform elevation, castaneous; posterior margins of eyes black; face and space between face and eyes pale castaneous; sternum and opercula in male ochraceous; tegmina and wings hyaline, the venation ochraceous or brownish ochraceous; tegmina with the costal membrane and claval area ochraceous; wings with extreme base and base of anal area ochraceous.

Long., excl. tegm., ♂ 14-15 mm.; exp. tegm. 43 mm.

Hab. North Australia (*J. R. Elsey*, Brit. Mus.).

Allied to *A. Willsi*, Dist.; tegmina unspotted; opercula in male longer and much less transverse, &c.

*Abricta Burgessii*, sp. n.

Body and legs ochraceous; anal abdominal segment dark castaneous, its posterior margin ochraceous; head with a small spot on each lateral margin of front, inner margins of eyes, the area of the ocelli, four small anterior spots to pronotum (two central and two lateral), and the margins of two central obconical spots to mesonotum, piceous or black; the inner areas of the black-margined spots, a large oblong spot on each lateral area, and a triangular basal spot to mesonotum, brownish ochraceous; body above and beneath sparingly greyish pilose; two central fasciæ to face and a central line to clypeus castaneous; apices of tibiæ, tarsi, and rostrum more or less piceous; tegmina and wings hyaline, the venation ochraceous; tegmina with the costal membrane ochraceous and the transverse veins at the bases of the second and third apical areas slightly infuscate; opercula in male short, transverse.

Long., excl. tegm., ♂ 18-19 mm.; exp. tegm. 60 mm.

*Hab.* Queensland; Ripple Creek (*Mrs. Jane Burgess*, Brit. Mus.).

In general appearance and abdominal apical markings resembling *Ueana lfuana*, Montr., from which the widely separated lower veins of radial and fourth ulnar areas at once distinguish it.

## Genus DORACHOSA.

*Dorachosa*, Dist. Ann. & Mag. Nat. Hist. (6) x. p. 63 (1892).

Type, *D. explicata*, Dist.

## UEANA, gen. nov.

Head (including eyes) about as wide as base of mesonotum, the front subprominent, in breadth about equal to the length of lateral margins of vertex, space between eyes very much narrower than anterior margin of pronotum, lateral margins of front and vertex continuous; pronotum about as long as head, its lateral posterior angles ampliate; length of mesonotum (including cruciform elevation) less than breadth of head (including eyes); abdomen about as long as space between apex of head and base of cruciform elevation; tympana entirely exposed; opercula in male small, transverse; metasternum shortly posteriorly produced in the male between the opercula; anterior femora strongly spined beneath; tegmina and wings hyaline; tegmina with eight apical areas and the bases of the lower veins of radial and



fourth ulnar areas contiguous but not touching; wings with six apical areas.

Type, *U. lifuana*, Montr. (*Cicada*).

PARNKALLA, gen. nov.

Head as long as pronotum, including eyes about as wide as base of mesonotum, vertex longer than front; pronotum with the lateral margins nearly straight, the posterior lateral angles somewhat angularly dilated; mesonotum longer than pronotum; abdomen short, about as long as space between apex of head and base of cruciform elevation; tympana entirely exposed; face globose, transverse striations and longitudinal sulcation sometimes almost entirely absent or obsolete; anterior femora strongly spined beneath; opercula in male short and transverse; tegmina long and slender, more than three times longer than broad, apical areas eight, basal cell at least twice as long as broad; wings with six apical areas.

Type, *P. Mülleri*, Dist. (*Tibicen*).

BURBUNGA, gen. nov.

Head (including eyes) about as wide or very slightly wider than base of mesonotum, front of head conically prominent, its breadth at base very considerably narrower than the length of lateral margins of vertex, in length nearly as long or a little shorter than vertex, front and vertex together about as long as pronotum; pronotum with the lateral margins oblique, the posterior angle widely dilated; abdomen short, robust, about as long as space between apex of head and base of cruciform elevation; tympana entirely exposed, tympanal coverings absent, only denoted by a rudimentary convexity or ridge; anterior femora shortly or obsoletely spined beneath; opercula in male short, basal, transverse; posterior tibiæ strongly spined; rostrum reaching or just passing the posterior coxæ; face not sulcate; tegmina and wings hyaline; tegmina somewhat narrow, their greatest breadth about one third their length, apical areas eight, basal cell longer, but not twice as long as broad; wings with six apical areas.

Type, *B. Gilmorei*, Dist. (*Tibicen*).

*Burbunga inornata*, sp. n.

♂. Body brownish ochraceous, sternum and legs ochraceous; tegmina and wings hyaline, the venation ochraceous;

tegmina with the transverse veins at the bases of the apical areas, and small spots at apices of longitudinal veins to apical areas, obsoletely infusate; front of head narrow, prominent, and conical, space between eyes a little narrower than anterior margin of pronotum; rostrum passing the posterior coxæ; opercula short, transverse, their posterior margins moderately convex, their inner angles well separated.

Long., excl. tegm., ♂ 15 mm.; exp. tegm. 48 mm.

*Hab.* West Australia: Champion Bay (Brit. Mus.).

Allied to *B. Gilmorei*, Dist., but with the front of head more prominent, rostrum a little longer, and much paler in hue and markings.

#### Genus TRISMARCHIA.

*Trismarcha*, Karsch, Ent. Nachr. xvii. pp. 348, 349 (1891).

Type, *T. umbrosa*, Karsch.

#### *Trismarcha atrata*, sp. n.

Pronotum castaneous; head, a central longitudinal fascia (much widened posteriorly) to pronotum, mesonotum, and abdomen above, piceous; a marginal spot at anterior angles of vertex of head, posterior margin of pronotum, spots to cruciform elevation, and lateral areas of metanotum, ochraceous; body beneath brownish ochraceous; face, area between face and eyes, apex of rostrum, tarsi, lateral margins and a central longitudinal fascia to abdomen beneath, piceous or black; tegmina and wings subhyaline, talc-like, venation fuscous; costal membrane to tegmina and basal anal area to wings fuscous brown.

Long., excl. tegm., ♂ 23 mm.; exp. tegm. 65 mm.

*Hab.* Congo (Coll. Dist. and Paris Mus.).

Allied to *T. umbrosa*, Karsch, but smaller; opercula in male shorter and narrower, abdomen much more slender, transverse vein at base of second apical area to tegmina more vertical, and at fourth area much shorter.

#### *Trismarcha angolensis*, sp. n.

♂. Body and legs pale castaneous brown, ochraceously pilose; mesonotum with two obscure ochraceously margined anterior obconical spots; abdomen beneath with the disk piceous; tegmina and wings smoky hyaline, the venation fuscous brown; tegmina with the costal membrane pale castaneous brown; head (including eyes) a little wider than anterior margin of pronotum and about as wide as base of

mesonotum; basal joint of abdomen above centrally, longly, anteriorly produced; rostrum reaching the posterior coxæ; front of head considerably shorter than vertex, their lateral margins continuous, front centrally sulcate; anterior femora armed with three strong spines beneath; opercula obliquely transverse, narrow, inwardly convex, widely separated.

Long., excl. tegm., ♂ 20 mm.; exp. tegm. 62 mm.

*Hab.* Angola (*Dr. Welwitsch*, Brit. Mus.).

Allied to *T. excludens*, Walk., but with the basal abdominal segment more anteriorly produced, pronotum more compressed and narrower, &c.

#### Genus MONOMATAPA.

*Monomatapa*, Dist. Ann. & Mag. Nat. Hist. (6) xix. p. 129 (1897).

Type, *M. insignis*, Dist.

#### *Monomatapa socotrana*, sp. n.

♂. Body above testaceous brown, greyishly pilose; head black, pronotum with a central hour-glass-shaped fascia (on each side of which are two short oblique fasciæ), the incisures and lateral margins black; mesonotum with four obconical black spots (the two central ones shortest), and two black spots in front of cruciform elevation; metanotum and anterior and lateral margins of basal abdominal segment black; body beneath pale dull ochraceous; central disk of face, space between face and eyes, apex of rostrum, femoral streaks, and anterior and intermediate tibiæ and tarsi, piceous or black; tegmina and wings semihyaline, talc-like, the venation fuscous; opercula not passing basal segment of abdomen; rostrum reaching posterior coxæ.

Long., excl. tegm., ♂ 16 mm.; exp. tegm. 50 mm.

*Hab.* Socotra (*I. B. Balfour*, Brit. Mus.).

#### Genus SELYMBRIA.

*Selymbria*, Stål, Ann. Soc. Ent. Fr. (4) i. p. 615 (1861).

Type, *S. stigmatica*, Germ. (*Cicada*).

#### Genus MALAGASIA.

*Malagasia*, Dist. Trans. Ent. Soc. Lond. 1882, p. 336.

*Epora*, Stål, Hem. Afr. iv. p. 41 (1861), nom. præocc.

Type, *M. inflata*, Dist.

*Malagasia virescens*, sp. n.

♂. Body and legs pale virescent; head with some black shadings at the area of the ocelli and a short transverse line at inner margins of eyes black; tarsi fulvous brown; tegmina and wings pale hyaline, the venation virescent or fuscous; costal membrane and extreme base of tegmina and extreme base of wings fulvous brown.

Long., excl. tegm., ♂ 18 mm.; exp. tegm. 60 mm.

*Hab.* Madagascar (*Sikora*).

Allied to *M. Distanti*, Karsch, from which it differs by its totally different colour and markings and by the much greater length of the second ulnar area.

## Genus KANAKIA.

*Kanakia*, Dist. Ann. & Mag. Nat. Hist. (6) x. p. 62 (1892).

Type, *K. typica*, Dist.

## Genus ABROMA.

*Tibicen*, subgen. *Abroma*, Stål, Hem. Afr. iv. p. 27 (1866).

Type, *A. Guerini*, Sign. (*Cicada*).

*Abroma Bowringi*, sp. n.

♀. Head and pronotum pale castaneous brown; head with the margins of front and nearly the whole of vertex piceous; pronotum with the margins and a central longitudinal fascia pale ochraceous; mesonotum ochraceous, with four obconical piceous spots, the two central ones smallest; abdomen above and body beneath and legs dull ochraceous; face pale castaneous, centrally and laterally ochraceous, between face and eyes piceous; tegmina and wings hyaline, venation ochraceous or brownish ochraceous, extreme bases of both testaceous; tegmina with the costal membrane and postcostal area ochraceous; body sparingly and finely greyish pilose; rostrum reaching the intermediate coxæ; head (including eyes) slightly broader than base of mesonotum; transverse vein at base of second apical area to tegmina more or less vertical.

Long., excl. tegm., ♀ 13 mm.; exp. tegm. 35 mm.

*Hab.* China: Hong Kong (*J. C. Bowring*, Brit. Mus.).

## LEMURIANA, gen. nov.

Head (including eyes) broader than base of mesonotum; head with the front prominent, not twice as broad as long,

about as long or a little shorter than vertex, its margins and those of vertex discontinuous, eyes projecting beyond the anterior angles of pronotum, which is about as long as head, its lateral margins sinuate, its posterior angles moderately ampliate; mesonotum (including cruciform elevation) nearly as long as head and pronotum together; abdomen about as long as space between apex of head and base of cruciform elevation; tympana entirely exposed; opercula in male short, narrow, transverse; posterior metasternal process distinct, in male, produced between the inner angles of the opercula; anterior femora strongly spined beneath; tegmina and wings hyaline; tegmina with the two upper ulnar areas as long as the remaining ulnar areas, apical areas eight; wings with six apical areas.

Type, *L. apicalis*, Germ. (*Cicada*).

*Lemuriana flavocostata*, sp. n.

♂. Body above brownish ochraceous, ochraceously pilose; head with centre and apex of front, area of ocelli, and lateral margins of vertex black; pronotum with a very large castaneous spot occupying the whole of each lateral area and with a small, central, elongate, black spot; mesonotum with two obscure, ochraceously margined, anterior, obconical spots and two somewhat suffused, discal, black spots; abdominal segmental margins piceous; body beneath and legs ochraceous; sternum longly greyishly pilose; face and space between face and eyes castaneous, central area of face, and an anterior fascia between face and eyes, black; apex of rostrum and central segmental ventral spots piceous; opercula moderately long and broadened posteriorly; rostrum reaching posterior coxæ; tegmina and wings semihyaline, talc-like; tegmina with the venation fuscous, the costal membrane flavescent; wings with the venation dull ochraceous.

Long., excl. tegm., ♂ 15 mm.; exp. tegm. 48 mm.

Hab. Brit. East Africa: Voi (*C. S. Betton*, Brit. Mus.).

*Lemuriana Sikora*, sp. n.

Body castaneous; head with the anterior angles of vertex, area of ocelli, and inner and posterior margins of eyes, pronotum with two spots on anterior and three transverse spots on posterior margin, mesonotum with four obconical spots (those on each lateral area longest, subsclerite), a posterior lateral streak, and two spots in front of cruciform elevation, black; abdomen with the segmental margins black, broadest

at base and apex; body beneath paler castaneous than above; sternum, opercula, and legs ochraceous; a broad, central, longitudinal fascia to face and a central fascia to abdomen, black; tegmina and wings hyaline, venation fuscous; tegmina with the costal membrane and claval area olivaceous; wings with the inner anal area dark olivaceous; abdomen above with a greyish pilose spot on each lateral area of the first and second segments.

Long., excl. tegm., ♂ 19 mm.; exp. tegm. 58 mm.

Hab. Madagascar (*Sikora*).

#### Genus TAPHURA.

*Taphura*, Stål, Rio Jan. Hem. ii. p. 20 (1858).

Type, *T. misella*, Stål (*Cicada*).

#### Genus LIGYMBOLPA.

*Ligympolpa*, Karsch, Berl. ent. Zeit. xxxv. pp. 112 & 122 (1890).

Type, *L. madegassa*, Karsch.

#### Genus AUTA.

*Auta*, Dist. Ann. Mus. Civ. Genov. (2<sup>a</sup>) xvii. p. 381 (1897).

Type, *A. insignis*, Dist.

#### PANKA, gen. nov.

Head (including eyes) about as wide or a little wider than base of mesonotum, its length not equal to breadth between the inner margins of eyes; pronotum longer than head, its lateral margins nearly straight, its posterior lateral angles subdentately produced; abdomen in female a little longer than space between apex of head and base of cruciform elevation; anterior femora strongly spined beneath; tegmina and wings hyaline; tegmina with eight, wings with five apical areas.

Type, *P. simulata*, Dist.

The above generic description is based on two female specimens; the venation of the wings is a primary character; the characters of the opercula and other abdominal structures can only be detailed when male specimens are examined.

#### *Panka simulata*, sp. n.

*Tibicen nubifurca*, Dist. (excl. syn.) Mon. Orient. Cicad. p. 131, tab. xiv. fig. 24 a, b (1892).

Hab. Ceylon.

On examination of Walker's type (*Cicada nubifurca*, Walk., = *Cicada apicalis*, Kirby) I find that the wings have six apical areas, and it should be included in the genus *Abroma*, Stål. The species which I figured (*supra*) as *T. nubifurca*, and which so closely simulates that species, therefore requires renaming.

*Panka africana*, sp. n.

♂. Body testaceous; front of head, pronotum (excluding anterior and posterior margins and a central longitudinal fascia), tympana, apex of abdomen (above and beneath), face, legs, and opercula, ochraceous; two anterior obconical spots to mesonotum, a central longitudinal line to face, and apices of tibiæ and tarsi, dark testaceous; eyes and lateral margins to vertex of head piceous; tegmina and wings hyaline, venation mostly fuscous; tegmina with the costal membrane ochraceous, claval area purplish; wings with the margins of the anal areas faintly fuscous.

Long., excl. tegm., ♂ 10; exp. tegm. 30 mm.

Hab. West Africa: Fernando Po (*Conradt*, Paris Mus.).

Genus NELCYNDA.

*Tibicen*, subgen. *Nelcynda*, Stål, Cefv. Vet.-Ak. Förh. 1870, p. 716.

Type, *N. tener*, Stål.

*Nelcynda madagascariensis*, sp. n.

♀. Brownish ochraceous; head with the lateral margins of front, a transverse line between eyes and traversing the area of the ocelli, inner margins of eyes, and two small basal spots, black; pronotum with two central longitudinal spots on anterior area, two central, elongate, oblique spots on posterior area, some spots on lateral areas, and the lateral margins, black; mesonotum with two small, central, anterior, obconical spots, a sublateral fascia on each side, two spots in front of and a transverse spot on each side of cruciform elevation, black; two central fasciæ to face, which are united posteriorly, a spot between face and eyes, lateral margins of clypeus, streaks to femora, and apices of tibiæ and rostrum, piceous or black; tegmina and wings hyaline, the venation fuscous; costal membrane to tegmina testaceous; wings with four apical areas.

Long., excl. tegm., ♀ 10 mm.; exp. tegm. 30 mm.

Hab. Madagascar: Fencrive (*E. Perrot*, Paris Mus.).

VI.—*A List of the Freshwater Fishes of Africa.*

By G. A. BOULENGER, F.R.S.

So many additions have been made to the African freshwater fish-fauna during the last few years, over 400 new species having been described by myself, that a full list, with a brief indication of the habitats, seems worthy of publication. This list is intended to serve as a basis for a general account of the distribution of these fishes which I am now preparing for the South African Meeting of the British Association.

In order to save space bibliographical references have been omitted; the indication of the author for each genus and species, coupled with the year of publication, should, with the help of the British Museum Catalogue and the series of volumes of the 'Zoological Record' (from 1864), suffice to meet the requirements of the student.

Merely estuarine forms are excluded from this list.

Species occurring both in the sea and in fresh water are marked with an asterisk after the indication of the habitat.

## Ord. I. PLAGIOSTOMI.

## Fam. 1. CARCHARIDÆ.

1. *Carcharias*, Cuv. 1817.  
     1. *zambesensis*, Peters, 1852. Zambesi.

## Fam. 2. PRISTIDÆ.

1. *Pristis*, Latham, 1794.  
     1. *Perroteti*, M. & H. 1838. East Coast\*.

## Ord. II. CROSSOPTERYGII.

## Fam. POLYPTERIDÆ.

1. *Polypterus*, Geoffr. 1802.  
     1. *bichir*, Geoffr. 1802. Nile, L. Chad.  
     2. *Lapradii*, Stdr. 1869. Senegal, Gambia, Niger.  
     3. *congius*, Blgr. 1898. Congo, L. Tanganyika.  
     4. *Endlicheri*, Heck. 1849. White Nile, Niger.  
     5. *Delhezi*, Blgr. 1899. Congo, L. Chad.  
     6. *ornatipinnis*, Blgr. 1902. Congo.  
     7. *Weeksii*, Blgr. 1898. Congo, Katanga.  
     8. *senegalus*, Cuv. 1829. Nile, L. Rudolf, Senegal, Gambia, Niger.  
     9. *palmas*, Ayres, 1850. Liberia, Congo.  
     10. *retropinnis*, Vaill. 1899. Congo.  
     2. *Calamichthys*, J. A. Smith, 1866.  
         1. *calabaricus*, J. A. Smith, 1866. Niger Delta to Chiloango.



## Ord. III. DIPNEUSTI.

## Fam. LEPIDOSIRENIDÆ.

1. *Protopterus*, Ow. 1839.
  1. *annectens*, Ow. 1839. Senegal, Gambia, Niger, L. Chad, Zambesi.
  2. *æthiopicus*, Heck. 1851. White Nile to Great Lakes, Ugalla Marshes, E. of L. Tanganyika.
  3. *Dolloi*, Blgr. 1900. Ogowe, Congo.

## Ord. IV. TELEOSTEI.

## Subord. I. MALACOPTERYGII.

## Fam. 1. ELOPIDÆ.

1. *Elops*, L. 1766.
  1. *saurus*, L. 1766. E. and W. Coasts, Madagascar\*.
  2. *lacerta*, C. & V. 1846. W. Coast\*.
2. *Megalops*, Lacep. 1803.
  1. *cyprinoides*, Brouss. 1782. E. Coast, Madagascar\*.

## Fam. 2. MORMYRIDÆ.

1. *Mormyrops*, J. Müll. 1843.
  1. *deliciosus*, Leach, 1810. Senegal to Congo, Zambesi, Webi Shebeli, Juba, L. Nyassa.
  2. *anguilloides*, L. 1766. Lower Nile.
  3. *longiceps*, Gthr. 1867. Gold Coast.
  4. *breviceps*, Stdr. 1894. St. Paul R. (Liberia).
  5. *zancirostris*, Gthr. 1867. Gaboon, Ogowe.
  6. *engystoma*, Blgr. 1898. Congo.
  7. *parvus*, Blgr. 1899. "
  8. *Masuianus*, Blgr. 1898. "
  9. *sirenoides*, Blgr. 1898. "
  10. *Boulengeri*, Pellegr. 1900. "
  11. *curtus*, Blgr. 1899. "
  12. *lineolatus*, Blgr. 1898. "
  13. *nigricans*, Blgr. 1899. "
  14. *microstoma*, Blgr. 1898. "
  15. *Mariae*, Schilth. 1891. "
  16. *attenuatus*, Blgr. 1898. "
  17. *furcidens*, Pellegr. 1900. "
2. *Petrocephalus*, Marcus. 1854.
  1. *banc*, Lacep. 1803. Nile, L. Chad, Niger.
  2. *Ansorgii*, Blgr. 1902. Lower Niger.
  3. *Sauvagi*, Blgr. 1887. Old Calabar to Congo.
  4. *Keatingii*, Blgr. 1901. White Nile.
  5. *Bovei*, C. & V. 1846. Nile, Senegal, Gambia.
  6. *Ballayi*, Sauv. 1883. Ogowe, Congo.
  7. *simus*, Sauv. 1878. Liberia to Cameroon, Ogowe, Congo, Angola, Juba.
  8. *gliroides*, Vincig. 1897. Rovuma, L. Nyassa.
  9. *catostoma*, Gthr. 1866. "
3. *Isichthys*, Gill, 1863.
  1. *Henryi*, Gill, 1863. Liberia to Mayumba.
4. *Marcusenius*, Gill, 1863.
  1. *Marchii*, Sauv. 1878. Ogowe.

4. *Marcusenius* (con.).

- |  |                              |
|--|------------------------------|
| 2. <i>sphecodes</i> , Sauv. 1878.        | S. Cameroon to Congo.        |
| 3. <i>bruchistius</i> , Gill, 1863.      | Sierra Leone to Congo.       |
| 4. <i>longianalis</i> , Blgr. 1901.      | Lower Niger.                 |
| 5. <i>Kingsleyæ</i> , Gthr. 1896.        | Old Calabar, Congo.          |
| 6. <i>Cabræ</i> , Blgr. 1900.            | Mayumba.                     |
| 7. <i>adpersus</i> , Gthr. 1866.         | Lagos, Congo.                |
| 8. <i>nigripinnis</i> , Blgr. 1899.      | Congo.                       |
| 9. <i>pulverulentus</i> , Blgr. 1899.    | "                            |
| 10. <i>Lhuysii</i> , Stdr. 1870.         | Senegal, L. Chad.            |
| 11. <i>Ansorgii</i> , Blgr. 1905.        | Angola.                      |
| 12. <i>Isidori</i> , C. & V. 1846.       | Nile.                        |
| 13. <i>pauciradiatus</i> , Stdr. 1866.   | Angola.                      |
| 14. <i>Harringtoni</i> , Blgr. 1905.     | White Nile.                  |
| 15. <i>Weeksii</i> , Blgr. 1902.         | Congo.                       |
| 16. <i>playiostoma</i> , Blgr. 1898.     | "                            |
| 17. <i>tumifrons</i> , Blgr. 1902.       | "                            |
| 18. <i>Wilverthi</i> , Blgr. 1898.       | "                            |
| 19. <i>discorhynchus</i> , Peters, 1852. | Zambesi, L. Nyassa.          |
| 20. <i>Petherici</i> , Blgr. 1898.       | White Nile, Blue Nile.       |
| 21. <i>Budgetti</i> , Blgr. 1904.        | Lower Niger.                 |
| 22. <i>psittacus</i> , Blgr. 1897.       | Congo.                       |
| 5. <i>Stomatorhinus</i> , Blgr. 1898.    |                              |
| 1. <i>puncticulatus</i> , Blgr. 1899.    | Congo.                       |
| 2. <i>Walkeri</i> , Gthr. 1867.          | Ogowe.                       |
| 3. <i>humilior</i> , Blgr. 1899.         | Congo.                       |
| 4. <i>Corneti</i> , Blgr. 1899.          | "                            |
| 5. <i>polylepis</i> , Blgr. 1899.        | "                            |
| 6. <i>microps</i> , Blgr. 1898.          | "                            |
| 6. <i>Myomyrus</i> , Blgr. 1898.         |                              |
| 1. <i>macrodon</i> , Blgr. 1898.         | Congo.                       |
| 7. <i>Gnathonemus</i> , Gill, 1863.      |                              |
| 1. <i>niger</i> , Gthr. 1866.            | Gambia.                      |
| 2. <i>leopoldianus</i> , Blgr. 1899.     | Congo.                       |
| 3. <i>Bentleyi</i> , Blgr. 1897.         | "                            |
| 4. <i>Friteli</i> , Pellegr. 1904.       | "                            |
| 5. <i>Livingstonii</i> , Blgr. 1898.     | Rovuma.                      |
| 6. <i>macrolepidotus</i> , Peters, 1852. | Zambesi, Katunga.            |
| 7. <i>Moorii</i> , Gthr. 1867.           | S. Cameroon to Congo.        |
| 8. <i>Lambouri</i> , Pellegr. 1904.      | Congo.                       |
| 9. <i>fuscus</i> , Pellegr. 1901.        | "                            |
| 10. <i>pictus</i> , Marcus. 1864.        | Upper Nile, White Nile.      |
| 11. <i>Schilthuisiæ</i> , Blgr. 1899.    | Congo.                       |
| 12. <i>cyprinoides</i> , L. 1766.        | Nile, L. Chad, Niger, Congo. |
| 13. <i>senegalensis</i> , Stdr. 1870.    | Senegal, Gambia, L. Chad.    |
| 14. <i>Brueyerii</i> , Pellegr. 1904.    | Ivory Coast.                 |
| 15. <i>angolensis</i> , Blgr. 1905.      | Angola.                      |
| 16. <i>Stanleyanus</i> , Blgr. 1897.     | Congo.                       |
| 17. <i>mento</i> , Blgr. 1890.           | Liberia, Gaboon.             |
| 18. <i>Monteiri</i> , Gthr. 1873.        | Congo.                       |
| 19. <i>Petersii</i> , Gthr. 1862.        | Niger, Calabar, Congo.       |
| 20. <i>longibarbis</i> , Hilg. 1888.     | L. Victoria.                 |
| 21. <i>Gilli</i> , Blgr. 1904.           | Lower Niger.                 |
| 22. <i>Ussheri</i> , Gthr. 1867.         | Liberia, Gold Coast.         |
| 23. <i>Abadii</i> , Blgr. 1901.          | Upper Niger.                 |
| 24. <i>Greshoffi</i> , Schilth. 1891.    | Congo.                       |
| 25. <i>kutuensis</i> , Blgr. 1899.       | "                            |
| 26. <i>tamandua</i> , Gthr. 1864.        | Niger, Calabar, Congo.       |

7. *Gnathonemus* (con.).  
 27. *mirus*, Blgr. 1898. Congo.  
 28. *elephas*, Blgr. 1898. L. Chad, Congo.  
 29. *rhynchophorus*, Blgr. 1898. Congo.  
 30. *curvirostris*, Blgr. 1898. "  
 31. *ibis*, Blgr. 1902. "  
 32. *numenius*, Blgr. 1898. "  
 8. *Genyomyrus*, Blgr. 1898.  
 1. *Donnyi*, Blgr. 1898. Congo.  
 9. *Mormyrus*, L. 1766.  
 1. *Hasselquistii*, C. & V. 1846. Nile.  
 2. *Anchietae*, Guim. 1884. Angola.  
 3. *Lacerdae*, Casteln. 1861. L. Ngami.  
 4. *Guentheri*, Blgr. 1898. Niger.  
 5. *macrophthalmus*, Gthr. 1866. "  
 6. *ovis*, Blgr. 1898. Congo.  
 7. *caschive*, Hasselq. 1757. Nile, L. Chad, Senegal to Congo.  
 8. *rume*, C. & V. 1846. Senegal.  
 9. *niloticus*, Bl. 1801. Nile.  
 10. *longirostris*, Peters, 1852. Nile, Congo, Zambesi, L. Mweru.  
 11. *Bozæ*, Pellegr. 1903. Congo.  
 12. *kannume*, Forsk. 1775. Nile, L. Victoria, Webi Shebeli.  
 13. *Hildebrandti*, Peters, 1882. Athi R. (Ukamba).  
 14. *caballus*, Blgr. 1898. Congo.  
 15. *proboscirostris*, Blgr. 1898. "  
 16. *tenuirostris*, Peters, 1882. Athi R. (Ukamba).  
 10. *Hyperopsis*, Gill, 1862.  
 1. *bebe*, Lacep. 1803. Nile, L. Chad, Senegal, Gambia, Niger.  
 2. *tenuicauda*, Pellegr. 1904. L. Chad.  
 11. *Gymnarchus*, Cuv. 1829.  
 1. *niloticus*, Cuv. 1829. White Nile, L. Chad, Senegal to Niger.

## Fam. 3. NOTOPTERIDÆ.

1. *Notopterus*, Lacep. 1800.  
 1. *afer*, Gthr. 1868. Gambia to Calabar, Congo.  
 2. *Xenomystus*, Gthr. 1868.  
 1. *nigri*, Gthr. 1868. Bahr el Gebel, Liberia to Congo.

## Fam. 4. OSTEGLLOSSIDÆ.

1. *Heterotis*, Cuv. 1829.  
 1. *niloticus*, Cuv. 1829. Nile, L. Chad, Senegal, Gambia, Niger.

## Fam. 5. PANTODONTIDÆ.

1. *Pantodon*, Peters, 1876.  
 1. *Buchholzi*, Peters, 1876. Low. Niger to Congo.

## Fam. 6. PHRACTOLÆMIDÆ.

1. *Phractolæmus*, Blgr. 1901.  
 1. *Ansorgii*, Blgr. 1901. Low. Niger, Congo.

## Fam. 7. CLUPEIDÆ.

1. *Clupea*, L. 1766.  
 1. *finta*, Cuv. 1829. N. Africa\*.

2. *Pellonula*, Gthr. 1868.
  1. *vorax*, Gthr. 1868. Senegal to Congo.
  2. *acutirostris*, Blgr. 1899. Congo.
3. *Microthrissa*, Blgr. 1902.
  1. *Royauxi*, Blgr. 1902. Congo.
4. *Odaxothrissa*, Blgr. 1899.
  1. *losera*, Blgr. 1899. Congo.
5. *Pellona*, C. & V. 1847.
  1. *indica*, Swains. 1838. Kingani\*.
6. *Chanos*, Lacep. 1803.
  1. *mossambicus*, Peters, 1852. Quisonga (Mozambique).

## Fam. 8. SALMONIDÆ.

1. *Salmo*, L. 1766.
  1. *trutta*, L. 1766. Atlas of Algeria.

## Fam. 9. CROMERIIDÆ.

1. *Cromeria*, Blgr. 1901.
  1. *nilotica*, Blgr. 1901. White Nile.

## Subord. II. OSTARIOPHYSI.

## Fam. 1. CHARACINIDÆ.

1. *Sarcodaces*, Gthr. 1864.
  1. *odoë*, Bl. 1794. Senegal to Congo, L. Chad, L. Ngami.
2. *Hydrocyon*, Cuv. 1817.
  1. *Forskali*, Cuv. 1817. Nile, Senegal, Niger.
  2. *lineatus*, Blkr. 1863. Blue Nile, White Nile, Liberia, Niger, Congo, L. Tanganyika and Mweru, Zambesi, Limpopo, L. Ngami (?). Congo.
  3. *vittiger*, Blgr. 1898. " "
  4. *goliath*, Blgr. 1898. Nile, L. Chad, Senegal, Gambia.
  5. *brevis*, Gthr. 1864. " "
3. *Bryconæthiops*, Gthr. 1873.
  1. *microstoma*, Gthr. 1873. Cameroon, Congo.
  2. *Yseuri*, Blgr. 1899. Congo.
4. *Alestes*, M. & T. 1846.
  1. *macrophthalmus*, Gthr. 1867. Gaboon to Congo, L. Tanganyika, L. Mweru, Congo.
  2. *Liebrechtsii*, Blgr. 1898. Congo.
  3. *baremoë*, Joann. 1835. Nile, L. Rudolf, L. Chad, Senegal to Niger.
  4. *dentex*, L. 1766. Nile, L. Chad, Senegal to Niger.
  5. *Stuhnnanni*, Pfeff. 1896. Kingani.
  6. *Tholloni*, Pellegr. 1901. Congo.
  7. *intermedius*, Blgr. 1903. Cameroon.
  8. *nurse*, Rüpp. 1832. Nile, L. Victoria, L. Rudolf, Senegal to Cameroon.
  9. *humilis*, Blgr. 1905. Angola.
  10. *imberi*, Peters, 1852. Wami to Zambesi, Angola.
  11. *lateralis*, Blgr. 1900. L. Dilolo, C. Africa.
  12. *senegalensis*, Stdr. 1870. Senegal.
  13. *Lemaïri*, Blgr. 1899. L. Mweru.
  14. *natalensis*, Blgr. 1904. Durban.
  15. *longipinnis*, Gthr. 1864. Sierra Leone to Congo.
  16. *Chaperi*, Sauv. 1882. Gold Coast.

4. *Alestes* (con.).
17. *affinis*, Gthr. 1894. Webi Shebeli to Tana.
  18. *teniurus*, Gthr. 1867. Cameroon, Gaboon.
  19. *Fuchsii*, Blgr. 1899. Congo.
  20. *bimaculatus*, Blgr. 1899. "
  21. *Kingsleyæ*, Gthr. 1896. Ogowe.
  22. *opisthotenia*, Blgr. 1903. Cameroon.
  23. *brevis*, Blgr. 1903. Gold Coast, Lagos.
  24. *macrolepidotus*, C. & V. 1849. Nile, L. Chad, Senegal to Ogowe, L. Tanganyika.
25. *grandisquamis*, Blgr. 1899. Congo.
  26. *Batesii*, Blgr. 1903. Cameroon.
5. *Micralestes*, Blgr. 1899.
1. *acutidens*, Ptrs. 1852. Nile, Omo, Niger, Congo, Rovuma, Zambesi.
  2. *humilis*, Blgr. 1899. Congo.
  3. *holargyreus*, Gthr. 1873. "
  4. *altus*, Blgr. 1899. "
  5. *Stormsi*, Blgr. 1902. "
  6. *interruptus*, Blgr. 1899. "
6. *Petersius*, Hilgendorf. 1894.
1. *conserialis*, Hilgendorf. 1894. Kingani.
  2. *occidentalis*, Gthr. 1899. Gold Coast.
  3. *caudalis*, Blgr. 1899. Congo.
  4. *Leopoldianus*, Blgr. 1899. "
  5. *Hilgendorfi*, Blgr. 1899. "
  6. *modestus*, Blgr. 1899. "
  7. *major*, Blgr. 1903. Cameroon.
7. *Eugnathichthys*, Blgr. 1898.
1. *Eetveldii*, Blgr. 1898. Congo.
  2. *macroterolepis*, Blgr. 1899. "
8. *Paraphago*, Blgr. 1899.
1. *rostratus*, Blgr. 1899. Congo.
9. *Mesoborus*, Pellegr. 1900.
1. *crocodilus*, Pellegr. 1900. Congo.
10. *Phago*, Gthr. 1865.
1. *loricatus*, Gthr. 1865. W. Africa.
  2. *intermedius*, Blgr. 1899. Congo.
  3. *Boulengeri*, Schilth. 1891. "
11. *Neoborus*, Blgr. 1899.
1. *ornatus*, Blgr. 1899. Congo.
  2. *quadrilineatus*, Pellegr. 1904. Casamanza.
12. *Ichthyoborus*, Gthr. 1864.
1. *besse*, Joann. 1835. Nile, White Nile, L. Chad.
13. *Hemistichodus*, Pellegr. 1901.
1. *Vaillanti*, Pellegr. 1901. Ogowe.
14. *Nannæthiops*, Gthr. 1871.
1. *uniteniatus*, Gthr. 1871. White Nile, Gold Coast to Congo.
15. *Neolebias*, Stdr. 1894.
1. *uvivittatus*, Stdr. 1894. Liberia, Cameroon.
  2. *trilineatus*, Blgr. 1899. Congo.
16. *Distichodus*, M. & T. 1845.
1. *notospilus*, Gthr. 1867. Cameroon to Congo.
  2. *affinis*, Gthr. 1873. Congo.
  3. *altus*, Blgr. 1899. L. Chad, Congo.
  4. *noboli*, Blgr. 1899. Congo.
  5. *hypostomatus*, Pellegr. 1900. Ogowe.

16. *Distichodus* (con.).
6. *maculatus*, Blgr. 1898. Congo.
  7. *Petersii*, Pfeff. 1896. Kingani R.
  8. *Antonii*, Schilth. 1891. Congo.
  9. *atroventralis*, Blgr. 1898. "
  10. *fasciolatus*, Blgr. 1898. "
  11. *mossambicus*, Peters, 1852. Zambesi.
  12. *brevipinnis*, Gthr. 1864. White Nile, L. Chad, Senegal, Niger.
  13. *rostratus*, Gthr. 1864. Nile, L. Chad, Senegal, Niger.
  14. *niloticus*, L. 1766. Nile, White Nile, L. Rudolf.
  15. *engycephalus*, Gthr. 1864. Nile, Blue Nile, Niger.
  16. *sc.fasciatus*, Blgr. 1897. Congo.
  17. *lusosso*, Schilth. 1891. "
17. *Nannocharax*, Gthr. 1867.
1. *brevis*, Blgr. 1902. Congo.
  2. *fasciatus*, Gthr. 1867. Gold Coast, Gaboon, Congo.
  3. *intermedius*, Blgr. 1903. Cameroun.
  4. *niloticus*, Joann. 1835. Nile, White Nile.
  5. *elongatus*, Blgr. 1900. Congo.
  6. *tenia*, Blgr. 1902. "
  7. *dimidiatus*, Pellegr. 1904. Casamanza.
18. *Xenocharax*, Gthr. 1867.
1. *spilurus*, Gthr. 1867. Cameroon to Congo.
  2. *crassus*, Pellegr. 1900. Congo.
19. *Citharidium*, Blgr. 1902.
1. *Ansorgii*, Blgr. 1902. Low. Niger.
20. *Citharinus*, Cuv. 1817.
1. *citharus*, Geoffr. 1809. Nile, L. Chad, Senegal, Gambia, Niger.
  2. *congius*, Blgr. 1897. Congo.
  3. *macrolepis*, Blgr. 1899. "
  4. *latus*, M. & T. 1845. Nile, Senegal, Niger, Kingani (?).
  5. *gibbosus*, Blgr. 1899. Congo, L. Tanganyika.

## Fam. 2. CYPRINIDÆ.

1. *Labeo*, Cuv. 1817.
1. *niloticus*, Forsk. 1775. Nile.
  2. *horie*, Heck. 1846. Nile, L. Albert, L. Chad, Senegal, Gambia, Niger.
  3. *Steindachneri*, Pfeff. 1896. Kingani.
  4. *altivelis*, Peters, 1852. Zambesi, L. Nyassa.
  5. *Rosæ*, Stdr. 1894. Limpopo R.
  6. *mesops*, Gthr. 1868. L. Nyassa.
  7. *lineatus*, Blgr. 1898. Congo.
  8. *velifer*, Blgr. 1898. "
  9. *longipinnis*, Blgr. 1898. "
  10. *coubie*, Rüpp. 1832. Nile, L. Chad, Senegal, Gambia, Niger.
  11. *congoro*, Peters, 1852. Zambesi.
  12. *Gregorii*, Gthr. 1894. Juba to Rovuma.
  13. *Neumanni*, Blgr. 1903. Webi Shebeli.
  14. *Darlingi*, Blgr. 1902. Rhodesia.
  15. *victorianus*, Blgr. 1901. L. Victoria.
  16. *Fuellebornii*, Hilg. & Pappenh. 1903. L. Rukwa.
  17. *cyclorhynchus*, Blgr. 1899. Ogowe, Congo.
  18. *falcipinnis*, Blgr. 1903. Congo.
  19. *Kürki*, Blgr. 1903. Rovuma.
  20. *Forskali*, Rüpp. 1835. Nile.
  21. *cylindricus*, Peters, 1852. Hawash to Zambesi, L. Baringo.

1. *Labeo* (con.).
22. *macrostoma*, Blgr. 1898. Congo.  
 23. *nasus*, Blgr. 1899. "  
 24. *Greenii*, Blgr. 1902. "  
 25. *brachypoma*, Gthr. 1868. Lagos, Gold Coast.  
 26. *annectens*, Blgr. 1903. Cameroon.  
 27. *chariensis*, Pellegr. 1904. L. Chad.  
 28. *Lukulæ*, Blgr. 1902. Congo.  
 29. *parvus*, Blgr. 1902. "  
 30. *barbatus*, Bigr. 1898. "  
 31. *capensis*, A. Smith, 1841. Orange R., Limpopo R.  
 32. *umbratus*, A. Smith, 1841. Orange R.
2. *Discognathus*, Heck. 1843.
1. *denbeensis*, Rüpp. 1837. L. Tsana, Nairobi R. (Kilimandjaro).  
 2. *Johnstoni*, Blgr. 1901. L. Victoria.  
 3. *Vinciguerræ*, Blgr. 1901. Upp. Nile, White Nile.  
 4. *Blanfordii*, Blgr. 1901. Eastern watershed of Abyssinia,  
 Erythraea,  
 Nyiro R.  
 5. *Hindii*, Blgr. 1905.  
 6. *makiensis*, Blgr. 1903. Maki R. (Lake Zwai).  
 7. *quadrinaculatus*, Rüpp. 1837. L. Tsana, Hawash R.
3. *Varicorhinus*, Rüpp. 1837.
1. *beso*, Rüpp. 1837. L. Tsana, Atbara R., Hawash R.  
 2. *tanganicæ*, Blgr. 1900. L. Tanganyika.  
 3. *maroccanus*, Gthr. Morocco.
4. *Barbus*, Cuv. 1817.
1. *callensis*, C. & V. 1842. Morocco, Algeria, Tunisia.  
 2. *nasus*, Gthr. 1868. Morocco.  
 3. *serra*, Peters, 1864. Oliphants R.  
 4. *setivimensis*, C. & V. 1842. Morocco, Algeria, Tunisia.  
 5. *Vinciguerræ*, Pfeff. 1896. Wembere R. (Usambara),  
 L. Rukwa (?).  
 Angola.  
 6. *Welwitschii*, Gthr. 1868. "  
 7. *Mattozi*, Guimar. 1884. "  
 8. *argenteus*, Gthr. 1868. "  
 9. *kurumani*, Casteln. 1861. Kuruman R.  
 10. *macropristis*, Blgr. 1904. L. Victoria.  
 11. *taitensis*, Gthr. 1894. Taita district, inland of Mombasa.  
 12. *paludinosus*, Peters, 1852. Hawash to Zambesi, Durban.  
 13. *longicauda*, Blgr. 1905. Mozambique.  
 14. *thikensis*, Blgr. 1905. Thika (Tana System).  
 15. *Pfefferi*, Blgr. 1905<sup>1</sup>. Unyamwesi district and Kingani.  
 16. *tetraspilus*, Pfeff. 1896. Upp. Ituri (Congo System).  
 17. *zanzibaricus*, Peters, 1868. Mombasa.  
 18. *Neumayeri*, Fisch. 1884. Nguruman (Masai district).  
 19. *carpio*, Pfeff. 1896. L. Albert.  
 20. *Percivali*, Blgr. 1903. Nairobi (Rufu).  
 21. *lumiensis*, Blgr. 1903. Lumi (Rufu).  
 22. *laticeps*, Pfeff. 1893. Wami R.  
 23. *Kerstenii*, Peters, 1868. Between Mombasa and Kilimandjaro.  
 24. *salmo*, Pfeff. 1896. Pangani.  
 25. *Kessleri*, Stdr. 1866. Angola.  
 26. *eutania*, Blgr. 1904. "  
 27. *holotænia*, Blgr. 1904. Cameroon to Congo.  
 28. *serrifer*, Blgr. 1900. L. Tanganyika.  
 29. *Ansorgii*, Blgr. 1904. Angola.

<sup>1</sup> *B. altus*, Pfeff. 1896, nec Gthr.

4. *Barbus* (con.).

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| 30. <i>mirolepis</i> , Blgr. 1902.                 | Congo.                                 |
| 31. <i>Gurrali</i> , Thomin. 1886.                 | Cameroons, Benito.                     |
| 32. <i>pleurogramma</i> , Blgr. 1902.              | L. Tsana.                              |
| 33. <i>Fritschii</i> , Gthr. 1868.                 | Morocco.                               |
| 34. <i>Rothschildi</i> , Gthr. 1901.               | "                                      |
| 35. <i>Waldoi</i> , Blgr. 1902.                    | "                                      |
| 36. <i>atlanticus</i> , Blgr. 1902.                | "                                      |
| 37. <i>Harterti</i> , Gthr. 1901.                  | "                                      |
| 38. <i>Riggenbachi</i> , Gthr. 1902.               | "                                      |
| 39. <i>ksibi</i> , Blgr. 1905.                     | "                                      |
| 40. <i>microterolepis</i> , Blgr. 1902.            | Maki R. (L. Zwai).                     |
| 41. <i>macronema</i> , Blgr. 1902.                 | Maki R., Hawash.                       |
| 42. <i>Rueppelli</i> , Blgr. 1902.                 | Hawash.                                |
| 43. <i>Holubi</i> , Sldr. 1894.                    | Orange R.                              |
| 44. <i>surkis</i> , Rüpp. 1837.                    | L. Tsana.                              |
| 45. <i>Harringtoni</i> , Blgr. 1902.               | Hawash.                                |
| 46. <i>jarsinus</i> , Blgr. 1902.                  | Jerrer R., near Harrar (Webi Shebeli). |
| 47. <i>intermedius</i> , Rüpp. 1837.               | L. Tsana.                              |
| 48. <i>Fergussonii</i> , Blgr. 1901.               | L. Albert Edward.                      |
| 49. <i>edwardianus</i> , Blgr. 1901.               | " "                                    |
| 50. <i>Breyeri</i> , M. Web. 1897.                 | Head-waters of Limpopo.                |
| 51. <i>plagiostomus</i> , Blgr. 1902.              | Hawash.                                |
| 52. <i>platystomus</i> , Blgr. 1902.               | L. Tsana.                              |
| 53. <i>gorguari</i> , Rüpp. 1837.                  | "                                      |
| 54. <i>bynni</i> , Forsk. 1775.                    | Nile, L. Baringo.                      |
| 55. <i>kassanensis</i> , Blgr. 1902.               | Hawash.                                |
| 56. <i>gananensis</i> , Vincig. 1895.              | Ganana R. (Jubi).                      |
| 57. <i>brevibarbis</i> , Blgr. 1902.               | L. Tsana.                              |
| 58. <i>leptosoma</i> , Blgr. 1902.                 | "                                      |
| 59. <i>oreas</i> , Blgr. 1902.                     | Jerrer R., near Harrar (Webi Shebeli). |
| 60. <i>altianalis</i> , Blgr. 1900.                | L. Kivu and Rusisi.                    |
| 61. <i>Erlangeri</i> , Blgr. 1903.                 | Head-waters of Webi Shebeli.           |
| 62. <i>marequensis</i> , A. Smith, 1841.           | " Interior of S. Africa."              |
| 63. <i>Duchesnii</i> , Blgr. 1902.                 | L. Tsana, Mogre (Blue Nile).           |
| 64. <i>Radcliffii</i> , Blgr. 1903.                | L. Victoria.                           |
| 65. <i>mento</i> , Blgr. 1902.                     | Hawash R.                              |
| 66. <i>Gregorii</i> , Blgr. 1902.                  | Nyuki R. (L. Baringo), Tana R.         |
| 67. <i>hursensis</i> , Blgr. 1902.                 | Hawash R.                              |
| 68. <i>affinis</i> , Rüpp. 1837.                   | L. Tsana, Hawash, Maki.                |
| 69. <i>Degeni</i> , Blgr. 1902.                    | L. Tsana.                              |
| 70. <i>nedgia</i> , Rüpp. 1837.                    | "                                      |
| 71. <i>labiatus</i> , Blgr. 1902.                  | Tana.                                  |
| 72. <i>Reinii</i> , Gthr. 1874.                    | Morocco.                               |
| 73. <i>Linnelli</i> , Lönnb. 1904.                 | Cameroon.                              |
| 74. <i>Batesii</i> , Blgr. 1903.                   | "                                      |
| 75. <i>tanensis</i> , Gthr. 1894.                  | Tana, Athi R.                          |
| 76. <i>Hindii</i> , Blgr. 1902.                    | "                                      |
| 77. <i>oxyrhynchus</i> , Pfeff. 1889.              | Rufu " (Pangani).                      |
| 78. <i>perplexicans</i> , Blgr. 1902.              | Tana.                                  |
| 79. <i>micronema</i> , Blgr. 1904.                 | Cameroon.                              |
| 80. <i>Compinei</i> , Sauv. 1879.                  | Ogowe.                                 |
| 81. <i>trimaculatus</i> , Peters, 1852.            | Zambesi, L. Nyassa, Limpopo.           |
| 82. <i>nummifer</i> , Blgr. 1904.                  | L. Victoria.                           |
| 83. <i>Jacksoni</i> , Gthr. 1889.                  | Head-waters of Rufu R. (Pangani).      |
| 84. <i>Pappenheimi</i> , Blgr. 1905 <sup>1</sup> . | L. Rukwa.                              |

<sup>1</sup> *Jacksoni*, Hilg. & Pappenh. nec Gthr.



4. *Barbus* (con.).

85. *kutangæ*, Blgr. 1900. Lofoi (Katanga).  
 86. *platyrhinus*, Blgr. 1900. L. Tanganyika.  
 87. *capensis*, A. Smith, 1840. Oliphants and Berg R.  
 88. *Burchelli*, A. Smith, 1840. Cape Colony.  
 89. *Trevelyani*, Gthr. 1877. Berg R., Buffalo R.  
 90. *Gurneyi*, Gthr. 1868. Durban.  
 91. *Bowkeri*, Blgr. 1902. ”  
 92. *rhodesianus*, Blgr. 1902. Zambesi.  
 93. *uniteniatus*, Gthr. 1867. Angola.  
 94. *lagoensis*, Gthr. 1868. Lagos.  
 95. *inermis*, Peters, 1852. Zambesi.  
 96. *zambesensis*, Peters, 1852. ”  
 97. *progenys*, Blgr. 1903. Cameroon.  
 98. *gobioides*, C. & V. 1842. Cape of Good Hope.  
 99. *ablades*, Blkr. 1863. Liberia, Gold Coast, Gaboon.  
 100. *camptacanthus*, Blkr. 1863. Fernando Po, Cameroon,  
 Benito R.  
 101. *tæniurus*, Blgr. 1903. Cameroon.  
 102. *Thollonianus*, Thomin. 1886. Benito R.  
 103. *nigeriensis*, Blgr. 1902. L. Niger.  
 104. *trispilus*, Blkr. 1863. Gold Coast, Liberia (?).  
 105. *Walkeri*, Blgr. 1904. Gold Coast.  
 106. *fasciolatus*, Gthr. 1868. Angola.  
 107. *quadripunctatus*, Pfeff. 1896. Rufu R.  
 108. *Pagenstecheri*, Fisch. 1884. Mt. Kilimandjaro.  
 109. *innocens*, Pfeff. 1896. Wami, L. Rukwa.  
 110. *lineomaculatus*, Blgr. 1903. Lumi (head-waters of Rufu R.).  
 111. *amphigramma*, Blgr. 1903. Nairobi ( ” ” ).  
 112. *vulneratus*, Casteln. 1861<sup>1</sup>. Cape of Good Hope.  
 113. *viviparus*, M. Web. 1897. Natal.  
 114. *perince*, Rüpp. 1837. Nile.  
 115. *trispilopteura*, Blgr. 1902. L. Tsana.  
 116. *humilis*, Blgr. 1902. ”  
 117. *neglectus*, Blgr. 1903. Nile.  
 118. *caudovittatus*, Blgr. 1902. Congo.  
 119. *congius*, Blgr. 1899. ”  
 120. *radiatus*, Peter, 1852. Mozambique.  
 121. *humeralis*, Blgr. 1902. Congo.  
 122. *Werneri*, Blgr. 1905. Nile, L. Rudolf, Rovuma.  
 123. *Doggetti*, Blgr. 1904. L. Victoria.  
 124. *pleuropholis*, Blgr. 1899. Congo.  
 125. *rapax*, Stdr. 1894. E. Cape Colony, Limpopo.  
 126. *tropidolepis*, Blgr. 1900. L. Tanganyika.  
 127. *afer*, Peters, 1864. Cape Colony.  
 128. *anoplus*, M. Web. 1897. Orange R., Klip R., Natal.  
 129. *anema*, Blgr. 1903. Nile.  
 130. *stigmatopygus*, Blgr. 1903. White Nile.  
 131. *pumilus*, Blgr. 1901. ”  
 132. *Brazzæ*, Pellegr. 1902. Congo.  
 133. *jaë*, Blgr. 1903. S. Cameroon.
5. *Rasbora*, Blkr. 1859. 1. *zanziburensis*, Gthr. & Playf. 1836. Rovuma.
6. *Phoxinellus*, Heck. 1843. 1. *Chaigoni*, Vail. 1904. Algerian and Tunisian Sahara.

<sup>1</sup> *multimaculatus*, Stdr. 1870.

7. *Alburnus*, Heck. 1843.  
1. *callensis*, Guich. 1850. Algeria.
8. *Leplocypris*, Blgr. 1900.  
1. *modestus*, Blgr. 1900. Congo.
9. *Barilius*, Ham. Buch. 1822.  
1. *niloticus*, Joann. 1835. Nile, Omo, Niger.  
2. *Weeksii*, Blgr. 1899. Congo.  
3. *longirostris*, Blgr. 1902. " "  
4. *microlepis*, Gthr. 1864. L. Nyassa.  
5. *tanganicae*, Blgr. 1900. L. Tanganyika.  
6. *microcephalus*, Gthr. 1864. L. Nyassa.  
7. *Guentheri*, Blgr. 1896. Upp. Shiré.  
8. *senegalensis*, Sldr. 1870. Senegal.  
9. *Louti*, Blgr. 1901. Nile, Bahr el Gebel, Omo.  
10. *Kingsleyæ*, Blgr. 1899. Cameroon, Ogowe, Congo.  
11. *Buchholzi*, Peters, 1876. Ogowe.  
12. *Moorii*, Blgr. 1900. L. Tanganyika, L. Rukwa.  
13. *ubangensis*, Pellegr. 1901. Cameroon, Congo.  
14. *Weymsii*, Blgr. 1899. Congo.  
15. *zambesensis*, Peters, 1868. Zambesi.  
16. *sardella*, Gthr. 1868. Shiré, L. Nyassa.
10. *Chelethiops*, Blgr. 1899.  
1. *bibe*, Joann. 1835. Nile, White Nile, Bahr el Gebel, Webi Shebeli, Congo.  
2. *clongatus*, Blgr. 1899. Congo.
11. *Neobola*, Vincig. 1895.  
1. *Bottegi*, Vincig. 1895. Dana and Ganana R. (Juba), Omo, L. Rudolf, L. Victoria.  
2. *argentea*, Pellegr. 1904. L. Victoria.
12. *Nemachilus*, Hass. 1823.  
1. *abyssinicus*, Blgr. 1902. L. Tsana.

## Fam. 3. SILURIDÆ.

1. *Clarias*, Gron. 1781.  
1. *lazera*, C. & V. 1840. Syria, Nile, L. Albert Edward, L. Victoria, Senegal, Niger, L. Chad, Congo, L. Ngami (?).  
2. *Moorii*, Blgr. 1901. L. Albert.  
3. *mossambicus*, Peters, 1852. Mozambique, L. Rukwa.  
4. *Robecchii*, Vincig. 1893. Abyssinia to Zanzibar, L. Tanganyika.  
5. *Vinciguerræ*, Blgr. 1902. Hawash.  
6. *senegalensis*, C. & V. 1840. Senegal, Niger.  
7. *Budgetti*, Blgr. 1900. Gambia.  
8. *anguillaris*, L. 1766. Nile, White Nile.  
9. *capensis*, C. & V. 1840. Cape of Good Hope.  
10. *garipepinus*, Burch. 1822. Zambesi and Katanga to Orange R. and Natal.  
11. *tsanensis*, Blgr. 1902. L. Tsana.  
12. *lioccephalus*, Blgr. 1898. L. Tanganyika.  
13. *longiceps*, Blgr. 1899. Congo.  
14. *submarginatus*, Peters, 1882. Gaboon (?).  
15. *breviceps*, Blgr. 1900. Mayumba.  
16. *platycephalus*, Blgr. 1902. Congo.  
17. *angolensis*, Sldr. 1866. L. Niger to Angola.  
18. *liberiensis*, Sldr. 1894. Liberia, Sierra Leone, Cameroon, Benito R.

1. *Clarias* (con.).
  19. *Walkeri*, Gthr. 1896. Cameroon, Gabcon, Ogowe.
  20. *bythipogon*, Sauv. 1878. Calabar to Congo.
  21. *macromystax*, Gthr. 1864. Gambia.
  22. *Dumerili*, Sdr. 1866. Angola.
  23. *Carsonii*, Blgr. 1903. L. Victoria, N. Nyassaland.
  24. *læviceps*, Gill, 1862. Gold Coast.
  25. *pachynema*, Blgr. 1903. Cameroon.
  26. *Buettikoferi*, Sdr. 1894. Liberia.
  27. *Salæ*, Huhr. 1881. "
  28. *Theodoræ*, M. Web. 1897. Natal.
  29. *amplexicauda*, Blgr. 1902. Congo.
2. *Allabenchelys*, Blgr. 1902.
  1. *brevior*, Blgr. 1903. Cameroon.
  2. *longicauda*, Blgr. 1902. "
3. *Cluriallabes*, Blgr. 1900.
  1. *melas*, Blgr. 1887. Congo.
4. *Gymnallabes*, Gthr. 1867.
  1. *typus*, Gthr. 1867. Low. Niger, Old Calabar.
5. *Chamaulabes*, Gthr. 1873.
  1. *apus*, Gthr. 1873. Congo, Angola.
6. *Heterobranchus*, Geoffr. 1809.
  1. *bidorsalis*, I. Geoffr. 1827. Nile.
  2. *senegalensis*, C. & V. 1840. Nile, L. Chad, Senegal, Niger, Nile!
  3. *longifilis*, C. & V. 1840. Nile!
  4. *laticeps*, Peters, 1852. Congo, Mozambique.
  5. *isopterus*, Blkr. 1863. Gold Coast.
7. *Plotosus*, Lacep. 1803.
  1. *arab*, Forsk. 1775. Zanzibar, Madagascar\*.
8. *Eutropius*, M. & T. 1849.
  1. *congolensis*, Leach, 1818. Congo.
  2. *Grenfelli*, Blgr. 1900. C. Chad, Congo.
  3. *Adansonii*, C. & V. 1839. Senegal, Cameroon.
  4. *liberiensis*, Huhr. 1881. Liberia, Gaboon, Ogowe.
  5. *altipinnis*, Sdr. 1894. Liberia to Congo.
  6. *niloticus*, Rüpp. 1829. Nile, Niger, Old Calabar.
  7. *Bocagii*, Guimar. 1882. Kwanga R. (Angola).
  8. *Debauwi*, Blgr. 1900. Congo.
  9. *mentalis*, Blgr. 1901. Gold Coast, Cameroon.
  10. *depressirostris*, Peters, 1852. Juba, Tana, Zambesi, Katanga, Limpopo.
  11. *mandibularis*, Gthr. 1867. Liberia, Gold Coast.
  12. *Mæbii*, Pfeff. 1896. Kingani R.
  13. *laticeps*, Blgr. 1899. Congo.
9. *Schilbe*, Cuv. 1817.
  1. *uranoscopus*, Rüpp. 1832. Nile.
  2. *Emini*, Pfeff. 1893. Uniamwesi Country.
  3. *mystus*, L. 1766. Nile, L. Chad, Niger to Congo, L. Mweru, L. Rukwa.
  4. *senegalensis*, C. & V. 1839. Senegal, Gambia, Niger, Upp. Zambesi.
10. *Siluranodon*, Blkr. 1858.
  1. *auritus*, Geoffr. 1809. Low. Nile.
11. *Physailia*, Blgr. 1901.
  1. *pellucida*, Blgr. 1901. Upp. Nile.
  2. *somalensis*, Vincig. 1897. Ganana (Upp. Juba).
  3. *occidentalis*, Pellegr. 1901. Ogowe.

12. *Parailia*, Blgr. 1899.  
 1. *congica*, Blgr. 1899. Low, Niger, Congo.  
 2. *longifilis*, Blgr. 1902. Congo.
13. *Bayrus*, Cuv. 1817.  
 1. *bayad*, Forsk. 1775. Nile, L. Chad, Senegal, Niger.  
 2. *urostigma*, Vincig. 1895. Ganana (Upp. Juba).  
 3. *orientalis*, Blgr. 1902. Pangani.  
 4. *docmac*, Forsk. 1775. Nile.  
 5. *ubangensis*, Blgr. 1902. Congo.  
 6. *meridionalis*, Gthr. 1894. Upp. Shiré.
14. *Clarotes*, Blkr. 1858.  
 1. *laticeps*, Rüpp. 1829. Upp. Nile, White Nile, Bahr el Gebel,  
 L. Chad, Juba, Tana, Niger.
15. *Chrysichthys*, Blkr. 1858.  
 1. *furcatus*, Gthr. 1864. Senegal to Congo.  
 2. *Sharpii*, Blgr. 1901. L. Mweru.  
 3. *Cranchii*, Leach, 1818. Congo, L. Tanganyika.  
 4. *ornatus*, Blgr. 1902. Congo.  
 5. *myriodon*, Blgr. 1900. L. Tanganyika.  
 6. *brachynema*, Blgr. 1900. "  
 7. *punctatus*, Blgr. 1899. Congo.  
 8. *Delhezi*, Blgr. 1899. "  
 9. *Wagenauri*, Blgr. 1899. "  
 10. *auratus*, I. Geoffr. 1829. Nile, L. Chad, Niger, Gold Coast.  
 11. *camerouensis*, Gthr. 1899. Gambia, Cameroon.  
 12. *Buettikoferi*, Stdr. 1894. Liberia, Gold Coast, Niger.  
 13. *Walkeri*, Gthr. 1899. Gold Coast.  
 14. *coriscanus*, Gthr. 1899. Corisco Island.  
 15. *Kingsleyæ*, Gthr. 1899. Ogowe.  
 16. *nigrodigitatus*, Lacep. 1803. Senegal, Gambia, Niger.  
 17. *nigrita*, Lacep. 1803. Senegal.  
 18. *acutirostris*, Gthr. 1864. Angola.  
 19. *brevibarbis*, Blgr. 1899. Congo.  
 20. *longibarbis*, Blgr. 1899. "
16. *Gephyroglanis*, Blgr. 1899.  
 1. *congicus*, Blgr. 1899. Congo.  
 2. *Sclateri*, Blgr. 1901. Vaal R.  
 3. *ogoensis*, Pellegr. 1900. Ogowe.  
 4. *longipinnis*, Blgr. 1899. Cameroon to Congo.
17. *Læmuncena*, Sauv. 1884.  
 1. *borbonica*, Sauv. 1884. Madagascar, Mauritius.
18. *Amphilius*, Gthr. 1864.  
 1. *uranoscopus*, Pfeff. 1889. Upper ranges of Wami R.  
 2. *grandis*, Blgr. 1905. Head-waters of Tana System.  
 3. *platychir*, Gthr. 1864. Head-waters of Rufu R., between  
 L. Tanganyika and L. Nyassa,  
 Sierra Leone (?).  
 4. *longirostris*, Blgr. 1901. S. Cameroon.  
 5. *atesuensis*, Blgr. 1904. Gold Coast.  
 6. *brevis*, Blgr. 1902. S. Cameroon, Congo.  
 7. *angustifrons*, Blgr. 1902. Congo.
19. *Leptoglanis*, Blgr. 1902.  
 1. *xenognathus*, Blgr. 1902. Congo.
20. *Auchenoglanis*, Gthr. 1865.  
 1. *biscutatus*, I. Geoffr. 1829. Nile, L. Chad, Senegal.  
 2. *occidentalis*, C. & V. 1840. Nile, Senegal to Congo, L. Rudolf,  
 L. Tanganyika.

20. *Auchenoglanis* (con.).  
 3. *punctatus*, Blgr. 1902. Congo.  
 4. *ubangensis*, Blgr. 1902. "  
 5. *Ballayi*, Sauv. 1878. Cameroon to Congo.  
 6. *guttatus*, Lönnb. 1895. Cameroon, Congo.
21. *Notoglanidium*, Gthr. 1902.  
 1. *Walkeri*, Gthr. 1902. Gold Coast.
22. *Ancharius*, Sldr. 1880.  
 1. *fuscus*, Sldr. 1880. Madagascar.
23. *Arius*, C. & V. 1840.  
 1. *biscutatus*, Gthr. 1864. Fernando Po to Congo\*.  
 2. *Heudeloti*, C. & V. 1840. Senegal\*.  
 3. *Parkii*, Gthr. 1864. Liberia, Lagos, Niger\*.  
 4. *Kirkii*, Gthr. 1864. Zambesi\*.  
 5. *falcarius*, Richards. 1845. Pangani R.\*
24. *Galeichthys*, C. & V. 1840.  
 1. *feliceps*, C. & V. 1840. S. Africa\*.
25. *Synodontis*, Cuv. 1817.  
 1. *caudalis*, Blgr. 1899. Congo.  
 2. *Depanwi*, Blgr. 1899. "  
 3. *Tholloni*, Blgr. 1901. Ogowe, Congo.  
 4. *multimaculatus*, Blgr. 1902. Congo.  
 5. *granulosus*, Blgr. 1900. L. Tanganyika.  
 6. *schall*, Bl. Schn. 1801. Nile, Senegal, L. Rudolf and Stephanie.  
 7. *polyodon*, Vaill. 1895. Ogowe.  
 8. *omias*, Gthr. 1864. Niger.  
 9. *acanthomias*, Blgr. 1899. Congo.  
 10. *riphias*, Gthr. 1864. Niger.  
 11. *humervatus*, C. & V. 1840. Upp. Nile.  
 12. *angelicus*, Schilth. 1891. Congo.  
 13. *frontosus*, Vaill. 1895. White Nile, Omo R.  
 14. *caudovittatus*, Blgr. 1901. White Nile.  
 15. *nigrita*, C. & V. 1840. White Nile, Senegal, Gambia.  
 16. *ocellifer*, Blgr. 1900. Gambia.  
 17. *zambesensis*, Peters, 1864. Webi Shebeli to Zambesi, L. Rukwa, L. Nyassa.
18. *multipunctatus*, Blgr. 1898. L. Tanganyika.  
 19. *gambiensis*, Gthr. 1864. Gambia, Niger.  
 20. *nebulosus*, Peters, 1852. Zambesi.  
 21. *obesus*, Blgr. 1898. Old Calabar, Cameroon, Gaboon.  
 22. *Greshoffi*, Schilth. 1891. Congo.  
 23. *eupterus*, Blgr. 1901. White Nile.  
 24. *Afro-Fischeri*, Hilg. 1888. L. Victoria.  
 25. *Alberti*, Schilth. 1891. Congo.  
 26. *serratus*, Rüpp. 1829. Nile.  
 27. *geledensis*, Gthr. 1896. Webi Shebeli.  
 28. *filamentosus*, Blgr. 1901. White Nile.  
 29. *labeo*, Gthr. 1865. Niger.  
 30. *Vaillanti*, Blgr. 1897. Congo.  
 31. *longirostris*, Blgr. 1902. "  
 32. *guttatus*, Gthr. 1865. Lagos, Niger, Gaboon.  
 33. *Robbionus*, J. A. Smith, 1875. Gold Coast, Niger, Calabar.  
 34. *Soloni*, Blgr. 1899. Congo.  
 35. *Smiti*, Blgr. 1902. "  
 36. *ornatipinnis*, Blgr. 1899. Congo, Angola.  
 37. *Fuelleborni*, Hilg. & Pappenh. 1903. L. Rukwa.  
 38. *melanopterus*, Blgr. 1902. Low. Niger.

25. *Synodontis* (con.).
- 39. *notatus*, Vaill. 1893. Congo.
  - 40. *nummifer*, Blgr. 1899. Congo.
  - 41. *sorex*, Gthr. 1864. White Nile.
  - 42. *pleurops*, Blgr. 1897. Congo.
  - 43. *clarias*, L. 1766. Nile, L. Chad, Senegal, Gambia.
  - 44. *decorus*, Blgr. 1899. Congo.
  - 45. *resupinatus*, Blgr. 1904. Upp. Niger.
  - 46. *batensoda*, Rüpp. 1832. White Nile, L. Chad, Senegal, Gambia, Niger.
  - 47. *membranaceus*, Geoffr. 1809. White Nile, Senegal, Niger.
26. *Microsynodontis*, Blgr. 1903.
- 1. *Batesii*, Blgr. 1903. Cameroon.
27. *Chiloglanis*, Peters, 1868.
- 1. *Deckenii*, Peters, 1868. Rufu R. (Pangani).
  - 2. *modjensis*, Blgr. 1903. Modjo R. (Webi Shebeli).
  - 3. *cameronensis*, Blgr. 1904. S. Cameroon.
  - 4. *niloticus*, Blgr. 1900. Upp. Nile.
  - 5. *brevibarbis*, Blgr. 1902. Mathoiya R. (Tana).
  - 6. *Batesii*, Blgr. 1904. S. Cameroon.
28. *Tuchitichthys*, Blgr. 1900.
- 1. *Guentheri*, Schilth. 1891. Congo.
  - 2. *Royauvi*, Blgr. 1902. "
  - 3. *Dybowskii*, Vaill. 1892. "
29. *Atopochilus*, Sauv. 1878.
- 1. *Savorgnani*, Sauv. 1878. Ogowe.
30. *Mochocus*, Joann. 1835. Upp. Nile, White Nile, L. Rudolf.
- 1. *niloticus*, Joann. 1835.
31. *Doumea*, Sauv. 1878.
- 1. *typica*, Sauv. 1878. S. Cameroon, Ogowe.
32. *Ihractura*, Blgr. 1900.
- 1. *Bovei*, Perugia, 1892. Congo.
  - 2. *Ansorgii*, Blgr. 1901. Low. Niger.
  - 3. *indica*, Blgr. 1902. S. Cameroon, Congo.
  - 4. *longicauda*, Blgr. 1903. S. Cameroon.
  - 5. *scaphirhynchura*, Vaill. 1886. Congo.
33. *Paraphractura*, Blgr. 1902.
- 1. *tennicauda*, Blgr. 1902. Congo.
34. *Trachyglanis*, Blgr. 1902.
- 1. *minutus*, Blgr. 1902. Congo.
35. *Belonoglanis*, Blgr. 1902.
- 1. *tenuis*, Blgr. 1902. Congo.
36. *Andersonia*, Blgr. 1900.
- 1. *leptura*, Blgr. 1900. Upp. Nile.
37. *Malopterurus*, Lacep. 1803.
- 1. *electricus*, Gm. 1789. Nile and Senegal to Congo and Zambesi.

## Subord. III. APODES.

## Fam. ANGUILLIDÆ.

1. *Anguilla*, Cuv. 1817.
- 1. *vulgaris*, Turt. 1807. N. Africa\*.
  - 2. *bengalensis*, Ham. Buch. 1822. E. Africa, Natal\*.
  - 3. *virescens*, Peters, 1852. E. Africa\*.
  - 4. *Delalandii*, Kaup, 1856. Madagascar, S. Africa\*.
  - 5. *ambledon*, Gthr. & Playf. 1866. Seychelles\*.
  - 6. *Hildebrandti*, Sauv. 1891. Madagascar\*.

## Subord. IV. HAPLOMI.

## Fam. 1. GALAXIIDÆ.

1. *Galaxias*, Cuv. 1817.  
 1. *zebratus*, Casteln. 1861. Cape of Good Hope.  
 2. *punctifer*, Casteln. 1861. " "

## Fam. 2. KNERIIDÆ.

1. *Kneria*, Stdr. 1866.  
 1. *angolensis*, Stdr. 1866. Angola.  
 2. *Spekii*, Gthr. 1868. Coast of Zanzibar.

## Fam. 3. CYPRINODONTIDÆ.

1. *Cyprinodon*, Lacep. 1803.  
 1. *calaritanus*, Bonelli, 1829. Algeria (N. and S. of Sahara),  
 Low. Egypt, Somaliland.  
 2. *iberus*, C. & V. 1846. Algeria.  
 3. *dispar*, Rüpp. 1828. Syria and borders of the Red Sea.  
 2. *Tellia*, Gerv. 1853.  
 1. *apoda*, Gerv. 1853. Atlas of Algeria.  
 3. *Fundulus*, Lacep. 1803.  
 1. *bivittatus*, Lönnb. 1895. Cameroon.  
 2. *Loenbergyi*, Blgr. 1903. S. Cameroon.  
 3. *nisorius*, Cope, 1877. Gaboon.  
 4. *capensis*, Garm. 1895. False Bay.  
 5. *orthonotus*, Peters, 1844. Mozambique.  
 6. *Guentheri*, Pfeff. 1893. Zanzibar coast and island.  
 7. *melanospilus*, Pfeff. 1896. Zanzibar coast, Seychelles.  
 8. *teniopygus*, Hilg. 1891. L. Victoria.  
 9. *gularis*, Blgr. 1901. S. Nigeria.  
 10. *Sjostedti*, Lönnb. 1895. Cameroon.  
 11. *microlepis*, Vincig. 1897. Somaliland.  
 4. *Haplochilus*, McClell. 1839.  
 1. *spilauchen*, A. Dum. 1859. Senegal to Congo.  
 2. *Chevalieri*, Pellegr. 1904. Congo.  
 3. *macrurus*, Blgr. 1904. Angola.  
 4. *Chaperi*, Sauv. 1882. Gold Coast.  
 5. *Schalleri*, Blgr. 1904. Low. Egypt.  
 6. *senegalensis*, Stdr. 1870. Senegal.  
 7. *Marni*, Stdr. 1881. White Nile.  
 8. *bifasciatus*, Stdr. 1881. Upp. Nile, White Nile.  
 9. *Loati*, Blgr. 1901. White Nile.  
 10. *atripinnis*, Pfeff. 1896. E. Africa (?).  
 11. *Johnstoni*, Gthr. 1893. L. Nyassa.  
 12. *singa*, Blgr. 1899. Congo.  
 13. *Decorsii*, Pellegr. 1904. " "  
 14. *Petersii*, Sauv. 1882. Gold Coast.  
 15. *elegans*, Blgr. 1899. Congo.  
 16. *sexfasciatus*, Gill, 1863. S. Nigeria to Congo.  
 17. *fasciolatus*, Gthr. 1866. Sierra Leone.  
 18. *homalonotus*, A. Dum. 1861. Madagascar.  
 19. *nuchinaculatus*, Guich. 1866. " "  
 20. *cameronensis*, Blgr. 1903. S. Cameroon, R. Benito.  
 21. *Antinorii*, Vincig. 1883. L. Arsadé (Shoa).

4. *Haplochilus* (con.).  
 22. *Playfairii*, Gthr. 1866. Seychelles.  
 23. *tanganicanus*, Blgr. 1898. L. Tanganyika.  
 5. *Procatopus*, Blgr. 1904.  
 1. *nototania*, Blgr. 1904. S. Cameroon.

## Subord. V. CATOSTEOMI.

## Fam. 1. GASTROSTEIDÆ.

1. *Gastrosteus*, L. 1766.  
 1. *aculeatus*, L. 1766. Algeria.

## Fam. 2. SYNGNATHIDÆ.

1. *Syngnathus*, L. 1766.  
 1. *algeriensis*, Playf. 1871. Algeria.  
 2. *zambesensis*, Peters, 1855. Zambesi.  
 2. *Calonotus*, Peters, 1855.  
 1. *argulus*, Peters, 1855. Johanna (Comoro Is.).

## Subord. VI. PERCISOSES.

## Fam. 1. SCOMBRESOCIDÆ.

1. *Hemirhamphus*, Cuv. 1817.  
 1. *Commersonii*, Cuv. 1817. Licuare R. (Mozambique) \*.

## Fam. 2. ATHERINIDÆ.

1. *Atherina*, Art. 1738.  
 1. *mocho*, C. & V. 1835. Algeria, Low. Egypt \*.  
 2. *gabonensis*, H. W. Fowler, 1904. Gaboon \*.  
 2. *Bedotia*, Regan, 1903.  
 1. *madagascariensis*, Regan, 1903. Madagascar.

## Fam. 3. MUGILIDÆ.

1. *Mugil*, Art. 1738.  
 1. *cephalus*, L. 1766. N. and W. Africa \*.  
 2. *grandisquamis*, C. & V. 1836. Senegal, Gambia \*.  
 3. *Constantiæ*, C. & V. 1836. S. Africa \*.  
 4. *robustus*, Gthr. 1861. Madagascar \*.  
 5. *capito*, Cuv. 1829. N.W. and S. Africa \*.  
 6. *auratus*, Risso, 1810. N.W. and S. Africa, Madagascar \*.  
 7. *multilineatus*, A. Smith, 1840. S. Africa \*.  
 8. *Smithii*, Gthr. 1861. S. Africa, Madagascar \*.  
 9. *hypslopterus*, Gthr. 1861. Niger, Gaboon \*.  
 10. *cephalotus*, C. & V. 1836. Madagascar \*.  
 11. *fuleipinnis*, C. & V. 1836. Senegal to Congo \*.  
 2. *Agonostomus*, Benn. 1830.  
 1. *Telfairii*, Benn. 1830. Mozambique, Comoro Is., Madagascar \*.  
 2. *dobuloides*, C. & V. 1836. Madagascar \*.

## Fam. 4. POLYNEMIDÆ.

1. *Pentanemus*, Art. 1758.  
 1. *quinquarius*, L. 1766. W. Africa \*.



2. *Polyneemus*, L. 1766.  
 1. *quadrifilis*, C. & V. 1829. W. Africa \*.  
 3. *Galcoides*, Gthr. 1860.  
 1. *decadactylus*, Bl. 1793. W. Africa \*.

## Fam. 5. SPHYRÆNIDÆ.

1. *Sphyræna*, Art. 1738.  
 1. *guachancho*, C. & V. 1829. W. Africa \*.

## Fam. 6. OPHIOCEPHALIDÆ.

1. *Ophiocephalus*, Bl. 1793.  
 1. *obscurus*, Gthr. 1861. White Nile, Bahr el Jebel, L. Chad,  
 Gambia to Congo.  
 2. *insignis*, Sauv. 1884. Ogowé, Congo.  
 3. *africanus*, Stdr. 1879. Lagos, Niger, Old Calabar.

## Fam. 7. ANABANTIDÆ.

1. *Auabas*, Cuv. 1817.  
 1. *capensis*, C. & V. 1831. Cape of Good Hope.  
 2. *Bainsii*, Casteln. 1861. "Mozambique."  
 3. *multispinis*, Peters, 1846. Gaboon to Congo.  
 4. *nigropannosus*, Reichen. 1875. Congo.  
 5. *Pellegrini*, Blgr. 1902. Congo.  
 6. *congius*, Blgr. 1887. S. Cameroon, Gaboon.  
 7. *maculatus*, Thomin. 1886. S. Cameroon to Congo.  
 8. *multifasciatus*, Thomin. 1886. Congo.  
 9. *fasciolatus*, Blgr. 1899. Bahr el Jebel.  
 10. *Petherici*, Gthr. 1864. Senegal to Congo.  
 11. *Kingsleyæ*, Gthr. 1896. L. Chad, Congo.  
 12. *Weeksii*, Blgr. 1896. Congo.  
 13. *ocellatus*, Pellegr. 1899. Congo.  
 14. *oxyrhynchus*, Blgr. 1902. "

## Subord. VII. ACANTHOPTERYGII.

## Fam. 1. CENTRARCHIDÆ.

1. *Kuhlia*, Gill, 1861.  
 1. *rupestris*, Lacep. 1802. Zanzibar, Madagascar \*.  
 2. *taniura*, C. & V. 1829. E. Africa, Natal, Seychelles \*.  
 3. *caudovittata*, Lacep. 1802. Madagascar \*.

## Fam. 2. NANDIDÆ.

1. *Polycentropsis*, Blgr. 1901.  
 1. *abbreviata*, Blgr. 1901. Low. Niger.

## Fam. 3. SERRANIDÆ.

1. *Morone*, Mitchill, 1814.  
 1. *punctata*, Bl. 1792. Low. Nile, Senegal \*.  
 2. *Plesiops*, Cuv. 1817.  
 1. *nigricans*, Rüpp. 1828. Johanna (Comoro Is.) \*.

3. *Lates*, C. & V. 1828.  
 1. *niloticus*, Hasselq. 1757. Nile, L. Chad, Senegal, Niger, Congo.  
 2. *microlepis*, Blgr. 1898. L. Tanganyika.
4. *Ambassis*, C. & V. 1828.  
 1. *Commerstonii*, C. & V. 1828. Pangani R., Madagascar\*.  
 2. *urotania*, Blkr. 1852. Seychelles\*.
5. *Apogon*, Lacep. 1802.  
 1. *hyalosoma*, Blkr. 1851. Seychelles\*.
6. *Therapon*, Cuv. 1817.  
 1. *servus*, Bl. 1790. Mozambique\*.

## Fam. 4. SCLERIDÆ.

1. *Otolithus*, Cuv. 1829.  
 1. *senegalensis*, C. & V. 1833. Senegal to Congo\*.

## Fam. 5. PRISTIPOMATIDÆ.

1. *Pristipoma*, Cuv. 1829.  
 1. *Jubelini*, C. & V. 1830. Senegal to Congo\*.
2. *Diagramma*, Cuv. 1829.  
 1. *macrolepis*, Blgr. 1899. Senegal to Congo\*.

## Fam. 6. SPARIDÆ.

1. *Chrysophrys*, Cuv. 1817.  
 1. *vagus*, Peters, 1852. Mozambique\*.

## Fam. 7. SCORPIDIDÆ.

1. *Psettus*, C. & V. 1831.  
 1. *sebæ*, C. & V. 1831. Senegal to Congo\*.  
 2. *argenteus*, L. 1766. S. Africa\*.  
 3. *falciformis*, Lacep. 1802. „\*.

## Fam. 8. OSPHROMENIDÆ.

1. *Micracanthus*, Sauv. 1878.  
 1. *Marchii*, Sauv. 1878. Ogowe.

## Fam. 9. CICHLIDÆ.

1. *Hemichromis*, Peters, 1857.  
 1. *fasciatus*, Peters, 1857. Senegal to Congo, L. Chad, Transvaal (?).  
 2. *bimaculatus*, Gill, 1862. Sahara, Nile, L. Chad, Senegal to Congo.  
 3. *angolensis*, Sdr. 1865. Angola.  
 4. *Frederici*, Casteln. 1861. L. Ngami.
2. *Paratilapia*, Blkr. 1868.  
 1. *Polleni*, Blkr. 1868. Madagascar.  
 2. *Pfefferi*, Blgr. 1898. L. Tanganyika.  
 3. *Moffati*, Casteln. 1861. Transvaal.  
 4. *dorsalis*, Pellegr. 1902. Congo.  
 5. *cerasogaster*, Blgr. 1899. „  
 6. *multicolor*, Schoell. 1903. Lower Egypt.  
 7. *longirostris*, Hilg. 1888. L. Victoria.  
 8. *Luebberti*, Hilg. 1902. S.W. Africa.  
 9. *Demeusii*, Blgr. 1899. Congo.

2. *Paratilapia* (con.).
10. *moeruenssis*, Blgr. 1899. L. Mweru.
  11. *afra*, Gthr. 1893. L. Nyassa.
  12. *vittata*, Blgr. 1901. L. Kivu.
  13. *Carlottæ*, Blgr. 1905. Zambesi.
  14. *modesta*, Gthr. 1893. L. Nyassa and Shiré.
  15. *nototenia*, Blgr. 1902. L. Nyassa.
  16. *dimidiata*, Gthr. 1864. L. Nyassa and Shiré.
  17. *serranus*, Pfeff. 1896. L. Victoria.
  18. *victoriana*, Pellegr. 1904.
  19. *robusta*, Gthr. 1864. L. Nyassa, Katanga, Zambesi.
  20. *macrocephala*, Blgr. 1899. L. Mweru.
  21. *cavifrons*, Hilg. 1888. L. Victoria.
  22. *retrodens*, Hilg. 1888.
  23. *Thumbergi*, Casteln. 1861. L. Ngami.
  24. *Schwebischi*, Sauv. 1884. Ogowe.
  25. *calliura*, Blgr. 1901. L. Tanganyika.
  26. *intermedia*, Gthr. 1864. L. Nyassa, Shiré.
  27. *longiceps*, Gthr. 1864.
  28. *ventralis*, Blgr. 1898. L. "Tanganyika".
  29. *Dewindti*, Blgr. 1899. "
  30. *leptosoma*, Blgr. 1898. "
  31. *nigripinnis*, Blgr. 1901. "
  32. *stenosoma*, Blgr. 1901. "
  33. *furcifer*, Blgr. 1898. "
3. *Nanochromis*, Pellegr. 1904.
1. *nudiceps*, Blgr. 1899. Congo.
  2. *dimidiatus*, Pellegr. 1900. "
4. *Pelmatochromis*, Sldr. 1894.
1. *lateralis*, Blgr. 1898. Congo.
  2. *Jentinki*, Sldr. 1894. Liberia, Gambia.
  3. *polylepis*, Blgr. 1900. L. Tanganyika.
  4. *Kingsleyæ*, Blgr. 1898. Gaboon, Ogowe.
  5. *Guentheri*, Sauv. 1882. Gold Coast.
  6. *Wedwitschi*, Blgr. 1898. Angola.
  7. *Pellegrini*, Blgr. 1902. Low. Niger.
  8. *nigrofasciatus*, Pellegr. 1900. Cameroon to Congo.
  9. *longirostris*, Blgr. 1903. Cameroon.
  10. *Boulengeri*, Lönnb. 1903.
  11. *subocellatus*, Gthr. 1871. "
  12. *Ansorgii*, Blgr. 1901. Gaboon.
  13. *pulcher*, Blgr. 1901. Low. Niger.
  14. *tenuatus*, Blgr. 1901. "
  15. *macrops*, Blgr. 1898. "
  16. *auritus*, Blgr. 1901. L. Tanganyika.
  17. *multidens*, Pellegr. 1900. "
  18. *Buettikoferi*, Sldr. 1894. Congo.
  19. *congius*, Blgr. 1897. Liberia, Congo.
5. *Cyrtocara*, Blgr. 1902. Congo.
1. *Moorii*, Blgr. 1902. L. Nyassa.
6. *Lamprologus*, Schilth. 1891.
1. *tetracanthus*, Blgr. 1899. L. Tanganyika.
  2. *tritocephalus*, Blgr. 1899.
  3. *modestus*, Blgr. 1898. "
  4. *tumbanus*, Blgr. 1899. "
  5. *Mocquardi*, Pellegr. 1903. Congo.
  6. *congolensis*, Schilth. 1891. "

6. *Lampulogus* (con.).
7. *Lemairii*, Blgr. 1899. L. Tanganyika.
  8. *Moorii*, Blgr. 1898. "
  9. *Hecqui*, Blgr. 1899. "
  10. *fasciatus*, Blgr. 1898. "
  11. *brevis*, Blgr. 1899. "
  12. *compressiceps*, Blgr. 1898. "
  13. *furcifer*, Blgr. 1898. "
  14. *elongatus*, Blgr. 1898. "
7. *Julidochromis*, Blgr. 1898.
1. *ornatus*, Blgr. 1898. L. Tanganyika.
8. *Telmatochromis*, Blgr. 1898.
1. *temporalis*, Blgr. 1898. L. Tanganyika.
  2. *vittatus*, Blgr. 1898. "
9. *Tilapia*, A. Smith, 1840.
1. *Moorii*, Blgr. 1901. L. Tanganyika.
  2. *Linnellii*, Lönnb. 1903. Cameroon.
  3. *Desfontainesi*, Lacep. 1802. Algeria, Tunis.
  4. *Bloueti*, Sauv. 1883. Wami and Kingani R., L. Kivu.
  5. *Wingatii*, Blgr. 1902. Bahr el Jebel.
  6. *Guiarti*, Pellegr. 1904. L. Victoria.
  7. *Livingstoni*, Gthr. 1893. L. Nyassa and Shiré.
  8. *Johnstoni*, Gthr. 1893. "
  9. *microlepis*, Blgr. 1899. L. Tanganyika.
  10. *Hunteri*, Gthr. 1889. Crater lake of Kilimandjaro.
  11. *nigra*, Gthr. 1894. Kibwesi.
  12. *shivana*, Blgr. 1896. Upp. Shiré.
  13. *mossambica*, Ptrs. 1852. Coast of Zanzibar to Zambesi.
  14. *nilotica*, L. 1766. Nile, L. Victoria, L. Albert, L. Tsana, L. Abeia, L. Kivu, E. Africa to Pangani R., Senegal to Niger, L. Chad.
15. *natalensis*, M. Web. 1897. Coast of Zanzibar, L. Mweru, Congo, Katanga, Zambesi, Natal.
16. *tanganicae*, Gthr. 1893. L. Tanganyika.
  17. *gabitæa*, Art. 1762. Nile, Senegal, Gambia, Niger.
  18. *flavomarginata*, Blgr. 1899. Ogowe, Congo.
  19. *Heudeloti*, A. Dum. 1859. Senegal to Congo, L. Chad.
  20. *nigripinnis*, A. Dum. 1859. Gaboon.
  21. *macrocephala*, Blkr. 1862. Gold Coast.
  22. *Dumerili*, Sldr. 1864. W. Africa (?).
  23. *lepidura*, Blgr. 1899. Congo, Angola.
  24. *Boulengeri*, Pellegr. 1903. Congo.
  25. *squamipinnis*, Gthr. 1864. L. Nyassa, Shiré.
  26. *Sparrmani*, A. Smith, 1840. Angola, Katanga, Zambesi to Orange R.
  27. *ovalis*, Sldr. 1866. Angola, Katanga, Bechuanaland.
  28. *Burtoni*, Gthr. 1893. L. Kivu, L. Tanganyika.
  29. *humilis*, Sldr. 1866. Angola.
  30. *vorax*, Pfeff. 1893. Zambesi.
  31. *Buettikoferi*, Hubr. 1881. Liberia.
  32. *Maricae*, Blgr. 1899. Low. Niger.
  33. *dubia*, Lönnb. 1904. Cameroon (Crater Lake).
  34. *Cabrae*, Blgr. 1899. Chiloango.
  35. *Tholloni*, Sauv. 1884. Ogowe.
  36. *crassa*, Pellegr. 1903. Congo.
  37. *bitineata*, Pellegr. 1900. "
  38. *polyacanthus*, Blgr. 1899. L. Mweru.

9. *Tilapia* (con.).
39. *Zilli*, Gerv. 1848. N. Africa to Niger, L. Chad, White Nile,  
L. Rudolf.  
Cameroon (Crater Lake).
40. *kottæ*, Lönnb. 1904. L. Tanganyika.
41. *Horii*, Gthr. 1893. Zambesi.
42. *Jullæ*, Blgr. 1896. Senegal to Congo, L. Chad,  
Zambesi.
43. *melanopleura*, A. Dum. 1859. Gold Coast.
44. *busumana*, Gthr. 1902. Gaboon, Congo.
45. *Dottoi*, Blgr. 1899. Ashantee.
46. *guineensis*, Blkr. 1862. L. Tanganyika.
47. *pleurotænia*, Blgr. 1901. L. Nyassa.
48. *trematocephala*, Blgr. 1901. L. Nyassa, Shiré.
49. *Williamsi*, Gthr. 1893. White Nile, Wami.
50. *calliptera*, Gthr. 1893. L. Nyassa.
51. *Kirkii*, Gthr. 1893. Rufu.
52. *strigigena*, Pfeff. 1893. L. Victoria.
53. *lethrinus*, Gthr. 1893. Congo.
54. *pectoralis*, Pfeff. 1893. Transvaal, Natal.
55. *nuchisquamulata*, Hilg. 1888. Angola, Zambesi.
56. *fasciata*, Perugia, 1892. L. Rukwa.
57. *Stormsi*, Blgr. 1902. Zambesi.
58. *philander*, M. Web. 1897. L. Ngami.
59. *acuticeps*, Stdr. 1866. L. Tanganyika.
60. *Puelleborni*, Hilg. & Pappenh. 1903. L. Nyassa.
61. *Livingstonii*, Gthr. 1899. L. Tanganyika.
62. *Giardi*, Pellegr. 1903. L. Nyassa.
63. *Levuillanti*, Casteln. 1861. L. Tanganyika.
64. *Andersoni*, Casteln. 1861. L. Nyassa.
65. *Dardennii*, Blgr. 1899. L. Tanganyika.
66. *zebra*, Blgr. 1899. L. Nyassa.
67. *aurata*, Blgr. 1897. L. Tanganyika.
68. *labiata*, Blgr. 1898. L. Nyassa.
69. *rostrata*, Blgr. 1899. L. Tanganyika.
70. *boops*, Blgr. 1901. L. Tanganyika.
71. *grandoculis*, Blgr. 1899. L. Tanganyika.
72. *oligacanthus*, Blkr. 1868. Madagascar.
10. *Hemitylapia*, Blgr. 1902. L. Nyassa.
1. *oxyrhynchus*, Blgr. 1902. L. Nyassa.
11. *Simochromis*, Blgr. 1898. L. Tanganyika.
1. *diagramma*, Gthr. 1893. L. Tanganyika.
12. *Astatoreochromis*, Pellegr. 1904. L. Victoria.
1. *Alluandi*, Pellegr. 1904. L. Victoria.
13. *Tropheus*, Blgr. 1898. L. Tanganyika.
1. *Moorii*, Blgr. 1898. L. Tanganyika.
2. *annectens*, Blgr. 1900. L. Tanganyika.
14. *Docimodus*, Blgr. 1896. Shiré.
1. *Johnstoni*, Blgr. 1896. Shiré.
15. *Corematodus*, Blgr. 1896. Shiré.
1. *shiranus*, Blgr. 1896. Shiré.
16. *Steatocranus*, Blgr. 1899. Congo.
1. *gibbiceps*, Blgr. 1899. Congo.
17. *Petrochromis*, Blgr. 1898. L. Tanganyika.
1. *tanganica*, Gthr. 1893. L. Albert.
2. *Andersoni*, Blgr. 1901. L. Tanganyika.
3. *polyodon*, Blgr. 1898. L. Tanganyika.
4. *nyassa*, Blgr. 1902. L. Nyassa.

18. *Chilochromis*, Blgr. 1902.  
1. *Duponti*, Blgr. 1902. Congo.
19. *Aspnotilapia*, Blgr. 1901.  
1. *leptura*, Blgr. 1901. L. Tanganyika.
20. *Paretroplus*, Blkr. 1868.  
1. *Dami*, Blkr. 1868. Madagascar.  
2. *polyactis*, Blkr. 1870. "
21. *Eretmodus*, Blgr. 1898.  
1. *cyanostictus*, Blgr. 1898. L. Tanganyika.
22. *Spathodus*, Blgr. 1900.  
1. *erythrodon*, Blgr. 1900. L. Tanganyika.
23. *Perissodus*, Blgr. 1898.  
1. *microlepis*, Blgr. 1898. L. Tanganyika.
24. *Plecodus*, Blgr. 1898.  
1. *paradoxus*, Blgr. 1898. L. Tanganyika.
25. *Xenochromis*, Blgr. 1899.  
1. *Hecqui*, Blgr. 1899. L. Tanganyika.
26. *Bathybates*, Blgr. 1898.  
1. *ferox*, Blgr. 1898. L. Tanganyika.  
2. *fasciatus*, Blgr. 1901. "
27. *Trematocara*, Blgr. 1899.  
1. *marginatum*, Blgr. 1899. L. Tanganyika.  
2. *unimaculatum*, Blgr. 1901. "
28. *Grammatotria*, Blgr. 1899.  
1. *Lemairii*, Blgr. 1899. L. Tanganyika.
29. *Ectodus*, Blgr. 1898.  
1. *Descampsii*, Blgr. 1898. L. Tanganyika.  
2. *melanogenys*, Blgr. 1898. "  
3. *longianalis*, Blgr. 1899. "
30. *Xenotilapia*, Blgr. 1899.  
1. *sima*, Blgr. 1899. L. Tanganyika.  
2. *ornatipinnis*, Blgr. 1899. "

## Fam. 10. PLEURONECTIDÆ.

1. *Citharichthys*, Blkr. 1862.  
1. *spilopterus*, Gthr. 1862. Niger, Gaboon\*.
2. *Cynoglossus*, Ham. Buch. 1822.  
1. *senegalensis*, Kaup, 1858. Senegal to Ogowe\*.

## Fam. 11. GOBIDÆ.

1. *Eleotris*, Gron. 1763.  
1. *ophiocephalus*, C. & V. 1837. Madagascar, Comoro, Seychelles\*.  
2. *senegalensis*, Stdr. 1870. Senegal to Ogowe.  
3. *Lebretoni*, Stdr. 1870. Senegal, Angola.  
4. *daguenensis*, Stdr. 1870. Senegal.  
5. *Fornasini*, Bianc. 1850. Mozambique.  
6. *madagascariensis*, C. & V. 1837. Madaga-car\*.  
7. *fusca*, Bl. Schn. 1801. Pangani, Madagascar, Comoro, Seychelles\*.  
8. *butis*, Ham. Buch. 1822. Johanna (Comoro).  
9. *pectoralis*, Regan, 1903. Madagascar.  
10. *Pisonis*, Gmel. 1789. Liberia\*.  
11. *Buettikoferi*, Stdr. 1894. Liberia, Gaboon.  
12. *Monteiri*, O'Sh. 1875. Gaboon, Angola.

1. *Eleotris* (con.).  
 13. *africanus*, Stdr. 1880. Sierra Leone, Gaboon, Congo\*.  
 14. *naus*, Blgr. 1901. Upp. Nile, White Nile.
2. *Gobius*, Art. 1738.  
 1. *rhodopterus*, C. & V. 1837. Algeria\*.  
 2. *güris*, Ham. Buch. 1822. E. and S. Africa, Madagascar\*.  
 3. *spectabilis*, Gthr. 1861. Natal.  
 4. *gymnauchen*, M. Web. 1897. " "  
 5. *Devaalü*, M. Web. 1897. " "  
 6. *Gilchristi*, Blgr. 1898. Cape of Good Hope.  
 7. *paganellus*, L. 1766. Algeria\*.  
 8. *Schlegelü*, Gthr. 1861. Gold Coast, Niger.  
 9. *æneofuscus*, Peters, 1852. Zambesi.  
 10. *guineensis*, Peters, 1876. Niger to Ogowe.  
 11. *macrorhynchus*, Blkr. 1875. Madagascar.  
 12. *madagascariensis*, Blkr. 1875. "  
 13. *sambiranoensis*, Blkr. 1875. "  
 14. *hypselosoma*, Blkr. 1875. "  
 15. *polyzona*, Blkr. 1875. "  
 16. *macrorhynchus*, Blkr. 1875. "  
 17. *ocellaris*, C. & V. 1837. " \*.

## Fam. 12. BLENNIIDÆ.

1. *Blennius*, Art. 1738.  
 1. *vulgaris*, Pollini, 1816. Algeria\*.
2. *Alticus*, Blkr. 1875.  
 1. *monochrous*, Blkr. 1875. Madagascar\*.
3. *Cristiceps*, C. & V. 1836.  
 1. *argentatus*, Risso, 1810. Algeria (?)\*.

## Subord. VIII. OPISTHOMI.

## Fam. MASTACEMBELIDÆ.

1. *Mastacembelus*, Gron. 1781.  
 1. *paucispinis*, Blgr. 1899. Congo.  
 2. *frenatus*, Blgr. 1901. L. Tanganyika.  
 3. *Moorii*, Blgr. 1898. " "  
 4. *Marchii*, Sauv. 1879. Ogowe.  
 5. *Sclateri*, Blgr. 1903. S. Cameroon.  
 6. *cryptacanthus*, Gthr. 1867. Cameroon.  
 7. *congius*, Blgr. 1896. Congo.  
 8. *liberiensis*, Blgr. 1898. Liberia.  
 9. *Loennbergii*, Blgr. 1898. Niger, Cameroon, L. Chad.  
 10. *Ansorgii*, Blgr. 1905. Angola.  
 11. *marmoratus*, Perugia, 1892. Congo.  
 12. *goro*, Blgr. 1902. " "  
 13. *ellipsifer*, Blgr. 1899. L. Tanganyika.  
 14. *tanganica*, Gthr. 1893. " "  
 15. *shiranus*, Gthr. 1896. L. Nyassa, Shiré.  
 16. *victoriae*, Blgr. 1904. L. Victoria.  
 17. *tæniatus*, Blgr. 1901. L. Tanganyika.  
 18. *brachyrhinus*, Blgr. 1899. Congo.  
 19. *Greshoffi*, Blgr. 1901. " "  
 20. *niger*, Sauv. 1879. Ogowe.

1. *Mastacembelus* (con.).  
 21. *flavomarginatus*, Blgr. 1898. Cameroon, Gaboon, Ogowe.  
 22. *nigromarginatus*, Blgr. 1898. Ashantee.  
 23. *ophidium*, Gthr. 1893. L. Tanganyika.

## Subord. IX. PLECTOGNATHI.

## Fam. TETRODONTIDÆ.

1. *Tetrodon*, L. 1766.  
 1. *fahaka*, Hasselq. 1757. Nile, L. Chad, Senegal, Niger.  
 2. *mbu*, Blgr. 1899. Congo.  
 3. *pustulatus*, Murr. 1857. Old Calabar, Gaboon.  
 4. *miurus*, Blgr. 1902. Congo.

VII.—*A Revision of the Fishes of the American Cichlid Genus Cichlosoma and of the Allied Genera.* By C. TATE REGAN, B.A.

I GRATEFULLY acknowledge the kind assistance given to me in the preparation of this paper by Dr. Steindachner, to whom I am indebted for information as to the number of gill-rakers in the typical examples of *Cichlosoma bifasciatum*, *C. lentiginosum*, *C. altifrons*, and *C. Sieboldii*, and by Dr. Th. Gill, through whose intervention the British Museum has acquired typical specimens of *Cichlosoma centrarchus*, *C. balteatum*, *C. rostratum*, and *C. basilare*. Dr. S. Garman has very kindly given me information as to the number of gill-rakers and the length of the dorsal spines in *C. pavonaceum*.

In the descriptions of the species the number of scales in a longitudinal series is counted from above the origin of the lateral line to the base of the caudal fin, in a transverse series from the base of the first dorsal spine to the lateral line and thence to the middle of the abdomen. The number of scales in a transverse series between the lateral line and the base of the soft dorsal fin does not include the scales forming the sheath which is usually present at the base of the fin. The length of the last dorsal spine is measured from its tip to its actual base, not to the free edge of the scaly sheath at its base. The caudal peduncle is measured from the level of the base of the last anal ray to the actual base of the middle caudal rays, a point which is easily ascertained by bending the fin laterally. I have given a list of the specimens in the British Museum collection on which my descriptions are founded, with the total length in millimetres of each.



The relations of the genera here dealt with are shown in the following synopsis:—

Dorsal fin without notch between spinous and soft portions; anal fin with more than 3 spines; gill-rakers short or of moderate length, in small or moderate number.

I. Dorsal with XIII–XX 10–16 rays, anal with IV–XII 7–16.

A. Teeth all conical or cylindrical, not compressed.

Posterior (ascending) processes of præmaxillaries shorter than the head. . . . . *Cichlosoma*.

Posterior processes of præmaxillaries as long as the head. *Petenia*.

B. Teeth mostly conical, but the median teeth of the outer series compressed, pointed in the young, truncate in the adult.

*Herichthys*.

C. Teeth all rather broad and strongly compressed; scales large, those of the lateral line of the same size as the others.

Teeth entire, with pointed or rounded apices . . . . . *Paraneetroplus*.

Teeth entire, truncate, incisor-like . . . . . *Neetroplus*.

Teeth tricuspid, except the median ones of the outer series, which are entire, truncate, incisor-like . . . *Herotilapia*.

D. Teeth slender, compressed, pointed in the young, rounded in the adult; scales rather small, those of the lateral line larger than the others . . . . . *Uaru*.

II. Dorsal with VIII–XIII 24–31 rays, anal with V–IX 24–32; teeth conical.

Teeth confined to the anterior part of each jaw . . . . . *Symphysodon*.

Teeth extending on to the sides of the jaws . . . . . *Pterophyllum*.

#### CICHLISOMA.

*Cichlasoma*, Swains. Nat. Hist. Fish. ii. p. 230 (1839); Eigenm. & Bray, Ann. Ac. N. York, vii. 1894, p. 615; Jord. & Everm. Proc. U.S. Nat. Mus. xlvii. 1898, p. 1514; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 202 (1904); Meek, Zool. Pub. Columbian Mus. v. 1904, p. 204.

*Acara* (part.), Heck. Ann. Mus. Wien, ii. 1840, p. 338; Günth. Cat. Fish. iv. p. 276 (1862); Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 63.

*Heros*, Heck. t. c. p. 362; Günth. t. c. p. 285; Jord. & Everm. t. c. p. 1526; Pellegr. t. c. p. 226.

*Hoplarchus*, Kaup, Arch. f. Nat. 1860, p. 128.

*Theraps*, Günth. t. c. p. 254.

*Mesonauta*, Günth. t. c. p. 300.

*Archocentrus*, Gill, Proc. Ac. Philad. 1877, p. 186.

*Petenia* (part.), Eigenm. & Bray, t. c. p. 614; Pellegr. t. c. p. 243.

*Astronotus* (part.), Eigenm. & Bray, t. c. p. 615.

*Astatheros*, Pellegr. t. c. p. 203.

*Thorichthys*, Meek, t. c. p. 222.

Body deep or elongate, compressed; scales large or moderate, usually ctenoid. Two lateral lines. Jaws with bands of small conical teeth, the outer series more or less enlarged and sometimes forming canines. Mouth small or moderate.

Præmaxillary processes shorter than the head; maxillary exposed or not. Upper surface of head scaly to the level of the orbits or beyond; cheeks and opercular bones scaly; præoperculum entire. Gill-rakers rather short and few (6-15 on the lower part of anterior arch). A single dorsal fin, with XIV-XIX 7-15 rays; no notch between spinous and soft portions. Anal with IV-XII 6-14 rays. Pectoral asymmetrical, with 12-18 rays; ventrals below or a little behind the base of the pectorals. Caudal rounded, truncate or emarginate.

Numerous species from Mexico, Central and South America.

I have examined the skeleton in four species, in which the number of vertebræ is as follows:—

<i>C. guttatum</i>	. . . . .	14 + 16 = 30.
<i>C. tetracanthus</i>	. . . . .	13 + 15 = 28.
<i>C. octofasciatum</i>	. . . . .	13 + 16 = 29.
<i>C. Salvini</i>	. . . . .	13 + 15 = 28.

The ribs are subsessile. The supraoccipital crest is high and extends forwards on to the frontals, which are hollowed out anteriorly for the reception of the præmaxillary processes. In *C. guttatum* and *C. octofasciatum* these are comparatively short and the supraoccipital crest extends forward nearly to the level of the anterior margins of the orbits. In *C. tetracanthus* and *C. Salvini* the præmaxillary processes are longer and the supraoccipital crest terminates above the middle of the orbits. The parietal crests are well developed and extend forward to above the middle of the orbits. The pelvic bones do not diverge anteriorly. In *C. tetracanthus* the lower pharyngeals are strongly developed, they are firmly united by a very sinuous suture, and bear large obtuse teeth; the fourth vertebra bears a moderately developed inferior apophysis. In the other three species the suture between the lower pharyngeals is straight, the teeth are pointed, whilst the inferior apophysis is feeble or wanting.

The genus *Cichlosoma* stands in the same relation to *Acara* that the African *Lamprologus* does to *Paratilapia*, and, as far as external characters are concerned, it is more difficult to distinguish between *Cichlosoma* and *Lamprologus* than between *Acara* and *Paratilapia*. *C. Dovii*, for example, presents considerable similarity to *L. congolensis* in general form, structure of the fins, structure of the mouth, dentition, &c. The most notable difference is that in *Lamprologus* the scales on the cheeks and opercular bones are usually

deciduous or wanting and the scales on the upper surface of the head and of the anterior part of the body and on the lower part of the abdomen are very small, which is not the case in *Cichlosoma*. A comparison of the skeletons shows that the African genus is distinguished by certain features of specialization, such as the low occipital crest, the absent parietal crests, the attachment of the ribs near the free ends of the parapophyses, and the anterior divergence of the pelvic bones.

A natural arrangement of the numerous species of this genus is a matter of considerable difficulty. I have tried to group the species according to their relationships and at the same time to so define the various sections that they may be mutually exclusive.

*Synopsis of the Species.*

1. Teeth of the outer series in the upper jaw usually more or less distinctly and regularly increasing in size anteriorly (the anterior pair not strongly enlarged unless the lips are exceptionally thick). Teeth of the outer series in the lower jaw either similar to those of the upper jaw or with the anterior 2 to 6 on each side enlarged, subequal, and rather distinct from the smaller lateral teeth.
  - A. Scales of the lateral line of the same size as those below it on the side of the body.
    1. D. XIV-XVI 9-11. A. IV (? V or VI) 8-9. Scales of thoracic region not much smaller than those on the side of the body.
      1. *bimaculatum*.
    2. D. XIV-XVI 10-12. A. VIII-IX 10-12. Body increasing in depth to below posterior part of dorsal fin.
      2. *festivum*.
    3. D. XV-XIX 7-14. A. VI-XII 6-11. 6 to 8 gill-rakers on the lower part of the anterior arch. Body ovate. Pectoral extending to above the origin of anal or beyond. Soft dorsal scaly at the base. Lips normal.
      - a. D. XV-XVII 9-11. A. VI-VIII 7-9. 1 or 1½ scales between lateral line and base of anterior part of soft dorsal.
 

Depth of body 1¾-2½ in the length; fold of the lower lip not continuous; pectoral extending to above origin of anal .....	3. <i>facetum</i> .
Depth of body about 2 in the length; fold of the lower lip continuous; pectoral extending a little beyond origin of anal .....	4. <i>autochthon</i> .
Depth of body 2½ in the length .....	5. <i>oblongum</i> .
      - b. D. XVI-XVIII 11-14. A. VI-VIII 9-11.
 

2½ scales between lateral line and base of anterior part of soft dorsal .....	6. <i>temporale</i> .
4 scales between lateral line and base of anterior part of soft dorsal .....	7. <i>coryphænoïdes</i> .
      - c. D. XVII-XIX 7-10. A. VIII-XII 6-9.
    - D. XVII-XVIII 8-9. A. VIII-X 6-8. Snout much shorter than postorbital part of head.
      8. *nigrofasciatum*.

- D. XVIII-XIX 9-10. A. VIII-X 7-8. Snout not shorter than postorbital part of head . . . . . 9. *spilurum*.
- D. XVIII-XIX 7-8. A. XI-XII 7-8 . . . . . 10. *spinossissimum*.
- D. XVIII-XIX 9-10. A. IX 9 . . . . . 11. *immaculatum*.
4. D. XVI 8-9. A. X-XI 8-9. 15 gill-rakers on the lower part of the anterior arch . . . . . 12. *centrarchus*.
5. D. XV-XVIII 10-15. A. IV-VII 8-11. Scales of thoracic region considerably smaller than those on the side of the body. Either less than 11 gill-rakers on the lower part of anterior arch or the depth of body  $\frac{1}{3}$  or less than  $\frac{1}{3}$  its length. Pectoral not extending to above the anal. Soft dorsal more or less distinctly scaly at the base.
- a. Caudal truncate or rounded.
- a. Last dorsal spine  $\frac{1}{2}$ - $\frac{2}{3}$  the length of head; lower jaw shorter than the upper; depth of body  $2\frac{1}{3}$ - $2\frac{2}{3}$  in the length. D. XVII-XVIII 12-15. A. V-VI 8-10.
- Length of head  $3\frac{1}{4}$ - $3\frac{1}{2}$  in the length of the fish . . . . . 13. *Eigenmanni*.
- Length of head  $3\frac{2}{3}$ -4 in the length of the fish . . . . . 14. *nebuliferum*.
- $\beta$ . Last dorsal spine  $\frac{2}{3}$ - $\frac{3}{5}$  the length of head; jaws equal anteriorly.
- † Depth of body  $1\frac{2}{3}$ -2 in the length; caudal peduncle  $\frac{1}{2}$ - $\frac{3}{4}$  as long as deep.
- D. XVI-XVII 12-14. A. VI-VII 9-10. Last dorsal spine more than  $\frac{1}{2}$  the length of head. A large dark blotch on the caudal peduncle . . . . . 15. *maculicauda*.
- D. XVII-XVIII 11-13. A. VI-VII 8-9. Last dorsal spine  $\frac{1}{2}$  the length of head. Dark cross-bars and a dark band from operculum to base of caudal . . . . . 16. *fenestratum*.
- †† Depth of body 2 in the length; caudal peduncle as long as deep; last dorsal spine  $\frac{1}{2}$  the length of head. D. XVII 13. A. VI 9 . . . . . 17. *bifasciatum*.
- ††† Depth of body  $2\frac{1}{3}$ - $2\frac{2}{3}$  in the length; caudal peduncle from  $\frac{2}{3}$  to as long as deep; last dorsal spine  $\frac{2}{3}$ - $\frac{1}{2}$  the length of head.
- \* 8 to 10 gill-rakers on the lower part of the anterior arch; anal with 6 or 7 spines. 18. *guttulatum*.
- \*\* 7 or 8 gill-rakers on the lower part of the anterior arch; anal with 4 to 6 spines.
- ‡ Fold of the lower lip continuous. 19. *microphthalmus*.
- †† Fold of the lower lip not continuous or sub-continuous.
- § Caudal peduncle  $\frac{2}{3}$  as long as deep. 20. *sexfasciatum*.
- §§ Caudal peduncle from  $\frac{3}{4}$  to as long as deep.
- 3 scales between lateral line and base of anterior part of soft dorsal; interorbital width  $2\frac{2}{5}$ -3 in the length of head; 2 dark longitudinal bands or series of spots, one above the upper lateral line, the other from the middle of side to the base of caudal . . . . . 21. *melanurum*.
- 3 scales between lateral line and base of anterior part of soft dorsal; interorbital width  $2\frac{1}{4}$ - $2\frac{2}{3}$

- in the length of head; dark cross-bars and a dark longitudinal band from operculum to base of caudal . . . . . 22. *Gadovii*.
- 2 or  $2\frac{1}{2}$  scales between lateral line and base of anterior part of soft dorsal; a broad dark band from operculum to middle of side and thence running upwards to the dorsal fin. . . . . 23. *intermedium*.
- ††† Depth of body  $2\frac{2}{3}$ - $2\frac{5}{8}$  in the length.
- D. XVIII 13. A. VI 9-10 . . . . . 24. *Guentheri*.
- D. XVI 12. A. V 8 . . . . . 25. *pavonaceum*.
- γ. Last dorsal spine  $\frac{1}{3}$  the length of head; depth of body  $2\frac{1}{3}$ - $2\frac{3}{4}$  in the length.
- D. XVII 11. A. V 8. Depth of body  $2\frac{1}{3}$  in the length . . . . . 26. *Sieboldii*.
- D. XVI-XVII 12-13. A. V 10. Depth of body  $2\frac{2}{3}$ - $2\frac{3}{4}$  in the length. . . . . 27. *Godmanni*.
- δ. Last dorsal spine  $\frac{1}{3}$ - $\frac{2}{3}$  the length of head; depth of body  $3$ - $3\frac{1}{2}$  in the length. D. XV-XVII 12-14. A. IV-V 9-10. . . . . 28. *irregulare*.
- b. Caudal emarginate, with rounded lobes. . . . . 29. *lentiginosum*.
6. D. XVIII-XIX 10-11. A. VII-VIII 7-9. 9 or 10 gill-rakers on the lower part of the anterior arch. Pectoral extending to above the origin of anal or beyond.
- Interorbital width 3 in the length of head; pectoral extending to above the origin of anal. . . . . 30. *balteatum*.
- Interorbital width  $2\frac{1}{2}$ - $2\frac{2}{3}$  in the length of head; pectoral extending a little beyond the origin of anal . . . . . 31. *nicaraguense*.
7. D. XIV-XVII 10-14. A. V-VII 8-10. 9 to 13 gill-rakers on the lower part of the anterior arch. Depth of body  $\frac{2}{3}$  its length or more. Pectoral extending beyond origin of anal or 11 to 13 gill-rakers on the lower part of the anterior arch. Soft dorsal more or less distinctly scaly at the base. Lips normal.
- a. Fourth to sixth dorsal spines longer than the rest. D. XVI 10-11. A. VI 8-9.
- Pectoral extending to above the middle of anal . . . . . 32. *Robertsoni*.
- Pectoral extending to the posterior end of anal . . . . . 33. *longimanus*.
- b. Dorsal spines either subequal from the fifth or sixth or increasing in length throughout.
- a. D. XIV-XV 12-15. A. V 8-9. Snout shorter than post-orbital part of head.
- Pectoral extending beyond the origin of anal . . . . . 34. *macracanthus*.
- Pectoral not extending beyond the origin of anal. . . . . 35. *heterodontus*.
- β. D. XVI 11. A. V 8-9. Snout longer than postorbital part of head; pectoral extending nearly to the origin of anal . . . . . 36. *altifrons*.
- γ. D. XVI-XVII 11-12. A. VII 8-9.
- † Pectoral extending to above the last anal spine. . . . . 37. *rostratum*.

†† Pectoral extending to above the third or fourth anal spine.

Caudal slightly emarginate, with rounded lobes. . . . . 38. *margaritifera*.  
Caudal rounded . . . . . 39. *citrinellum*.

8. D. XVII 11-12. A. VII-VIII 8-9. Pectoral extending beyond the origin of anal. Lips exceptionally thick.

a. Lips subnormal . . . . . 40. *erythreum*.  
b. Each lip produced as a long fleshy triangular flap.

Depth of body  $2\frac{1}{4}$  in the length, length of head nearly 3 . . . . . 41. *lobochilus*.

Depth of body  $2\frac{1}{3}$  in the length, length of head  $2\frac{1}{3}$ - $2\frac{2}{3}$  . . . . . 42. *labiatum*.

9. D. XV-XVII 8-12. A. VI-IX 6-9. Dorsal fin entirely scaleless. Caudal slightly emarginate, with pointed lobes.

a. Last dorsal spine  $\frac{1}{2}$  the length of head; pectoral extending beyond origin of anal.

Snout not longer than postorbital part of head . . . . . 43. *aureum*.

Snout longer than postorbital part of head . . . . . 44. *affine*.

b. Last dorsal spine  $\frac{2}{3}$  the length of head or less; pectoral extending to above origin of anal . . . . . 45. *callolepis*.

10. D. XV-XVII 13-14. A. VII-VIII 12-14. Body ovate. . . . . 46. *severum*.

B. Scales of the lateral line larger than those below it on the side of the body . . . . . 47. *psittacum*.

II. Teeth of the outer series in the upper jaw increasing in size anteriorly, with the anterior pair more or less distinctly differentiated as canines. Anterior pair of teeth in the lower jaw, if present, smaller than the next 1 or 2 pairs, which are more or less strongly enlarged and canine-like. Lips normal. Scales of thoracic region small.

A. D. XV-XVI 10-12. A. IV 8-10.

Caudal peduncle nearly as long as deep . . . . . 48. *adpersum*.

Caudal peduncle  $\frac{3}{5}$ - $\frac{2}{4}$  as long as deep . . . . . 49. *tetracanthus*.

B. D. XV-XVI 10-13. A. V (IV-VI) 7-10.

1. Snout nearly equal to postorbital part of head (in the adult); caudal peduncle as long as deep.

Depth of body  $2\frac{3}{5}$ - $2\frac{2}{3}$  in the length; jaws equal anteriorly . . . . . 50. *istlanum*.

Depth of body  $2\frac{1}{5}$ - $2\frac{2}{5}$  in the length; lower jaw projecting . . . . . 51. *Bartoni*.

2. Snout shorter than postorbital part of head (in the adult); lower jaw projecting.

Depth of body  $2$ - $2\frac{1}{3}$  in the length; caudal peduncle  $\frac{2}{3}$  as long as deep . . . . . 52. *Beani*.

Depth of body  $2\frac{3}{5}$ - $2\frac{4}{5}$  in the length; caudal peduncle as long as deep . . . . . 53. *mento*.

3. Snout longer than postorbital part of head (in the adult); depth of body  $2\frac{1}{3}$ -3 in the length.

Lower jaw slightly projecting (in the adult); caudal peduncle deeper than long . . . . . 54. *Festæ*.

Lower jaw a little shorter than the upper (in the adult); caudal peduncle as long as deep . . . . . 55. *ornatum*.

C. D. XVII-XIX 8-10. A. VIII-X 7-8. Præmaxillary processes extending to above the anterior margin of eye.

56. *octofasciatum*.

D. D. XV-XVIII 9-12. A. VI-IX 7-10.

1. Præmaxillary processes extending to above anterior  $\frac{1}{3}$  of eye. D. XV-XVII 10-12. A. VI 8-9.... 57. *urophthalmus*.

2. Præmaxillary processes extending to above middle of eye or beyond.

a. Last dorsal spine  $\frac{1}{2}$  or nearly  $\frac{1}{2}$  the length of head; maxillary extending to below anterior margin of eye; D. XVI-XVII 9-12.

Snout shorter than postorbital part of head (in the adult). A. VI-VIII 8-9 .....

58. *trimaculatum*.

Snout as long as postorbital part of head (in the adult). A. VIII-IX 7-9 .....

59. *Salvini*.

b. Last dorsal spine about  $\frac{2}{5}$  the length of head; maxillary extending to below anterior  $\frac{1}{4}$  of eye; D. XVIII 10. A. VII-VIII 8-9; depth of body  $2\frac{1}{4}$ - $2\frac{1}{3}$  in the length; caudal peduncle  $\frac{1}{2}$ - $\frac{2}{3}$  as long as deep..... 60. *multifasciatum*.

c. Last dorsal spine about  $\frac{1}{3}$  the length of head.

a. Maxillary extending to below anterior margin or anterior  $\frac{1}{4}$  of eye; D. XVII-XVIII 9-11. A. VII-VIII 8-9; depth of body  $2\frac{2}{5}$ - $2\frac{2}{3}$  in the length.

Caudal peduncle  $\frac{2}{3}$  as long as deep; depth of præorbital  $\frac{2}{3}$ - $\frac{3}{5}$  the diameter of eye (in specimens of 120-130 mm. in total length) .....

61. *Friedrichstahli*.

Caudal peduncle  $\frac{2}{3}$ - $\frac{4}{5}$  as long as deep; depth of præorbital  $\frac{2}{3}$  the diameter of eye (in a specimen of 115 mm.) or equal to it (in the adult fish) .....

62. *motaguense*.

β. Maxillary extending to below middle of eye. D. XVIII 10. A. VII 8 .....

63. *managuense*.

γ. Maxillary extending to below anterior  $\frac{1}{3}$  of eye. D. XVIII 12. A. VI 9-10 ....

64. *Dovi*.

d. Last dorsal spine  $\frac{1}{2}$  or nearly  $\frac{1}{2}$  the length of head; maxillary extending to below the middle of eye.

D. XV 12-13. A. VI 9-10; scales above lateral line of the same size as those below it .....

65. *spectabile*.

D. XV-XVI 10-11. A. VI 8-9; scales above lateral line smaller than those below it ....

66. *Kraussi*.

### Subgenus CICHLOSOMA.

In the more generalized forms the teeth of the outer series in both jaws rather small, scarcely increasing in size anteriorly. In more specialized forms the teeth of the outer series stronger, regularly and distinctly increasing in size anteriorly. Sometimes the anterior 3 to 6 teeth on each side in the lower jaw enlarged, subequal and rather sharply differentiated from the smaller lateral teeth. In 3 very specialized species (with exceptionally thick lips) the anterior pair of teeth in the upper jaw very strong, the anterior 2 pairs in the lower jaw strongly enlarged, subequal.



Section 1 (*Cichlosoma*).

Body ovate; scales of lateral line of the same size as those above and below it; scales of thoracic region scarcely smaller than those on the side of the body. Mouth rather small, moderately protractile; maxillary not exposed; teeth of the outer series rather small, scarcely increasing in size anteriorly. Dorsal XIV–XVI 9–11, the soft fin scaly at the base. Anal IV (? V or VI) 8–9. Caudal rounded.

The single species, from South America, is undoubtedly closely allied to *Acara portalegrensis*. On the other hand, it shows clear affinities with *Cichlosoma facetum* and its allies.

1. *Cichlosoma bimaculatum*.

*Sciæna bimaculata*, Linn. Mus. Ad. Fried. i. p. 66 (1754).

*Labrus bimaculatus*, Linn. Syst. Nat. (ed. x.) p. 285 (1758).

*Labrus punctatus* (part.), Linn. l. c.

*Labrus punctatus*, Bloch, Ausl. Fische, vi. p. 20, pl. cccv. (1792);

Schneider, Bloch's Syst. Ichth. p. 251 (1801).

*Perca bimaculata*, Bloch, t. c. p. 82, pl. cccx.

*Cichla bimaculata*, Schneider, o. c. p. 338.

*Chromis tænia*, Bennett, Proc. Zool. Soc. i. 1830, p. 112; Storer, Mem. Ac. Amer. ii. 1846, p. 520.

*Acara margarita*, Heck. Ann. Mus. Wien, ii. 1840, p. 338.

*Acara marginata*, Heck. t. c. p. 350.

*Acara punctata*, Heck. t. c. p. 360.

*Acara Gronovii*, Heck. t. c. p. 361.

*Cychlasoma tænia*, Gill, Ann. Lyc. N. York, vi. 1858, p. 383.

*Heros bimaculatus*, Cope, Proc. Ac. Philad. xxiii. 1872, p. 254.

*Acara (Heros) bimaculata*, Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 82.

*Astronotus (Cichlasoma) bimaculatus*, Eigenm. & Bray, Ann. Ac. N. York, vii. 1894, p. 618.

*Cichlasoma bimaculatum*, Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 204 (1904).

Depth of body  $1\frac{3}{4}$ – $2\frac{1}{5}$  in the length, length of head  $2\frac{2}{3}$ –3. Eye much nearer to tip of snout than to extremity of operculum, its diameter  $2\frac{2}{3}$ –4 in the length of head, interorbital width 2– $2\frac{3}{4}$ . Depth of præorbital equal to the diameter of eye or less. Maxillary extending to the vertical from anterior margin of eye; præmaxillary processes extending nearly to above anterior margin of eye; jaws equal anteriorly; fold of the lower lip not continuous; cheek with 3 series of scales; 6 or 7 gill-rakers on the lower part of anterior arch. Scales 25–27  $\frac{3-4}{9-10}$ , 2 between lateral line and base of anterior part of soft dorsal. Dorsal XIV–XVI 9–11, commencing above the opercular cleft, the spines slightly increasing in length to the last, which is  $\frac{2}{5}$  the length of head. Anal IV (V–VI) 8–9. Pectoral as long as the head, extending to



above the anal spines; ventral often extending to posterior end of anal. Caudal rounded. Caudal peduncle about  $\frac{2}{5}$  as long as deep. Brownish, with 8 dark cross-bars, the third bearing a blotch below the lateral line; a dark spot below the posterior part of eye and another on the upper part of the base of caudal; a longitudinal band from eye to lateral blotch; each scale of the lower half of the body with a light spot at its base; each scale of the posterior half of the body with a dark spot; soft dorsal, anal and caudal spotted.

Brazil; Guiana; Trinidad.

1-2. (72 and 83 mm.)	Demerara.	Dr. Hancock.
3-5. (83-121 mm.)	British Guiana.	Sir R. Schomburgk.
6-14. (73-141 mm.)	Guiana.	Berlin Museum.
15. (150 mm.)	Trinidad.	Zoological Society.
16-17. (93 and 107 mm.)	Bahia.	Dr. Wucherer.
18-21. (41-56 mm.)	Demerara.	F. G. Beckford, Esq.
22-36. (40-92 mm.)		
37-39. (70-112 mm.)	Berbice.	F. G. Beckford, Esq.
40-42. (50-105 mm.)	Demerara.	
43-46. (144-156 mm.)	British Guiana.	
47. (180 mm.)	Trinidad.	F. W. Urich, Esq.
48-52. (134-171 mm.)	Trinidad.	L. Guppy, Esq.
53-54. (72 and 88 mm.)	Tabatinga.	Mus. Comp. Zool.

All agree in having 4 anal spines, and the numbers 5 and 6 are evidently quite exceptional.

### Section 2 (*Mesonauta*).

Body increasing in depth to below the posterior part of the dorsal fin; scales of lateral line of the same size as those above and below it; scales of thoracic region not very much smaller than those on the side of the body. Mouth small, moderately protractile; maxillary very slightly exposed distally; teeth of the outer series distinctly increasing in size anteriorly. Dorsal XIV-XVI 10-12, the soft fin scaly at the base. Anal VIII-IX 10-12. Caudal rounded.

The single species, from South America, shows relationships with *C. bimaculatum* and *C. autochthon*.

### 2. *Cichlosoma festivum*.

*Heros festivus*, Heck. Ann. Mus. Wien, ii. 1840, p. 376.

*Heros insignis*, Heck. t. c. p. 378.

*Chromys acora*, Casteln. Anim. Am. Sud, Poiss. p. 17, pl. ix. fig. 1 (1855).

*Mesonauta insignis*, Günth. Cat. Fish. iv. p. 300 (1862).

*Acara (Heros) festiva*, Steind. Sitzb. Ak. Wien, lxxxii. 1875, p. 93.

*Mesonauta festivus*, Eigenm. & Bray, Ann. Ac. N. York, vii. 1894, p. 619.

*Cichlasoma insigne*, Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 221 (1904).

Depth of body  $1\frac{3}{4}$ -2 in the length, length of head  $2\frac{2}{5}$ -3. Snout longer than postorbital part of head. Diameter of eye  $2\frac{2}{3}$ - $3\frac{1}{2}$  in the length of head, interorbital width  $2\frac{1}{4}$ - $2\frac{1}{3}$ . Depth of præorbital equal to diameter of eye (adult) or less (young). Maxillary extending to a little beyond the nostril; præmaxillary processes not extending to above the eye; jaws equal anteriorly; fold of the lower lip not continuous; cheek with 3 series of scales; 5 or 6 gill-rakers on the lower part of anterior arch. Scales 27-29  $\frac{3\frac{1}{2}-4}{11-12}$ ,  $3\frac{1}{2}$ -4 between lateral line and anterior rays of soft dorsal. Dorsal XIV-XVI 10-12, commencing above or behind axil of pectoral, the spines increasing in length to the last, which is  $\frac{3}{5}$ - $\frac{3}{4}$  the length of head, the soft fin pointed, much produced in the adult. Anal VIII-IX 10-12. Pectoral  $\frac{3}{4}$ - $\frac{4}{5}$  the length of head, extending to above the fifth anal spine; ventral, in the adult, extending to the caudal. Caudal rounded. Caudal peduncle  $\frac{1}{4}$  as long as deep. Brownish, with an oblique blackish stripe from the snout, through the eye, to the tip of soft dorsal; a dark ocellated spot on the upper  $\frac{1}{2}$  of base of caudal; dorsal and caudal fins spotted.

Guiana; R. Amazon; R. de la Plata.

1. (90 mm.)	?	Zoological Society.
2. (102 mm.)	Demerara.	F. G. Beckford, Esq.
3. (147 mm.)	Rio Negro.	Mr. J. C. Antony.
4. (72 mm.)	Descalvados, Matto Grosso.	Dr. Ternetz.
5-7. (45-56 mm.)	Carandasiñho, Matto Grosso.	Dr. A. Borelli.
8. (106 mm.)	Tocantins, Brazil.	Paris Museum.

### Section 3.

Body ovate; scales of lateral line of the same size as those above and below it; scales of thoracic region not very much smaller than those on the sides of the body. Mouth rather small, moderately protractile; maxillary very slightly exposed distally; teeth of the outer series moderate, distinctly enlarged anteriorly. Dorsal XV-XVII 9-11, the soft fin scaly at the base. Anal VI-VIII 7-9. Pectoral extending to above the origin of anal or a little beyond. Caudal rounded.

The three species, from South America, show relationship to *C. bimaculatum* in their general form and in the comparatively large size of the scales of the thoracic region.

### 3. *Cichlosoma facetum*.

*Chromis facetus*, Jenyns, Voy. 'Beagle,' Fishes, p. 104 (1842).

*Heros facetus*, Günth. Cat. Fish. iv. p. 260 (1862); Steind. Sitzb. Ak. Wien, lx. 1869, p. 290, pl. i.

*Heros Jemysii*, Steind. t. c. p. 292, pl. ii.

*Heros acuroides*, Hensel, Arch. f. Nat. xxxvi. 1870, p. 54.

*Acara faceta*, Steind. Sitzb. Ak. Wien, lxx. 1874, p. 506.

*Cichlasoma facetum*, Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 217 (1904).

Depth of body  $1\frac{3}{4}$ – $2\frac{1}{5}$  in the length, length of head  $2\frac{5}{7}$ –3. Eye nearer to tip of snout than to the extremity of operculum, its diameter  $3$ – $4\frac{1}{2}$  in the length of head, interorbital width  $2\frac{2}{5}$ – $2\frac{1}{3}$ . Depth of præorbital equal to diameter of eye (adult), or a little more than  $\frac{1}{2}$  diameter of eye (young). Maxillary not or scarcely reaching the vertical from anterior margin of eye; præmaxillary processes extending to above anterior margin of eye; jaws equal anteriorly; fold of the lower lip not continuous; cheek with 4–5 series of scales, the lower 1 or 2 rows often deciduous in the adult; 7 or 8 gill-rakers on the lower part of the anterior arch. Scales 26–28  $\frac{3\frac{1}{2}$ – $4\frac{1}{2}}$ <sub>10–11</sub>,  $1\frac{1}{2}$  between lateral line and base of anterior rays of soft dorsal. Dorsal XV–XVII 9–11, commencing above the opercular cleft, the spines increasing in length to the last, which is nearly half the length of head, the soft fin pointed, when laid back extending to or beyond the middle of caudal. Anal VI–VIII 7–9. Pectoral  $\frac{3}{4}$ – $\frac{4}{5}$  the length of head, extending to above the origin of anal; ventral extending to origin of anal or beyond. Caudal rounded. Caudal peduncle  $\frac{2}{5}$ – $\frac{1}{2}$  as long as deep. Olivaceous, with 6 or 7 dark cross-bars; a dark spot at the base of caudal; fins dusky.

Río de la Plata; Río Grande do Sul.

1. (158 mm.)	Buenos Ayres.	Mr. White.
2–8, 9–11, 12–14. (50–122 mm.)	Río Grande do Sul.	Dr. H. von Ihering.
15–16. (132 & 152 mm.)	Río Parana.	Mr. Salmin.

#### 4. *Cichlosoma autochthon*.

*Heros autochthon*, Günth. Cat. Fish. iv. p. 299 (1862); Kner, Novara Fische, p. 265 (1869); Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 235 (1904).

*Acara (Heros) autochthon*, Steind. Sitzb. Ak. Wien, lxx. 1874, p. 502, pl. i.

Depth of body about 2 in the length, length of head about  $2\frac{1}{5}$ . Eye much nearer to tip of snout than to extremity of operculum, its diameter  $3$ – $3\frac{1}{3}$  in the length of head, interorbital width about  $2\frac{1}{3}$ . Depth of præorbital  $\frac{3}{5}$ – $\frac{3}{4}$  diameter of eye. Maxillary not or scarcely extending to the vertical from anterior margin of eye; præmaxillary processes extending to above anterior  $\frac{1}{4}$  of eye; lower jaw usually slightly projecting; fold of the lower lip continuous; cheek

with 3 series of scales; 7 or 8 gill-rakers on the lower part of anterior arch. Scales 26-28  $\frac{2-4}{9-10}$ , 1 between lateral line and base of anterior part of soft dorsal. Dorsal XV-XVI (XVII) 9-10, commencing above the opercular cleft, the spines increasing in length to the last, which is  $\frac{1}{2}$  the length of head or more; the soft fin pointed, when laid back extending to the extremity of caudal. Anal VI-VII (VIII) 7-8. Pectoral as long as the head, extending to above the third or fourth anal spine; ventral extending beyond origin of anal, sometimes nearly to the caudal. Caudal rounded. Caudal peduncle  $\frac{1}{3}$ - $\frac{2}{5}$  as long as deep. Olivaceous, with 6 or 7 dark cross-bars; a dark spot at the base of the caudal; fins dusky.

Eastern Brazil.

1-3. (123-128 mm.)	Brazil.	Lord Stuart.
4. (113 mm.)		
5-6. (82 and 123 mm.)	Theresopolis.	Dr. E. A. Göldi.
7. (89 mm.)	Porto Real, Prov. Rio Janeiro.	M. Hardy du Dréneuf.

### 5. *Cichlosoma oblongum*.

*Chromys oblonga*, Casteln. Anim. Am. Sud, Poiss. p. 14 (1855).

*Ieros oblongus*, Günth. Cat. Fish. iv. p. 299 (1862); Pellegr Mém. Soc. Zool. France, xvi. 1903, p. 236 (1904).

Depth of body  $2\frac{2}{5}$  in the length, length of head  $2\frac{2}{3}$ . Snout as long as eye, the diameter of which is  $3\frac{1}{2}$  in the length of head, interorbital width  $3\frac{1}{4}$ . Depth of præorbital  $\frac{2}{3}$  the diameter of eye. Maxillary extending nearly to below the eye; præmaxillary processes extending to above anterior  $\frac{1}{3}$  of eye; jaws equal anteriorly; fold of the lower lip subcontinuous; cheek with  $1\frac{1}{2}$  series of scales, its lower part naked; 6 gill-rakers on the lower part of anterior arch. Scales 26  $\frac{3\frac{1}{2}}{11}$ ,  $1\frac{1}{2}$  between lateral line and base of anterior rays of soft dorsal. Dorsal (XV) XVI 10, commencing above the opercular cleft, the spines subequal from the fourth to the twelfth, thence increasing to the last, which is  $\frac{1}{2}$  the length of head; soft fin, when laid back, extending nearly to middle of caudal. Anal VI 9 (VII 7). Pectoral nearly as long as the head, extending to above the fourth anal spine; ventral extending a little beyond origin of anal. Caudal slightly rounded. Caudal peduncle  $\frac{1}{2}$  as long as deep. Brownish, with about 7 dark cross-bars; fins blackish.

Southern and Eastern Brazil; Argentina.

1. (101 mm.)	Argentina.	Captain Vipan.
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According to Pellegrin, the type of *Chromys oblonga*, from

Tocantins, is in bad condition, but the species is closely allied to *C. autochthon*. As the specimen described above agrees well enough with his description of *H. oblongus*, I provisionally refer it to that species.

#### Section 4.

Body ovate; scales of lateral line of the same size as those above and below it; scales of thoracic region considerably smaller than those on the sides of the body. Mouth moderate or rather large (maxillary extending to or nearly to below the eye, snout longer than postorbital part of head), moderately protractile; maxillary very slightly exposed distally; teeth of the outer series moderate, well developed laterally, distinctly increasing in size anteriorly. Dorsal XVI-XVIII 11-14, the soft fin scaly at the base. Anal VI-VIII 9-11. Pectoral extending to above the origin of anal. Caudal rounded.

The two species, from South America, are modified from the type represented by *C. facetum*.

#### 6. *Cichlosoma temporale*.

*Heros temporalis*, Günth. Cat. Fish. iv. p. 287 (1862).

*Acara (Heros) crassa*, Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 88, pl. v.

*Heros Goeldii*, Bouleng. Ann. & Mag. Nat. Hist. xx. 1897, p. 298;

Goeldi, Boll. Mus. Para, ii. 1898, pl.

*Cichlasoma temporale*, Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 218 (1904).

Depth of body about  $1\frac{5}{6}$  ( $1\frac{2}{3}$ -2) in the length, length of head  $2\frac{1}{3}$ -3. Snout longer than postorbital part of head. Diameter of eye  $3\frac{1}{3}$ - $3\frac{1}{2}$  in the length of head, interorbital width  $2\frac{1}{5}$ - $2\frac{1}{3}$ . Depth of præorbital equal to diameter of eye. Maxillary nearly extending to the vertical from anterior margin of eye; præmaxillary processes not extending to above the eye; jaws equal anteriorly; fold of the lower lip not continuous; check with 4 or 5 series of scales; 7 or 8 gill-rakers on the lower part of anterior arch. Scales 30-32  $\frac{4-4\frac{1}{2}}{10-11}$ ,  $2\frac{1}{2}$  between lateral line and base of anterior part of soft dorsal. Dorsal XVI-XVII 11-12, commencing above the opercular cleft, the spines slightly increasing in length to the last, which is nearly  $\frac{1}{2}$  the length of head; the soft fin pointed, when laid back extending beyond the middle of caudal. Anal VI-VII (VIII) 9 (10). Pectoral  $\frac{4}{5}$  the length of head, extending to above the origin of anal. Ventral extending to middle of anal or beyond. Caudal rounded. Caudal peduncle  $\frac{1}{2}$  as long as deep. Brownish, with 3

blackish spots or blotches, one behind the eye, the second on the middle of the side, and the third on the upper half of the base of caudal; a blackish stripe connecting the spots. Fins dusky.

Brazil; Guiana.

1. (161 mm.) type of the species. Zoological Society.
2. (159 mm.) type of *H. Goeldii*. Rio Couanani, French Guiana. Dr. E. A. Göldi.

### 7. *Cichlosoma coryphænoides*.

*Heros coryphænoides*, Heck. Ann. Mus. Wien, ii. 1840, p. 373; Günth. Cat. Fish. iv. p. 296 (1862).

*Heros niger*, Heck. t. c. p. 375.

*Acara (Heros) coryphænoides*, Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 84.

*Cichlasoma coryphænoides*, Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 219 (1904).

Depth of body 2 in the length, length of head  $2\frac{5}{6}$ . Snout longer than postorbital part of head. Diameter of eye  $3\frac{2}{3}$ – $3\frac{3}{4}$  in the length of head, interorbital width  $2\frac{3}{5}$ – $2\frac{2}{3}$ . Depth of præorbital  $\frac{2}{3}$ – $\frac{3}{4}$  the diameter of eye. Maxillary extending to the vertical from anterior margin of eye; præmaxillary processes not extending to above the eye; jaws equal anteriorly; fold of the lower lip slightly interrupted; check with 5 series of scales; 7 or 8 gill-rakers on the lower part of anterior arch. Scales 31–33  $\frac{6}{13}$ , 4 between lateral line and base of anterior rays of soft dorsal. Dorsal XVI 12–13 (14), commencing above the opercular cleft, the spines subequal from the sixth to the thirteenth, thence increasing to the last, which is more than  $\frac{1}{2}$  the length of head; soft fin, when laid back, extending beyond middle of caudal. Anal VI (VII) 9–10 (11). Pectoral  $\frac{5}{6}$  the length of head, extending to above origin of anal; ventral extending to middle of anal. Caudal rounded. Caudal peduncle  $\frac{1}{2}$  as long as deep. Brownish, with obscure darker cross-bars; a blackish blotch or vertical bar above the lateral line and below the eleventh to thirteenth dorsal spines; fins blackish.

Rio Negro.

- 1–2. (121 and 127 mm.) Rio Negro. Mr. J. C. Antony.

### Section 5 (*Archocentrus*).

Body ovate; scales of lateral line of the same size as those above and below it; scales of thoracic region considerably smaller than those on the side of the body. Mouth rather small, moderately protractile; maxillary not or slightly

exposed; teeth of the outer series distinctly enlarged anteriorly. Dorsal XVII-XIX 7-10, the soft fin scaly at the base. Anal VIII-XII 6-9. Pectoral extending beyond the origin of anal. Caudal rounded or subtruncate.

The five species, from Guatemala and Nicaragua, are probably derived from the type represented by *C. facetum*.

### 8. *Cichlosoma nigrofasciatum*.

*Heros nigrofasciatus*, Günth. Trans. Zool. Soc. vi. 1869, p. 452, pl. lxxiv. fig. 3.

*Cichlasoma nigrofasciatum*, Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1898, p. 1525; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 223 (1904).

Depth of body  $2-2\frac{1}{4}$  in the length, length of head  $2\frac{3}{4}-3$ . Snout considerably shorter than postorbital part of head. Diameter of eye  $2\frac{3}{4}-3\frac{1}{2}$  in the length of head, interorbital width  $2\frac{2}{3}-3\frac{1}{4}$ . Depth of præorbital  $\frac{1}{2}-\frac{4}{5}$  the diameter of eye. Maxillary extending to the vertical from anterior margin of eye; præmaxillary processes extending to just above anterior margin of eye; jaws equal anteriorly; fold of the lower lip not continuous; cheek with 4 or 5 series of scales; 7 or 8 gill-rakers on the lower part of anterior arch. Scales 28-31  $\frac{4}{11-12}$ , 2 or  $2\frac{1}{2}$  between lateral line and base of anterior part of soft dorsal. Dorsal XVII-XVIII 8-9, commencing above the opercular cleft, the spines subequal from the sixth to the fourteenth, thence increasing to the last, which is  $\frac{2}{3}$  the length of head; soft fin, when laid back, extending to the middle of caudal. Anal VIII-X 6-8. Pectoral a little shorter than the head, extending to above the third or fourth anal spine; ventral extending beyond origin of anal. Caudal rounded. Caudal peduncle  $\frac{1}{2}-\frac{2}{3}$  as long as deep. Brownish, the body with 7 or 8 black cross-bars which extend on to the dorsal fin; a dark bar at the base of caudal.

Guatemala.

1-15. (43-82 mm.) types of the Lake Amatitlan. O. Salvin, Esq. species.

### 9. *Cichlosoma spilurum*.

*Heros spilurus*, Günth. Cat. Fish. iv. p. 289 (1862), and Trans. Zool. Soc. vi. 1869, p. 451, pl. lxxiii. fig. 1.

*Cichlasoma spilurum*, Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1898, p. 1520; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 222 (1904).

Depth of body 2 in the length, length of head 3. Snout as long as or longer than postorbital part of head. Diameter



of eye 3 in the length of head, interorbital width  $2\frac{2}{3}$ -3. Depth of præorbital equal to the diameter of eye or less. Maxillary not extending to below the eye; præmaxillary processes just extending to above anterior margin of eye; jaws equal anteriorly; fold of the lower lip not continuous; cheek with 4 or 5 series of scales; 6 or 7 gill-rakers on the lower part of anterior arch. Scales 28-30  $\frac{5\frac{1}{2}}{12-13}$ , 2 or  $2\frac{1}{2}$  between lateral line and base of anterior part of soft dorsal. Dorsal XVIII-XIX 9-10, commencing above the opercular cleft, the spines subequal from the sixth to the sixteenth, thence increasing to the last, which is  $\frac{1}{2}$ - $\frac{3}{5}$  the length of head; soft fin, when laid back, extending to middle of caudal. Anal VIII-IX (X 7) 8. Pectoral as long as or longer than the head, extending to above the third to fifth anal spines; ventral extending to middle of anal. Caudal rounded or subtruncate. Caudal peduncle  $\frac{1}{2}$ - $\frac{2}{3}$  as long as deep. Body with 7 dark cross-bars; a dark spot or vertical bar on the base of caudal; vertical fins dusky, sometimes spotted.

Guatemala.

1-4. (75-90 mm.) types of the species.	Lake Yzabal.	O. Salvin, Esq.
5. (92 mm.)	Rio Motagua.	O. Salvin, Esq.

#### 10. *Cichlosoma spinosissimum*.

*Heros* (*Cichlasoma*) *spinosissimum*, Vaill. & Pellegr. Bull. Mus. Paris, 1902, p. 87.

*Cichlasoma spinosissimum* (part.), Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 224 (1904).

Depth of body  $1\frac{3}{4}$  in the length, length of head 3. Diameter of eye  $3\frac{1}{2}$  in the length of head. Maxillary not extending to below the eye; fold of the lower lip not continuous; cheek with 5 series of scales; 6 gill-rakers on the lower part of anterior arch. Scales 28  $\frac{5}{14-15}$ . Dorsal XVIII-XIX 7-8, the spines subequal from the fourth, the eighth  $\frac{1}{3}$  the length of head. Anal XI-XII 7-8. Pectoral  $\frac{4}{5}$  the length of head. Caudal rounded. Caudal peduncle  $\frac{1}{2}$  as long as deep. Olivaceous, with small dark spots on the body and soft vertical fins; a dark longitudinal band from the eye to the middle of the side; posterior part of body with 4 or 5 dark cross-bars; a dark spot on the base of caudal.

Rio Polochic, Guatemala.

The types (four specimens) measure from 78-100 mm.



Very similar to *Herotilapia multispinosa*, but especially distinguished by the absolutely conical teeth.

### 11. *Cichlosoma immaculatum*.

*Cichlasoma spinosissimum*, var. *immaculatum*, Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 225 (1904).

Very similar to the preceding species. Dorsal XVIII-XIX 9-10. Anal IX 9. Scales  $29 \frac{5}{13-14}$ . Cheek with 5 or 6 series of scales. 8 gill-rakers on the lower part of anterior arch. Uniformly greyish.

Rio Polochic.

Since two specimens agree in these characters, it seems to me best to regard them as belonging to a distinct species.

### 12. *Cichlosoma centrarchus*.

*Heros centrarchus*, Gill & Bransford, Proc. Ac. Philad. 1877, p. 185.

*Cichlasoma centrarchus*, Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1898, p. 1526; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 224 (1904).

Depth of body nearly 2 in the length, length of head 3. Snout  $\frac{2}{3}$  as long as postorbital part of head. Diameter of eye  $3\frac{2}{3}$  in the length of head, interorbital width  $2\frac{1}{2}$ . Depth of præorbital  $\frac{3}{5}$  the diameter of eye. Maxillary not extending to below the eye; præmaxillary processes extending to above the anterior margin of eye; jaws equal anteriorly; fold of the lower lip continuous (? or not); cheek with 4 or 5 series of scales; 15 gill-rakers on the lower part of the anterior arch. Scales  $29 \frac{5}{12}$ , 2 between lateral line and base of anterior rays of soft dorsal. Dorsal XVI (8) 9, commencing above the opercular cleft, the spines subequal from the fifth to the fourteenth, the last more than  $\frac{1}{2}$  the length of head. Anal XI 8 (X 9). Pectoral as long as the head, extending to above the fifth anal spine; ventral extending to middle of anal. Caudal subtruncate. Caudal peduncle  $\frac{1}{2}$  as long as deep. Olivaceous, with 7 or 8 dark brown cross-bars; a dark spot at the base of caudal; fins dusky.

Lake of Nicaragua.

1. (140 mm.) one of the types      L. Nicaragua.      Smithsonian Inst.  
of the species.

[To be continued.]

VIII.—*Revised Nomenclature of the Species described in Bate and Westwood's 'British Sessile-eyed Crustacea.'* By  
 Canon A. M. NORMAN, M.A., D.C.L., LL.D., F.R.S.

THE work of Bate and Westwood from the first presented great difficulties to the student of the Amphipoda and Isopoda in consequence of the unsatisfactory figures and inadequate descriptions of many of the species. Moreover, with increasing knowledge of these Crustacea extensive changes in nomenclature have become necessary. Hence there lies a heavy stumbling-block in the way of any carcinologist who commences the study of the species represented in our fauna, and only an adequate knowledge of all that during recent years has been written on the subject can at the present time enable the species described in this work to be correctly named.

The object of the present paper is to remove, at any rate partially, this difficulty and bring the nomenclature of Bate and Westwood into juxtaposition with the names which are now employed for the several species. I have, of course, availed myself of all that has been written on the subject by carcinologists, such as the Rev. T. R. R. Stebbing, Mr. A. O. Walker, and others in our own country, and by Professor G. O. Sars and M. Chevreux and others on the Continent, and I trust that I shall moreover be able to throw fresh light on the relationship of certain species which have hitherto not received full elucidation.

There have been very large additions to our knowledge of the species of these two orders which inhabit our seas during recent years, but with such additions these notes have nothing to do.

One new genus is here introduced—*Coremapus* (κόρημα, a brush, and πούς, a foot). Allied to *Microdeutopus*; first gnathopods the largest, complexly subchelate in male and simply subchelate in female as in that genus, but the second gnathopods in both sexes narrow, scarcely subchelate, terminating in a minute nail, the limb forming a brush, the meros, carpus, and manus being densely setose, especially the meros, which is much produced over the carpus. Type, *Coremapus (Microdeutopus) versiculatus*, Bate.

In the earlier part of this paper the species are taken in the order in which they are arranged in our authors' work; the nomenclature, where necessary, is corrected and a number prefixed.

In the latter part the species with their corrected names

are arranged as in the existing leading works upon the subject, those of Professor G. O. Sars, and the affixed number is that under which the species occurs in the previously given list.

## I.

The Species described in Bate and Westwood, with correction of names where such correction is required.

## VOL. I.

1. *Talitrus locusta* (Linné), p. 16, = *Talitrus locusta* (Pallas).
2. *Orchestia littorea* (Montagu), p. 27.
3. — *mediterranea* (Costa), p. 31.
4. — *Deshayesii*, Audouin, p. 36, = *Orchestoidea Deshayesii* (Audouin) (Norman, Ann. & Mag. Nat. Hist. ser. 7, vol. v. p. 139).
5. *Allorchestes Nilssonii* (Rathke), p. 40, = *Hyale Nilssonii* (Rathke).
6. — *imbricatus*, Bate, p. 43, = *Hyale Lubbockiana* (Bate), ♂.
7. *Nicea Lubbockiana*, Bate, p. 47, = *Hyale Lubbockiana* (Bate), ♀.
8. *Montagua monoculoides* (Montagu), p. 54, = *Stenothoe monoculoides* (Montagu).
9. — *marina*, Bate, p. 58, = *Stenothoe marina* (Bate).
10. — *Alderi*, Bate, p. 61, = *Metopa Alderi* (Bate), ♀.
11. — *pollexiana*, Bate, p. 64, = *Metopa norvegica* (Lilljeborg) (Norman, Ann. & Mag. Nat. Hist. ser. 7, vol. vi. p. 41).
12. *Danaia dubia*, Bate, p. 68, = *Cressa dubia* (Bate).
13. *Lysianassa Costæ*, Bate and Westwood (nec Milne-Edwards), p. 74, = *Lysianax septentrionalis*, Della Valle.
14. — *Audouiniana*, Bate, p. 79, = *Perrierella Audouiniana* (Bate).
15. — *atlantica*, Bate and Westwood (? Milne-Edwards), p. 82, = *Ambasia Danielsseni*, Boeck (Norman, Ann. & Mag. Nat. Hist. ser. 7, vol. v. 1900, p. 144).
16. — *longicornis*, Bate and Westwood (nec Lucas), p. 85. The entire figure and the urosome probably taken from *Orchomene humilis* (Costa), ♂, the other dissections from *Lysianax septentrionalis*, Della Valle, ♂ (see Walker, Ann. & Mag. Nat. Hist., Feb. 1892; and Norman, *ibid.* ser. 7, vol. v. p. 142).
17. *Anonyx longicornis*, Bate, p. 91, = *Lepidepecreum longicorne* (Bate), ♂.
18. — *Edwardsi*, Bate (nec Kröyer), p. 94, = *Orchomene humilis* (A. Costa) (see Norman, Ann. & Mag. Nat. Hist. ser. 7, vol. v. 1900, p. 202).

19. *Anonyx obesus*, Bate, p. 98, = *Acidostoma obesum* (Bate).  
 20. — *denticulatus*, Bate, p. 101, = *Hippomedon denticulatus* (Bate).  
 21. — *Holbölli*, Bate and Westwood (nec Kröyer), p. 104, = *Huplonyx cicada* (Fabricius).  
 22. — *minutus*, Bate and Westwood (nec Kröyer), p. 108. Perhaps a young male of *Orchomene humilis* (Norman, Ann. & Mag. Nat. Hist. ser. 7, vol. v. p. 204).  
 23. — *plautus*, Bate and Westwood (nec Kröyer), p. 111, = *Menigrates obtusifrons*, Boeck.  
 24. — *longipes*, Bate, p. 113, = *Tryphosites longipes* (Bate), ♀.  
 25. — *ampulla*, Bate and Westwood (nec Kröyer), p. 116, = *Tryphosites longipes* (Bate), ♂.  
 26. *Callisoma crenata*, Bate, p. 120, = *Callisoma Hopei*, Costa.  
 27. *Ampelisca Gaimardi*, Bate and Westwood (nec Kröyer), p. 127, = *Ampelisca typica* (Bate), ♂.  
 28. — *Belliana* (Bate), p. 135, = *Ampelisca brevicornis* (A. Costa).  
 29. *Phoxus simplex*, Bate, p. 140, = *Phoxocephalus simplex* (Bate).  
 30. — *Holbölli*, Kröyer, p. 143, = *Phoxocephalus Holbölli* (Kröyer).  
 31. — *plumosus*, Bate and Westwood (nec Kröyer), p. 146, = *Harpinia neglecta*, G. O. Sars.  
 32. *Graia imbricata*, Bate, p. 152, = *Amathilla angulosa* (Rathke), young. I do not, however, consider *A. angulosa* to be a distinct species from *A. homari* (Fabricius).  
 33. *Westwoodilla cæcula*, Bate, p. 155. }  
 34. — *hyalina*, Bate, p. 158. }
- Both these *Westwoodillæ*, which are the same species, were so erroneously described that even Bate himself could not recognize his own genus or species, and the very next species is called *Ædiceros parvimanus*. The name to be used for the species should be therefore, I think, that by which the species was properly described and by which it could be recognized, and the species should be called *Halimelon parvimanus* (Bate and Westwood).
35. *Ædiceros parvimanus*, Bate and Westwood, p. 161, = *Halimelon parvimanus* (Bate), = *H. Mülleri*, Boeck.  
 36. *Monoculodes carinatus*, Bate, p. 165.  
 37. — *Stimpsoni*, Bate, p. 168, = *Monoculodes carinatus*, Bate.  
 38. *Kroyera arenaria*, Bate, p. 173, = *Pontocrates arenarius* (Bate).  
 39. — *altamarina*, Bate and Westwood, p. 177, = *Pontocrates altamarinus* (B. & W.).  
 40. *Amphilochus manudens*, Bate, p. 180.  
 41. *Darwinia compressa*, Bate, p. 184, = *Laphystius sturionis*, Kröyer

42. *Sulcator arenarius*, Bate, p. 189, = *Ilustorius arenarius* (Slabber).
43. *Urothoe Bairdi*, Bate, p. 193, = ♂ of *U. marinus*.
44. — *marinus*, Bate, p. 195, ♀.
45. — *brevicornis*, Bate, p. 198, ♀.
46. — *elegans*, Bate, p. 200, ♂.
- The species of *Urothoe* require further working out.
47. *Liljeborgia pallidu*, Bate, p. 203, = *Liljeborgia pallida*, Bate.
48. — *shetlandica*, Bate and Westwood, p. 206, = *Cheirocratus Sundevalli* (Rathke), ♂.
49. *Phædra antiqua*, Bate, p. 209. Unknown; might be an *Apherusa*, if it were not that it has a secondary appendage to the antennæ.
50. — *Kinahani*, Bate, p. 211, = *Liljeborgia Kinahani* (Bate).
51. *Isca Montagu*, H. Milne-Edwards, p. 215.
52. *Iphimedia obesa*, Rathke, p. 219.
53. — *eblance*, Bate, p. 221.
54. *Otus carinatus*, Bate, p. 224, = *Odius carinatus* (Bate).
55. *Pereionotus testudo* (Montagu), p. 228.
56. *Acanthonotus Owenii*, Bate, p. 232, = *Epimeria cornigera* (Fabricius).
57. *Dexamine spinosa* (Montagu), p. 237.
58. — *tenuicornis*, Bate and Westwood (nec Rathke), p. 240, = *Dexamine thea*, Boeck.
59. — *vedlomensis*, Bate and Westwood, p. 242, = *Paratyclus vedlomensis* (B. & W.).
60. *Atylus Swammerlamii* (H. Milne-Edwards), p. 246, = *Paratyclus Swammerlamii* (H. Milne-Edwards).
61. — *gibbosus*, Bate, p. 248, = *Triteta gibbosa* (Bate).
62. — *bispinosus*, Bate, p. 250, = *Apherusa bispinosa* (Bate).
63. *Pherusa bicuspis*, Bate (nec Kröyer), p. 253, = *Apherusa cirrus* (Bate), ♂, = *Apherusa borealis*, Boeck.
64. — *fucicola*, Leach, p. 255, = *Gammarella brevicaudata*, H. Milne-Edwards, ♀ (Walker, Ann. & Mag. Nat. Hist. ser. 6, vol. vii. p. 418).
65. *Calliope leviuscula* (Kröyer), p. 259, = *Calliopius leviusculus* (Kröyer).
66. — *Ossiani*, Bate, p. 261, = *Parapleustes latipes* (M. Sars).
67. — *Fingalli*, Bate and Westwood, p. 263, = *Parapleustes latipes* (M. Sars), adult.
68. — *grandoculis*, Bate, p. 265, = *Calliopius leviusculus* (Kröyer), ♂.
69. *Eusirus helvetic*, Bate, p. 267, = *Eusirus longipes*, Boeck.

70. *Leucothoe articulosa* (Montagu), p. 271, = *Leucothoe spinicarpa* (Abildgaard).
71. — *furina* (Savigny), p. 274, = ? *Leucothoe furina* (Savigny).
72. *Gossea microdeutopa*, Bate, p. 277. "Appears to be *Apherusa Jurinii*, M.-Edw." (Walker, Ann. & Mag. Nat. Hist. ser. 6, vol. xv. 1895, p. 469).
73. *Aora gracilis*, Bate, p. 280.
74. *Stimpsonia chelifera*, Bate, p. 285, = *Stimpsonella chelifera* (Bate).
75. *Microdeutopus gryllotalpa*, Bate (nec Costa), p. 289, = *Microdeutopus damnoniensis*, Bate.
76. — *Websteri*, Bate, p. 291, = *Lembos Websteri*, Bate.
77. — *anomalus*, Rathke, ♀, p. 293. ♀ of *M. damnoniensis*, if not of *M. anomalus*.
78. — *versiculatus*, Bate, p. 295, = *Coremapus versiculatus* (Bate), ♀.
79. *Protomeдея hirsutimana*, Bate, p. 298, = *Leptocheirus pilosus*, Zaddach.
80. — *Whitei*, Bate, p. 300, = *Cheirocratus Sundevalli* (Rathke), ♀.
81. *Bathyporeia pilosa*, Bate and Westwood (nec Lindström), p. 304, = *Bathyporeia Guilliansonia* (Bate), = *B. norvegica*, Sars.
82. — *Robertsoni*, Bate, p. 307, ♂.
83. — *pelagica*, Bate, p. 309, ♂.
84. *Niphargus aquilex*, Schiödte, p. 315, = *Niphargus subterraneus* (Leach).
85. — *fontanus*, Bate, p. 319.
86. — *Kochianus*, Bate, p. 323.
87. *Crangonyx subterraneus*, Bate, p. 327.
88. *Gammarella brevicaulata* (H. Milne-Edwards), p. 330, ♂.
89. — *Normanni*, Bate and Westwood, p. 333, = *Gammarella brevicaulata* (H. Milne-Edwards), ♀.
90. *Melita palmata* (Montagu), p. 337.
91. — *obtusata* (Montagu), p. 341, ♂.
92. — *proxima*, Bate, p. 344, = *Melita obtusata* (Montagu), ♂.
93. — *gladiosa*, Bate, p. 346.
94. *Mcera grossimana* (Montagu), p. 350.
95. *Eurystheus erythrophthalmus* (Lilljeborg), p. 354, = *Gammaropsis maculatus* (Johnston), ♂.
96. — *bispinimanus*, Bate, p. 357, = *Gammaropsis maculatus* (Johnston), ♀.
97. *Amathilla Sabinii* (Leach), p. 361, = *Amathilla homari* (Fabricius), var. *Amathilla angulosa* (Rathke).
98. *Gammarus marinus*, Leach, p. 370.
99. — *campylops*, Leach, p. 375.

100. *Gammarus locusta* (Linné), p. 378.
101. — *tenuimanus*, Bate, p. 384, =? *Mæra Batei*, Norman (see Walker, Ann. & Mag. Nat. Hist. ser. 6, vol. xv. 1895, p. 471).
102. — *Edwardsii*, Bate, p. 386 (not as yet recognized by any other author).
103. — *pulex* (De Geer), p. 388.
104. — *dubius*, Johnston, p. 397, =?
105. — *maculatus*, Johnston, p. 399, = *Gammaropsis maculatus* (Johnston).
106. *Megamæra semiserrata*, Bate, p. 401, = *Ceradocus semiserratus* (Bate).
107. — *longimanus* (Leach, MS.), p. 403, = *Mæra othonis* (H. Milne-Edwards), ♂.
108. — *othonis* (H. Milne-Edwards), p. 405, = *Mæra othonis* (H. Milne-Edwards), ♀.
109. — *Alderi*, Bate, p. 407, = *Melita obtusata* (Montagu), ♀.
110. — *brevicaudata*, Bate, p. 409, = *Elasmopus rapax*, Costa.
111. *Eiscladus longicaudatus*, Bate and Westwood, p. 412, = *Photis longicaudata* (Bate and Westwood).
112. *Amphithoe rubricata* (Montagu), p. 418.
113. — *littorina*, Bate, p. 422, = *Amphithoe rubricata* (Montagu), ♀.
114. — *albomaculata*, Bate and Westwood (nec Kröyer), p. 426. The specimen figured is in my collection. It is *Podocerospis excavata*, Bate, ♀. The long setæ of the antennæ and the first gnathopods as drawn agree with *Podocerospis*, but the specimen shows nothing of the strong upturned third segment of metasome or the *Amphithoe*-like last uropod of Bate and Westwood's figure.
115. — *gammaroides*, Bate, p. 427, = *Pleonexes gammaroides*, Bate, ♂.
116. *Sunamphithoe hamulus*, Bate, p. 430, = *Pleonexes gammaroides*, Bate, ♀.
117. — *conformata*, Bate, p. 432, = *Sunamphithoe pelagica* (H. Milne-Edwards).
118. *Podocerus pulchellus* (Leach), p. 436, = *Bruzeliella* \* *falcata* (Montagu), ♂.

\* I have examined the types of the genera *Podocerus* and *Jassa* in the British Museum, and fully confirm what Messrs. Stebbing and Walker have written upon them, that *Podocerus variegatus*, Leach (as interpreted by Milne-Edwards's figure in 'Règne Animal de Cuvier,' but not *P. variegatus*, B. & W.), is *Platophium Darwinii*, and that *Jassa pelagica*, Leach (but not of B. & W.), is the same as *Podocerus capillatus*, B. & W. Bruzelius long ago restricted the use of *Jassa* to the species last mentioned, which has only a rudimentary appendage (scarcely visible with a high power) to the antennules. This use must be maintained, and not *Parajassa* as suggested by Stebbing. I have therefore found it necessary to institute a genus *Bruzeliella*, with *B. falcata*, Montagu, as its type.

119. *Podocerus variegatus*, Bate and Westwood (nec Leach), p. 439, = *Bruzeliella pusilla* (Sars), ♀.
120. — *capillatus*, Rathke, p. 442, = *Jassa pelagica*, Leach (nec B. & W.).
121. — *falcatus* (Montagu), p. 445, = *Bruzeliella falcata* (Montagu), ♂ junior.
122. — *pelagicus* (Bate and Westwood) (nec Leach), p. 447, = *Bruzeliella falcata* (Montagu), ♀.
123. — *ocius*, Bate, p. 450, = *Bruzeliella ocia* (Bate).
124. *Cerapus abditus*, Templeton, p. 455, = *Erichthonius abditus* Templeton, ♂.
125. — *difformis* (H. Milne-Edwards), p. 457, = *Erichthonius difformis*, H. Milne-Edwards, ♂.
126. *Dercothoe punctatus*, H. Milne-Edwards, p. 461, = *Erichthonius difformis*, H. Milne-Edwards, ♀.
127. *Siphonæcetes typicus*, Bate and Westwood (nec Kröyer), p. 465, *Siphonæcetes Whitei* (Gosse), ♂.
128. — *Whitei*, Gosse, p. 467, = *Siphonæcetes Whitei* (Gosse), ♀, = *C. Colletti*, Boeck.
129. — *crassicornis*, Bate, p. 469, = *Cerapus crassicornis* (Bate).
130. *Nania tuberosa*, Bate, p. 472, = *Podoceroopsis Sophiæ*, Boeck, ♂.
131. — *rimapalmata*, Bate, p. 474, = *Podoceroopsis excavata* (Bate), ♂.
132. — *excavata*, Bate, p. 476, = *Podoceroopsis excavata* (Bate), ♀.
133. — *undata*, Bate, p. 477, = *Podoceroopsis Sophiæ*, Boeck, ♀.
134. *Cyrtophium Darwinii*, Bate, p. 481, = *Platophium variegatum* (Leach)\*.
135. *Cratippus tenuipes*, Bate, p. 485, = *Colomastix pusilla*, Grube.
136. *Dryope irrorata*, Bate, p. 488, = *Unciola irrorata* (Bate), ♀.
137. — *crenatipalma*, Bate, p. 490, = *Unciola irrorata* (Bate), ♂.
138. *Corophium longicorne*, Latreille, p. 493, = *Corophium volutator* (Pallas), ♂.
139. — *Bonellii*, Bate and Westwood (nec Milne-Edwards), p. 497, = *Corophium affine*, Bruzelius, ♀.
140. — *crassicorne*, Bruzelius, p. 499, ♂.
141. *Chelura terebrans*, Philippi, p. 503.

## VOL. II.

142. *Listrignonus exulans*, Kröyer, p. 5, = *Hyperia galba* (Montagu), ♂ junior.

\* I think that, considering the inadequate description of the genus *Podocerus* and its erroneous use for nearly one hundred years, the name ought to be excluded from an altered use.



143. *Listrignonus Kinahani*, Bate, p. 8, = *Hyperia galba* (Montagu), ♂ mature.
144. *Hyperia galba* (Montagu), p. 12, ♀.
145. — *oblivia*, Bate and Westwood (nec Kröyer), p. 16, = *Euthemisto gracilipes* (Norman).
146. *Phronima sedentaria* (Forskaal), p. 23.
147. *Dulichia porrecta*, Bate, p. 31, ♂.
148. — *falcata*, Bate, p. 33, ♂.
149. *Proto pedatu*, Abildgaard, p. 38, = *Phthisica marina*, Slabber, ♀.
150. — *Goodsirii*, Bate, p. 42, = *Phthisica marina*, Slabber, ♂.
151. *Protella phasma* (Montagu), p. 45, = *Pseudoprotella phasma* (Montagu).
152. *Caprella linearis* (Linné), p. 52.
153. — *lobata* (Müller), p. 57, = *Caprella linearis* (Linné), ♂.
154. — *acutifrons* (Latreille), p. 60.
155. — *hystrix* (Kröyer), Bate and Westwood, p. 63, = *Caprella septentrionalis*, Kröyer, var. *nodifera*, Mayer.
156. — *acanthifera*, Leach, p. 65.
157. — *tuberculata*, Guérin, p. 68.
158. — *æquilibra*, Say, p. 71.
159. — *typica*, Kröyer, p. 75, = *Perianthus typicus* (Kröyer).
160. *Cyamus ceti*, Martens, p. 85, = *Cyamus mysticeti*, Lütken.
161. — *ovalis*, Roussel de Vauzème, p. 91, not British.
162. — *gracilis*, Roussel de Vauzème, p. 94, not British.
163. — *Thompsoni*, Gosse, p. 96, = *Platygyamus Thompsoni* (Gosse).

## ISOPODA.

164. *Tanais vittatus* (Rathke), p. 125, = *Tanais Cavolini*, H. Milne-Edwards.
165. — *Dulongii* (? Audouin), p. 129.
166. *Leptochelia Edwardsii* (Kröyer), p. 134, = *Leptochelia Savignii* (Kröyer).
167. *Paratanais forcipatus*, Bate and Westwood (nec Lilljeborg), p. 138, = *Paratanais Batei*, G. O. Sars.
168. — *rigidus*, Bate and Westwood, p. 141, = *Leptognathia rigida* (Bate and Westwood).
169. *Apseudes talpa* (Montagu), p. 148.
170. — *Latricillii*, H. Milne-Edwards, p. 153 (*vide* Norman, Ann. & Mag. Nat. Hist. ser. 7, vol. iii. p. 327).
171. *Anthuru gracilis* (Montagu), p. 160, ♀.
172. *Paranthuru Costana*, Bate and Westwood, p. 165, = *Paranthura nigropunctata* (Lucas), ♀.

173. *Anceus maxillaris* (Montagu), p. 187, = *Gnathia maxillaris* (Montagu).
174. — *Edwardii*, Bate, p. 201, = *Gnathia oxyurea* (Lilljeborg).
175. — *Halidaii*, Bate and Westwood, p. 203, = *Gnathia formica* (Hesse).
176. *Bopyrus squillarum*, Latreille, p. 218.
177. *Gyge galathea*, Bate and Westwood, p. 225, = *Gyge branchialis*, Cornalia and Panceri. The specimen which is described and illustrated at p. 225 was procured by me from *Upagebia stellata*, and not, as erroneously recorded by the authors, from a *Galathea*.
178. — *hippolytes*, Kröyer, p. 230, = *Bopyroides hippolytes* (Kröyer).
179. *Phryxus abdominalis* (Kröyer), p. 234.
180. — *fusicaudatus*, Bate and Westwood, p. 238, = *Athelges paguri*, Rathke, young.
181. — *paguri*, Rathke, p. 240, = *Athelges paguri* (Rathke).
182. — *Hyndmanni*, Bate and Westwood, p. 243, = *Pseudione Hyndmanni* (Bate and Westwood).
183. — *longibranchiatus*, Bate and Westwood, p. 246, = *Pleurocrypta longibranchiata* (Bate and Westwood).
184. — *galathea*, Bate and Westwood (nec Hesse), p. 249, = *Pseudione confusa* (Norman).
185. *Ione thoracica* (Montagu), p. 255.
186. *Cryptothiria pygmaea* (H. Rathke), p. 261, = *Liriopsis pygmaea* (H. Rathke).
187. — *balani* (Bate), p. 267, = *Cryptothir balani* (Bate).
188. *Aega bicarinata*, Leach, p. 278, = *Aega rosacea*, Risso. A doubtful British species (see Norman, Ann. & Mag. Nat. Hist. ser. 7, vol. xiv. 1904, p. 433).
189. — *tridens*, Leach, p. 281.
190. — *psora* (Pennant), p. 283.
191. — *monophthalma*, Johnston, p. 286.
192. *Rocinelu danmoniensis*, Leach, p. 291.
193. *Cirolana Cranchii*, Leach, p. 296.
194. — *spinipes*, Bate and Westwood, p. 299, = *Cirolana borealis*, Lilljeborg.
195. *Conilera cylindracea* (Montagu), p. 304.
196. *Eurydice pulchra*, Leach, p. 310.
197. *Jæra albifrons* (Montagu), p. 317, = *Jæra marina* (Fabricius).
198. — *Nordmanni* (Rathke), p. 320.
199. *Munna Kröyeri*, Goodsir, p. 326, ♂.
200. — *Whiteana*, Bate and Westwood, p. 329, = *Munna Kröyeri*, Goodsir, ♀.

201. *Leptaspidia brevipes*, Bate and Westwood, p. 333. I think that this must be *Paramuina bilobata*, Sars, and should have precedence of that name.
202. *Janira maculosa*, Leach, p. 338.
203. *Asellus aquaticus* (Linné), p. 343.
204. *Linnoria lignorum* (Rathke), p. 351.
205. *Arcturus longicornis* (Sowerby), p. 365, = *Astacilla longicornis* (Sowerby), ♀.
206. — *intermedius* (H. Goodsir), p. 371, = *Astacilla intermedia* (H. Goodsir).
207. — *gracilis* (H. Goodsir), p. 373, = *Astacilla longicornis* (Sowerby), ♂.
208. *Idotea tricuspidata*, Desmarest, p. 379, = *Idotea balthica* (Pallas).
209. — *pelagica*, Leach, p. 384.
210. — *emarginata* (Fabricius), p. 386.
211. — *linearis* (Pennant), p. 388.
212. — *parallela*, Bate and Westwood, p. 391, = *Zenobiana prismatica* (Risso).
213. — *acuminata*, Leach, p. 394, = *Stenosoma acuminatum*, Leach.
214. — *appendiculata* (Risso), p. 396, = *Stenosoma lanciferum* (Leach).
215. *Spheroma serratum* (Fabricius), p. 405.
216. — *rugicauda*, Leach, p. 408.
217. — *Hookeri*, Leach, p. 410.
218. — *curtum*, Leach, p. 412, = *Cymodoce truncata* (Montagu), ♀.
219. — *Prideauxianum*, p. 415, = *Cymodoce truncata* (Montagu), ♀.
220. *Dynamene rubra*, Leach, p. 419, = *Nesa bidentata* (Adams), ♀.
221. — *viridis*, Leach, p. 421, = *Nesa bidentata* (Adams), ♀.
222. — *Montagui*, Leach, p. 423, = ?? young of *Nesa bidentata* (Adams), ♂.
223. *Cymodocea truncata*, Leach, p. 426, ♂, = *Cymodoce truncata*, Leach, ♂.
224. — *emarginata*, Leach, p. 428, = *C. truncata*, Leach, ♂ variety.
225. *Nesa bidentata* (Adams), p. 431, ♂.
226. *Campeopea hirsuta* (Montagu), p. 434, ♂.
227. — *Cranchii*, Leach, p. 436, = *Campeopea hirsuta* (Montagu), ♀.
228. *Ligia oceanica* (Linné), p. 444.

229. *Philoscia muscorum* (Scopoli), p. 450.  
 230. — *Couchii*, Kinahan, p. 452.  
 231. *Philourgria riparia* (Koch), p. 456, = *Trichoniscus pusillus*, Brandt.  
 232. — *vivida* (Koch), p. 458, = *Trichoniscus vividus* (Koch).  
 233. — *rosea* (Koch), p. 460, = *Trichoniscus roseus* (Koch).  
 234. *Platyarthrus Hoffmannseggii*, Brandt, p. 464.  
 235. *Oniscus asellus*, Linné, p. 468.  
 236. — *fossor*, Koch, p. 471, = *Oniscus asellus*, Linné.  
 237. *Porcellio scaber*, Latreille, p. 475.  
 238. — *dilatatus*, Brandt, p. 478.  
 239. — *pictus*, Brandt, p. 480.  
 240. — *lævis*, Latreille, p. 483.  
 241. — *armadilloides*, Lereboullet, p. 485, = *Cylisticus convexus* (De Geer).  
 242. — *pruinus*, Brandt, p. 487, = *Metoponorthus pruinus* (Brandt).  
 243. — *cingendus*, Kinahan, p. 489, = *Metoponorthus cingendus* (Kinahan).  
 244. *Armadillo vulgaris*, Latreille, p. 492, = *Armadillidium vulgare* (Latreille).

## APPENDIX.

245. *Orchestia brevidigitata*, Bate and Westwood, p. 498, = *Orchestia littorea* (Montagu), ♂ young.  
 246. *Montagua clypeata*, Bate and Westwood (nec Kröyer), p. 499, = *Metopa abscisa*, Norman.  
 247. — *norvegica*, Bate and Westwood (nec Lilljeborg), p. 500, = *Metopa Akleri* (Bate), ♂.  
 248. *Opis leptochela*, Bate and Westwood, p. 501, = *Euonyx chelatus*, Norman.  
 249. — *quadrimana*, Bate and Westwood, p. 503, = *Normanion quadrimanus* (Bate and Westwood).  
 250. *Ampelisca levigata*, Bate and Westwood (nec Lilljeborg), p. 504, = *Ampelisca tenuicornis*, Lilljeborg.  
 251. *Haploops tubicola*, Lilljeborg, p. 505.  
 252. *Monoculodes longimanus*, Bate and Westwood, p. 507, = *Peri-oculodes longimanus* (Bate and Westwood).  
 253. *Kroyera brevicarpa*, Bate and Westwood, p. 508, = *Synchelidium haplocheles* (Grube).  
 254. *Lepidepcreum carinatum*, Bate and Westwood, p. 509, = *Lepidepcreum longicorne* (Bate and Westwood), ♀.  
 255. *Nicippe tumida*, Bruzelius, p. 511.

256. *Cheirocratus mantis*, Norman, p. 513, = *Cheirocratus assimilis* (Lilljeborg), ♂.
257. *Megamera multidentata*, Bate and Westwood, p. 515, = *Mera Batei*, Norman.
258. *Unciola leucopes*, Bate and Westwood (nec Kröyer), p. 517, = *Unciola planipes*, Norman.
259. *Hyperia tauriformis*, Bate and Westwood, p. 519, = *Hyperoche tauriformis* (Bate and Westwood).
260. — *prehensilis*, Bate and Westwood, p. 520, = ? *Hyperia tauriformis*, Bate and Westwood, young (vide Norman, Ann. & Mag. Nat. Hist. ser. 7, vol. v. 1900, p. 130).
261. — *cyaneæ* (Sabine), p. 521, = ??
262. *Themisto crassicornis*, Kröyer, p. 522, = *Euthemisto libellula* (Mandt).
263. *Vibilia borealis*, Bate and Westwood, p. 524.
264. *Tessarops hastata*, Norman, p. 530, = *Tiron acanthurus*, Lilljeborg.
265. *Eriopis elongatus*, Bruzelius, p. 530, = *Eriopisa elongata* (Bruzelius).
266. *Mera Loveni*, Bruzelius, p. 530.
267. — *Batei*, Norman, p. 530.
268. *Helleria coalita*, Norman, p. 530, = *Guernea coalita* (Norman).
269. *Microprotopus maculatus*, Norman, p. 530.
270. *Civolana truncata*, Norman, p. 530, = *Eurydice truncata* (Norman).
271. *Anilocra mediterranea*, Leach, p. 530, = *Anilocra physodes* (Linné).

## II.

Species described by Bate and Westwood in accordance with present Nomenclature, and arranged after the Monographs of Professor G. O. Sars\*.

## I. AMPHIPODA.

## Tribe I. HYPERIDEA.

- Hyperia galba* (Montagu), 142 and 143 ♂, 144 ♀.
- *cyaneæ*, Sabine, 261 ?
- Hyperoche tauriformis* (B. & W.), 259 (and ? 260).
- Euthemisto libellula* (Mandt), 262.
- *gracilipes* (Norman), 145.

\* The numbers appended to the names are those prefixed to the species in the preceding list of Bate and Westwood's species.

*Phronima sedentaria* (Forskaal), 146.

*Vibilia borealis*, B. & W., 263.

Tribe II. GAMMARIDEA.

*Talitrus locusta* (Pallas), 1.

*Orchestea littorea* (Montagu), 2, 245.

— *mediterranea* (Costa), 3.

*Orchestoidea Deshayesii* (Audouin), 4.

*Hyale Nilssoni* (Rathke), 5.

— *Lubbockiana* (Bate), 6 ♂, 7 ♀.

*Normanion quadrimanus* (B. & W.), 249.

*Acidostoma obesum* (Bate), 19.

*Lysianax septentrionalis*, Della Valle, 18 and part of 16.

*Ambasia Danielsseni*, Boeck, 15?

*Perrierella Audouiniana* (Bate), 14.

*Callisoma Hopei*, Costa, 26.

*Hippomedon denticulatus*, Bate, 20.

*Orchomene humilis* (Costa), 18 and part of 16, and ? 22 junior.

*Tryphosites longipes* (Bate), 24 ♀, 25 ♂.

*Haplonyx cicada* (Fabricius), 21.

*Menigrates obtusifrons*, Boeck, 23.

*Lepidepcreum longicorne* (Bate), 17 ♂, 254 ♀.

*Euonyx chelatus*, Norman, 248.

*Bathyporeia Guilliansonia* (Bate), 81 ♀.

— *Robertsoni*, Bate, 82 ♂.

— *pelagica*, Bate, 83 ♂.

*Haustorius arenarius* (Slabber), 42.

*Urothoe marinus*, Bate, 44 ♀, 43 ♂.

— *brevicornis*, Bate, 45 ♀.

— *elegans*, Bate, 46 ♂.

*Phoxocephalus Holbölli* (Kröyer), 30.

— *simplex* (Bate), 29.

*Harpinia neglecta*, G. O. Sars, 31.

*Ampelisca typica* (Bate), 27.

— *brevicornis* (Costa), 28.

— *tenuicornis*, Lilljeborg, 250.

*Haploops tubicola*, Lilljeborg, 251.

*Amphilochus manudens*, Bate, 40.

*Stenothoe marina* (Bate), 9.

— *monoculoides* (Montagu), 8.

- Metopa Alderi* (Bate), 10 ♀, 247 ♂.  
 — *norvegica* (Lilljeborg), 11.  
 — *abscisa*, Norman, 246.  
*Cressa dubia* (Bate), 12.  
*Leucothoe spinicarpa* (Müller), 70.  
 — ? *furina* (Savigny), 71.  
*Monoculodes carinatus*, Bate, 36, 37.  
*Perioculodes longimanus* (B. & W.), 252.  
*Pontocrates arenarius* (Bate), 38.  
 — *altamarinus* (Bate), 39.  
*Synchelidium haplocheles* (Grube), 253.  
*Halimedes parvimanus* (B. & W.), 33, 34, 35.  
*Parapleustes latipes* (M. Sars), 66, 67.  
*Epimeria cornigera* (Fabricius), 56.  
*Iphimedia obesa*, Rathke, 52.  
 — *eblance*, Bate, 53.  
*Pereionotus testudo* (Montagu), 55.  
*Odius carinatus* (Bate), 54.  
*Laphystius sturionis*, Kröyer, 41.  
*Tiron acanthurus*, Lilljeborg, 264.  
*Nivippe tumida*, Bruzelius, 255.  
*Eusirus longipes*, Boeck, 69.  
*Apherusa bispinosa* (Bate), 62.  
 — *cirrus*, Bate, 63 ♂.  
 — *Jurinii* (H. M.-Edw.)?, 72.  
*Calliopius leviusculus* (Kröyer), 65, 68 ♂.  
*Paratylus Swammerdamii* (H. M.-Edw.), 60.  
 — *vedlomensis* (B. & W.), 59.  
*Dexamine spinosa* (Montagu), 57.  
 — *thea*, Boeck, 58.  
*Tritæta gibbosa* (Bate), 61 ♀.  
*Guerneæ coalita* (Norman), 268.  
*Amathilla homari* (Fabricius), 32 young, 97.  
*Gammarus marinus*, Leach, 98.  
 — *campylops*, Leach, 99.  
 — *locusta* (Linné), 100.  
 — *pulex*, De Geer, 103.  
 — *Edwardsii*, Bate?, 102.  
 — “*dubius*, Johnston,” 104.  
*Melita palmata* (Montagu), 90.  
 — *obtusata* (Montagu), 91 and 92 ♂, 109 ♀.

*Melita gladiosa*, Bate, 93.

*Eriopisa elongata* (Bruzelius), 265.

*Niphargus subterraneus* (Leach), 84.

— *fontanus*, Bate, 85.

— *Kochianus*, Bate, 86.

*Crangonyx subterraneus*, Bate, 87.

*Mera othonis* (H. M.-Edw.), 108 ♀, 107 ♂.

— *Loveni* (Bruzelius), 266.

— *Batei*, Norman, 101 ?, 257, 267.

— *grossimana* (Montagu), 94.

*Ceradocus semiserratus* (Bate), 106.

*Elasmopus rapax*, Costa, 110.

*Gammarella brevicaudata*, 64 ♀, 88 ♂, 89 ♀.

*Cheirocratus Sundevalli* (Rathke), 48 ♂, 80 ♀.

— *assimilis* (Lilljeborg), 256 ♂.

*Lilljeborgia pallida*, Bate, 47 ♀.

— *Kinahani*, Bate, 50.

“*Phædra antiqua*, Bate,” 49.

*Isca Montagu*, H. M.-Edw., 51.

*Microdeutopus anomalus* (Rathke)?, 77 ♀.

— *dannoniensis* (Bate), 75 ♂.

*Aora gracilis*, Bate, 73.

*Stimpsonella chelifera* (Bate), 74.

*Lembos Websterii*, Bate, 76.

*Coremapus versiculatus* (Bate), 78.

*Leptocheirus pilosus*, Zaddach, 79.

*Gammaropsis maculatus* (Johnston), 95 ♂, 96 ♀, 105.

*Microprotopus maculatus*, Norman, 269.

*Photis longicaudata* (Bate), 111.

*Podocerosia Sophiae*, Boeck, 130 ♂, 133 ♀.

— *excavata* (Bate), 131 ♂, 132 ♀, 114.

*Amphithoe rubricata* (Montagu), 112 ♂, 113 ♀.

*Pleonexes gammaroides*, Bate, 115 ♂, 116 ♀.

*Sunamphithoe pelagica* (H. M.-Edw.), 117.

*Bruzeliella falcata* (Montagu), 121 ♂ junior, 118 ♂, 122 ♀.

— *pusilla* (G. O. Sars), 119 ♀.

— *ovia* (Bate), 123.

*Jassa pelagica*, Leach, 120.

*Erichthonius abditus* (Templeton), 124 ♂.

— *difformis* (H. M.-Edw.), 125 ♂, 126 ♀.

*Cerapus crassicornis* (Bate), 129.



- Siphonocetes Whitei* (Gosse), 127 ♂, 128 ♀.  
*Corophium volutator* (Pallas), 138 ♂.  
 — *affine*, Bruzelius, 139 ♀.  
 — *crassicorne*, Bruzelius, 140 ♂.  
*Unciola irrorata* (Bate), 136 ♀, 137 ♂.  
 — *planipes*, Norman, 258.  
*Chelura terebrans*, Philippi, 141.  
*Platophium variegatum* (Leach), 134.  
*Dulichia porrecta*, Bate, 147 ♂.  
 — *falcata*, Bate, 148 ♂.  
*Colomastix pusilla*, Grube, 135.

## Tribe III. CAPRILLIDEA.

- Phthisica marina*, Slabber, 149 ♀, 150 ♂.  
*Pseudoprotella phasma* (Montagu), 151.  
*Periambus typicus* (Kröyer), 159.  
*Caprella linearis* (Linné), 152 ♀, 153 ♂.  
 — *septentrionalis*, Kröyer, var. *nodifera*, Mayer, 155.  
 — *æquilibra*, Say, 158.  
 — *acanthifera*, Leach, 156.  
 — *acutifrons* (Latreille), 154.  
 — *tuberculata*, Guérin, 157.  
*Cyamus mysticeti*, Lütken, 160.  
 — ? *ovalis*, Roussel de Vauzème, 161.  
 — ? *gracilis*, Roussel de Vauzème, 162.  
*Platygyamus Thompsoni* (Gosse), 163.

## II. ISOPODA.

## Tribe I. CHELIFERA.

- Apseudes talpa* (Montagu), 169.  
 — *Latreillii* (H. M.-Edw.), 170.  
*Tanais Cavolini*, H. M.-Edw., 164.  
 — *Dulongii* (? Audouin), 165.  
*Leptocheilia Savignii* (Kröyer), 166.  
*Paratanais Batei*, G. O. Sars, 167.  
*Leptognathia rigida* (B. & W.), 168.

## Tribe II. FLABELLIFERA.

- Anthura gracilis* (Montagu), 171.  
*Paranthura nigropunctata* (Lucas), 172.

- Gnathia maxillaris* (Montagu), 173.  
 — *oxyuræa* (Lilljeborg), 174.  
 — *formica* (Hesse), 175.  
*Anilocera physodes* (Linné), 271.  
*Æga tridens*, Leach, 189.  
 — *psora* (Pennant), 190.  
 — *monophthalma*, Johnston, 191.  
 — ? *rosacea*, Risso, 188.  
*Rocinela danmoniensis*, Leach, 192.  
*Cirolana Cranchii*, Leach, 193.  
 — *borealis*, Lilljeborg, 194.  
*Conilera cylindracea*, Leach, 195.  
*Eurydice pulchra*, Leach, 196.  
 — *truncata* (Norman), 270.  
*Limnoria lignorum* (Rathke), 204.  
*Sphæroma serratum* (Fabricius), 215.  
 — *rugicauda*, Leach, 216.  
 — *Hookeri*, Leach, 217.  
*Cymodocea truncata*, Leach, 218 and 219 ♀, 223 and 224 ♂.  
*Nesa bidentata* (Adams), 220 and 221 ♀, 225 ♂.  
 — *Montagui*, Leach?, 222.  
*Campeopea hirsuta* (Montagu), 226 ♂, 227 ♀.

## Tribe III. VALVIFERA.

- Astacilla longicornis* (Sowerby), 205 ♀, 207 ♂.  
 — *intermedia* (Goodsir), 206.  
*Idotea balthica* (Pallas), 208.  
 — *pelagica*, Leach, 209.  
 — *emarginata* (Fabricius), 210.  
 — *linearis* (Pennant), 211.  
*Zenobiana prismatica* (Risso), 212.  
*Stenosoma acuminatum*, Leach, 213.  
 — *lanciferum* (Leach), 214.

## Tribe IV. ASELOTATA.

- Asellus aquaticus* (Linné), 203.  
*Janira maculosa*, Leach, 202.  
*Jæra marina* (Fabricius), 197.  
 — *Nordmanni* (Rathke), 198.  
*Munna Krøyeri*, Goodsir, 199 ♂, 200 ♀.  
*Leptaspidia brevipes*, B. & W., 201.

## Tribe V. ONISCOIDEA.

- a oceanica* (Linné), 228.  
*honiscus pusillus*, Brandt, 231.  
 — - *vividus* (Koch), 232.  
 — — *roseus* (Koch), 233.  
*Oniscus asellus*, Linné, 235, 236.  
*Philoscia muscorum* (Scopoli), 229.  
 — — *Couchii*, Kinahan, 230.  
*Platyarthrus Hoffmannseggii*, Brandt, 234.  
*Porcellio scaber*, Latreille, 237.  
 — — *dilatatus*, Brandt, 238.  
 — — *pictus*, Brandt, 239.  
 — — *levis*, Latreille, 240.  
*Metoponorthus pruinosis* (Brandt), 242.  
 — — *cingendus* (Kinahan), 243.  
*Cylisticus convexus* (De Geer), 241.  
*Armadillidium vulgare* (Latreille), 244.

## Tribe VI. EPICARIDA.

- Bopyrus squillarum*, Latreille, 176.  
*Pseudione Hyndmanni* (B. & W.), 182.  
 — — *confusa* (Norman), 184.  
*Pleurocrypta longibranchiata* (B. & W.), 183.  
*Athelges paguri* (Rathke), 181 and 180, the young.  
*Phryxus abdominalis* (Kröyer), 179.  
*Ione thoracica* (Montagu), 185.  
*Liriopsis pygmaea* (Rathke), 186.  
*Cryptothir balani* (Bate), 187.

IX. — Kerunia, a Symbiosis of a Hydractinian with a Cephalopod. By Dr. FRANCIS BARON NOPCSA, Member of the Hungarian Geological Society.

[Plate III.]

DURING a recent visit to Qasr-el-Sagha, in the Fayum district of Egypt, I succeeded in obtaining a large number of specimens belonging to the Eocene genus *Kerunia* uniting characters which have hitherto not been properly described.

In the first description of *Kerunia*, given by Professor Mayer-Eymar, this fossil was regarded as a Cephalopod, but in a later paper by Dr. Paul Oppenheim it was placed among the Hydractinians. Remarkable peculiarities in the structure of this fossil have brought about this discrepancy of views as to its systematic position in the animal kingdom; but after a careful study of a fairly complete set of specimens I find myself in accordance with Mayer-Eymar, as well as with Oppenheim, and consider *Kerunia* to be both a Hydractinian and a Cephalopod.

(A) *Kerunia inhabited by a Cephalopod.*

Contrary to Oppenheim's criticism on Mayer-Eymar's reconstruction of *Kerunia*, an examination of several examples in the British Museum, in the Museum of the Egyptian Geological Survey at Cairo, in my own collection, as well as a specimen portrayed in one of Oppenheim's figures (Oppenheim, *loc. cit.* p. 46, fig. 1), all exhibit the accuracy of Mayer-Eymar's views, although between the different specimens there exists a good deal of what may perhaps be termed individual variation. *Kerunia* is a bilateral, calcareous, mostly recrystallized mass, always showing, however, a rapidly augmenting, strongly bent, cone-like, median cavity (Pl. III. fig. 6), the outer wall (convex) of which carries in its median line a row of lofty spines (fig. 9), while from each side wall of the cavity mentioned one long spine-like projection is given off (fig. 3). The cone-like cavity, which evidently contained the soft parts of the animal, shows on its internal (convex) side a projecting lip, forming the margin of its opening (fig. 1). The opening itself is sometimes large and somewhat lobate (fig. 1), although quite as frequently round and rather constricted (fig. 4). In one case, to be referred to later on, it is perfectly closed (fig. 10). As shown in figs. 1-10 of Plate III., *Kerunia* is a perfectly regularly built organism, and Oppenheim's aggressive phrase, "Es bedarf daher eigentlich kaum einer Versicherung, dass auch mir nichts Aehnliches vorliegt, und dass es die Phantasie des Autors, nicht wie dieser meint, diejenige der Natur war, welche geschäftig dieses Fabelwesen geschaffen hat," is entirely without foundation.

Looking over my specimens of *Kerunia* with Mr. R. Bullen Newton, of the British Museum, to whom all students of Dibranchiata are greatly indebted for his very useful paper (written in conjunction with Mr. G. F. Harris) "A Revision of the British Eocene Cephalopoda," he at once indicated to

me the great resemblance that existed between *Kerunia* and the Middle Eocene *Belosepia* found in the Bracklesham beds of England. *Belosepia* seems to differ from *Kerunia* mainly by the absence of lateral horns and by the fact that the front median spines of *Kerunia* are represented in *Belosepia* by several rows of irregular tubercles. The last and principal horn of *Kerunia* is, however, present in the British Eocene genus.

Fig. 1.

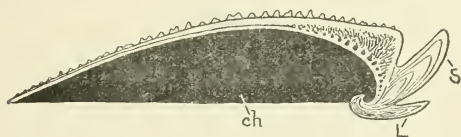


Fig. 2.

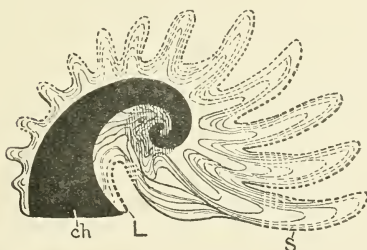


Fig. 1. Longitudinal section of *Belosepia* ( $\frac{3}{4}$  nat.). Fig. 2. Longitudinal section of *Kerunia* ( $\frac{3}{4}$  nat.).

The unshaded surface indicates the calcareous substance and lines of growth; the shaded surface (in fig. 2) is the region where the lateral spines are given off; the black surface shows the chamber containing the soft parts of the animal. L=ventral lip; S= principal spine in *Kerunia* (=rostrum in *Belosepia*); ch=chamber. (The parts marked in fig. 2 by dotted lines are not preserved.)

To prove the morphological resemblance of *Kerunia* and *Belosepia* I have thought it best to figure two cross-sections representing both organisms together (text-figs. 1 & 2). These exhibit the turned-back ventral lip, separated from the first spine by a deep transverse cleft, and beyond this first spine in *Belosepia* rugosities are visible, while in *Kerunia*

some more spines are developed. Internally both fossils are furnished with the bent cone-like chamber which in *Belosepia* has a much shorter ventral side than characterizes *Kerunia*; therefore in this latter genus the cone appears to be much more complete and more involute than in *Belosepia*. Thus, though the lateral horns of *Kerunia* are absent in *Belosepia*, still the similarity is striking. Moreover the bilobate opening of *Kerunia* (Pl. III. fig. 1) is fairly safe evidence that the internal chamber of this organism was inhabited by a *Belosepia*-like animal. The growth of *Kerunia* occurred by thin layers of calcareous matter superimposed one above the other over the whole body, so that at the same time the oral opening was shifted forwards and the different spines augmented in height and length. No new layers were formed on the inside wall of the chamber, except close by the mouth, where sometimes a constriction resulted. That the formation of new layers was influenced by the animal living in the cone-like chamber is clearly shown by the fact that in the same degree as the oral aperture was shifted forward new spines were developed in the median line, one in front of the other. In some cases, however, double spines were developed, that is, one or two on each side of the median line (fig. 4).

As the new layers which augmented the size of *Kerunia* showed different thicknesses, the first small dorsal spines slowly got covered up, and it is thus explainable that the hindermost free spine of the dorsal row (the one nearest to the ventral lip) is always the strongest, while the more posterior spines form a breast-like projection. In large or old specimens the lateral spines show branch-like protuberances or outgrowths (fig. 5), and as the number of these outgrowths augments an irregular body is formed resembling somewhat the horns of an elk with its pointed ends turned upwards (fig. 6). On such occasions it also happens that the basal region of the lateral branches in medium-aged specimens (fig. 1), which exhibit a certain amount of flattening, becomes perfectly flat and united with the breast-like projection (fig. 7). Then it is that remarkable asymmetry occurs, the dorsal spines branch off in quite a posterior direction high above their base, and frequently again become irregularly united (fig. 8).

Taking all these facts into consideration, I am unable to acknowledge *Kerunia* as a Hydractinian: first, because of its regular shape; secondly, on account of its external resemblance to *Belosepia*; and, thirdly, from its regular growth on the plan of a *Belosepia*-like organism.

The regular shape of *Kerunia* and its external resemblance

to *Belosepia*, as well as the continuous development of new spines near the shifting oral opening, are characters which prevent us from assuming that it is the result of a Hydractinian covering some Gastropod or other animal in the manner quoted by H. J. Carter and others, because in such cases irregular masses are the only result.

(B) *Kerunia a Hydractinian*.

Though it was rather easy to prove in the previous remarks that *Kerunia* could not be a simple Hydractinian, it is probably easier to demonstrate that this organism could have been nothing else. The internal structure of *Kerunia* throughout the entire fossilized body, as shown by different sections, is everywhere exactly the same and without any sign whatever of a shell-like centre. Agreeing altogether with Hydrozoan structure and perfectly unlike the dense shell of *Belosepia*\*, *Kerunia* is built up of concentric layers, showing a tubular structure (fig. 11). The tubulæ of the different layers are always directed so as to point vertically towards the external surface of the more internal layer, and through irregular tubes of similar size they are in communication with each other. The outermost layer is capable of covering Balanids and other animals that adhere to its surface, forming another fact which forcibly reminds us of Hydractinian affinities.

As already remarked by Oppenheim, there can be distinguished on the external surface of *Kerunia* low spine-like defences, pits for the single individuals, and small channels corresponding to the sarcorhiza. The tubercle-like defences show clearly small convergent riblets, and are mostly accumulated on the bottom or more flattened surface, the pits are more numerous on the top, while the dense network formed by the sarcorhiza seems equally spread out over the whole body; but none of these elements appear to be present in the cone-like chamber. Since Oppenheim's sketch gives but a poor representation of the delicate surface-sculpture of our animal, it is considered necessary to introduce a micro-drawing of a portion of the surface of *Kerunia* (fig. 12), where a great resemblance will be observed to Vinasso de Regny's illustration of the external structure of *Cyclactinia* † *incrustans*. At the same time it should be observed that *Cyclactinia incrustans* is the single Hydractinian species giving off *Kerunia*-like ramifications.

\* *Beloptera* seems to be less dense in its shell-structure.

† This genus, according to Oppenheim, belongs to *Hydractinia*.

A specimen of *Kerunia* in the British Museum collected by Dr. C. W. Andrews has the aperture of the conical chamber not only constricted but perfectly closed up by Hydractinian structure (fig. 10), proving that the outer layer continued growing and developing even after the death of the problematical organism that occupied the cavity. In this case, therefore, the Hydractinian growth along the oral opening developed irregularly over the surface of the fossil as characterizes a true Hydractinian.

The study of such an example of irregular growth amply proved by its microscopical structure, both internal and external, leads to the inference that the animal which formed these calcareous masses must have been a Hydractinian.

### (C) *Conclusion: Kerunia a Symbiosis.*

There is only one way of merging these two results as set out in the A and B divisions of this paper, and that is by assuming that *Kerunia* resulted from a remarkably close symbiosis of a *Belosepia*-like Cephalopod with an encrusting Hydractinian, in which case symbiosis went so far that the Hydractinian overtook the labour of building up the protective shell of the Cephalopod which fixed or controlled to a certain extent the growth of the Hydractinian.

Only by the death or incapacity of the Cephalopod could the Hydractinian develop in an irregular, and in consequence also an asymmetrical, manner.

Perhaps the symbiosis of Hydractinians with *Pagurus* may also throw some light on these biological questions.

This explanation of *Kerunia* is of necessity only a hypothesis, and yet it seems more probable than any other theory we can advance, since the phenomenon of symbiosis may be traced among recent Hydractinians, as, for example, *H. laevispina*, which has the tendency to destroy the Gastropod shell on which it settles. Besides, the symbiosis hypothesis only can account for the otherwise most remarkable fact that among the numberless *Kerunias* I have examined no two specimens were precisely alike.

The locality where I found the *Kerunias* here described and figured was the second low terrace above the temple ruins of Qasr-el-Sagha. The specimens occur in great quantities in an oyster-bed (*Alectryonia Clot-Beyi*, Bellardi) and are always found with their oral openings and the flattened side downwards, so that the dorsal spines and the ends of the somewhat twisted lateral horns are turned upwards as weapons



of defence. Such an occurrence would make it possible that during life *Kerunia* existed on a sea-bottom with its head downwards.

Before finishing this short note I would like to express my hearty thanks to Mr. R. B. Newton for the great kindness he has shown by giving me many valuable suggestions as well as by undertaking the very tedious work of revising the manuscript and proof-sheets of this paper.

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#### EXPLANATION OF PLATE III.

- Fig.* 1. *Kerunia*, basal view, showing ventral lip and large oral opening.
- Fig.* 2. The same, posterior view, showing section of median part of chamber and fractured surface for main dorsal spine.
- Fig.* 3. Another specimen, showing breast-like projection and constricted oral opening.
- Fig.* 4. Another specimen, showing perfectly preserved oral opening with fractures of numerous symmetrically placed spines.
- Fig.* 5. Distal end of a lateral spine exhibiting ramification.
- Fig.* 6. An irregular specimen, showing internal chamber and complex ramification of both lateral branches, dorsal aspect.
- Fig.* 7. The same, giving basal view and showing flattened internal surface.
- Fig.* 8. Part of a dorsal spine of another specimen exhibiting ramification.
- Fig.* 9. Dorsal aspect of small example, showing dorsal and lateral spines.

Fig. 10. Front view of same specimen, showing a perfectly closed oral opening.

Fig. 11. Longitudinal median section of another specimen, illustrating tubular structure, enlarged.

Fig. 12. Enlarged surface-drawing of the specimen figured in figs. 1 and 2.

The figures are drawn half the natural size of the specimens with the exception of 11 and 12, which represent magnified structures. Figures 9, 10, and 11 refer to specimens in the British Museum, the remainder being in the Author's collection.

## MISCELLANEOUS.

### *The Nomenclature of Types in Natural History.*

By CHARLES SCHUCHERT and S. S. BECKMAN.

PRACTICAL work on the arrangement and cataloguing of "types" and other museum material has shown us that the present nomenclature is not yet sufficient for critically distinguishing all the different classes of such specimens. Further, some of the terms which have been proposed for the purpose are already employed in other ways—for instance, *homotype* is in use in biology, *monotype* is the name of a printing-machine, *autotype* is the term for a printing-process. We wish, therefore, to submit the following system of nomenclature, and we hope that in making it more complete we have provided a scheme which will render efficient service in the labelling and registration of types and typical material.

The terms printed in broad-faced letters are the additions or modifications for which we are at present responsible. A fuller explanation of all the terms will be found in the 'Catalogue of the Types and Figured Specimens of Invertebrate Fossils in the U.S. National Museum,' a work which has been prepared by Charles Schuchert and is now passing through the press. The present article gives a synopsis of the terms which it has been found necessary to use in connexion with that and similar work.

We now make another suggestion. After the different terms we have placed in circles the contractions which we propose should be used in the actual marking of small specimens, to which it is impossible or inadvisable to affix the full label. Our plan for such contractions is this:—For types of the first class two capital letters; for those of the second class one capital and one small letter; for typical specimens two small letters.

In the definitions which follow, the term description indicates either a description by words or by a picture, or by both combined. For the sake of accuracy, we suggest that the original description by words (type-description) be called the **protolog**, the original

description by a picture (type-figure) the **protograph**. It is obviously more easy to identify actual types from the latter than from the former.

PRIMARY TYPES (**Proterotypes**).

Material upon which original descriptions of species are based.

*Holotype* (**H.T.**). The only specimen possessed by the nomenclator at the time; the one specimen definitely selected or indicated by the nomenclator as "the type"; the one specimen which is the basis for a given or cited protograph.

*Syntype* (more correct than *Cotype*) (**S.T.**). A specimen of the original series, when there is no holotype.

*Paratype* (**P.T.**). A specimen of the original series, when there is a holotype.

**Lectotype** (**L.T.**). A syntype chosen, subsequently to the original description, to take the place which in other cases a holotype occupies. (*λεκτός*, chosen, picked.)

SUPPLEMENTARY TYPES (**Apotypes**, vice *Hypotype* in use).

Material upon which supplementary descriptions of species are based.

**Heautotype** (vice *Autotype*, in use) (**H.t.**). A specimen identified with an already described and named species, selected by the nomenclator himself in illustration of his species, such specimen not being recognizable as one of the proterotypes. (*ἑαυτῶν*, of his own.)

*Plesiotype* (**P.t.**). A specimen identified with an already described and named species, but not selected by the nomenclator himself.

*Neotype* (**N.t.**). A specimen identified with an already described and named species, selected to be the standard of reference in cases when the proterotypes are lost, destroyed, or too

imperfect for determination, such specimen being from the same locality and horizon as the holotype or lectotype of the original species.

TYPICAL SPECIMENS (**Icotypes**). (ἐικός, what is like\*.)

Material which has not been used in literature, but serves a purpose in identification.

*Topotype* (t. t.). A specimen of a named species from the locality of the holotype or lectotype—in palæontology from the same locality and horizon.

*Metatype* (m. t.). A topotype identified by the nomenclator himself.

**Idiotype** (i. t.). A specimen identified by the nomenclator himself, but not a topotype. (ἰδιος, one's own.)

**Homœotype** (vice *Homotype*, preoccupied) (h. t.). A specimen identified by a specialist after comparison with the holotype or lectotype. (ὁμοιος, resembling.)

**Chirotype** (x. t.). A specimen upon which a chironym is based. (*Chironym*, a MS. name, Coues, 1884.)

In addition to the above we have the use of the word "type" in connexion with genera—a given species is the type of the genus. The classification of such types is as follows:—

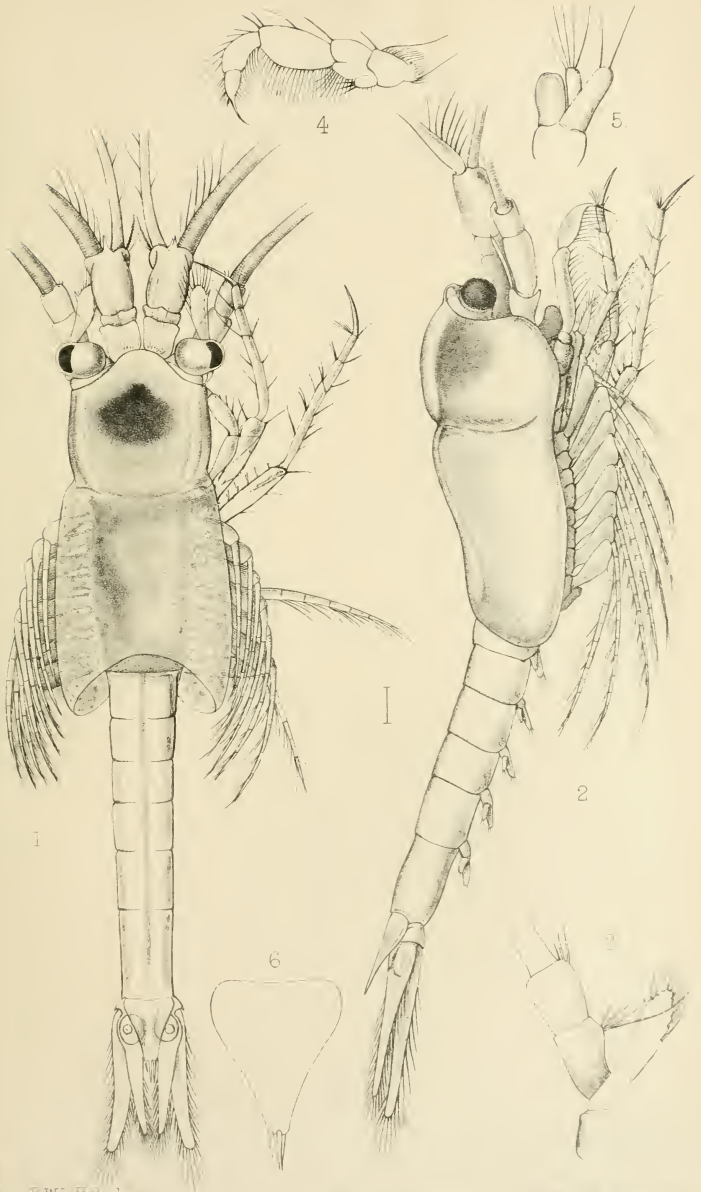
#### TYPES OF GENERA (*Genotypes*).

**Genoholotype.** The one species on which a genus is founded; of a series of species on which a genus is founded, the one species stated by the author to be "the type."

**Genosyntype.** One of a series of species upon which a genus is founded, no one species being the genoholotype.

**Genolectotype.** The one species subsequently selected out of genosyntypes to become "the type."

\* ἐικός (gen. ἐικός), ἐικο—for ἐικοτο,—to make Icotype for euphony.

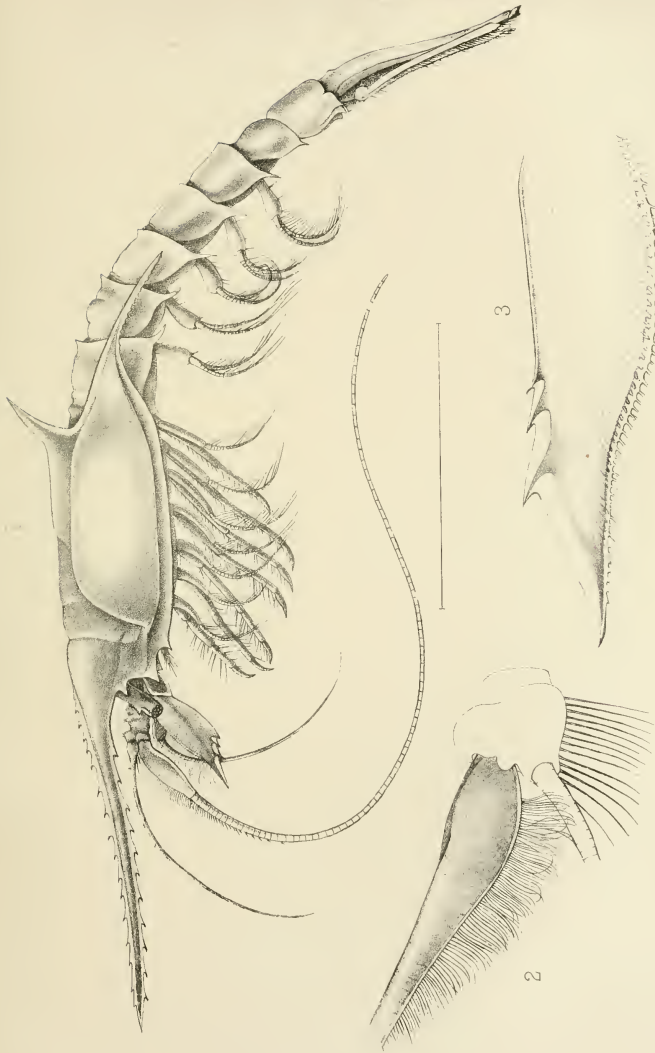


R. W. Hoj: des.  
G. M. Woodward: lig.

*Katerythrops Oceanæ*.

New York, 1891.





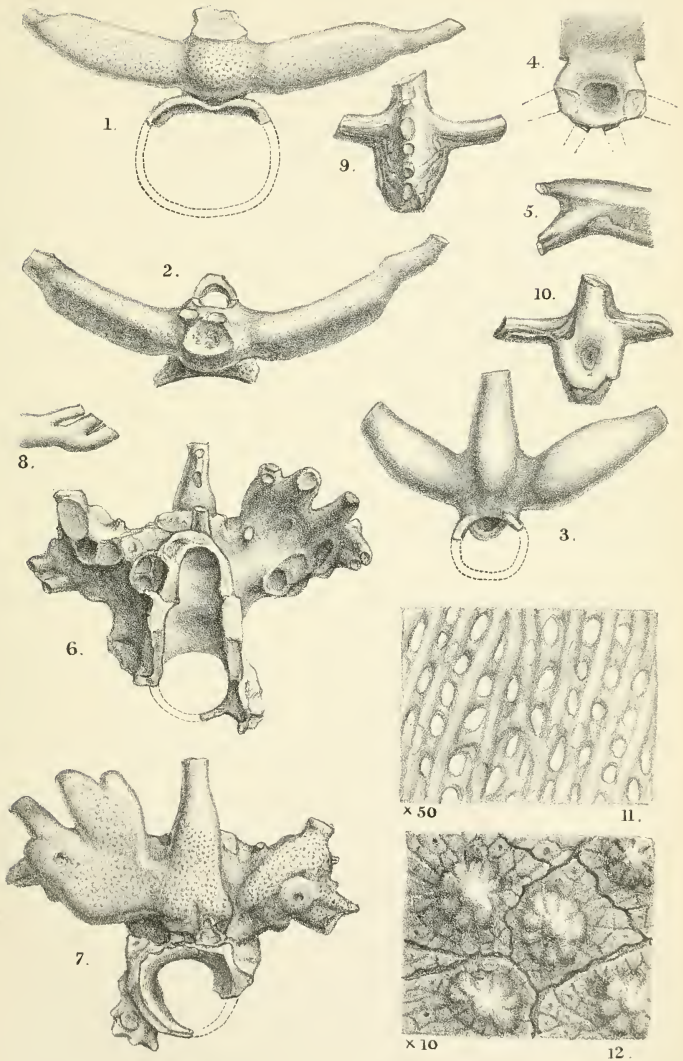
West, Newmed. prof.

Gnathophausia drepanophora.

Fig. 1. C. Greer, sculp. E. W. L. H. del.  
G. M. Woodward lith.







P. Highley del. et lith.

Bale & Danielsson l. d. imp.

KERUNIA CORNUTA, *Mayer-Eymar* from the Eocene of Egypt.



# THE ANNALS

AND

## MAGAZINE OF NATURAL HISTORY.

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No. 92. AUGUST 1905.

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X.—*A List of the Batrachians and Reptiles collected by Dr. W. J. Ansorge in Angola, with Descriptions of new Species.* By G. A. BOULENGER, F.R.S.

[Plate IV.]

THE collection made in 1903–1905 by Dr. Ansorge has considerably added to our knowledge of the Batrachians and Reptiles of Angola, the study of which has been pursued for so many years by Professor Barboza du Bocage. Travelling under somewhat unfavourable conditions for the preservation of specimens in spirit, Dr. Ansorge has been so fortunate as to discover as many as four new species. As a contribution to the knowledge of the exact distribution, a full list of the species represented in the collection is here given.

Dr. Ansorge has supplied me with the following notes on some of the localities visited by him:—

*Ambaca.*—A station of the Loanda to Lucalla railway. Was visited by Livingstone in 1854, and is mentioned by him. Is now a very insignificant place, consisting of some official quarters and half a dozen small shops. April–May 1903.

*Bange Ngola.*—The Portuguese were erecting a fort here when I visited it (end of 1903). It is named, as usual with African natives, after the important chief who lives here. In maps the whole of this north-eastern part of the Loanda province is called the “Jinga country,”

ruled by a number of petty native chiefs apparently independent of each other.

*Bango*.—The village of another petty chief in the Jinga country. End of 1903.

*Bihé*.—A district in the north-east of the occupied portion of the Benguela province; roughly only the eastern half of the Benguela province is only nominally Portuguese. End of 1904.

*Bingondo*.—A locality in the northern part of Bihé. The country is wooded, interspersed with large open glades, and well populated. October 1904.

*Canhoca*.—An important station on the Loanda to Lucalla railway. Nov. 1903–Feb. 1904.

*Duque de Bragança*.—Some hundreds of years ago this was an important Portuguese fort, now it is an insignificant military station with a dozen shops. It lies on the south side of the Lucalla River. End of 1903.

*Fort Don Carlos*.—The most northern fort of the Loanda province, and in process of erection when I visited it. It lies at the junction of the Cambo and Cuango rivers. End of 1903.

*Golungo Alto*.—A rich agricultural district, with a town of the same name, visited by Livingstone in 1854. Miles and miles of coffee-plantations are going to waste. Jan. 1904.

*Marimba*.—Just conquered by the Portuguese from rebellious Jingos when I visited it towards the end of 1903. A fort was being built. Near here is a small lake which I named "Sarmiento," where I caught the new Cyprinodontid fish named *Haplochilus macrurus* (Blgr. Ann. & Mag. Nat. Hist. (7) xiv. 1904, p. 19).

*Pungo Andongo*.—A famous spot for hundreds of years, known also as the "pedras negras" or "black rocks," to which prisoners were transported from Lisbon. Similar to our "Botany Bay" as an exile for prisoners. It consists of quaint and curious gigantic rocks, hundreds of feet high, rising suddenly out of the level plain. It is still important, owing to the sugar-plantations in the plain. The village of the same name consists of official quarters, a few shops, and an American Mission. June and July 1903.

*Quilenges*.—A district, not far from the ocean, in the south-western corner of Benguela province. The ruins of an old fort of the same name still serves as the official quarters of the officer in charge of the district. It is a

basin-like depression at the western foot of a lofty chain of hills. January and February 1905.

*Tembo Aluma*.—A native village about two hours on foot from Fort Don Carlos. End of 1903.

## BATRACHIA.

### ECAUDATA.

#### 1. *Xenopus levis*, Daud.

Pungo Andongo.

I have carefully compared the specimens brought home by Dr. Ansorge with one from Benguella received from Prof. Barboza du Bocage and with others from various parts of South Africa, with the result that I cannot regard *X. Petersii*, Bocage, as more than a small race of *X. levis*.

#### 2. *Bufo regularis*, Reuss.

Duque de Bragança, Pungo Andongo, Locomi, Canhoca, Marimba, between Benguella and Bihé.

#### 3. *Hemismus marmoratum*, Peters.

Semba Acendu.

#### 4. *Rana ornatissima*, Bocage.

Bingondo in Bihé. Caught in the forest in October.

In the breeding male a brown callous pad is present on the inner side of the forearm at the base of the second and third fingers; similar callosities cover the upper surface of the three inner fingers. In all other characters this fine frog agrees with *R. Budgetti* as described by me in 1903, and I must therefore now regard the Gambia specimens as representing merely a colour-variety of the species previously described by Barboza du Bocage. *R. moeruensis*, Blgr., is also very closely allied to *R. ornatissima*, but differs in the inner finger extending beyond the second.

#### 5. *Rana mascareniensis*, D. & B.

Between Benguella and Bihé.

#### 6. *Rana Ansorgii*, sp. n. (Pl. IV. fig. 1.)

Vomerine teeth in two short transverse series close to the inner front edges of the choanæ. Head once and a half

as long as broad; snout acutely pointed, longer than the diameter of the orbit, very strongly projecting beyond the mouth; canthus rostralis feebly marked; loreal region slightly concave; nostril midway between the eye and the end of the snout; interorbital space narrower than the upper eyelid; tympanum distinct, three fourths the diameter of the eye. Fingers moderate, obtusely pointed, first not extending quite as far as second; toes very long and slender, barely half webbed; subarticular tubercles moderate; a small, oval, inner metatarsal tubercle. The tibio-tarsal articulation reaches far beyond the tip of the snout. Foot nearly two thirds the length of head and body, tibia rather more than two thirds. Back with eight glandular longitudinal folds, outer strongest; a glandular fold from beneath the eye to the shoulder. Greyish olive above, with black spots; limbs with regular blackish cross-bars; a black band on the side of the head, passing through the eye and covering the temple; a vertebral stripe, the outer glandular fold, and a streak on the upper lip, from the end of the snout to the shoulder, yellowish white; lower parts white, edge of lower jaw and side of throat black.

From snout to vent 40 mm.

A single female specimen from between Benguella and Bihé.

This new species is intermediate between *R. mascareniensis* and *R. stenocephala*, Blgr.

7. *Rana angolensis*, Bocage.

Pungo Andongo.

8. *Rana oxyrhynchus*, A. Smith.

Duque de Bragança, Cuanza R.

9. *Phrynobatrachus natalensis*, A. Smith.

Bange Ngola.

10. *Arthroleptis xenochirus*, sp. n. (Pl. IV. figs. 2, 2 a.)

Head moderate, as long as broad; snout obtusely pointed, projecting beyond the mouth; nostril a little nearer the end of the snout than the eye; interorbital space as broad as the upper eyelid; tympanum moderately distinct, two thirds the diameter of the eye. Third finger extremely long, three times the length of the second; toes free; tips of fingers and toes very slightly swollen; subarticular tubercles strong; a small, oval, inner metatarsal tubercle. The tibio-tarsal

articulation reaches the tympanum. Skin smooth; sides and lower belly granulate; a strong fold across the chest. Greyish brown above, with a vase-shaped dark marking from between the eyes to the sacral region; some dark spots on the temple and above the shoulder; rather irregular dark brown bars across the fore limb and the tibia; lower parts white. Male with a subgular vocal sac.

From snout to vent 19 mm.

A single male specimen from Marimba.

The longer third finger distinguishes this species from *A. macrodactylus*, Blgr.

11. *Arthroleptis parvulus*, sp. n. (Pl. IV. figs. 3-3 b.)

Head moderate, as long as broad; snout rounded, projecting beyond the mouth, shorter than the diameter of the orbit; nostril a little nearer the end of the snout than the eye; inter-orbital space a little broader than the upper eyelid; tympanum hidden. Fingers moderate, third about once and a half as long as second; toes one fourth webbed; tips of fingers and toes very slightly swollen; subarticular tubercles strong; a tarsal and two metatarsal tubercles, small and round. The tibio-tarsal articulation reaches the eye. Skin smooth or with small warts on the back. Greyish brown above, with blackish spots and a triangular blackish marking between the eyes, with or without a light vertebral line, or with a broad whitish area, edged with black, covering the top of the head and the back; limbs with dark cross-bars; a white, dark-edged streak along the back of the thighs; lower parts white, with or without brown spots on the breast.

From snout to vent 13 mm.

Four specimens from Bange Ngola.

Closely allied to *A. dispar*, Peters. Distinguished by the shorter snout, the more distinct web between the toes, and the less distinct digital expansions.

12. *Rappia marmorata*, Rapp.

Tembo Aluma, Bango, Bange Ngola, Locomi, Canhoca, Golungo Alto, between Benguella and Bihé.

13. *Rappia cinnamomeiventris*, Bocage.

Canhoca.

This species is, perhaps, not separable from *R. picturata*, Peters (*olivacea*, Peters).

14. *Rappia Bocagii*, Stdr.  
Canhoca.
15. *Rappia cinctiventris*, Cope.  
Bange Ngola, Nana Meya.
16. *Rappia microps*, Gthr.  
Fort Don Carlos, Marimba, Bange Ngola.
17. *Rappia nasuta*, Gthr.  
Bange Ngola, Canhoca.
18. *Hylambates Anchietae*, Bocage.  
Between Benguella and Bihé.

## REPTILIA.

## LACERTILIA.

1. *Hemidactylus mabuia*, Mor.  
Pungo Andongo.
2. *Pachydactylus ocellatus*, Cuv.  
Cuanza.
3. *Agama armata*, Peters.  
Cuanza, between Benguella and Bihé, between Bihé and Quilenges.
4. *Agama planiceps*, Peters.  
Pungo Andongo, Ambaca, between Benguella and Bihé, between Bihé and Quilenges.
5. *Agama atricollis*, A. Smith.  
Duque de Bragança, Bange Ngola, Pungo Andongo, Cuanza R.
6. *Varanus niloticus*, L.  
Cunga R.
7. *Ichnotropis capensis*, A. Smith.  
Duque de Bragança, Bange Ngola, between Benguella and Bihé.



8. *Eremias lugubris*, A. Smith.

Cuanza R.

9. *Gerrhosaurus validus*, A. Smith.

Between Bihé and Quilenges.

The single specimen measures 2500 mm. from snout to vent.

10. *Gerrhosaurus nigrolineatus*, Hallow.

Duque de Bragança, Pungo Andongo, between Bihé and Quilenges.

The frontal shield varies much in form and the frontonasal is sometimes in contact with the rostral, but the præfrontals constantly form an extensive suture on the median line. Femoral pores 14 to 18 on each side.

11. *Mabuia quinquetæniata*, Licht.

Pungo Andongo.

12. *Mabuia Bayonii*, Bocage.

Duque de Bragança, Ambaca.

13. *Mabuia varia*, Peters.

Pungo Andongo, between Benguella and Bihé.

14. *Mabuia striata*, Peters.

Between Benguella and Bihé.

15. *Ablepharus Wahlbergii*, A. Smith.

Between Benguella and Bihé.

16. *Sepsina angolensis*, Bocage.

Pungo Andongo, between Benguella and Bihé.

17. *Feylinia Currori*, Gray.

Golungo Alto.

## RHIPTOGLOSSA.

18. *Chamaleon gracilis*, Hallow.

Duque de Bragança, Pungo Andongo, Canhoca, Marimba.

19. *Chamaeleon quilensis*, Bocage.  
Cuanza R.

20. *Chamaeleon dilepis*, Leach.  
Between Bihé and Quilenges.

OPHIDIA.

21. *Typhlops punctatus*, Leach.  
Golungo Alto.

22. *Glauconia scutifrons*, Peters.  
Golungo Alto.

23. *Tropidonotus olivaceus*, Peters.  
Pungo Andongo.

24. *Helicops bicolor*, Gthr.  
Duque de Bragança.

25. *Boodon lineatus*, D. & B.  
Pungo Andongo.

26. *Lycophidium capense*, A. Smith.  
Between Benguella and Bihé.

27. *Chlorophis heterolepidotus*, Gthr.  
Duque de Bragança.

28. *Chlorophis irregularis*, Leach.  
Pungo Andongo.

29. *Chlorophis ornatus*, Bocage.  
Between Benguella and Bihé.

30. *Dasypeltis scabra*, L.  
Pungo Andongo.

The specimen (a female), which belongs to the var. *palmarum*, Leach, has 27 scales across the body, 244 ventrals, and 63 caudals.

31. *Leptodira hotamlæia*, Laur.  
Canhoca.

32. *Rhamphiophis acutus*, Gthr.

Between Benguella and Bihé.

Upper portion of rostral shield considerably shorter than its distance from the frontal. Ventrals 168-183, caudals 53-59.

33. *Psammophis sibilans*, L.

Duque de Bragança, Pungo Andongo.

34. *Psammophis Ansorgii*, sp. n. (Pl. IV. fig. 4.)

Snout but slightly longer than the eye. Rostral a little broader than deep, just visible from above; nostril between two or three shields; internasals two thirds the length of the præfrontals; frontal twice as long as broad, longer than its distance from the end of the snout, as long as the parietals; loreal barely once and a half as long as deep; one præocular, in contact with the frontal; two postoculars; temporals 2+2; seven upper labials, third and fourth entering the eye; four lower labials in contact with the anterior chin-shields, which are shorter than the posterior. Scales in 15 rows. Ventrals 153; anal divided; subcaudals 76. Grey above, with a very indistinct streak of rusty along each side of the back; no markings on the upper surface of the head; præ- and postoculars yellowish; a white black-edged streak on the upper lip, the upper outline crossing the rostral, the lower half of which is white; lower parts uniform white.

Total length 700 mm.; tail 165.

A single male specimen from between Benguella and Bihé.

This very distinct species is most nearly related to the South-African *P. crucifer*, Daud., from which it differs in the larger eye, the shorter snout, and the coloration.

35. *Dispholidus typus*, A. Smith.

Between Benguella and Bihé.

36. *Xenocalamus Mechovii*, Peters.

Between Benguella and Bihé.

A single male specimen, measuring 395 mm., tail 30. Ventrals 217, caudals 25. The two postoculars confluent into one. Black above, with white spots forming more or less regular cross-bars; upper lip, two outer rows of scales, and lower parts white, each ventral and subcaudal shield with crowded black dots forming cross-bars.

37. *Miodon collaris*, Peters.

Golungo Alto.

A single female specimen, with 233 ventrals and 17 caudals.

38. *Aparallactus Bocagii*, Blgr.

Between Benguella and Bihé.

A single female specimen, measuring 330 mm., tail 45. Ventrals 175, caudals 35.

39. *Naia melanoleuca*, Hallow.

Pungo Andongo.

40. *Naia nigricollis*, Reinh.

Golungo Alto.

41. *Causus rhombeatus*, Licht.

Pungo Andongo, Canhoca, between Benguella and Bihé.

Some of the specimens from between Benguella and Bihé belong to a colour-variety described by Barboza du Bocage (*Herp. d'Angola*, p. 146), a pair of light lines running along the back and dividing the large transverse dark dorsal spots. Specimens of this variety, for which I propose the name *bilineatus*, appear to have constantly 17 or 18 rows of scales only. Ventrals 128-144; caudals 23-30.

42. *Bitis Peringueyi*, Blgr.

Between Benguella and Bihé.

A single female specimen of this little-known Viper, measuring 340 mm., tail 37. Scales in 27 rows; ventrals 131, caudals 27. 12 or 14 scales round the eye; two series of scales between the eye and the upper labials, which are 12 in number. Coloration as figured by Bocage (*Vipera heraldica*), but the mid-dorsal region and the lateral round spots are reddish brown.

43. *Atheris squamiger*, Hallow.

Golungo Alto.

A single female specimen, with 17 scales across the body, 171 ventrals, and 53 caudals.

44. *Atractaspis congica*, Peters.

Duque de Bragança and Golungo Alto.

Scales 19-21; ventrals 224-235; caudals 18-22.

EXPLANATION OF PLATE IV.

- Fig. 1. *Rana Ansorgii*, p. 107, natural size.  
 Fig. 2. *Arthroleptis xenochirus*, p. 108, natural size.  
 Fig. 2 a. *Arthroleptis xenochirus*, lower aspect of hand,  $\times 4$ .  
 Figs. 3, 3 a. *Arthroleptis parvulus*, p. 109, natural size.  
 Fig. 3 b. *Arthroleptis parvulus*, lower aspect of foot,  $\times 4$ .  
 Fig. 4. *Psammodis Ansorgii*, p. 113, upper and side views of head and anterior part of body, natural size.

XI.—On the Internal Parasites of the Tweed Salmon. By JAMES R. TOSH, M.A., D.Sc., Assistant Professor and Lecturer on Natural History in the University of St. Andrews.

[Plate V.]

SPECIMENS of the parasites mentioned below were collected during the net-fishing season of 1895 at the premises of the Salmon Fishing Company, Berwick-on-Tweed.

The distinctly marine character of the parasitic guests of the salmon is an indication of the nature of its food. Fresh-water parasitic forms are very rare in the salmon, and the fact that they are practically absent in well-grown fishes seems to point to the conclusion that salmon do not feed in the fresh water of a short river like the Tweed except under extraordinary conditions, when a prolonged stay is imposed upon them.

The following is a list of Entozoa observed:—

<i>Ascaris capsularia</i> , Rud.	<i>Echinorhynchus angustatus</i> , Rud.
— <i>acuta</i> , Müll.	<i>Bothriocephalus infundibuliformis</i> , Rud.
— <i>obtusocaudata</i> , Zed.	
<i>Distoma varicum</i> , Rud.	<i>Tetrarhynchus grossus</i> , Rud.
— <i>ocreatum</i> , Rud.	— <i>macrobothrius</i> , Rud.
— <i>Miescheri</i> , Zschokke.	<i>Tetrabothrium minimum</i> . Larva.
<i>Echinorhynchus acus</i> , Rud.	— sp. Larva.
— <i>proteus</i> , Westrumb.	<i>Tænia</i> sp. Larva.

*Ascaris capsularia*, Rud. Entoz. t. ii. i. p. 179.

This form occurs very plentifully encapsuled on the pyloric cæca and mesenteries. The average length is about 26 mm. It is very active when taken out. The usual infection is from 20 to 50 in each fish.

*Ascaris acuta*, Müll. Zool. Dan. vol. iii. p. 53.

This is the parasite that occurs most frequently in the

almon, usually in the stomach, seldom below the pylorus. Many are sexually mature, and if kept in fresh water will often extrude their eggs, which undergo a direct development.

*Ascaris obtusocaudata*, Zed., Rud. Entoz. t. ii. i. p. 177.

Only one specimen was obtained from the stomach. It measures 6 mm. Others may have been overlooked.

*Distoma varicum*, Rud. Entoz. t. ii. i. p. 396.

This well-known form is the most constant parasite of the salmon. It varies in size from 2-3 mm. and occurs as noticeable yellow specks on the walls of the œsophagus and stomach, rarely in the intestine. The colour is from the yellow-brown ova in the uterus. The usual infection is up to 40 or 50.

*Distoma ocreatum*, Rud. Entoz. t. ii. i. p. 397.

Large infections of this species were occasionally found floating in a watery mucus in the stomach above the bend. It was not observed attached to the stomach-walls like the preceding species. It occurs more frequently in the sea-trout than in the salmon, and especially after a diet of herring.

*Distoma Miescheri*, Zschokke, Verhand. naturforsch. Gesell. Basel, viii. Theil, 3 Heft.

A few solitary specimens in the gullet adhering to the mucous membrane. Brown in colour, with stalked ventral sucker, it varies in length from 9-17 mm. The species is described and figured by Prof. Zschokke from the Rhine salmon.

*Echinorhynchus acus*, Rud. Entoz. t. ii. i. p. 278.

*E. acus* was found attached in the lower intestine. The specimens varied in length from 12-31 mm. Not common.

*Echinorhynchus proteus*, Westrumb. De Helm. Acanth. p. 37, no. 66.

*E. proteus* has been described under many names. It occurred in the lower intestine with the proboscis buried up to the neck and with the bulb expanded but out of sight. Length 6-9 mm. Commoner than *E. acus*.

*Echinorhynchus angustatus*, Rud. Entoz. t. ii. i. p. 266.

*E. affinis* is given by Rudolphi as a synonym. My

specimens agreed better with the description of the latter. Found occasionally in smolts and once in a small salmon. Length 7-9 mm. A freshwater form.

*Bothriocephalus infundibuliformis*, Rud. Entoz. t. ii. i. p. 46.

Same as *B. proboscideus*, Rud. This tapeworm, which has a wide distribution among marine fishes, is in appearance the most formidable parasite of the Tweed salmon. It does not seem to be seriously harmful to its host, and is to be found in the largest and best-fed fishes, usually in numbers ranging from 1 to half a dozen. The great infections of from 100 upwards mentioned by Zschokke as occurring in the Rhine salmon have not been observed in the case of the Tweed fishes, but have been noted in the sea-trout of the same river. In one sea-trout as many as 150 specimens, all very young, were counted. The head of the tapeworm is almost invariably attached near the bottom of a pyloric cæcum.

Appended is a table giving the occurrence of this tapeworm as noted in the fishes observed at the Berwick-on-Tweed Salmon Company's Fish House in 1895:—

	Male Grilse.		Female Grilse.		Male Salmon.		Female Salmon.	
	Number examined.	Number containing tapeworms.	Number examined.	Number containing tapeworms.	Number examined.	Number containing tapeworms.	Number examined.	Number containing tapeworms.
March....	..	..	..	..	3	1	12	3
April ....	..	..	..	..	15	10	67	22
May ....	5	..	..	..	23	8	106	34
June ....	8	1	11	3	18	9	79	23
July ....	36	7	20	2	25	9	88	24
August ..	42	5	24	3	13	5	65	22
September.	13	..	7	1	3	..	33	11
October ..	21	4	3	..	34	6	37	4
November.	12	..	4	..	20	5	45	14
	137	17	69	9	154	53	532	157

Of a total of 892 fishes examined 236, or 26·4 per cent., were infected with tapeworm. It would be interesting to know if the falling off about October were at all constant, and, if so, whether the rise in November was connected with a final feast before the dash for the river.

*Tetrarhynchus grossus*, Rud. Synops. pp. 129 & 448, pl. ii. figs. 9 & 10. (Pl. V.)

This form, known to the salmon-fishermen of Berwick-on-Tweed as a "flatty," occurs in the abdominal cavity of both salmon and sea-trout, and is more often dead than alive. The live form is found almost invariably attached by its proboscides to the outside of the lower intestine near the vent. It is cream-coloured and soft, with parallel striæ on the flattened body behind the head. If touched or detached it contracts actively. When preserved the striated part becomes rugose and sometimes almost tuberculated. A preserved specimen sent by the late Dr. Johnston from Berwick-on-Tweed was described and figured by Dr. Baird as *T. rugosus* \*.

If unable to pass to the intestine of another host, *e. g.* shark, where it would most likely become sexual, the worm after some time seems to die, loosens its hold, drifts forward in the body-cavity, and usually becomes embedded in a soft organ, such as the liver. There it is pressed out of shape, becoming often triangular in section or bent on itself. The head retains most of its former bulk, but the body becomes stiff and attenuates. Sometimes specimens are found with the flesh coming away in irregular layers from the body. The surrounding tissue is often affected by this process of degeneration. Specimens in this stage were described and figured by Drummond as *T. solidus* †.

In the accompanying Plate the process of degeneration is illustrated. Fig. 1 is *T. grossus* from a preserved specimen; fig. 2 has a head and body of *T. solidus* and a tail of *T. grossus*, and shows the papilla where the strobila would have budded.

Von Siebold considers his *T. claviger* ‡ to be identical with *T. grossus*, and most likely all the species listed by him on p. 235 (*loc. cit.*) are synonyms; but he places the *T. solidus*

\* Catal. Entoz. Brit. Mus. p. 69, tab. ii. fig. 3.

† Charlesworth's Mag. Nat. Hist. vol. ii. (1838).

‡ Zeitschr. wiss. Zool. Bd. ii.



of Drummond with *T. megacephalus*, which is distinctly separated from *T. grossus* by its tapering proboscides. In the dead form the proboscides are rarely altogether retracted, and they still resemble those of *T. grossus*.

*Tetrarhynchus macrobothrius*, Rud. Synops. pp. 131 & 453.

Length 3–8 mm. Specimens occurred free in the body-cavity, oftenest in the region of the liver and also encysted on the outer wall of the œsophagus. When liberated from cysts they were yellow, almost orange-coloured. Those in the body-cavity were creamy white. *T. megabothrius*, Rud., and *T. appendiculatus*, Rud., may be the same as the species in question.

The larva of *Tetrabothrium minimum* occurred in the mucus of the pyloric cæca.

*Tetrabothrium* sp.

A few larval forms were found in fluid in the rectum—probably more advanced forms of the last species.

*Tenia* sp.

One larva was observed.

The list of parasites of the Tay salmon given by Prof. M'Intosh\* corresponds to the above in its thoroughly marine character.

Gatty Marine Laboratory, St. Andrews,  
March 31, 1905.

#### EXPLANATION OF PLATE V.

- Fig. 1.* *Tetrarhynchus grossus*, Rud. Length 30 mm.  
*Fig. 2.* Ditto. Length 38 mm.  
*Fig. 3.* Ditto. Length 29 mm.  
*Fig. 4.* Ditto. Length 24 mm.  
*Fig. 5.* Ditto. Length 30 mm.

All from spirit-specimens.

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\* Journ. Proc. Linn. Soc. vol. vii. pp. 145–154, 2 woodcuts.

XII.—*On Hermaphroditism and Vestigial Structures in the Reproductive Organs of Testudo græca.* By H. B. FANTHAM, B.Sc. Lond., A.R.C.S., University College, London.

[Plate VI.]

AMONG the various groups of the Vertebrata from time to time there occur cases of true hermaphroditism, or of the persistence of some of the genital organs of the opposite sex, especially in the male. Such occurrences are of interest, and as apparently few (if, indeed, any) instances have hitherto been described among the Chelonia, I considered the following two cases, which recently came under my notice, worthy of record.

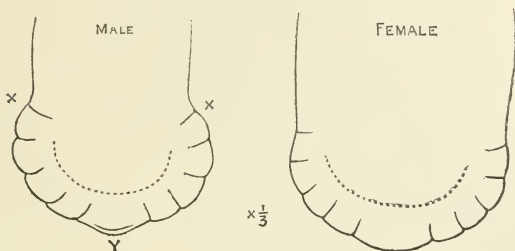
Last summer, while dissecting a specimen of *Testudo græca*, an abnormal development of the genitalia was noticed. Further examination showed that the specimen in question was hermaphrodite, after comparison with male and female specimens of this tortoise procured and dissected. Since that date other adult specimens of *Testudo græca* have been examined, about a dozen altogether, of which all but two possessed the external characters of the male. Among those with male external features was one showing the persistence of the Müllerian ducts as slender rudimentary tubes. To distinguish between these two tortoises, each with abnormal reproductive organs, the hermaphrodite specimen first found may be denoted by A, and the second one (a male with vestigial oviducts) by B. The anatomy and histology of each may then be dealt with, as far as possible.

I. *External Characters and Anatomy.*

The external features aiding in the determination of the sex of a tortoise are, according to Gadow [4], as follows:—The male is slightly smaller in size, has a long tail, and possesses a concave plastron. The plastron of the female is flat. Another point of difference between the sexes that I noticed was in the shape of the posterior end of the plastron, as viewed ventrally (see text-figures).

Concerning the anatomy of the tortoise, no easily accessible detailed account in English is known to me. I have used Bojanus's figures and explanations of *Emys europæa* [2]. In Sedgwick's recently published "Vertebrata" [10] of his 'Student's Text-book of Zoology,' however, a good general account of the anatomy of the Chelonia is given.

At first it does not appear easy to delineate the relation of the gonad and the kidney in *Testudo*. The latter organ (kidney) is very dorsal and posterior in position and needs careful dissection, being covered ventrally by a black pigmented body. This is the epididymis, lying naturally on



A marked indentation or angle at  $\times$  in the case of the exoskeleton of the male. The female is more rounded than the male, especially at Y.  
 $\times$  .

the top of the kidney, from the ventral aspect, in a closely ensheathing and darkly pigmented mesentery (*cf.* Pl. VI. fig. 2, *ep.*). In this mesentery vasa efferentia pass from the testis, and by it the testes are attached to the kidneys. The testes (fig. 2, *t.*) are normally brownish-yellow bodies, ovoid in shape, about 1.6 to 1.8 cm. long, 1.2 to 1.3 cm. broad, and 1 cm. thick. The kidneys (fig. 2, *k.*) are dark brown, showing a convoluted ventral surface. There is a slight orange supra-renal body on the ventral or inner surface of each kidney, partly covered in the natural position by the epididymis and testis. The supra-renal body of each side is apparently the "Ren succenturiatus" of Bojanus in his figures of *Emys europæa*.

*Tortoise A.*—This specimen in external features possessed a slightly concave plastron (rather less concave than in the normal male), had a long tail, and was a little smaller in size than the female specimens compared (though, of course, this may be merely a question of age). It had well developed gonads—the left one of which, at any rate, might be termed an "ovotestis" (see below)—and well developed oviducts (Müllerian ducts), in addition to well-marked epididymes, vasa deferentia, and penis, which are, of course, essentially male genitalia. The epididymes of this specimen were slightly larger than in some of the normal males examined. The gonads (Pl. VI.

fig. 1, *g.*) attracted attention as soon as seen, being yellowish brown in colour, rather elongate ovoid in shape, and slightly larger, darker, and more pointed anteriorly than the testes in normal male specimens. The gonads were approximately equal in size and general shape, about 1.9 cm. long, 1.1 cm. broad, and 1 cm. thick. Especially noteworthy was the presence of a conspicuous yellow egg (fig. 1, *o.*) on the ventral surface of the posterior third of the left gonad (hence use of term "ovotestis" for this gonad). This egg was .3 cm. in diameter, but those found in females of *T. graeca* were often larger.

The Müllerian ducts were well developed and lay ventral and to the outer side of each gonad (fig. 1, *m.*). They were light yellow in colour and approximately equal in length, and their external diameter varied from .3 cm. anteriorly to .6 cm. in the uterine portion. They were attached by a mesentery posteriorly to the epididymis of either side, and anteriorly by the broad ligament to the lungs. Each opened in front by an ostium, apparently ciliated (fig. 1, *Fl.*), into the coelom, considerably in front of the gonads. No eggs, however, were noticed free in the body-cavity, nor in the Müllerian ducts, the lumen of each of the latter being continuous throughout. These oviducts opened into the neck of the cloacal bladder, slightly behind and ventral to the ureters and vasa deferentia, as shown in Pl. VI. fig. 1. The foldings of these ducts were chiefly confined to their anterior third.

*Tortoise B.*—This specimen exhibited all the external characters of the male, the concavity of its plastron being well marked. The genitalia (Pl. VI. fig. 2) were of the normal size, shape, and appearance common to the male tortoise, each testis being 1.6 cm. long, 1.2 cm. broad, and 1 cm. thick. But in addition there were rudimentary Müllerian ducts present (fig. 2, *m.*), opening anteriorly into the coelom, that of the left side being slightly longer than that of the right, but rather narrower in its posterior sixth and at its entrance to the cloaca (Pl. VI. fig. 2). The hinder portion of the right oviduct being wider (.3 cm. in external diameter), its posterior fifth was found to contain functionally mature spermatozoa, which, however, were not found in the more constricted hinder part of the left oviduct. Apparently the basal part of the right rudimentary oviduct functioned as a sort of vesicula seminalis (*cf.* Howes's observations [6] on a specimen of *Lacerta viridis*), the spermatozoa having probably migrated into it from the vas deferens. Unfortunately the oviducts of specimen A were not examined for spermatozoa when fresh, for reasons given below.

## II. Histology.

*Tortoise A.*—Sections of each of the gonads of this specimen were prepared and examined. Unfortunately the material was not fixed immediately after death, the alimentary canal and vascular system overlying the genitalia ventrally having been first dissected and examined in detail. On microscopic examination of the sections the material showed somewhat poor fixation, as was to be expected under the circumstances. Delafield's hæmatoxylin or iron-hæmatoxylin was used for staining, together with eosin or acid fuchsin. A few transverse sections of a portion across the end of the anterior third of the right gonad were made, and longitudinal sections of the whole of the rest of this gonad were cut. Testicular seminiferous canals and developing spermatozoa were seen in all the sections, but no developing ova could be made out with certainty. In longitudinal section the tissue was seen to be denser in the anterior part of this right gonad than in the posterior portion.

The left gonad was carefully sectionized longitudinally, as it showed on its ventral surface an apparent egg. This latter was, in section, found to be an ovum, the nucleus and yolk being seen (Pl. VI. fig. 3, *n.* & *y.*). Slightly anterior and dorsal to this ovum, and so within the substance of the left gonad, another was found developing, after examining a series of sections. Further, a few groups of bodies resembling developing "ovarian ova" were seen scattered in separate groups (follicles) among otherwise testicular tissue, more especially near the periphery of the anterior portion of the gonad (Pl. VI. fig. 4, *ov.*). The rest of this organ consisted of seminiferous canals, connective-tissue stroma, and a few blood-vessels. I very much regret that circumstances do not permit of my giving a longer and more detailed account of the histology of the left gonad, owing to unavoidable delay in fixation.

The oviducts were lined internally by a glandular epithelium, as is normally the case in the female, the walls being highly muscular.

*Tortoise B.*—The right gonad was carefully fixed in corrosive sublimate and acetic acid, and sectionized. The left gonad was teased up. In neither case were any traces of ova found, only seminiferous canals and developing spermatozoa. The fact of mature spermatozoa being found in the right rudimentary oviduct directly after death has been already mentioned. These oviducts, the lumen of each of which was in some parts very narrow but continuous, were lined by a glandular epithelium, though the walls were thin.

Tortoise A, according to the classification of Taruffi (quoted by Windle [14]), would be a bilateral hermaphrodite. Tortoise B would perhaps be regarded by him as pseudo-hermaphrodite. However, specimen B was without doubt functionally a male, while A had a preponderance of male characters.

### III. Note on Hermaphroditism in the Vertebrata.

It may at once be said that this is rare, especially in the Amniota. It occurs in *Myxine*, which is protandrous. It occurs casually in some Selachians and in the Sturgeon. Among Teleostean fishes it constantly occurs in *Serranus* and *Chrysophrys*, while it is occasionally met with in the cod, herring, mackerel, &c.

Among the Amphibia it is known in *Triton* (*Molge*) *taeniatus* and some frogs. There is the remarkable "Bidder's organ" in toads. Among frogs the possession of well-marked rudiments of Müllerian ducts is fairly common, while specimens with complete Müllerian ducts or oviducts are sometimes found together with hermaphrodite gonads (cf. Marshall [9] and others). Remains of Müllerian ducts may occur in *Emys europæa*, *Lacerta viridis* (cf. Howes [6]), and *L. agilis* (cf. Jaquet [8]) among Reptiles, and hermaphroditism has been recorded in the chaffinch among birds.

A remarkable case of hermaphroditism in the common fowl was, I believe, lately exhibited at the Royal Society's *Conversazione*, showing secondary characters of both sexes in addition to a strictly hermaphrodite gonad.

Professor Howes in 1891 described a case of hermaphroditism in the codfish [7], and, after discussing the significance of the phenomenon in the Vertebrates, inclined to the idea that the ancestral vertebrate was hermaphrodite. Whether this is likely or not is open to question. The case of *Myxine* is usually considered as a secondary acquirement of hermaphroditism, connected with its partially parasitic habit. The young tadpole of the frog is at one period of its existence indifferent, which should be carefully distinguished from hermaphrodite.

If hermaphroditism be considered the primitive or ancestral condition of the Vertebrata, then the cases of tortoises A and B are retrogressive. Stephan [11], in an exhaustive and valuable paper on this question, inclines to the view that hermaphroditism in the Vertebrates is not a phenomenon of retrogression, but a secondary acquirement, substituted for the dicecious state (Stephan, 1902, page 129).

Again, the female organ (ovary) is perhaps simpler and more primitive than the male organ (testis), as suggested by Marshall [9], the ovum being undoubtedly less highly differentiated than the spermatozoon. A long theoretical discussion on the question of hermaphroditism in the Vertebrates would, however, be out of place in this paper.

In the foregoing note only the more commonly occurring and well known forms of Vertebrates in which hermaphroditism may be found are mentioned. A very full bibliography and comprehensive treatment of the subject will be found in Stephan's paper of 1902. A few other papers, relating especially to the Reptilia, will be cited in the appended references.

In the present state of our knowledge only suggestions as to the significance of hermaphroditism in forms like the tortoise can be put forward, and the recording of such occurrences may be of value in developing that knowledge.

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## EXPLANATION OF PLATE VI.

<i>b.v.</i> Blood-vessel.	<i>ov.</i> Ovarian ovum in follicle.
<i>cl.</i> Cloaca.	<i>p.</i> Penis.
<i>ep.</i> Epididymis.	<i>r.</i> Rectum.
<i>f.ep.</i> Follicular epithelium.	<i>t.</i> Testis.
<i>Fl.</i> Cœlomic aperture in Müllerian duct.	<i>ts.</i> Seminiferous tubules.
<i>g.</i> Gonad.	<i>v.ef.</i> Vasa efferentia.
<i>k.</i> Kidney.	♂. Aperture of vas deferens contiguous with that of ureter.
<i>m.</i> Müllerian duct (oviduct)	♀. Aperture of Müllerian duct.
<i>n.</i> Nucleus.	<i>y.</i> Yolk.
<i>o.</i> Ovum.	

- Fig. 1.* *Tortoise A*, genitalia seen from ventral surface. Cloacal bladder removed ventrally. Left Müllerian duct and epididymis separated and slightly displaced to show kidney dorsal to them. Penis turned over dorsally to show groove. Nat. size.
- Fig. 2.* *Tortoise B*, genitalia, ventral view. Round and broad ligaments not shown (nor in fig. 1). Cloacal bladder cut away ventrally. Nat. size.
- Fig. 3.* Part of a longitudinal section of the left gonad of *Tortoise A*, showing an egg on the surface and the relative size of the seminiferous tubules of the rest of the gonad.  $\times 12$  diameters.
- Fig. 4.* Part of a longitudinal section of the left gonad of *Tortoise A*, showing developing follicle (with ovarian ovum) wedged in between seminiferous tubules. Slightly diagrammatic.  $\times 100$  diameters.

XIII.—*Reply to Mr. G. A. Boulenger.*

By NILS ROSÉN.

To the "Remarks" which Mr. Boulenger in the March number of these 'Annals' has made upon my paper on snakes belonging to the Museums of Lund and Malmö, and which at first sight may seem to many to have been totally annihilating, I beg to give the following reply, which I hope will fully convince all impartial readers of the groundlessness of these "Remarks."

I will begin with Mr. Boulenger's statement that the snake I have described as a new genus under the name of *Anisodon Lilljeborgi* is identical with *Psammodynastes pulverulentus*, Boie, and first make a comparative survey of the most prominent differences between them:—



*Anisodon Lilljeborgi* (of which there are two specimens of exactly the same shape, one larger than the other).

(1) *Hypapophyses* present throughout the vertebral column, represented on the posterior dorsal vertebrae by a well-developed crest, projecting below the condyle.

(2) At least 13 maxillary teeth.

(3) Of the maxillary teeth the fourth and fifth enlarged.

(4) The last two maxillary teeth much enlarged and grooved.

(5) Rostral distinctly visible from above.

(6) Frontal not twice as long as broad.

(7) Temporals 2+2.

(8) Snout pointed.

(9) A dorsal series of rather large lighter spots, edged with black. Along the upper labials a white streak, edged with black.

*Psammodynastes pulverulentus*, Boie (according to Mr. Boulenger's description).

(1) *Hypapophyses* absent on the posterior dorsal vertebrae.

(2) 9-11 maxillary teeth.

(3) Of the maxillary teeth the third or the third and fourth much enlarged.

(4) The last maxillary tooth enlarged and grooved.

(5) Rostral scarcely visible from above.

(6) Frontal twice to twice and a half as long as broad.

(7) Temporals 2+3 (rarely 2+2).

(8) Snout short, profile truncate or somewhat turned up in the adult. (Head more distinct from neck than in *A. Lilljeborgi*.)

(9) With or without small darker and lighter spots above. A more or less distinct dark streak on each side of the head, passing through the eye.

Assuming that Mr. Boulenger's description of *P. pulverulentus* is correct, the difference between these two snakes, as shown by the above comparison, is so great that it seems strange that anybody should seriously think of uniting them. That Mr. Boulenger is, nevertheless, inclined to do so is unintelligible, all the more so because he has himself put forth the dentition as well as the hypapophyses as distinguishing characteristics of very great value for the classification of snakes, the snakes mentioned above differing widely from each other in these two respects. As to the hypapophyses, I have ('Annals,' Feb. 1905, p. 171) called attention to the fact that they are not of so much importance as Mr. Boulenger is inclined to ascribe to them, which particularly finds expression in his 'Catalogue of Snakes' concerning Colubrinae as well as Dipsadomorphae, since he arranges the genera of these two subfamilies in two series, "according to the presence or absence of hypapophyses or hæmal processes on the posterior dorsal vertebrae" (Cat. Snakes, i. p. 170 seqq., iii. p. 27); and so I have of course not exclusively attached importance to this difference, even if, as is quite natural, I have

given it some significance with the rest. *But to Mr. Boulenger, who seems still to adhere to it, this difference should be of such importance that he ought to be very far from thinking that these two snakes are identical.* Upon examination of the specimens of *P. pulverulentus* from the Zoological Museum of Copenhagen, which have been kindly placed at my disposal, I have also found that the difference between this species and *A. Lilljeborgi*, described by me, is really so great that it is quite out of the question that they are the same, as Mr. Boulenger maintains, and so I am of opinion that I have the right still to adhere to its being a *new genus*, although under another name (*Anisodontes*), as I overlooked the fact that *Anisodon* has already been applied to a *fossil mammal*. However, I shall please Mr. Boulenger with the information that the difference between them has in some degree been lessened for *him* by the observations I have made upon *P. pulverulentus*. The fact is that I have seen one specimen with well-developed hypapophyses also on the posterior dorsal vertebræ—this being quite contrary to Mr. Boulenger's own statements, so that I expect the pleasure will not be altogether unmixed to him. Yet it will be evident from what has been stated above that this has no real importance so far as this question is concerned, while, on the other hand, it tends to *confirm my opinion that the hypapophyses have not the great systematic value which Mr. Boulenger maintains in his Cat. Snakes.*

But enough on this subject! Just as strange as this is Mr. Boulenger's doubt as to the correctness of my statement that *Chrysopelea ornata* sometimes has well-developed hypapophyses also in the posterior region, *for one can hardly imagine a greater inconsistency than this—first to maintain the great importance of the hypapophyses as a systematic characteristic, then, without changing one's opinion on this point, to identify one snake having hypapophyses with another without them, and at last to doubt the statement that with the same species these apophyses are sometimes present, sometimes absent!* Or have these apophyses a systematic value for *Chrysopelea* and other *Dipsadomorphine* and *Colubrine*, but not for my *Dipsadomorphine* *Anisodon*? Add to this that Mr. Boulenger does not mention the other species—*Helicops modestus*, Gthr., *H. leopardinus*, Schleg., and *Tretanorhinus intermedius*, sp. n. (pp. 170, 171)—which I have given as a proof of the variation and comparative unimportance of this feature for classification, and I think that Mr. Boulenger's "Remarks" will appear to be unfounded.

Mr. Boulenger calls upon those who possess specimens of

*Chrysopelea ornata* to examine how the matter stands respecting the hypapophyses, and to verify *his* statement. An opportunity of complying with his request has kindly been afforded me as regards specimens belonging to the Zoological Museum of Copenhagen, and I have thereby found *my* statement perfectly verified: there were several specimens, some with, others without developed hypapophyses in the posterior region, and I hope that Mr. Boulenger too will succeed in finding a specimen having these apophyses.

That *Coluber fasciatus* should be the same as *Drymobius Boddaertii*, var. *Rappii*, Gthr., seems rather doubtful, supposing one were to keep to Mr. Boulenger's own description of it in Cat. Snakes.

Having shown Mr. Boulenger's criticism in these instances to be unjustified, I pass over his suppositions, put forward without argument, as regards the other determinations. I will only mention that I have not been "encouraged &c."

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XIV.—*List of the Lizards in the Zoological Museum of Lund, with Descriptions of new Species.* By NILS ROSÉN, Zool. Inst. Lund.

[Plates VII.-IX.]

Fam. Geckonidæ.

1. *Gymnodactylus marmoratus*, Kuhl.  
Java.
2. *Gymnodactylus Miliusii*, Bory.  
West Australia.
3. *Phyllodactylus marmoratus*, Gray.  
Australia.
4. *Ptyodactylus lobatus*, Geoffr.  
Egypt.
5. *Thecadactylus rapicaudus*, Houtt.  
West Indies.
6. *Hemidactylus frenatus*, D. & B.  
Java.
7. *Hemidactylus Bowringii*, Gray.

8. *Hemidactylus platyurus*, Schn.  
Java.
9. *Gehyra mutilata*, Wiegman.  
Java.
10. *Gehyra variegata*, D. & B.  
West Australia.
11. *Gehyra australis*, Gray.  
Australia.
12. *Spathoscalabotes mutilatus*, Gthr.  
Java. Collected (1897) by Dr. Hj. Möller.
13. *Naultinus elegans*, Gray.  
New Zealand.
14. *Gecko verticillatus*, Laur.  
Java.
15. *Gecko monarchus*, D. & B.
16. *Ptychozoon homalocephalum*, Crev.  
Java.

17. *Tarentola tuberculata*, sp. n.  
(Pl. VII. fig. 1; woodcut, fig. 1.)

A supraorbital bone. Snout longer than the distance between the eye and the ear-opening. Rostral scarcely twice as broad as high. The nostril is pierced between the first labial and three shields (woodcut, fig. 1). A median cleft in the upper part of the rostral. Ten upper labials, posterior very small. Mental not twice as long as it is broad in the middle. Three chin-shields on each side, in contact with the lower labials; latter eight or nine. Anterior border of ear-opening not denticulated. Neck, back, and limbs covered with large pyramidal tubercles and smaller conical ones: on the back they are more or less distinctly arranged in twelve longitudinal rows; the largest tubercles on the back mostly surrounded by smaller ones. The tail for about two thirds of its length\* with posteriorly directed large spine-like tubercles, decreasing in size. Greyish brown above, more or less marbled with darker and lighter.

Algiers (*C. Ask*, 1895-96).

\* In one specimen nearly to the end.

One specimen, with rudiments of claws on the first, second, and fifth digits.

This new species is very closely allied to *T. mauritanica*, L. (Boulenger, 'Catalogue of Lizards,' i. p. 196). It differs in the following points:—

- (1) The nostril is pierced between the first labial and *three* shields; in *T. mauritanica*, L., and, so far as I know, in all the other species of *Tarentola*, it is pierced between the first labial and *two* shields.
- (2) The median cleft in the upper part of the rostral is more distinct in this species.
- (3) A much greater number of larger tubercles on the body as well as on the limbs and the tail.

Fig. 1.



*Tarentola tuberculata*, sp. n. Upper view of snout.

18. *Tarentola annularis*, Geoffr.

Egypt.

19. *Sphaerodactylus argus*, Gosse.

#### Fam. Pygopodidæ.

20. *Delma Fraseri*, Gray.

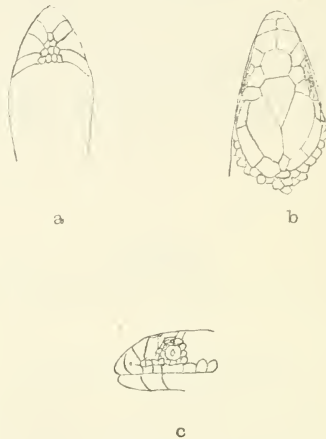
Victoria (Australia).

21. *Delma lineata*, sp. n. (Pl. VIII. fig. 1 ;  
woodcut, fig. 2.)

Snout not prominent, a little shorter than the distance between the orbit and the ear-opening. Tail a little more than twice as long as head and body. Rudimentary limbs small. Rostral triangular. Nostril pierced in the lower portion of the nasal, which forms a suture with its fellow on the snout. The anterior part of the nasal fused with the first upper labial. No supranasals. A pair of large plates between the nasals and the præfrontal; the latter seven-sided, not so broad as the frontal. Three enlarged scales on the outer

side of each parietal. A large loreal. Four small plates in a line between the orbit and the nasal and some small ones between the loreal and the orbit. Two supraorbitals. Seven upper labials; fourth elongate and situated below the orbit, from which it is separated by a row of small scales. Mental large, triangular, broader than long. Five lower labials, the

Fig. 2.



*Delma lineata*, sp. n. a. Lower view of snout. b. Upper view of head. c. Side view of head.

first separated from its fellow by a small scale behind the mental. Sixteen longitudinal rows of scales round the middle of the body. The enlarged ventral scales decreasing in width posteriorly, the anterior at least twice as broad as long; they form 51 pairs. Two large anal scales.

Olive above, lighter beneath, the anterior part of the lower surfaces yellowish. A broad light (grey? in spirit!) vertebral line extending to the end of the tail. The edges of the scales lighter, on the back forming small longitudinal lines between the rows of scales.

	mm.
Width of head . . . . .	5
From snout to vent . . . . .	75
Tail . . . . .	160
Hind limb . . . . .	2.5

Victoria (Australia).

A single specimen.

This species seems to be allied to *D. impar*, Fisch.\* ('Catalogue of Lizards,' i. p. 244), from which it differs by having 16 rows of scales round the middle of the body, the first lower labial not in contact with its fellow. In *D. impar*, Fisch., the præfrontal is a little larger than the frontal, whereas this lizard has the frontal larger than the præfrontal. In the coloration there is also some difference. This new species differs from all previously described species of *Delma* by having the anterior part of the nasal fused with the first upper labial (perhaps an individual character).

#### Fam. Agamidæ.

22. *Draco volans*, L.

Java.

23. *Draco fimbriatus*, Kuhl.

24. *Gonyocephalus Kuhlii*, Schleg.

Java.

Supraorbitals more or less distinctly keeled. Total length 300 mm.

25. *Calotes cristatellus*, Kuhl.

Java.

26. *Calotes jubatus*, D. & B.

Java.

27. *Calotes tympanistriga*, Gray.

Java.

28. *Calotes versicolor*, Daud.

29. *Calotes ophiomachus*, Merr.

30. *Calotes aberrans*, sp. n. (Pl. VIII. fig. 3.)

Upper head-scales rather large, irregular, smooth or feebly keeled. A rather large tubercle behind the superciliary edge and a smaller one on its anterior end. A pair of tubercles on the occiput. Tympanum scale-like. A slight nuchal crest, composed of a few small spines. No transverse gular fold. No oblique fold in front of the shoulder. Dorsal crest indistinct; a very slightly serrated ridge. 36

\* *Pseudodelma impar*, Fischer, Archiv f. Naturgeschichte, 48 Jahrg. (1882) p. 286.

scales round the middle of the body. Dorsal scales very large, much larger than the ventrals, pointing backwards and downwards, smooth. The median series of the dorsal scales keeled, forming a slight ridge. Ventral scales strongly keeled, larger on the sides of the belly than on the middle. The adpressed hind limb reaches the shoulder. Fourth finger as long as the third or very slightly longer. Tail compressed, with a slight upper ridge. Caudal scales strongly keeled.

The specimen is preserved in spirit. The coloration is indistinct, bluish, marbled white (?).

	mm.
Total length .....	200
Head .....	19
From snout to vent .....	81
Fore limb .....	31
Hind limb .....	43
Tail .....	119

Java. A single specimen, collected by Dr. Hj. Möller (1897).

This species is characterized from all the others by its short hind limbs. It seems to be most allied to *C. tympanistriga* (Gray), from which, however, it is quite distinct.

31. *Agama pallida*, Reuss.

Egypt.

32. *Agama mossambica*, Ptrs.

33. *Agama stellio*, L.

Sinai.

34. *Amphibolurus maculatus*, Gray.

West Australia. Collected by Dr. N. Holst (1896-97).

Seems to differ a little in coloration.

35. *Amphibolurus Holsti*\*, sp. n. (Pl. IX.)

Head moderately large. Snout as long as the diameter of the orbit, with subangular canthus rostralis. Tympanum large. Nostril below the canthus rostralis, much nearer the eye than the tip of the snout. Upper head-scales subequal, strongly keeled, smallest on the supraorbital region. Gular

\* I take the liberty of naming this lizard after the Swedish geologist Dr. N. Holst, who has made very valuable collections of reptiles in West Australia.



scales much smaller than ventrals, feebly keeled. A dorso-lateral crest on each side of the neck. A well-developed dorsal crest, beginning on the neck and extending on the anterior part of the tail, composed of closely-set compressed spines. Body covered above with very strongly keeled scales, largest and more strongly keeled on the middle of the back, not intermixed with enlarged scales. The keels converge towards the vertebral line. Ventral scales very distinctly keeled. The hind limb stretched forwards reaches beyond the orbit. Limbs with keeled scales. About 55 pores, extending along the whole length of the thighs, scarcely interrupted on the præanal region. Caudal scales equal, keeled.

Brown above, head and body with irregular dark spots and lines. Four large dark spots on the middle of the anterior part of the back. Tail uniform brown. Lighter beneath. Lower surface of head with smaller black spots and a large one in the middle line reaching from snout to the gular sac. The anterior part of belly and the middle of chest black. Lower surface of fore limbs black.

	mm.
Total length .....	350
Head .....	30
Body .....	80
Fore limb .....	42
Hind limb .....	90
Tail .....	240

West Australia. A single specimen, collected by Dr. N. Holst (Dec. 1896).

This species seems to find a systematic position between *A. cristatus*, Gray (Cat. Liz. i. p. 383), and *A. caudicinctus*, Gthr. (Cat. Liz. i. p. 384). To *A. cristatus*, Gray, it is allied by the dorsal crest and the keeled ventral scales, but these characters are more developed in this new species. In *A. cristatus*, Gray, the crest is composed of a few widely separated spines, the ventral scales are smooth or very feebly keeled. This species has the crest composed of *many* spines, *in contact with each other*, the ventral scales distinctly keeled. In these points it is well separated from *A. caudicinctus*, which has a very small nuchal crest, a slight dorsal ridge, and smooth ventral scales.—With *A. caudicinctus*, Gthr., it agrees in having the dorsal scales not intermixed with scattered enlarged scales, as in *A. cristatus*.

### 36. *Amphibolurus caudicinctus*, Gthr.

West Australia. Collected by Dr. N. Holst (1896–97).

Seems to agree with the description of *A. caudicinctus*,

Gthr. (Cat. Liz. i. p. 384), except the coloration. Lighter beneath. Tail dark, with narrow indistinct lighter (white?) rings. In the 'Catalogue of Lizards' *A. caudicinctus*, Gthr., is described as having regular black rings, narrower than the interspaces between them.

37. *Amphibolurus reticulatus*, Gray.

West Australia (*N. Holst*, 1896-97).

Twenty-three specimens (all from West Australia) are preserved in the collections. They vary very much, forming a continuous series, from such as have no trace of a nuchal crest to those in which it is distinct and rather well-developed. In some specimens the ventral scales are feebly but distinctly keeled. The coloration also is very variable. In other characters they agree with the description of *A. reticulatus*, Gray.—I have not been able to separate them into varieties or species, and I have therefore referred them all to *A. reticulatus*, Gray.

38. *Amphibolurus muricatus*, White.

West Australia.

39. *Amphibolurus barbatus*, Cuv.

Australia.

40. *Tympanocryptis cephalus*, Gthr.

West Australia (*N. Holst*).

41. *Uromastix spinipes*, Daud.

Egypt.

42. *Moloch horridus*, Gray.

Australia.

Fam. Iguanidæ.

43. *Anolis cristatellus*, D. & B.

44. *Anolis Leachii*, D. & B.

West Indies.

45. *Norops auratus*, Daud.

46. *Polychrus marmoratus*, L.

47. *Ophryoesa superciliosa*, L.

48. *Liolaemus pictus*, D. & B.

Chili.

49. *Amblyrhynchus cristatus*, Bell.  
Galapagos Islands.
50. *Iguana tuberculata*, Laur.
51. *Iguana delicatissima*, Laur.
52. *Sceloporus spinosus*, Wiegmann.
53. *Phrynosoma cornutum*, Harl.  
N. America.

## Fam. Anguidæ.

54. *Ophisaurus apus*, Pall.
55. *Anguis fragilis*, L.  
Europe.

## Fam. Varanidæ.

56. *Varanus salvator*, Laur.  
Java.
57. *Varanus niloticus*, L.  
Egypt.
58. *Varanus Gouldii*, Gray.
59. *Varanus caudolineatus*, Blgr.  
W. Australia (*Dr. N. Holst*, 1896).

## Fam. Teiidæ.

60. *Tupinambis teguixin*, L.  
S. America.
61. *Ameiva surinamensis*, Laur.  
W. Indies.
62. *Ameiva edracantha*, Bocourt.  
Ecuador.
63. *Cnemidophorus lemniscatus*, Daud.

## Fam. Amphisbænidæ.

64. *Amphisbæna fuliginosa*, L.  
Ecuador.

65. *Trogonophis Wiegmanni*, Kaup.  
Algeria.

## Fam. Lacertidæ.

66. *Tachydromus sexlineatus*, Daud.  
Java.

67. *Lacerta ocellata*, Daud.  
Algeria.

In the 'Catalogue of Lizards' (iii. p. 13) a variety of *L. ocellata* is described (var. *pater*), inhabiting Algeria and Tunis, and characterized by having the dorsal scales more distinctly keeled and the occipital shield smaller, viz. as broad as or a little narrower than the frontal. The number of scales across the middle of the body and the number of femoral pores seem to be mostly a little larger. Boulenger says respecting it:—"In some Spanish specimens the occipital is quite of the same size as in '*L. pater*,' and also the other characters given as distinctive are by no means constant; therefore the Algero-Tunisian form can, in my opinion, not be specifically separated from the European."—In the specimens (from Algeria) in the collections these characters vary considerably, so that I have not been able to distinguish the var. *pater* from the European form.

Spec. <i>a</i> ....	17	femoral pores; occipital broader than frontal.
<i>b</i> ....	16-18	" " " " "
<i>c</i> ....	16-18	" " " narrower "
<i>d</i> ....	15	" " " " "
<i>e</i> ....	18	" " " broader "
<i>f</i> ....	17-18	" " " " "

68. *Lacerta viridis*, Laur.  
Europe.

69. *Lacerta agilis*, L.  
Europe.

70. *Lacerta vivipara*, Jacq.  
Europe.

71. *Lacerta muralis*, Laur.  
Europe.

72. *Psammodromus algerius*, L.  
Algeria.

73. *Acanthodactylus pardalis*, Licht.

Algeria.

74. *Acanthodactylus boskianus*, Daud.

Algeria.

75. *Eremias guttulata*, Licht.

Algeria.

Fam. Scincidæ.

76. *Egernia inornata*, sp. n.  
(Pl. VII. fig. 2; woodcut, fig. 3.)

Head moderate. Curved groove behind the nostril absent or very feebly marked. No distinct suture below the nostril. Fronto-nasal large, larger than the præfrontals, forming a suture with the rostral, separated from the frontal. Præfrontals forming a median suture. Frontal about twice as long as broad, considerably longer than the fronto-parietal. 6 supraoculars, third largest, first and sixth small. 7 upper

Fig. 3.



*Egernia inornata*, sp. n. Upper view of head.

labials, fourth, fifth, and sixth below the eye; fourth largest. 3 large temporals. One pair of nuchals. Ear-opening with four obtuse lobules anteriorly. Scales smooth, 42 round the middle of the body. The adpressed limbs overlap. Fourth toe long. Tail slightly compressed. Caudal scales smooth. Upper surface yellowish brown, with irregular dark brown spots, most numerous on the sides. Yellowish beneath.

	mm.
Total length . . . . .	160
Head . . . . .	15
Width of head . . . . .	11
From snout to vent . . . . .	74
Fore limb . . . . .	22
Hind limb . . . . .	32
Tail . . . . .	86

West Australia (*Dr. N. Holst*, 1897). A single specimen.  
Seems to be allied to *E. Whitii*, Lacép.

77. *Egernia depressa*, Gthr.

W. Australia (*Dr. N. Holst*, 1896).

In one specimen (four spec. in the Museum) some dorsal scales with *five* keels and spines.

78. *Trachysaurus rugosus*, Gray.

Australia.

79. *Mabuia Perrotetii*, D. & B.

80. *Mabuia multifasciata*, Kuhl.

Java.

One specimen with *feebly* keeled subdigital lamellæ. Hind limbs a little longer. In other respects it seems to agree with *M. multifasciata*, Kuhl.

81. *Mabuia siamensis*, Gthr.

82. *Mabuia Sloanii*, Daud.

83. *Lygosoma (Hinulia) tæniolatum*, White, var. *maculata*,  
nov. (Pl. VIII. fig. 2.)

Rostral and præfrontal narrowly in contact; the præfrontals separated. Eight upper labials, the last three largest.

Brown above. A narrow vertebral line, edged with white (in spirit). On each side of the body two longitudinal lines (white in spirit), between which small spots of the same colour arranged in a regular line. White beneath.

West Australia.

Two specimens, collected by *Dr. N. Holst* (1896).

I have not been able to find any structural characters distinctly separating this lizard from the *L. tæniolatum*, White, and therefore I believe that it is only a colour-variety of that species.

84. *Lygosoma olivaceum*, Gray.  
Java.
85. *Lygosoma ornatum*, Gray.  
New Zealand.
86. *Lygosoma Temminckii*, D. & B.  
Java.
87. *Eumeces Schneideri*, Daud.
88. *Scincus muscatensis*, Murray (?).
89. *Chalcides ocellatus*, Forsk.  
(a) A (Cat. Liz. iii. p. 401).  
Algeria, Egypt.  
(b) B (Cat. Liz. iii. p. 401).
90. *Chalcides tridactylus*, Laur.  
(a) A (Cat. Liz. iii. p. 404).  
Algeria.  
(b) B (Cat. Liz. iii. p. 404).  
Italy.  
(c) Var. nov. Four black longitudinal streaks, the median pair broken up.  
Algeria.

Fam. *Chamaeleontidæ*.

91. *Chamaeleon vulgaris*, Daud.  
Algeria, Sinai.
92. *Chamaeleon senegalensis*, Daud.
93. *Chamaeleon gallus*, Gthr.  
Madagascar.

## CORRIGENDUM.

Since I finished my descriptions of these lizards, the Ann. & Mag. Nat. Hist. for December 1904 has been published, in which Boulenger has described (p. 414) a new lizard from Western Australia (*Amphibolurus Websteri*). The

*Amphibolurus Holsti*, which I have described in this paper as new, agrees with his species, and therefore the name "*Holsti* (sp. n.)" must be changed to "*Websteri*, Blgr."

## EXPLANATION OF THE PLATES.

## PLATE VII.

Fig. 1. *Tarentola tuberculata*, sp. n.

Fig. 2. *Egernia inornata*, sp. n.

## PLATE VIII.

Fig. 1. *Delma lineata*, sp. n.

Fig. 2. *Lygosoma tenuilatum*, White, var. *maculata*, nov.

Fig. 3. *Calotes aberrans*, sp. n.

## PLATE IX.

*Amphibolurus Holsti*, sp. n.

XV.—Notes on Eastern and Australian Heterocera, with Descriptions of One new Genus and Thirteen new Species.  
By Colonel CHARLES SWINHOE, M.A., F.L.S., &c.

## Family Eupterotidæ.

1. *Melanothrix fumosa*, nov.

♀. Of a uniform dull smoky brown, shafts of the antennæ with an ochreous tinge; palpi blackish above: fore wings with a broad, white, discal, transverse band, with even sides, very broad on the costa a little beyond the middle, occupying at least a fifth of the wing, gradually narrowing hindwards to the hinder angle, where it is about one eighth of an inch broad; no other markings. Underside as above, general tint of colour paler, costal line of fore wings slightly ochreous.

Expanse of wings  $2\frac{4}{10}$  inches.

Brunei, Borneo; one example.

Allied to *M. alternans*, Pag. Iris, iii. p. 13, from Palawan, but the white band on the fore wings is much broader and there are no markings on the hind wings.

## Family Drepanulidæ.

2. *Oreta figlina*, nov.

♂. Palpi, head, frons, and legs crimson; antennæ, body,



and wings above of a uniform brick-red colour: fore wings with some grey marks on the basal half of the costa, a brown spot near the apex, and another at one fifth from the apex; a yellow thick line from the apex to the hinder margin beyond the middle, rather concave in shape; a broad shadowy grey band on the inner side of this line, which is continued across the centre of the hind wings. Underside more ochreous and brighter in colour; fore wings and costal portion of the hind wings with brown striations.

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

Java; one example.

Same shape as *O. bicolor*, Warren, from Malacca, but that has no indications of any median band.

### Family Arctiidæ.

#### 3. *Diacrisia sumatrana*, nov.

♂. Of a uniform dull ochreous brown: fore wings with faint indications of antemedial, medial, and discal transverse bands: hind wings with better-defined medial and post-medial bands, the latter more or less macular. Underside slightly paler in colour; a brown mark at the end of each cell, no other markings; shaft of the antennæ pale; legs without markings; abdomen with dorsal and lateral indistinct blackish spots.

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

Soekaranda, Sumatra; two examples.

Received under the above name, but I can find no record of its description; is allied to *D. landaka*, Moore, from Java, but that form has crimson sides to the abdomen and distinct markings, especially on the underside.

### Family Lithosiidæ.

#### 4. *Eugoa crassa*.

*Lyclene crassa*, Walker, Journ. Linn. Soc. vi. p. 114 (1862).

*Eugoa crassa*, Hmps. Phal. ii. p. 547, pl. xxxiv. fig. 28 (1900).

Khasia Hills; two examples.

The type, from Sarawak, is in Mus. Oxon.; the outer portion of the fore wings beyond the discal band is darker than usual, but otherwise it appears to me to be identical.

#### 5. *Chionæma axiologa*, nov.

♂. Frons, head, and thorax white; thorax with lateral scarlet bands; abdomen grey, with scarlet hairs; antennæ

red : fore wings white, bands scarlet, first subbasal and erect, second antemedial, outwardly curved, banded with black on the inner side, third postmedial extending from the costa, where it is nearly bifurcate, towards outer margin below the middle, then down straight to the hinder margin about one sixth from the angle, banded with black on the outer side, fourth band marginal and is continued round the apex and on the costa till it ends in the arm which nearly forms the bifurcation of the third band ; a large black spot at the upper end of the cell : hind wings scarlet, with the costal space broadly white. Underside pale scarlet, the lower portion of fore and costa of hind wings white, the two lobes on the fore wings smeared with white ; fore legs brown, with white bands, the other legs and body white.

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

Nias ; one example.

Resembles *C. Plateni*, Elwes, from N. Celebes, but that has two discoidal spots on the fore wings and the subbasal band of that species is of a different and very abnormal character.

#### 6. *Chionæma subornata*.

*Bizone subornata* (♀), Walker, ii. 550 (1854).

*Chionæma subornata* (♀), Hmps. Phal. ii. p. 321 (1900).

Ceylon ; type ♀ in B. M., Andaman Islands.

The male (hitherto unknown) is very like *C. obliquilineata*, Hmps., from Sikkim, the type of which is also in the B. M. ; the lobe on the underside distorts the upper surface of the fore wing and bends the ante- and postmedial bands, and there are also some indications of the diffused fuscous patch below the costa towards apex ; it is otherwise marked like the female. I have received in a collection from Kandy one male and two females, and I have both sexes from Port Blair, Andamans, collected by Wimberly.

#### Family Zygænidæ.

#### 7. *Thyrassia orepes*, nov.

♂. Palpi, frons, and collar ochreous ; antennæ, body, and wings black ; thorax with an ochreous spot behind ; abdomen with ochreous band : fore wings with an obscure semidiaphanous whitish streak from the base, running beneath the median vein ; a large wedge-shaped hyaline streak at the end of the cell, four thin streaks beyond it, and three broader ones below it : hind wings with the basal half hyaline. Underside : body and legs black.

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

Key Island; one example.

Allied to *T. Rafflesii*, Moore, from Java.

### Family Chalcosiidæ.

#### 8. *Soritia bicolor*.

*Devanica bicolor* (♀), Moore, Trans. Ent. Soc. 1884, p. 355.

*Soritia bicolor*, Hmps. Moths India, iv. p. 469 (1896).

*Soritia viridivena* (♀), Hmps. l. c. i. p. 253 (1892).

*Soritia nigribasalis* (♂), Hmps. l. c.

Cachar, Silhet, Khasia Hills.

The type from Cachar is in the Indian Museum, Calcutta; the type of *viridivena* from Silhet is in the B. M.; Sir George Hampson has compared the two together, and found them to be identical. The type of *nigribasalis* from Sikkim is in Coll. Elwes—by some printer's error it was described as a female. I have received a good many examples of both sexes of this species from the Khasia Hills.

#### 9. *Soritia Bocki*, nov.

♂ ♀. Antennæ, head, and abdomen black; thorax with the fore half scarlet, the hinder half black: fore wings with a band at the apex and a large space on the hinder margin blackish brown, leaving a large ochreous band tinged with scarlet, which occupies more than half the wing-space, from the base running along the upper half and bending down to the outer margin, occupying the whole space below the apical band: hind wings uniform blackish brown, without markings. Underside same as above; body and legs black.

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

Hsipaw, Burma. Types in B. M.

Some examples have a stronger suffusion of scarlet on the band on the fore wings than the types; there are altogether three males and two females in the National Collection from Hsipaw, a male from Hong Kong, and a female from Shanghai. I have in my own collection a male from Kiang-Si, which I received as *Pidorus Bocki*, but I can find no reference; it is allied to *S. costata*, Walker, of which there are many examples from Northern and Western China; the wings of that species are much longer, the coloration is deep black with a bright scarlet narrow band, the head and collar scarlet, the thorax wholly black.

10. *Soritia costimacula*.

*Soritia costimaculata* (♂), Auriv. Ent. Tidsk. xv. p. 169 (fig.) (1894);

Pag. Semon's Forschungsreisen, v. pl. xiii. fig. 2 (1895).

*Soritia leptalinoïdes* (♀), Auriv. l. c. (fig.).

## Java.

I cannot but believe that these are sexes of the same species; the fore wings of the male have the basal streak of the female, the subcostal discal spot, and a costal spot, indicating the commencement of the medial transverse band, and on the underside of the hind wings the same peculiar macular submarginal band; the other differences are no more than is usual between the sexes in this extraordinary family: the types of both came from Java, and I have three males and a female from the same locality.

11. *Pidorus ericydes*, nov.

♀. Shafts of antennæ, frons, head, thorax, and first two segments of the abdomen bright metallic blue-green; remainder of abdomen dull ochreous; wings white; plumes of the antennæ and basal portions of both wings black, the latter being well covered with bright metallic blue-green scales, and on the fore wings is extended along the costa and joins the large outer black band, which occupies quite a third of the wing and contains a white subcostal spot near the apex and two white spots close together near the outer margin a little above the middle; hind wings with a black outer marginal band about half the width of the band of the fore wings, the band narrowing hindwards and terminating in a point before reaching the anal angle. Underside: body and legs with metallic blue-green scales; wings as above; both wings with metallic blue-green scales covering the basal patch, and similar scales, forming marginal bands.

Expanse of wings  $2\frac{2}{10}$  inches.

Woodlark Island; two examples in B. M., including the type.

12. *Cyclosia papilionaris*.

*Noctua papilionaris* (♀), Drury, Ill. Exot. Ent. ii. pl. ii. fig. 4 (1773).

*Eterusia ferrea* (♂), Walker, ii. 431 (1854).

## China.

Drury's type came from China; Walker's type of *ferrea* in the B. M. is from Hong Kong, I have it from Toukin; Drury's figure is a very good representation of the Chinese insect, which is very different to the various Indian forms in

both sexes. The allied form *C. australinda*, Hmps., from S. India, was bred by T. R. Bell and found to be the female of *Pintia latipennis*, Hmps.

### 13. *Cyclosia venaria*.

*Phalena venaria*, Fabr. Syst. Ent. p. 627 (1775).

*Cyclosia papilionaris*, Hmps. (nec Drury), Moths India, i. p. 269 (1892).

Sikkim, Khasia Hills.

The male is much like *ferrea*, Walker, but the white spots are larger and more prominent; the female has a much more glossy sheen than *papilionaris*, Drury; the white spots beyond the cell of the fore wings are much broader than in that species and are spear-shaped; the black on the hind wings forms a regular marginal border, instead of running into the wing above vein 2, right up to the cell, as is the case in the Chinese form. The type is in the Banksian Cabinet in the B. M.; it is quite as distinct from *papilionaris* as are *nigrescens*, Moore, *parvula*, Butler, *australinda*, Hmps., *enodis*, Swinhoe, *chartacea*, Swinhoe, from each other and from both *papilionaris* and *venaria*.

### 14. *Cyclosia castigata*.

*Cyclosia castigata* (♀), Walker, xxxi. 115 (1864).

*Pintia cyanea* (♂), Butler, Ann. & Mag. Nat. Hist. (5) xii. p. 160 (1883).

Sumatra, Borneo.

The type from Sumatra is in Mus. Oxon.; Butler's type from the same locality is in the B. M.; there are three females and one male from Borneo in the National Collection and one in mine. The allied form *metachloros*, Walker, from Java, was bred by Horsfield, the sexes showing the same characteristic differences.

### 15. *Cyclosia sordida*.

*Pidorus sordidus* (♀), Walker, Journ. Linn. Soc. vi. p. 98 (1862); Swinh. Cat. Het. Mus. Oxon. i. p. 67, pl. ii. fig. 4 (1892).

*Pintia insularis* (♂), Swinhoe, l. c. p. 76.

*Codane obscurata*, Snellen (nec Walker), Tijds. voor Ent. xlv. p. 200, pl. xiv. figs. 4 ♀, 8 ♂ (1902).

Borneo, Sumatra, Singapore.

The type from Sarawak is in Mus. Oxon., as also is the type of *insularis* from Singapore; there are six males and two females from the latter locality in the B. M. and one male from Sumatra: I have males from Singapore, Johore,

Makassar, Celebes, and females from Palembang, Sumatra, and from Nikko, Japan; the last, collected by Mr. Sanson, in no way differs from the other Island examples. Piepers appears to have bred these in Java: I had put them together in my collection long before I saw Suellen's paper; by some curious mistake, though he has figured correctly Walker's type of *sordida*, he has printed a wrong name and a wrong reference both of the text of Cat. Het. Mus. Oxon. and of the number of the figure on the plate.

### 16. *Cyclosia distincta*.

*Gynautocera distincta* (♀), Guér. Voy. Deless. p. 85, pl. xxiv. fig. 3 (1843).

*Eterusia drataraja* (♂), Moore, Cat. Lep. E. I. C. ii. p. 321, pl. viii. a, fig. 3 (1859).

*Eterusia osscata* (♀), Walker, xxxi. 120 (1864).

Java, Borneo, Sumatra, Mergui.

From all the above localities in the B. M.; in my collection from Jelebu, Singapore, Sarawak, and Sandakan; they are undoubtedly sexes of the same species. Moore's type from Java is in the B. M., Walker's type from Sumatra in Mus. Oxon. Guérin's locality Assam is undoubtedly wrong; at all events, it has never since been recorded from India proper. There is an example, however, in Mus. Oxon., taken by Mouhot in Cambodia, Siam.

### 17. *Isbarta pieridoides*.

*Epyrgis pieridoides*, Herr.-Schäff. Ausser. Schmett. i. p. 5 (1853).

Java, Borneo, Sumatra, Nias.

The type came from Java. Only females have heretofore been known; the male is glaucous blue, about half the size of the female; it somewhat resembles *Isbarta glauca*, Walker, has the same kind of yellow band on the abdominal margin of the hind wings below, but otherwise the markings above and below are identical with those of the other sex except for some black suffusion on the outer third of the fore wings above and white submarginal spots: it has heretofore been mixed up with *glauca* in collections; the female of that form is not yet known. There is a form of *pieridoides* in Sumatra and another in the island of Nias, in which the females are very similar, but the males have the thick black vein-markings on the hind wings very obscure and more white spots on the fore wings. There are in the B. M. and in my own collection examples of both sexes of all three forms.

18. *Isbarta Binghami*.

*Epyrgis Binghami* (♀), Butler, Ann. & Mag. Nat. Hist. (5) x. p. 374 (1882).

*Isbarta cyanesens* (♂), Himpson, Trans. Ent. Soc. 1895, p. 284.

Tenasserim, Burma.

There can be no doubt these are sexes of the same species; the types of both are in the B. M. from Tenasserim, also three other females from the same locality; I have a female in my own collection from the same place.

19. *Isbarta curiosa*.

*Isbarta curiosa*, Swinhoe, Ann. & Mag. Nat. Hist. (7) vi. p. 305 (1900).

*Isbarta aspasia*, Snellen, Tijds. voor Ent. 1902, p. 183, pl. xiv. fig. 3.

Java.

Types (♂ ♀) in B. M. Snellen's types are from the same locality.

Genus *PSAPHIS*.

Walker, ii. p. 433 (1854).

20. *Psaphis camadeva*.

*Gynautocera camadeva* (♂), Doubl. Ann. & Mag. Nat. Hist. xix. p. 75 (1847).

*Euschema semiplena* (♀), Walker, xxxi. 177 (1864).

Penang, Malacca, Borneo.

Doubleday's type from Penang is in the B. M.; Walker's type without locality, from Coll. Norris, is not in the National Collection, but there is one example from Malacca and another from Borneo. Rothschild's species *gloriosa*, a female from Sumatra\*, must come under this genus; the male, when found, will certainly resemble *camadeva*; there is a female example from Kuching in the B. M.

Family *Callidulidæ*.21. *Cleis aureola*, nov.

♀. Antennæ, palpi, frons, and pectus golden yellow; head, body, and wings above dark chocolate-brown; fore wings with a short submarginal band from near the hinder margin, and hind wings with a broader marginal band, golden yellow; the latter is crescent-shaped and does not touch the margin. Underside: body and legs golden yellow; wings same as above, but the golden-yellow band on

\* Nov. Zool. vii. p. 275, pl. v. fig. 6.

the fore wings is complete and circles outwardly from the costa beyond the middle to near the hinder margin, where it narrows somewhat.

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

Obi Island; one example.

Nearest to *C. posticalis*, Guérin, but that has a large golden-yellow spot near the hinder angle of the fore wings above and below, and the band on the hind wings is much broader.

### Family Lymantriidæ.

#### 22. *Anthela epicrypha*, nov.

♀. Pale cinnamon-grey, with a slight pinkish tinge, very uniform in colour; indications of an antemedial outwardly curved grey line; a brownish spot at the end of each cell; a discal sinuous grey line, immediately followed by a crenulate grey line containing dull spots on the veins, both lines bent inwards on to the costa; on the hind wings these two lines open out a little towards the costa, and the inner line corresponds to the outer line of the fore wings. Underside: paler lines as above, the inner line on both wings thicker and more even; an obscure small spot inside each cell in addition to the spot at the end.

Expanse of wings  $3\frac{7}{10}$  inches.

New South Wales; one example.

I have had this example in my collection for years; it is in fine condition. I have carefully gone through the descriptions of all the described species, examples of which are not in the B. M., but cannot find any description that fits it; the nearest is *Darala succinia*, Lucas (Proc. Linn. Soc. N. S. W. 1891, p. 290); there is nothing like it in the B. M.

### Family Hadenidæ.

#### 23. *Polia illoba*.

*Agrotis illoba*, Butler, Ann. & Mag. Nat. Hist. (5) i. p. 162 (1878).

*Polia illoba*, Hampsn. Phal. v. p. 151 (1905).

Khasia Hills.

Not mentioned by Hampson as from India; the type from Hakodaté, Japan, is in the B. M.; I have it from Yokohama and Nikko.



## Family Acontiidæ.

24. *Bryophila khasiana*.

*Bryophila khasiana*, Hampsn. Moths India, ii. p. 299 (1894).

*Apamea repetita*, Swinh. (nec Butler), Ann. & Mag. Nat. Hist. (7) xv. p. 499 (1905).

Khasia Hills.

Type in Coll. Elwes. Sir George Hampson informs me that I misidentified this moth. Since writing the above paper I have received another example from Cherra Punji.

25. *Maliattha marginalis*.

*Acontia marginalis*, Walker, Journ. Linn. Soc. vii. p. 49 (1864).

*Maliattha marginalis*, Swinh. Cat. Het. Mus. Oxon. ii. p. 51, pl. i. fig. 9 (1900).

*Maliattha stolasa*, Swinh. Ann. & Mag. Nat. Hist. (7) xv. p. 154 (1905).

Khasia Hills.

The type is in Mus. Oxon. from Sarawak. I overlooked it when describing *stolasa*. It is new to the Indian fauna.

## Family Sarrothripidæ.

26. *Blenina solomonis*, nov.

♂. Palpi brown above, white below and at the sides; head, body, and fore wings white, thickly irrorated with dark grey: fore wings with basal, medial, and submarginal grey irregular bands, the first outwardly margined by an outwardly rounded sinuous brown line; the medial band margined on both sides in a similar manner, the band much contracted below the middle and narrow downwards to the hinder margin; the submarginal band narrow, bifurcate below the costa, and outwardly margined by a deeply sinuous thick brown line, the sinuations forming three blunt outward dentations: hind wings dark brown, without markings. Underside uniform sordid brown, with some darker shading in the interior of the fore wings.

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

Solomon Islands; one example.

Somewhat similar in the colour and markings on the fore wings above to *B. lichenopa*, Meyrick, which I have from Queensland, but very different on the underside.

Family *Gonopteridæ*.27. *Beara nubiferella*.

*Beara nubiferella*, Walker, xxxv. 1704 (1866).

Port Blair, Andamans.

The type from Java is in the B. M. I have it also from Muok-Lek, Siam, Goping, Perak, Sarawak, and Mackay, Queensland. It is not mentioned by Hampson.

Genus *ERIZADA*.

*Erizada*, Walker, xxxii. 506 (1865).

*Tinosoma*, Hmps. Moths India, ii. p. 426 (1894).

28. *Erizada semifervens*.

*Gadirtha* (?) *semifervens*, Walker, Journ. Linn. Soc. vii. p. 163 (1864).

*Tinosoma semifervens*, Swinh. Cat. Het. Mus. Oxon. ii. p. 101 (1900).

*Erizada lichenaria*, Walker, xxxii. 507.

*Tinosoma hyperythrum*, Hmps. *l. c.*

Borneo, Java, Siam, Naga Hills.

The type from Sarawak, Borneo, is in Mus. Oxon., the types of *lichenaria* from Java in the B. M., and of *hyperythrum* from the Naga Hills in Coll. Elwes; I have it also from Siam.

Family *Quadridæ*.29. *Ophiusa rubida*.

*Ophisma rubida*, Walker, Journ. Linn. Soc. vii. p. 179 (1864).

*Ophiusa rubida*, Swinh. Cat. Het. Mus. Oxon. ii. p. 144 (1900).

Khasia Hills, Jaintia Hills; three examples.

The type from Sarawak, Borneo, is in Mus. Oxon. I have it also from Java. It is not mentioned by Hampson.

30. *Hypætra tepescens*.

*Athyrma tepescens*, Walker, xiv. 1417 (1858).

Port Blair, Andamans.

The type from Penang is in the B. M.; I have it also from Goping, Perak, Singapore, and Key Island. It is not mentioned by Hampson.

31. *Oromena noduna*, nov.

♀. Palpi brown above, ochreous grey beneath; head and thorax brown, speckled with white; abdomen ochreous

grey: fore wings with the ground-colour white, irrorated and thickly marked in parts with blackish brown; an ante-medial sinuous brown line, the space inside it with two brown marks on the costa, one in the middle and a brown suffusion on the hinder margin which extends to the middle of the wing; a deep black lunule at the end of the cell; a postmedial, sinuous, double line, with a white centre; the outer portion of the wing suffused with blackish brown and containing discal and submarginal white dentated lines; cilia brown, with whitish patches; four whitish spots on the costa near the apex: hind wings ochreous grey; a brown lunule at the end of the cell, indications of a discal sinuous grey line, and the outer margin broadly brown. Underside ochreous grey; a brown lunule at the end of each cell; a grey sinuous discal line and broad brownish-grey borders to both wings; legs brown; tarsi with white bands.

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

Ceylon.

Allied to *O. reliquenda*, Walker, from India.

#### Genus DELOCOMA, nov.

♂. Antennæ long, two thirds length of costa, with curved bristles and cilia; palpi upturned, second joint broad, uniform in width, moderately hairy, reaching vertex of head, third one third length of second, smooth and blunt; thorax with rather long hairs; abdomen smooth, extending a little beyond the hind wings; a sharp frontal tuft; fore tibiæ with long, thick, brush-like hairs; mid and hind tibiæ smooth, the former with one pair, the latter with two pairs of spurs; costa of fore wings straight, arched before apex, which is subfalcate; outer margin slightly rounded; hinder margin curved before base: hind wings with the costa arched, apex acute, outer margin slightly rounded; anal angle bluntly acute; the wing more or less triangular; neuriation normal.

Allied to the genus *Azazia*, Walker.

#### 32. *Delocoma marmorea*, nov.

♂. Palpi black on the outer and grey on the inner sides; body and wings dark lavender-brown; top of head, outer third of fore wings, and apical third of hind wings lavender-grey, giving the insect a peculiar marbled appearance: fore wings with a brown lunule at the end of the cell; ante-medial, medial, and postmedial highly sinuous dark brown

lines ; the medial line running through a dark brown fascia which crosses the middle of both wings, the third line dentate ; a submarginal sinuous fascia from the costa before apex to the hinder angle : hind wings with a dentate but not sinuous discal line and a submarginal sinuous line, which does not enter the white apical space ; cilia of both wings whitish. Underside brown, smeared with whitish scales ; a straight thick brown line, outwardly edged with white, from the costa of fore wings one fourth from apex to the abdominal margin of hind wings a little beyond the middle ; indications of a discal band ; a thin, brown, marginal band and whitish cilia.

Expanse of wings  $2\frac{4}{10}$  inches.

Sawangan, N. Celebes ; six examples.

In markings unlike anything I have ever seen.

#### Family Focillidæ.

##### 33. *Zethes subapicalis*, nov.

♂. Of a uniform ochreous fawn-colour ; first two joints of palpi brown ; thorax blackish brown in front : fore wings with a small black patch on costa at the base ; a black dot in the middle of the cell, one at the upper and another at the lower end ; a large rounded subapical patch of greyish-white scales on the outer margin, with some black suffusion in its interior, and four black dots marked with white close to the outer margin within the patch ; some very minute dots on the outer margin hindwards ; indistinct sinuous transverse lines, medial and postmedial : hind wing with a black dot at lower end of cell, the discoidal vein faintly marked with black ; a medial, indistinct, sinuous line, a prominent black spot below its commencement on the outer margin, also some black points along the margin. Underside brighter and paler, the interior of the fore wings and the whole of the hind wings whitish, the discoidal marks and rather prominent, discal, sinuous lines pinkish.

Expanse of wings  $1\frac{3}{10}$  inch.

Silchar, Cachar ; one example.

#### Family Boarmiidæ.

##### 34. *Thinopteryx prætoraria*.

*Urapteryx prætoraria*, Felder, Reise Nov. pl. cxxii. fig. 13 (1873).

N. Celebes ; five pairs.

Type in Coll. Rothschild ; in 'Reise Novara' it is said to be a male from the East Indies. Dr. Jordan, in answer to

my enquiries, has kindly informed me that the type is really a female. It bears two labels: on one there is only the name of the collector, "Lorquin"; on the other in red ink there is the name of the insect, reference to the plate in 'Reise Novara,' and the locality "Molluk?"; but he agrees with me that as Lorquin collected in the Celebes as well as in other places, the type probably came from that locality. It is citron-yellow above and below, and my females exactly resemble the figure; but the male is very differently coloured, it is ochreous brown above and black below, with yellow borders, like a large example of *T. nebulosa*, Butler, from India, but the sexes of that form are alike. There is also a citron-yellow form in India, common in the Khasia Hills, sexes also alike—*T. citrina*, Warren, Nov. Zool. i. p. 401.

Family Thyrididæ.

35. *Rhodoneura fallax*.

*Pharambara fallax*, Warren, Ann. & Mag. Nat. Hist. (6) xviii. p. 229 (1896).

Khasia Hills.

The type came from New Guinea. I have it also from the same locality. They are identical.

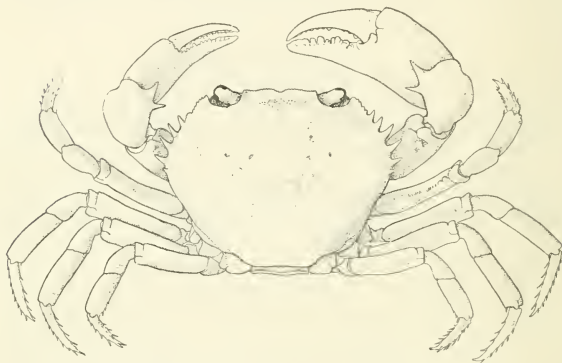
XVI.—*On a new Species of River-Crab from Yunnan.* By W. T. CALMAN, D.Sc., British-Museum (Natural History).

THE British Museum has recently received two specimens of a new species of river-crab collected by Mr. John Graham from the lake at Yunnan Fu. The species appears to be most nearly allied to the genus (or subgenus) *Parathelphusa*, though differing remarkably from any species hitherto described from Asia and resembling in some characters the African group of species forming the subgenus *Acanthothelphusa* of Ortmann. The lake from which the specimens were taken is situated at an altitude of 6000 feet above sea-level and drains into the Yang-tze river-system. No species of Potamonidæ appear to have been recorded from this part of Yunnan, although Wood-Mason described three species of *Potamon* from Western Yunnan, a district belonging to the river-system of the Irawady.

*Parathelphusa spinescens*, sp. n.

Carapace four fifths as long as broad, the greatest breadth a little in front of the middle, only slightly convex antero-posteriorly and from side to side. Surface smooth and polished, with very minute punctuations. The inter-regional grooves nearly obsolete, the median portion of the cervical groove not extending beyond the branchio-cardiac grooves on each side. The distance between the external orbital angles is a little less than two thirds of the greatest breadth. The front is rather steeply deflexed, with the margin slightly everted, extending a little in front of the external orbital

Fig. 1.

*Parathelphusa spinescens*, ♂. Nat. size.

angles as seen from above, with a distinct and moderately deep median notch. Seen from in front it is convex. The transverse diameter of the orbit is equal to half the width of the frontal margin. The frontal margin and the upper orbital margin are granulated. The lower orbital margin is more distinctly granulated than the upper; its inner angle is not produced, but there is a prominent, rounded, internal sub-orbital lobe. The postfrontal crest is nearly obsolete. It is only represented by the obscurely defined epigastric lobes, which are very slightly rugose in front and are separated by a shallow mesogastric furrow, showing only in one specimen a trace of bifurcation.

The antero-lateral margin is convex and is about as long

as the postero-lateral. The extra-orbital tooth is flattened, with a slightly convex and minutely serrate outer edge. It is followed by five or six teeth, which may be unsymmetrical on the two sides of the carapace. They are slender, spini-form, nearly straight, widely separate from each other, and standing nearly at right angles to the margin. The third or fourth is the longest, and the last is very small or may be absent on one side.

The lower surface of the carapace is nearly smooth and the hepatico-branchial groove is ill-defined.

Fig. 2.



*Parathelphusa spinescens.* a. Abdomen of male. b. Third maxilliped.

The ischium of the third maxillipeds (fig. 2 *b*) has a well-marked longitudinal groove. The merus is distinctly broader than long, the antero-external angle rounded and the anterior margin slightly convex.

Abdomen of male (fig. 2 *a*) with straight sides, converging but little to the base of telson, which has nearly the form of an equilateral triangle, the apex rounded and the sides concave.

Merus of chelipeds with a series of granules on its upper edge, leading to a subterminal spine; lower edge rounded off, with some obsolescent granules and a subterminal tubercle. Carpus bearing two stout unequal spines internally. The right chela of the male is quite smooth, its height equal to the length of the fingers and two thirds of its length. The dactylus is slightly arched, so that the fingers gape a little when closed, and is very obscurely furrowed. The left chela, like both chelæ of the female, has the dactylus nearly straight and the fingers about three fourths the length of the palm. The ambulatory legs are moderately long, the merus without a spine on the upper edge. The dactylus of the second pair is equal to the propodus, those of the other pairs are distinctly shorter, and all are strongly spinulose on the upper surface.

The carapace of the male specimen is 29.5 mm. in length and 37 mm. in breadth; that of the female is a little smaller.

The colour (in spirit) is yellowish, and the upper surface

of carapace, chelipeds, and legs is abundantly marbled with orange-red.

This species is distinguished from all the Asiatic representatives of the genus hitherto described by the possession of more than four antero-lateral teeth on the carapace and by having two spines instead of one on the carpus of the chelipeds. Further, the antero-lateral teeth are much more slender and spiniform and their number is variable, whereas Wood-Mason remarks that in this genus these teeth "in point of number and form are as constant for the several species as are those of the Portunidæ" \*. In all these points the new form approaches the African group of species referred to *Parathelphusa* by A. Milne-Edwards †, but regarded as forming a subgenus of *Potamon*, under the name *Acanthothelphusa*, by Ortmann ‡. But in some, if not all, of the African species the merus of the chelipeds has a spine on the anterior and none on the upper edge, and, further, most of them have a strong and continuous postfrontal crest. According to Ortmann's arrangement, the chief character separating *Parathelphusa* from *Potamon* (with its subgenus *Acanthothelphusa*) is the less deflexed front. This, however, is an ill-defined and variable character, and in some undoubted species of *Parathelphusa* (e. g. *P. Dayana*), as in the present form, the front is quite as much deflexed as in many species of *Potamon*.

Had the present species been found in Africa there can be little doubt that most carcinologists would have referred it to *Acanthothelphusa*. Nevertheless, I do not believe that it is necessary to assume any special relationship between it and the African species. The differences separating it from some of the other Asiatic species of *Parathelphusa* are comparatively small, and the distance is not great even to some of those species of *Potamon* in which the antero-lateral margin is coarsely granulated, as in *P. Atkinsonianum* and *P. denticulatum*. Throughout the whole family of the Potamonidæ the generic and specific characters are often very elusive, phylogenetic conclusions are more than usually hazardous, and our knowledge of the group appears to be somewhat inadequate to bear the weight of the geographical speculations which Ortmann has recently based upon it.

\* Wood-Mason, Ann. & Mag. Nat. Hist. (4) xvii. 1876, p. 120.

† A. Milne-Edwards, Bull. Soc. Philom. Paris, x. 1886, p. 143; and Ann. Sci. Nat. (7) iv. 1887, p. 140.

‡ Ortmann, Zool. Jahrb. Abth. f. Syst. x. 1898, p. 300. It is remarkable that not only in this, but also in a later paper (Proc. Amer. Phil. Soc. xli. 1902, p. 300), Ortmann appears to have overlooked the second of Milne-Edwards's papers quoted above, in which the African species are figured.



XVII.—*On some new Genera and Species of Parasitic Hymenoptera from Borneo.* By P. CAMERON.

Evaniidæ.

*Pristaulacus erythrocephalus*, sp. n.

Black; the head, pro- and mesothorax, antennal scape, and fore legs red; wings fuscous violaceous, the hinder pair paler, almost hyaline behind, the stigma dark testaceous, the recurrent nervure interstitial. ♂ ♀.

Length 18–19 mm.; terebra the same.

Kuching, Borneo (*R. Shelford, M.A.*).

Claws with four teeth, the apical small; the two middle teeth longer than the basal. Head smooth, shining, almost bare. Clypeus depressed at the apex in the centre; the sides rounded, narrowed to a point; in the centre is a narrow tooth as viewed from the front, but it is broad as seen from the sides. The narrowed basal part of the prothorax is smooth, impunctate, shining; the rest rugosely punctured; on the sides, at the base of the dilated apical part, is a stout tooth. Mesonotum rugosely reticulated. Scutellum with five stout, clearly separated keels, the apex being also bordered by one. Postscutellum obliquely raised in the centre; smooth, the sides stoutly, irregularly striated. Basal depression of metanotum crenulated; the rest of it coarsely transversely reticulated. Pleuræ reticulated, the metapleuræ more coarsely than the rest. Sternum irregularly weakly punctured, the central furrow wide, deep, crenulated. Abdomen smooth and shining: the second transverse cubital nervure is roundly curved; the first recurrent nervure is interstitial, the second received shortly behind the base of the apical third. Legs long, slender; the tibiæ sparsely, the tarsi thickly spinose. The pedicle of antennæ is about three times longer than thick; the following joint distinctly shorter than the next, it and the pedicle together being nearly as long as the third. The hind coxæ are finely transversely striated, weakly at the base, more strongly towards the apex. Temples wide, rounded.

Braconidæ.

EDYIA, gen. nov.

Hind femora stout, but not dilated, the middle irregularly serrate; the hind coxæ about three times longer than thick;

the basal joint of hind tarsi not longer than the following two united; calcaria short, claws cleft. Wings with three cubital cellules—the radial cellule long, the second cubital cellule behind shorter than the first, narrowed in front, the transverse cubital nervures converging in front, straight, oblique; the recurrent nervure is received near the base of the apical third of the first cubital cellule. Transverse basal nervure almost interstitial, anal nervure not interstitial. Middle lobe of mesonotum clearly raised. Metanotum areolated. Apex of clypeus transverse. Labrum projecting, rounded. Lower part of frontal depression bordered by a curved keel; in the centre is a short stout keel, not reaching to the middle above. Head cubital; temples wide, occiput margined. Thorax about four times longer than wide. First abdominal segment broad, longer than the following two united. Antennæ pilose, the first joint of the flagellum not much shorter than the second. Palpi very long, the maxillary reaching to the middle coxæ, 5-jointed.

The affinities of this genus are with *Euscelinus*, also from Borneo. The latter has the hind femora greatly thickened, the thorax shorter and broader, and the recurrent nervure is received in the second, not in the first cubital cellule.

*Edyia annulicornis*, sp. n.

Black; a broad ring on the middle of the antennæ; the four front legs except their coxæ, basal half (or nearly) of hind tibiæ and their tarsi whitish yellow. Wings hyaline, the stigma and nervures black. ♂.

Length 8 mm.

Kuching, August (*R. Shelford, M.A.*).

Antennæ stout, densely pilose, longer than the body. Head above the antennæ smooth, coarsely rugosely punctured, almost reticulated below. The depressed base of pronotum is coarsely, irregularly striated, the raised upper part smooth and shining. Apex of middle lobe of pronotum coarsely, irregularly reticulated. Scutellum flat, longish, punctured. Postscutellum with two square areæ at the base and two longer and deeper ones at the apex. There are three rows of areæ on the metanotum, the central longer and narrower than the others, the central is the longest, the basal the shortest; there is a large, irregular, spiracular area, rugose and irregularly striated. Metapleuræ coarsely, closely reticulated; mesopleuræ smooth in the centre, strongly punctured above and below, as is also the case with the propleuræ. First abdominal segment irregularly wrinkled;

there are two keels on the basal half, bordering the centre. The white ring on the antennæ is longer than the basal or apical part. There are five or six small teeth on the underside of the hind femora in the middle; they are widely separated and the middle ones are larger and sharper than the others.

*Neotrimorus? luteus*, sp. n.

Luteous, densely covered with long pale hair; the antennæ, ocelli, and hind tarsi black; the wings smoky, the basal third yellowish hyaline, stigma black. Face rugosely punctured, the rest of the head smooth and shining. Pronotum in front closely rugosely punctured; lower part of pleuræ bordered above by a keel, the centre with some stout irregular striæ. Mesothorax smooth, the pleural lower furrow crenulated. Metanotum finely reticulated; the reticulations round for the most part; the metapleuræ much more coarsely, irregularly reticulated. The first and the second abdominal segment to near the apex closely, longitudinally striated, as is also the base of the third and fourth segments. ♀.

Length 8; terebra 4 mm.

Kuchling (R. Shelford, M.A.).

In the 'Records of the Albany Museum,' i. p. 168, I described two species of Braconidæ under the name of *Trichiobracon*, but gave no generic description; as I was not sure but that the species might be referred to *Acanthobracon*, Szép., non Kriech. There seems to be considerable structural differences between the species, and it is probable that they might be split up into two genera. *Trimorus*, Kriech., is regarded by Szépligeti\* as identical with his *Acanthobracon*, but Kriechbaumer says nothing about the coxæ being toothed. The third longitudinal nervure in the hind wings may be broadly rounded, or geniculated as it is in *T. rufus*, Cam. I give a generic description of the Bornean species mentioned above:—

Radial cellule long, lanceolate. Transverse median nervure received before the transverse basal; the recurrent nervure in the first cubital cellule; accessory nervure interstitial. Hind wings with a third longitudinal nervure issuing from the lower part of the transverse præbrachial nervure and reaching close to the apex of the wing; there is a large basal cellule. Head cubital, not margined behind.

\* Gen. Insect., Braconidæ, p. 64.

Eyes oval; the malar space is nearly as long as them. Mesonotum 3-lobate. Scutellum flat. Median segment longer than wide; its apex transverse; it is closely reticulated. Abdomen sessile; the basal segments closely striated; the suturiform articulation deep. Ovipositor long. Maxillary palpi long. Base of hind coxæ with a large tooth.

The occiput is sharply margined on the lower side. The mesosternum is bordered by a distinct furrow. Legs short and stout; their claws simple. Body and legs densely covered with long hair. Pterostigma lanceolate; the radius issues from beyond its middle. The second transverse furrow on the abdomen is distinct. The centre of the second segment is raised, clearly separated by furrows, which shape it into a large, transverse, raised, oval area. Sides of median segment projecting into a blunt tubercle.

### Ichneumonidæ.

#### JOPPINI.

#### CÆNOJOPPA, gen. nov.

Scutellum obliquely raised at the base, the apex with a sharper, steeper slope; the base as long as broad, flat, the sides and apex bordered by a raised high keel. Areola widely separated from the base of the segment, 6-angled, narrowed towards the apex, which is transverse; it is longer than wide; the three basal areæ are confluent at the base; the sides bear longish teeth. Head cubital, about as wide as long; the occiput widely, deeply incised; temples as long as the eyes. Face and clypeus flat; the latter separated at the sides only, its apex bluntly rounded, very slightly projecting in the middle. Mandibles long, thick at the base, largely projecting downwards on the outer side; on the inner side are two large, sharp-pointed, widely separated teeth. Malar space large. Petiole long, narrow; postpetiole dilated, smooth, impunctate; the second and following segment punctured, the others smooth; the ventral keel extends to the apex of the fifth; there are seven segments, the last being large. Legs long; the hind tarsi twice the length of their tibiæ. Arcolet 5-angled; discocubital nervure with a minute stump of a nervure. Antennæ longer than the body, broadly ringed with white, serrate at the apex. Mesonotum reticulated in the middle. Fore coxæ small.

Comes near to *Imeria*, Cam., and *Xenojoppa*, Cam. (cf. Ann. & Mag. Nat. Hist. 1903, xi. p. 174).

*Cænojoppa longitarsis*, sp. n.

Black; the face, clypeus, orbits (largely below on the outer), mandibles, palpi, a narrow line on the pronotum, a broader one on the lower part of the propleuræ, tegulæ, a mark (longer than wide) on the mesonotum, scutellums, metanotal spines and the part surrounding them, a broad line on the lower side of the mesopleuræ, a large square mark on the apex of metapleuræ, the narrowed basal part of the first abdominal segments and the apices of all broadly, yellow. Legs yellow; the hind femora fulvous; the hind coxæ (except for a broad mark in the centre above), apex of hind trochanters below, base and apex of femora and apex of tibiæ, black. Wings hyaline, the stigma and nervures black. ♂.

Length 12 mm.

Kuching, June (*R. Shelford, M.A.*).

The space separating the mandibular teeth is broad and rounded. Mesonotum, except on the reticulated central apical part, closely, shallowly punctured. Scutellum impunctate. Metanotum smooth at the base, the rest more or less strongly transversely striated; the striæ on the apex strong and curved. Propleuræ stoutly striated at the base; the oblique keel stout; the meso- and metapleuræ for the greater part striated, the striæ on the latter closer, oblique, and intertwining. Gastrocœli deep, shining, more or less irregularly striated; the part between smooth, shining, irregularly, finely striated.

## DRUSEIA, gen. nov.

Scutellum pyramidal, obliquely raised from the base to the top, which ends in two stout teeth; the apex has a much shorter, steeper slope than the base. Metanotum regularly areolated; the sides in the middle with longish stout teeth; the areola twice longer than wide; the base rounded, the apex slightly bent inwardly; there is a longish basal area, gradually narrowed towards the apex. Spiracles linear, narrow. Temples long, obliquely narrowed; occiput deeply incised. Clypeus transverse at the apex, its sides broadly rounded. Labrum projecting. Abdominal petiole long, slender; the postpetiole gradually dilated towards the apex. Areolet narrow, five-angled; discocubital nervure not broken by a stump of a nervure.

The abdomen is sharply narrowed at the base and apex; closely punctured; gastrocœli shallow, indistinct; sheaths

of ovipositor as long as the apical three segments united. Antennæ thickened and dilated beyond the middle. Face and clypeus flat. Hind tarsi much longer than their tibiæ. The abdomen is not much longer than the head and thorax united. Malar space nearly as long as the antennal scape.

The flat face and clypeus in one line, sharply pointed abdomen with its long projecting ovipositor, stoutly spined scutellum and metanotum, and violaceous wings should distinguish this genus readily.

*Druseia quadridentata*, sp. n.

Black; the face (except for a line in the centre, which becomes gradually wider from the narrowed top to the apex), base of labrum, scutellar spines, apex of scutellum below, and the apices of the three middle segments of the abdomen narrowly, pale yellow. Wings fuscous violaceous, highly iridescent, the posterior paler. Basal three segments of abdomen red. Legs black; the greater part of the four front coxæ, trochanters, tibiæ and tarsi, and the calcaria whitish yellow; the hind coxæ, except at the base below, red; the rest of the hind legs black, except for a broad pale yellow line on the base of the tibiæ behind. ♀.

Length 14 mm.

Kuching, March (*R. Shelford, M.A.*).

Head smooth. Thorax for the greater part finely punctured; apical slope of metanotum thickly covered with white hair; the centre transversely, the sides more strongly obliquely striated; the pleuræ for the greater part striated. Petiole smooth; its base broadly yellow. Transverse median nervure almost interstitial.

XORIDINI.

*Cyanoxorides rufomaculatus*, sp. n.

Black, tinged with blue; the thorax, except the mesonotum, scutellum, and a line down the centre of metanotum red; head black, the face, a line on the inner orbits, a broad one on the lower half of the outer, whitish yellow; the clypeus, labrum, and malar space dull reddish; the base of first abdominal segment, a line, dilated at the base in the centre of the apex, a longish ovate longitudinal mark in the middle of the second, the apices of the others narrowly and the ventral surface, white. Four front legs red, the tarsi and tibiæ pale; the middle tibiæ infuscated behind; hind legs black, their coxæ red; a narrow band on the base of the

tibiæ and the tarsi, white. Wings hyaline; the nervures and stigma black, the latter white at the base. Scape of antennæ and a broad ring on the middle of flagellum white. ♀.

Length of body and ovipositor 18 mm.

Kuching (*R. Shelford, M.A.*).

Face punctured, covered with white pubescence; the middle near the top projecting; the black on the front and vertex distinctly tinged with blue and violaceous tints. Palpi pale fulvous. Base of mandibles rufous. Base and sides of mesonotum closely minutely punctured, the rest reticulated-striated; the apex in the centre depressed, marked with four or five longitudinal striæ. Scutellum roundly convex; its apex striated. Postscutellum with the sides stoutly keeled; its centre with a stout keel. Metanotum irregularly transversely striated, the base more finely than the rest; there is one narrow area, coarsely transversely striated and extending from the base to the apex of the segment, it is of equal width; there are three lateral areas, the basal is the larger, the middle is almost square, the apical triangular. Basal segments of abdomen finely, closely punctured; the apex of the first is bounded laterally by a curved keel, commencing at the sides and reaching close to the middle at the apex, the oblique furrow on the sides at the base extending from the inner to the outer and the furrow nearer the middle extending from the outer to the inner side are deep; the similar furrows on the third segment are wider and not so deep, the space between is more raised. The upper part of the metapleuræ is bounded by keels; except at the base, it is irregularly reticulated; the lower half is smooth and bounded by a keel below.

*Cyanoxorides cæruleus*, sp. n.

Blue, tinged with purple, the antennæ broadly ringed with white; the penultimate abdominal segment for the greater part clear white; the four front legs brownish, tinged with purple; the hinder purple, with the coxæ reddish fulvous. Wings hyaline, a cloud along the transverse basal and median nervures and a larger one in the radial and cubital cellules. Head smooth; the face keeled in the centre, sparsely punctured, the furrow separating it from the clypeus deep. Thorax smooth. Basal central area on metanotum small, triangular; the two keels running from it are close together and lead to a longish area, acutely pointed at base and apex; there are three lateral areas on



the metanotum—the basal is the longest, the apical small, square, its angles denticulate. Basal three segments of abdomen closely, longitudinally striated. ♀.

Length 13; terebra 9 mm.

Kuching (*R. Shelford, M.A.*).

Body and legs covered, but not thickly, with long hairs. Recurrent nervure broadly rounded. First abdominal segment nearly as long as the following two united; it is not keeled and has an oblique furrow on the sides at the apex.

*Spiloxorides erythrocephalus*, sp. n.

Black; the head, except the vertex, and the greater part of the four front legs red; antennæ densely covered with longish, stiff hair, black, the basal joints reddish. Wings hyaline, a cloud along the transverse median and the transverse basal nervures (broadest below), and one on the inner side of the transverse cubital and recurrent nervures, extending from the hinder part of the radial cellule into the discoidal; stigma and costa fuscous, the nervures black. Face strongly, transversely striated; the front and vertex smooth. The black of the thorax has a plumbeous hue; smooth; the propleuræ stoutly striated; the apex of mesonotum stoutly reticulated. Scutellar fovea deep, divided in the middle by a stout keel. Sides of scutellum stoutly keeled laterally, as is also the postscutellum. Metanotum regularly areolated, the petiolar area three times longer than wide, of equal width throughout; the areola is wider, more irregular, and also about three times longer than wide; outside these are two large areas and there are three lateral, the spiracular being larger, wider, and more irregular than the others; the posterior median occupies the apex, is strongly, closely, transversely striated; the other areas are more irregularly, sparsely striated. Metapleuræ coarsely reticulated. The pleural furrow is bordered below, especially at the apex. First abdominal segment irregularly reticulated, more strongly in the middle than on the sides; the base in the centre transversely striated; the middle segments are closely punctured; the depressions more or less striated. The apex of the last segment is white. ♂.

Length 10 mm.

Kuching, October (*R. Shelford, M.A.*).

CRYPTINÆ.

LOIADA, gen. nov.

Areolet small, square. Temples not developed, the large



eyes extending to the edge of the occiput, which is transverse. Eyes large, parallel, not converging. Parapsidal furrows distinct. Metathorax spined, with one (the basal) transverse keel. Abdominal petiole broadly dilated at the apex. Metapleural keel obsolete. Thorax three times longer than wide. First joint of flagellum slightly longer than the second. Ovipositor short. Hind legs stout, not greatly lengthened. Claws long. The spiracles on first abdominal segment are wider from each other than they are from the apex. Head not wider than the thorax.

The second transverse cubital nervure is faint; the transverse median nervure is received shortly behind the transverse basal; the transverse median nervure in hind wings is angularly broken below the middle. Scutellum roundly convex, the sides not margined. Metathoracic spiracles small, oval, not much longer than wide.

Of the Oriental genera of *Mesostenini* the present most resembles *Melcha*, which may be known from it by the longer and thinner abdominal petiole, which is not abruptly dilated at the apex and whose spiracles are nearer to each other than to the apex, by there being a complete metapleural keel and one above it, and by the longer median segment with two transverse keels. The Oriental genus *Skeatia*, Cam., has some affinity with *Loiada*; but it may be known by the longer, narrowed, not square areolet, by the long, linear metathoracic spiracles, by the head being distinctly wider than the thorax, and by the scutellum being clearly longer than wide, which is not the case with the present genus, in which it is, if anything, wider than long.

*Loiada maculiceps*, sp. n.

Black, clypeus, mandibles, palpi, an interrupted line on the inner orbits, malar space, a line on the pronotum, tegulæ, tubercles, scutellar keels, scutellum, sides of median segment, apex of basal two abdominal segments broadly, of the fourth more narrowly, and the whole of the apical two, yellow. Legs fulvous red; the four front coxæ and trochanters pale yellow; the base of hind tibiæ narrowly, the apex more broadly, and apex of tarsi, black. Wings hyaline, the stigma black. Antennæ with a broad white band. ♀.

Length 8 mm.; ovipositor 1 mm.

Kuching (*R. Shelford*, *M.A.*).

Face strongly, closely, rugosely punctured; upper part of front closely, finely, obliquely striated. Mesonotum minutely punctured-aciculated, the sides finely closely striated.

Scutellum smooth. Base of metanotum closely punctured, more or less striated; the rest strongly, closely reticulated; spines broad; the apical lateral edges serrate. Propleuræ above obliquely rugosely striated, the lower part with stout, clearly separated keels; the mesopleuræ closely rugosely reticulated-punctured, more or less striated at the apex; the metapleuræ closely, strongly, obliquely striated-reticulated. Postpetiole smooth, the middle segments closely punctured.

## O P H I O N I N I.

## TRICHIONOTUS, gen. nov.

Transverse median nervure in hind wings unbroken. Transverse median nervure in fore wings received shortly beyond the transverse basal. Scutellum roundly convex; its sides keeled. Mesonotum and mesopleuræ reticulated, the former without parapsidal furrows. Antennæ as long as the body. Basal joint of hind tarsi longer than the others united. Apex of clypeus rounded. Thorax densely pilose. Metanotum reticulated, the reticulations hid by the dense pile. Basal joint of hind trochanters as long as the second. Discoidal cellule at the apex twice its width at the base. Eyes large, slightly converging below. Ovipositor shorter than the apical two segments of the abdomen united. Mandibular teeth almost equal. Hinder calcaria as long as the second tarsal joint, clearly longer than the breadth of the apex of the tibiæ. Claws pectinated.

Comes close to *Trichomma*, which may be known from it by the hairy eyes, strongly converging below, by the basal joint of the trochanters being more than double the length of the second, and by the flatter, more oblique, not reticulated scutellum, by the more narrowed at the base brachial cellule, the transverse discoidal nervure being broken farther up the middle than it is in the present genus, which has further strongly pectinated claws, while in *Trichomma* the spines are very few, if any. The only other genus with which it could be confounded is *Atrometus*, but that has the discoidal cellule sharp-pointed at the base (*cf.* Schmiedeknecht, Zeit. f. Hym. u. Dipt. 1902, p. 361).

*Trichionotus reticulatus*, sp. n.

Black, the four front legs, hind coxæ, apical joint of trochanters, basal three fourths of hind tibiæ, and the calcaria, pale yellow; the mandibles, face (except in the middle above and below), the inner orbits and the lower

fourth of the outer of a bright yellow colour; the basal half of the first abdominal segments all round and the apical below yellow, tinged with fulvous; the greater part of the ventral segments, the top and the sides of the middle, testaceous. Thorax, and especially the median segment, densely covered with long, pale fulvous pubescence; the second and following abdominal segments densely covered with a fulvous pile. Wings hyaline, the stigma testaceous, the nervures black. ♀.

Length 14 mm.; ovipositor 1 mm.

Kuching, March (R. Shelford, M.A.).

Face irregularly rugosely punctured, keeled down the middle, the lower part with two short, stout keels on either side of the middle. Clypeus irregularly punctured. Front with some irregular striæ. Centre and sides at the base of the mesonotum irregularly stoutly reticulated; the sides raised into a stout keel. Scutellum apparently irregularly rugose (the sculpture hid by the dense pubescence); the sides stoutly keeled, and there are two keels on the apical central half. Median segment coarsely, irregularly rugose. Upper part of propleuræ strongly longitudinally striated; the mesopleuræ strongly longitudinally striated all over, the striæ curved and almost forming reticulations in the middle. Middle tarsi blackish at the apex.

XVIII.—*On a Second Collection of Mammals obtained by Dr. W. J. Ansorge in Angola.* By OLDFIELD THOMAS and R. C. WROUGHTON.

IN the 'Annals' for last year\* an account was given of the mammals obtained during 1903 in Northern Angola by Dr. W. J. Ansorge, and the present paper is based on a series formed by the same collector during 1904 in the central part of that country.

Dr. Ansorge was not able to devote so much attention to mammals as on his previous trip, but the series he obtained is still a very valuable one and adds considerably to our knowledge of Angolan mammals. It consists of about 90 specimens belonging to 34 species, of which we have found it necessary to describe 5 as new, the most notable being the fine rodent-mole we have named *Georychus Ansorgei*.

\* Ann. & Mag. Nat. Hist. (7) xiii. p. 405 (1904).

1. *Galago Monteiri*, Bartlett.

♂. 15. Ndongo, Benguella.

Very similar in colour to the Nyasan *G. Kirkii*, Gray.

2. *Galago moholi*, Smith.

Benguella.

3. *Epomophorus Dobsoni*, Boc.

♂. Kalonga, Bihé. Alt. 6200 feet.

The skull of this interesting species is very different in the proportions of the palate from that of any other member of the genus.

4. *Hipposiderus caffer*, Sund.

♀. 58. Caiala.

5. *Macroscelides brachyurus*, Boc.

♂. 32; ♀. 19, 33. Caconda, Benguella. Alt. 5700 feet.

6. *Macroscelides Schinzi*, Noack\*.

♂. 82, 83; ♀. 80. Fort Quillenges, Benguella.

7. *Crocidura* sp.

♂. 62. Caconda.

8. *Cynælurus jubatus*, Schr.

Benguella.

9. *Herpestes Bocagei*, sp. n.

= *H. gracilis punctulatus*, Boc. (nec *H. punctulatus*, Gray, 1849).

♀. 17. Caconda, Benguella. Alt. 5700 feet.

This specimen agrees excellently with the description given by Bocage of his *H. g. punctulatus* (except that the head, though dark, is not "presque noire"), but differs entirely from *H. punctulatus*, Gray, the type of which is in the British Museum. Indeed it much more resembles *H. ochraceus*, Gray. In the true *H. punctulatus* the speckled effect produced by the annulation of the individual hairs is present on the tail both above and below quite to the black

\* *Macroscelides brachyrhynchus*, var. *Schinzi*, Noack (Zool. Jahrb. 1889, iv. p. 198).

tip and also on the whole under surface of the body, while in *H. ochraceus*, as shown by the type, the annulation of the hairs ceases on the distal half of the tail and is entirely absent on the belly. The claws, too, are as in *ochraceus* and in strong contrast to the much longer, stouter claws of *punctulatus*. In *Bocagei* the hairs on the cheeks are ringed black and white, the tips being white; on the crown and nape the white gives place to brown, while on the back the hairs, which are 10–15 mm. long, have the basal third or half pale, then a ring, 3 mm. broad, black, a similar ring pale brown, and, finally, the tip black; on some of the longer hairs there is a second black ring with its accompanying brown ring. This annulation of the hairs is continued on the proximal third of the upper surface of the tail; the remainder of the upper surface and the whole under surface of the tail, excepting the black tip, is chestnut-brown. The under surface of the body is a reddish buff, the “roux-orangé uniforme” of Bocage’s description; in *ochraceus* it is straw-colour or dirty white.

The skull of *Bocagei* in size approximates to that of *ochraceus*, but in shape it distinctly resembles that of *punctulatus*; it is narrow and long-snouted, instead of broad and snub-nosed as in *ochraceus*, and, moreover, is more delicately built than in the latter species in all details. The posterior portion from the parietal suture is unfortunately missing in the type, but we record the following measurements:—

	<i>punctulatus.</i>	<i>ochraceus.</i>	<i>Bocagei.</i>
Length from parietal suture to end of nasals.....	mm. 38	mm. 33	mm. 34
Width at the fronto-maxillary suture .....	12	12	10
Width at the constriction behind the postorbital process.	11	14	12
Length of palate from hensenion .....	33	27	29

*Type.* ♀. B.M. no. 5. 5. 9. 13. Original number 17. Taken September 3rd, 1904.

#### 10. *Helogale* sp.

Young ♀. Quillenges.

#### 11. *Canis* sp. (probably *C. adustus*, Sund.).

Quite young.

12. *Ictonyx* sp.

♂. Bulu Bulu, Bihé.

The specimen is apparently immature and the skull is missing.

13. *Pæcilogale albinucha*, Gray.

♀. 51. Pedreira, Bihé.

14. *Funisciurus congicus flavinus*, Thos.

♂. 86, 87, 91; ♀. 84, 92. Quillenges.

♂. 6. Usolo River, Benguella.

♀. 1, 2. Busolo, Benguella.

♂. 3. Sand-pits, Benguella.

♂. 4; ♀. 5. Katenge, Benguella.

♂. 11. Cabeça de Ladroes, Benguella.

♂. 10. Eland's Water, Benguella.

These specimens agree very fairly with the type. The five specimens from Quillenges, however, show a rather duller colour and broader lateral black stripe.

15. *Graphiurus Kelleni*, Reuvens.

♂. 47; ♀. 46. Pedreira, Bihé.

We provisionally identify these specimens with *G. Kelleni*, described by Reuvens \* from Damaraland.

16. *Graphiurus angolensis*, de Winton.

♂. 45. Pedreira, Bihé.

A young individual.

17. *Tatera* sp.

♂. 77, 93; ♀. 72, 73, 74, 76. Quillenges.

Closely allied to, if not identical with, *T. Lobengulæ*, de Winton †. Much smaller than *T. valida*, Bocage, which Dr. Ansorge obtained on his previous expedition.

18. *Dasymys nudipes*, Peters.

♀. 14. Kupa, Benguella. Alt. 3000 feet.

19. *Arvicanthis pumilio*, Sparrm.

♂. 21, 24; ♀. 16, 27, 63, 64. Caconda.

\* 'Myoxidæ,' 1890, p. 35.

† Ann. &amp; Mag. Nat. Hist. (7) ii. p. 4 (1898).

Approaching in its dark coloration *A. pumilio dilectus*, de Wint., rather than *A. p. cinereus*, Thos. & Schw.

20. *Pelomys campanæ*, Huet.

♀. 9. Eland's Water.

♀. 12, 13. Kupa, Benguella. Alt. 3000 feet.

21. *Pelomys frater*, Thos.

♂. 52. Pedreira, Bihé.

22. *Dendromus Ansoergei*, sp. n.

♂. 39. Caiala, Bihé.

♀. 23. Caconda.

A small species without dorsal stripe. Hair of the back soft and long (7-8 mm.), shorter and more sparse on the belly. General colour of upperside of body near "ochraceous buff" (Ridgway), but the long hair, which is slaty at the base and fulvous terminally, is easily disarranged, and the animal then looks darker and duller in colour than it really is. Under surface only differing from the upper in being rather paler. Face of the same colour as the body, cheeks rather paler, chin and throat white. Ears large, only very sparsely covered with short hairs. Tail long and slender, dark above, pale below.

Skull short and broad, the orbit very broad anteriorly, so that the zygomata are parallel in their whole length.

Dimensions of type (measured in the flesh):—

Head and body 60 mm.; tail 72; hind foot 17; ear 10.

Skull: greatest length 19; basilar length 11.5; greatest breadth 10; nasals, length 7; interorbital breadth 3; diastema 4.5; length of upper molar series 3.2.

*Hab.* Caconda, Benguella.

*Type.* ♀. B.M. no. 5. 5. 9. 52. Original number 23. Collected September 7th, 1904. A second specimen was taken at Caiala, Bihé, alt. 5600 feet, on the 17th October.

This species most resembles *D. messorius*, Thos.\*, from the Cameroons. It differs from that species by its smaller size, longer looser coat, and by the coloration of its under surface, which is little lighter than the upper, instead of being nearly white.

23. *Dendromus* sp.

♂. 54. Pedreira, Bihé.

\* Ann. & Mag. Nat. Hist. (7) xii. p. 340 (1903).

This specimen is quite young, but belongs to a form with black dorsal stripe.

24. *Steatomys Bocagei*, Thos.

- ♂. 40. Bingondo, Bihé.  
♀. 57. Chiffamba, Bihé. Alt. 4900 feet.

25. *Steatomys minutus*, sp. n.

- ♂. 81. Fort Quillenges, Benguella.

Smaller than any form of *Steatomys* as yet described.

Hairs of the back soft, 5-6 mm. long. General colour of upper surface of the body near "hair-brown" (Ridgway), paling to drab on the sides; a sharp line marking the change to the pure white of the underside. Individual hairs of the back slate-coloured at their bases, paling to buff and tipped with black; those of the belly white to their bases. Face coloured like the back, cheeks and area behind the eyes to the base of the ears paler. Chin, lips, and "whisker-patch" white. Ears moderate, a tuft of fulvous hairs at their base in front; a narrow white margin to the conch behind. Fore legs white, as are also the inner side of the thigh and hind feet. Tail short, dark above, pale below, especially at its base.

Dimensions (those of the body taken in the flesh) :—

Head and body 85 mm.; tail 33; hind foot 13; ear 12.

Skull: greatest length 21.5; nasals 8; interorbital breadth 4; greatest breadth 11.5; basilar length 17; diastema 6; palatal foramina 4.5; upper molar row 3.4.

*Hab.* Quillenges, Benguella.

*Type.* ♂. B.M. no. 5. 5. 9. 56. Original number 81. Taken January 11th, 1905.

The nearest ally of this little species seems to be *S. pentonyx*, Scl.\*, from the Cape Peninsula.

26. *Mus rattus*, L.

- ♂. 66; ♀. 65. Caconda, Benguella.

27. *Mus*. sp. (multimammate).

- ♂. 41. Bingondo, Bihé. Alt. 5100 feet.  
♂. 48. Pedreira, Bihé. Alt. 5200 feet.  
♂. 28, 31; ♀. 29. Caconda, Benguella. Alt. 5700 feet.

\* *Malacothrix pentonyx*, W. Sclat. Ann. S. Afr. Mus. i. p. 202 (1899); Mamm. S. Afr. ii. p. 36 (1901).



28. *Leggada minutoides*, Smith.

♂. 55; ♀. 44, 49, 50, 56. Pedreira, Bihé. Alt. 5200 feet.

♀. 61. Caconda, Benguella.

♀. 7. Usolo River, Benguella.

29. *Cricetomys Ansongei*, Thos.

♂. 67; ♀. 20, 60. Caconda, Benguella.

30. *Georychus Ansongei*, sp. n.

♂. Kukema R., Bihé. Alt. 5900 feet. 5th October, 1904. B.M. no. 5. 5. 9. 74. *Type*.

A very large species of a buffy-yellowish colour, with short velvety fur.

Size very large, the skull decidedly larger than that of *G. Mechowi*, the largest species of the genus hitherto described. Fur close, short, and crisp; hairs of back about 7 mm. in length. A few scattered longer bristles present on sides and rump. General colour above uniform buffy (between buff and clay-colour of Ridgway), the hairs whitish at their extreme bases, then dull slaty, then buffy, their extreme tips inconspicuously darker. Under surface dull greyish white, with a silvery gloss, not defined at all from the colour of the sides, the hairs whitish to their roots. Head like body, but the muzzle darker, with soiled patches on each side of the mouth, as in *G. Mechowi*. Upper surface of hands and feet almost naked, the few hairs whitish. Tail-hairs long, dull whitish; extreme tip of tail naked, warty, but whether this is natural or due to accident we are not able to say.

Skull as compared with that of *G. Mechowi* decidedly longer, although in the single specimen the basilar suture is not closed, while it is in the two adult specimens of *G. Mechowi* before us. Nasals broad and heavy. Supraorbital region rounded, broad, and expanded, the region just behind the rudimentary postorbital processes markedly inflated; as a result the greatest interorbital breadth is greater than the least breadth across the brain-case above the meatus, the converse being the case in *G. Mechowi*. Zygomata broadly expanded, thicker and heavier than in the allied species. Anteorbital foramina about equally broad and high. Palatal foramina minute, situated about a quarter of an inch in front of the anterior cheek-tooth (close to it in *G. Mechowi*). Posterior palate short, parallel-sided. Bullæ with the part

which appears on the occipital surface narrow and high, not broadly rounded. Lower jaw with its angular region far broader than in *G. Mechowi*.

Teeth large and heavy, the incisors very broad.

Dimensions of the type (measured in the flesh):—

Head and body 260 mm.; tail 24; hind foot, s. u. 40, c. u. 44.

Skull: greatest length in middle line 58; basilar length 49; zygomatic breadth 43.5; nasals 23.3 × 7.4; interorbital breadth 19; breadth across postorbital processes 20.6; intertemporal constriction 11.3; least breadth above meatus 19; palate length 37; diastema 22; combined breadth of two upper incisors 8; height of angular region of lower jaw, from top of condyle, 27.

*Hab.* and *Type* as above.

This fine species may be readily distinguished from *G. Mechowi*, Peters, its only near ally, by its larger size, more inflated interorbital region, and the other details above recorded. The type of *G. Mechowi* came from Malanje in Northern Angola, quite near to Duque de Braganza, whence Dr. Ansorge obtained in his previous collection the examples we have used in making the above comparisons.

### 31. *Georychus* sp.

♂. 43; ♀. 53. Pedreira, Bihé, 5200 feet.

♂. 71; ♀. 70. Salamunjamba, Quillenges, Benguela.

♀. 34. Bunhe, Benguela, 6200 feet.

These specimens are smaller than the type of *G. Bocogei*, de Wint.\*, which is, however, a very old individual.

### 32. *Lepus angolensis*, Thos.

♂. 59. Chiyuka, Bihé. Alt. 6000 feet.

### 33. *Lepus Ansorgei*, sp. n.

♂. 37. Caiala, Bihé.

♂. 35 (young). Chingwari.

A somewhat larger and more brightly coloured animal than *Lepus angolensis*, Thos.

Underfur copious; hair rather harsh, about 20 mm. long on the back. General colour above "wood-brown" (Ridgway), irregularly mottled with dark brown (so dark as to seem black

\* Ann. & Mag. Nat. Hist. (6) xx. p. 323 (1897).

in most lights), the mottling almost absent on the sides. Individual hairs pale for their basal halves, blackish brown above with a bright pale buff subterminal ring; underfur pale slate-colour at its base, merging into a pinkish buff (near ecru-drab of Ridgway) and ending in a black tip. Below, the belly and chest are white; the hairs white to their bases. Face and crown coloured like the back, but the mottling finer; an obsolescent white frontal patch. Upper lip and base of whiskers buffy brown. Chin white; the hairs with slaty bases. Ears shorter than in *angolensis*; anterior half of their outer surface, for its basal half, coloured like the head, darker at the tip, at the back of which is a small black patch; fringe dull buffy, changing to black about an inch from the tip; posterior edge narrowly edged with white. Nuchal patch very large, extending along the median line of the back as far as the points of the ears when these are laid back. Throat clothed with long hair (27–30 mm.) forming a cinnamon-coloured ruff (the individual hairs with short black tips). Fore legs pale brown on the outer, white on the inner side. Inner side of hind legs white, a distinct black patch down the centre of the back of the thigh. Tail black above, white below.

Skull, as compared with that of *L. angolensis*, longer and narrower, with much more lightly built postorbital wings, of which the anterior and posterior processes are unusually slender. Projecting "shoulders" of anterior zygoma-root much less developed than in the allied species. Bullæ markedly smaller, their antero-posterior diameter 10 mm. as compared with 12 mm. in the fresh specimen of *L. angolensis*. Incisors with the same additional enamel line as described by Thomas in *L. angolensis*: this line is no doubt present more often than has been recorded.

Dimensions of the type (the external ones taken by collector):—

Head and body 460 mm.; tail 75; hind foot 106; ear 111.

Skull: greatest length 87; basilar length 67; nasals, diagonal length 38; interorbital breadth 17; greatest breadth 40; diastema 25; length of upper molar tooth-row 15.

*Hab.* Caiala, Bihé. Alt. 6000 feet.

*Type.* ♂. B.M. no. 5. 5. 9. 80. Original number 37. Collected October 8th, 1904.

This species differs from *L. angolensis*, Thos., which is also found in Bihé, by its more rufous coloration, shorter ears, large nuchal patch, and by the skull-characters mentioned above. The only other hare described from Angola is

*L. Salæ*, Jentink\*, from Mossamedes; but from the description this seems to be a more brightly coloured animal with a much shorter tail, and a skull smaller in all dimensions except breadth.

34. *Cephalophus Grimmii*, L.

2. ♂. Bihé.

XIX.—*Descriptions of Three new Snakes discovered in South Arabia by Mr. G. W. Bury.* By G. A. BOULENGER, F.R.S.

*Glauconia Burii*.

Head not broader than neck; snout rounded; rostral broad, more than half the width of the head, extending to between the eyes; nasal completely divided, in contact with præfrontal; supraocular present, a little larger than the frontal; no enlarged parietal; ocular bordering the lip, between two labials, the first of which is very small and scarcely deeper than broad. 14 scales round the body. Diameter of body 52 times in the total length, length of tail  $15\frac{2}{3}$  times. Caudal spine strong. Pale brown above, yellow beneath.

Total length 210 mm.; tail 15.

A single specimen from El Kubar, Upper Hushabi, near Yemen frontier.

This species is allied to *G. Blanfordii*, Blgr., from Sind and Baluchistan, and *G. Nursii*, Anders., from Aden. It differs from both in the much broader rostral and in the absence of enlarged parietal shields.

*Zamenis variabilis*.

Head short; snout truncate, strongly projecting. Rostral a little broader than deep, the portion visible from above measuring one third or two fifths its distance from the frontal; internasals as long as or a little shorter than the præfrontals; frontal much broader than the supraocular, once and one fourth to once and one third as long as broad, longer than its distance from the end of the snout, shorter than the parietals; loreal longer than deep; one præocular, forming a

\* Notes Leyd. Mus. ii. 1880, p. 57.

suture with the frontal, with a subocular below it; two postoculars; temporals 2 + 2 or 2 + 3; eight upper labials, fourth and fifth entering the eye; four or five lower labials in contact with the anterior chin-shields; posterior chin-shields as long as the anterior and separated from each other by two series of scales. Scales smooth, in 17 rows. Ventrals 155-169; anal divided; subcaudals 80-90.

Total length 380 mm.; tail 110.

The specimens at hand, ten in number, exhibit a surprising amount of colour-variation. They may be arranged under seven heads:—

- A. Olive-grey above, with a dorsal series of large, brown, dark-edged, transverse spots and a lateral series of similar spots alternating with them; two dark bars on the head, the first across the eyes, the second across the temples and the parietal shields; a third bar across the nape; lower parts white.
  - a. ♂. V. 157. C. 83. El Kubar.
  - b. ♀. V. 162. C. 84. Schaf Ravine.
- B. Similar to the preceding in the markings, but reddish brown, with a bright red vertebral stripe; ventral shields spotted with red on the sides.
  - c. ♂. V. 157. C. ? Schaf Ravine.
- C. Body orange, with a bright red vertebral stripe, the scales and shields edged with brown; no spots; head olive-grey above, the temples and nape black.
  - d. ♀. V. 161. C. ? El Kubar.
- D. Scales brown or black, with yellowish or pale olive centres; ventral and subcaudal shields whitish, edged with brown or blackish; head olive-grey in front, black behind.
  - e-i. ♂ (V. 159, 157; C. 83, 83) & ♀ (V. 165, 169, 165; C. 80, 89, 82). El Kubar.
- E. Olive-grey above, the scales edged with blackish; whitish or grey beneath, the shields edged with dark grey or blackish.
  - k-l. ♂. V. 155, 161. C. ?, 90. El Kubar.
- F. Black, scales and shields speckled with white; head and nape olive-grey.
  - m. ♀. V. 161. C. ? El Kubar.
- G. Black above, dark grey below; throat and anterior ventral shields white.
  - n. ♀. V. 168. C. 82. El Kubar.

In the low number of its ventral shields *Z. variabilis* agrees with *Z. brevis*, Blgr., from Somaliland, which differs in the less prominent snout, the smaller rostral shield, the narrower frontal, the upper labials nine in number, and the scales in 19 rows.

*Atractaspis Andersonii.*

Snout very short. Portion of rostral seen from above nearly as long as its distance from the frontal; suture between the internasals about half as long as that between the præfrontals; frontal large, once and one fifth to once and one fourth as long as broad, much longer than its distance from the end of the snout, as long as the parietals; one præ- and one postocular; temporals scale-like, 2+3 or 3+4; six upper labials, third and fourth entering the eye, fourth largest; first lower labial forming a suture with its fellow behind the symphysial; three lower labials in contact with the chin-shields. Scales in 23 or 25 rows. Ventrals 219-243; anal entire; subcaudals 28-29, single. Uniform black.

Total length 550 mm.; tail 45.

Five specimens from El Kubar.

This species, named in memory of Dr. John Anderson, the author of several contributions to Arabian herpetology, is closely allied to *A. leucomelas*, Blgr., from Somaliland, from which it differs in the broader frontal shield.

In addition to the new snakes here described, Mr. Bury's collection contains examples of the following species new to Arabia:—*Boodon lineatus*, D. & B., *Dasypeltis scabra*, L., and *Naia haie*, L.

XX.—*Descriptions of new Tailless Batrachians in the Collection of the British Museum.* By G. A. BOULENGER, F.R.S.

*Arthroleptis Seimundi.*

Tongue with a conical median papilla. Head broader than long; snout short, broadly rounded, not prominent; canthus rostralis distinct; loreal region slightly concave; interorbital space much broader than the upper eyelid; tympanum very distinct, two thirds the diameter of the eye. Fingers slender, with swollen tips, third very long, nearly twice as long as second, first and second equal; toes slender, with swollen tips and a rudiment of web; a rather large, oval, compressed inner metatarsal tubercle; no outer metatarsal tubercle; no tarsal tubercle. The tibio-tarsal articulation reaches the eye. Skin smooth, granular on the lower belly and on the back of the thighs. Dark brown above, sides speckled with white; a light

line on the canthus rostralis; loreal and temporal regions black; a white streak, formed of numerous small spots, from below the eye to the fore limb, and prolonged on the upper surface of the latter to a little beyond the elbow; throat blackish, breast and limbs dark brown dotted with white, belly and lower surface of thighs brownish white.

From snout to vent 36 mm.

A single specimen from Fernando Po, collected by Mr. E. Seimund during the expedition carried out under the auspices of the Duke of Bedford, the Hon. Walter Rothschild, and Mrs. Percy Sladen.

This species is intermediate between *A. macrodactylus*, Blgr., and *A. variabilis*, Matsch.

*Atelopus tumifrons.*

Habit stout, toad-like. Head a little broader than long; snout very short, not projecting beyond the mouth, above with a strong rounded swelling extending to between the eyes; interorbital space nearly twice as broad as the upper eyelid. Fingers moderate, with a slight rudiment of web, first a little shorter than second; toes short, barely half-webbed; subarticular tubercles distinct, some double; two small metatarsal tubercles. The tibio-tarsal articulation reaches the shoulder. Skin warty, spinulose; the largest warts, at the angles of the mouth and around the vent, conical. Blackish; sides of snout, tips of digits, lower surface of hands and feet and of arms, three spots on the chin and throat, and a large blotch covering the lower belly and the lower side of the thighs yellow.

From snout to vent 29 mm.

A single female specimen from Pernambuco, presented by Dr. F. Werner.

Closely related to *A. Stelzneri*, Weyenb.

OOCORMUS, gen. nov. *Cistignathidarum.*

Pupil horizontal. Tongue circular, entire, free behind. Vomerine teeth in a long transverse series behind the choanæ. Tympanum hidden under the skin. Fingers and toes free, the tips not dilated. Outer metatarsals bound together. Sternum without bony style. Habit stout, *Engystoma*-like.

*Oocormus microps.*

Vomerine teeth forming a very open chevron, which is scarcely interrupted in the middle and the branches of which



are slightly curved. Tongue large, covering the whole floor of the mouth. Head much broader than long; snout very short, broadly rounded, not projecting beyond the mouth; eye very small, as large as the tympanum; interorbital width more than twice as great as the width of the upper eyelid. Fingers short, slightly swollen at the end, first and second equal; subarticular tubercles well developed. Toes short, perfectly free, not margined, with slightly swollen tips and strong subarticular tubercles; a large oval inner and a smaller rounded outer metatarsal tubercle. The tibio-tarsal articulation reaches the tympanum. Skin smooth and shiny; a strong fold from the eye to the shoulder, forming an angle behind the tympanum; a feebly marked glandular fold on each side from the upper eyelid to the sacral region, converging towards its fellow on the scapular region, where it forms an angle. Brown above, with symmetrical darker markings, viz. a chevron pointing backwards between the eyes, an angular band on the outer side of the dorsal glandular fold, a **M**-shaped band on the posterior part of the back, an oblique band on the side, and cross-bars on the limbs; dark brown beneath.

From snout to vent 34 mm.

Four specimens from the Organ Mountains, Brazil, presented by Messrs. Wagner Brothers.

#### *Hyla Steinbachi.*

Tongue circular, entire or indistinctly nicked, slightly free behind. Vomerine teeth on a level with the posterior borders of the very large choanæ, in two slightly curved oblique series forming a chevron pointing forwards. Head moderate, as long as broad; snout rounded, as long as the orbit; canthus rostralis feeble, slightly curved; loreal region oblique, concave; nostril near the tip of the snout; interorbital region as broad as the upper eyelid; tympanum distinct, three fifths the diameter of the eye. Outer fingers with a rudiment of web; no distinct rudiment of pollex; toes two-thirds webbed; disks barely half the diameter of the eye; subarticular tubercles well developed; no tarsal fold. Tibio-tarsal articulation reaching a little beyond the tip of the snout. Skin smooth above, granular on the belly and under the thighs; heel with a pointed dermal appendage. Pale pinkish grey above, with scattered darker dots and rather indistinct wavy longitudinal bands; a purplish-brown vertebral line, and another line of the same colour on the canthus rostralis and



temple, sometimes continued along the side of the body; limbs with ill-defined dark cross-bars; lower parts white.

From snout to vent 35 mm.

Three specimens from the Province Sara, Department Santa Cruz de la Sierra, Bolivia, collected by Hr. J. Steinbach.

Most nearly allied to *H. boans*, Daud., and *H. Spegazzinii*, Blgr.

*Hyla platydactyla.*

Tongue subcircular, entire, slightly free behind. Vomerine teeth just behind the level of the moderately large choanæ, in two slightly oblique series converging forwards. Head moderate, much depressed, a little broader than long; snout rounded, hardly as long as the orbit; canthus rostralis distinct; loreal region very oblique, concave; nostril near the tip of the snout; interorbital region a little broader than the upper eyelid; tympanum rather indistinct, one third the diameter of the eye. Fingers much flattened, with a short basal web which extends as a fringe to the disks; toes short, much flattened, with a deeply notched web extending to the disks; latter about half the diameter of the eye; subarticular tubercles feeble; no tarsal fold. Tibio-tarsal articulation reaching the eye. Skin smooth above, granular on the belly and under the thighs. Purplish above, closely dotted with darker; upper surface of arms and thighs white, with a median stripe of closely set dark purple dots; lower parts white. Male with a feebly developed subgular vocal sac.

From snout to vent 32 mm.

A single male specimen from Merida, Andes of Venezuela, collected by Señor Briceño.

Allied to *H. Vilsoniana*, Cope (*creolica*, Werner).

*Hyla graminea.*

Tongue heart-shaped, free behind. Vomerine teeth in two widely separated short transverse groups between the very large choanæ. Head rather large, much depressed, a little broader than long; snout rounded, as long as the orbit; canthus rostralis indistinct; loreal region very oblique, slightly concave; nostril near the end of the snout; interorbital space twice as broad as the upper eyelid; tympanum very distinct, three fourths the diameter of the eye. Fingers much flattened, nearly entirely webbed; toes also much flattened and entirely webbed; disks nearly as large as the

tympa-num; subarticular tubercles feeble; an outer tarsal fold. Tibio-tarsal articulation reaching the tip of the snout. Skin smooth, finely granulate on the head, coarsely on the belly and under the thighs; deep wrinkles form an areolation on each side of the anterior part of the body. Bright green above, yellowish white beneath; hand and arm, tarsus and foot, and upper eyelid with a white edge; arm and thigh colourless, the latter with a narrow green band in the middle.

From snout to vent 52 mm.

A single specimen from Northern British New Guinea, altitude 900 feet.

Most nearly allied to *H. gracilentata*, Peters, and *H. chloris*, Blgr.

XXI.—*Descriptions of new Species of Marine Shells, chiefly from Ceylon.* By G. B. SOWERBY, F.L.S.

THE shells here described formed part of the collection of the late Mr. Hugh Nevill. As very few of them were labelled, it is impossible to fix their habitats with any certainty, but the probability is that most, if not all, of them are from Ceylon.

Fam. Trochidæ.

*Calliostoma planiliratum*, sp. n.

Testa conica, elata, angustissime rimata, albida, rufo-fusco et olivaceo dense strigata et variegata; anfractus  $8\frac{1}{2}$ , primi 2 læves, rotundati, deinde planato declives, liris 7 confertis planulatis cingulati, cingulis duobus infernis magis elevatis; anfractus ultimus levissime concavus, liris duplicatis; basis planulata, vix convexa, liris 9, angustis, rotundatis, albo-fusco articulatis, interstitiis oblique striatis; apertura oblique subtrigona, intus margaritacea, haud lirata; columella brevis, rectiuscula, leviter callosa. Alt. 13, diam. 10 mm.

A high conical shell with an almost flat base. It has very close flattened spiral ridges, which in the last whorl are sometimes, as in the type, divided by a groove. The colouring of olivaceous brown, reddish here and there, is mostly disposed in close broad longitudinal streaks, which on the upper whorls are broken up into square spots, giving the ridges an articulated appearance.

Although of a not uncommon form, I know of no species

to which this shell bears a sufficiently close resemblance for comparison.

In writing the diagnosis of the type specimen I have said that the liræ of the last whorl are duplicated, or divided by a groove, but I find this is not a constant character.

*Calliostoma Nevilli*, sp. n.

Testa conica, solidiuscula, imperforata, albida, fulvo radiata; spira elatiuscula, acuta, vix convexa; anfractus 7, planato declives; liris 7, confertis conspicuo granatis spiraliter cingulati; interstitiis angustis, fulvis; sutura inconspicua; anfractus ultimus curtus, obtuse angulatus, supra angulum levissime convexus; basis planato convexa, liris granatis 8 instructa; columella brevis, crassa; apertura oblique subquadrata, intus lævis; labrum crenulatum.

Alt.  $7\frac{3}{4}$ , maj. diam. 7 mm.

A regularly conical shell, the whole surface of which is covered with closely and beautifully beaded spiral ridges. The base is not so flat as in the preceding species, and the spire less elevated.

The shell bears some resemblance to *C. scobinatum* (*Ziziphinus scobinatus*, Reeve, as of A. Adams), but it is more broadly conical, and the bead-like pustules are larger and closer together. Compared with *C. fragum*, Philippi, it is also broader, and the beaded ridges are closer together and more numerous, with very narrow interstices.

*Clanculus crassilabrum*, sp. n.

Testa turbinata, subovalis, anguste perforata, crassa, albida, maculis paucis pallide fulvis conspersa; spira elata, leviter convexa; anfractus  $4\frac{1}{2}$ , primus lævis, rotundatus, sequentes convexi, rotundati, dense grano-lirati; liris 8, crassis, pustulis numerosis confertis gemmuliformibus ornatis; interstitiis angustis, crenulatis; sutura inepte canaliculata; anfractus ultimus rotundatus, liris pustulosis circ. 15 instructus; apertura rotundata; labrum crassum, crenulatum, intus valde liratum; columella breviter expansa, planulata, bidentata, dente postico late rotundato, antico oblique elongatim producto.

Alt. 7, diam.  $6\frac{1}{2}$  mm.

A shell of an unusually oval form for the genus, approaching some of the forms of *Euchelus*, the surface being similar to that of the much larger *Euchelus baccatus*, Menke. It has a much smaller umbilicus than is common in the genus *Clanculus*, and is further distinguished by its narrow obliquely-produced anterior columellar tooth.

*Clanculus acutidentatus*, sp. n.

Testa breviter conoidea, profunde umbilicata, rufo-fusca, albo maculata; spira late conica, convexiuscula: anfractus 5, convexi, liris spiralibus 5 crenulato-pustulatis eingulati; interstitiis latiusculis, oblique striatis; sutura canaliculata; anfractus ultimus brevis, latiusculus; basis planato convexa, liris 9 rugosis instructa; umbilicus angustus sed profundus, ad marginem crenulatus; columella obliqua, ad basin acute unidentata; apertura postice quadrata, antice rotundata, intus lirata; labrum crassiusculum, crenulatum.

Alt. 5, maj. diam. 6 mm.

Compared with *C. ceylanicus*, Nevill, this shell is broader in proportion to its height, and is distinguished from that species, to which in other respects it is somewhat similar, by its sharp narrow columellar tooth.

*Euchelus cavernosus*, sp. n.

Testa globoso-turbinata, crassiuscula, anguste umbilicata, albida; spira obtusiusecula, convexa; anfractus 5, apicales 2 læves, pellucens, sequentes convexi, triearinati; earinis rotundatis, nodoso crenulatis; interstitiis profundis, liris validis, decussatis; sutura canaliculata; anfractus ultimus amplus, rotundatus, carinis 7, nodulosis, interstitiis profunde foveolatis; apertura subcircularis; columella arcuata, lævis.

Alt.  $7\frac{1}{2}$ , diam.  $7\frac{1}{4}$  mm.

A small globular white shell, very conspicuously and profoundly pitted between the rounded nodulous keels.

The species is similar to *E. foveolatus*, A. Adams, but larger, more globose, and with more nodulous liræ.

*Omphalius eusculptus*, sp. n.

Testa depresso orbicularis, rubro-earnea, fusco maculata, ad apicem alba; spira paulo elevata; anfractus  $4\frac{1}{2}$ , primi 2 læves, deinde triearinati, carinis rotundatis, crenulatis; interstitiis latiusculis, spiraliter anguste triliratis, eximie oblique decussatim striatis; sutura canaliculata; basis convexiuscula, sex-lirata; umbilicus rotundus, profundus, mediocriter latus; apertura oblique subquadrata, intus plicata, labrum crenulatum; columella obliqua, lævis.

Alt. 6, maj. diam.  $8\frac{1}{2}$  mm.

A pretty pink shell with brown spots and a white apex. The sculpture between the keels is very fine, minute, close-set, raised, slightly granular striæ obliquely traversing three narrow spiral ridges.

The shell rather closely resembles *Trochus plebeius*, Phil. (= *Clanculus nodiliratus*, A. Adams), the principal difference being that the margin of the umbilicus is smooth, not nodulous or dentate.

*Minolia eucoronata*, sp. n.

Testa depressa orbicularis, tenuis, late umbilicata, fulvescens, fusco strigata; spira obtusa, vix elevata; anfractus  $3\frac{1}{2}$ , concavi, bicarinati; carinis eximie tuberculosis, sutura indistincta; anfractus ultimus depressus, granoso triliratus, ad peripheriam carina acuta crenulata vix nodulosa; basis convexa, extus lævis, area mediana quadrisulcata et radiatim plicata; umbilicus latus et profundus, circularis, ad marginem tuberculatus.

Alt.  $2\frac{1}{4}$ , diam.  $4\frac{1}{2}$  mm.

A little depressed shell, with two beautifully beaded keels to each whorl, the last whorl exhibiting 3 granular liræ between the keels, the margin of the umbilicus being strongly nodulous.

I know of no species with which to compare this beautiful little shell.

*Ethalia Nevilli*, sp. n.

Testa depressa, circularis, alba, pellucida, perforata; spira convexo-depressa; anfractus 5, primus minutissimus, cæteri leviter convexi, spiraliter minute striati; penultimus puncturatus; ultimus striis partim fere obsoletis sculptus, ad peripheriam rotundatus; basis convexa, spiraliter leviter striata, striis in regione umbilicali magis conspicuis et confertis; umbilicus parvus, circularis, profundus; apertura suboblique ovalis, intus lævis, peristoma simplex; columella brevis, oblique arcuata, leviter incrassata.

Alt. 2, diam.  $4\frac{1}{2}$  mm.

This species appears to belong to the little group which, according to Pilsbry, is allied to *Teinostoma*, and erroneously referred to *Ethalia*. In the absence of further evidence than that furnished by the shell, I think it best, however, to place it in the latter genus. It may belong to Fischer's subgenus *Pseudorotella*, although the umbilicus is open, and not covered by a callus as in the type of that group (*P. semistriata*, Orb.).

*Teinostoma pellucidum*, sp. n.

Testa minuta, albo-nitens, perdepressa, tenuis, pellucida, imperforata; spira convexo-planulata; anfractus 5, læves; sutura anguste canaliculata; basis planato-convexiuscula, in regione umbilicali callo lato albo depresso munita; apertura parviuscula, ovato-subcircularis, vix obliqua; labrum tenue.

Alt. 1, diam.  $2\frac{1}{4}$  mm.

A little pellucid white shell, with an opaque white callus covering the umbilical region. It is very like *T. cancellatum*, Tate, but thinner, and without the sculpture.

*Solariella tenuis*, sp. n.

Testa conico-orbicularis, depressiuscula, tenuis, late umbilicata, albida, pallide aurantio strigata; spira obtuse conica, gradata; anfractus 4, rotunde-convexi, spiraliter lirati, liris in anfractu penultimo 3, in anfractu ultimo numerosis, evanidis; sutura late impressa; basis rotunde convexa; umbilicus perspectivus; apertura circularis; peristoma continuum, tenue.

Alt. 2, diam.  $2\frac{1}{2}$  mm.

A delicately coloured, thin, globosely conical shell with a perspective umbilicus.

I know of no species very similar to this; it might easily be mistaken for one of the minute Cyclostomidæ, having something the look of a *Cyclotopsis*.

Fam. Littorinidæ.

*Fossarina lineata*, sp. n.

Testa oblique ovata, perforata, luteo-albida, lineis virido-fuscis duplicatis spiraliter cincta, hic illic irregulariter fusco maculata; spira brevis, obtusa; anfractus 4, rotundati, oblique minutissime striati; anfractus ultimus late obliquus; basis convexa, area umbilicali alba, oblique late excavata, conspicue filo-striata; umbilicus profundus; apertura subcircularis, ampla, intus viridis, lineata, lævis; labrum tenue; columella arcuata, leviter incrassata, alba, postice tenuiter effusa.

Alt. 4, diam. 4 mm.

This shell partakes of the form and general characters common to the genus *Fossarina*. It is rounder and less oblique than *F. Brazieri*, Angas, and principally characterized by its greenish-brown spiral lines.

Fam. Fossaridæ.

*Fossarus oblongus*, sp. n.

Testa oblongo-ovata, alba, tenuis, subpellucida, angustissime rimata; spira brevis, obtusa; anfractus  $3\frac{1}{2}$ , convexi, supra obtuse angulati, supra angulum leviter planulati, sutura impressa sejuncti; ultimus oblongus, spiraliter multiliratus, leviter oblique plicatus; apertura elongato-ovata; labrum tenue; columella planulata, leviter effusa.

Alt.  $3\frac{1}{2}$ , diam.  $2\frac{1}{4}$  mm.

An oblong, thin, white, almost transparent shell. It seems to belong to the same section as *F. reticulatus*, S. Wood, but larger, with a more obtuse spire, and longitudinal plications much less distinct and more oblique.

Fam. Scutellinidæ.

*Scutellina nobilis*, sp. n.

Testa capuliformis, subcircularis, tenuis, lutescens, elatiuscula, antice valde arcuata, postice concaviuscula, apice acuto, postice inclinato; costellis radiantibus numerosis nodulosis, et liris concentricis distantibus cancellata, ad marginem crenulata.

Long. 28, lat. 26, alt. 17 mm.

This is the largest known species of the genus. Compared with *S. crenulata*, Brod., it is much larger, more elevated in form, and has more distant and much less closely nodulous ribs. It is further distinguished by the presence of concentric rather distant liræ crossing the radiating ribs.

Only one specimen found in the Nevill Collection.

Fam. Columbelligidæ.

*Columbella perlævis*, sp. n.

Testa ovato-fusiformis, aurantia, ad suturam rufo-fusco paucimaculata, ad apicem albida; spira elata, acute conica; anfractus  $7\frac{1}{2}$ , convexi, læves, ultimus supra obtusissime angulatus, infra leviter contracta, sulcata; apertura oblonga, postice angusta, antice latior; labrum leviter incrassatum, rectiusculum, postice angulatum, intus dentatum; columella rectiuscula, ad marginem tuberculis ovalis circ. 7 munita, intus bi-tuberculata; canalis brevis, latiusculus, vix recurvus.

Long. 13, diam.  $6\frac{1}{2}$  mm.

A typical *Columbella*, with a sharply acuminate spire; colour bright orange, with a few reddish-brown spots at the suture and near the base. It differs from *C. rustica*, Linn., in colour, in the relative height of the spire, in the slight but characteristic angularity of the top of the body-whorl, and in other respects.

*Columbella (Atilia) Macandrewi*, sp. n.

Testa acute pyramidata, pallidissime cinerea, longitudinaliter pallide aurantio strigata, ad suturam et peripheriam albo interruptim balteata; spira elatissima, acuta; anfractus 9, læves, vix convexi, sutura anguste canaliculata sejuncti; anfractus ultimus

convexus, infra contractus, ad basin valde sulcatus, vix rostratus; apertura mediocriter lata, intus paucilirata; labrum acutum, extus incrassatum; columella rectiuscula; canalis brevissimus. Long.  $6\frac{1}{2}$ , diam.  $2\frac{1}{2}$  mm.

A small very delicately-coloured shell allied to *C. eximia*, Reeve, compared with which species it is smaller, very different in colour and pattern, shorter at the base, and its spire is more regularly pyramidal.

#### Fam. Neritidæ.

##### *Nerita constellata*, sp. n.

Testa oblique ovata, solidiuscula, lævis, purpurascens, maculis parvis albidis inæqualibus conspersa; spira brevissima, planulata, fere immersa; anfractus ultimus rotunde convexus, concentricè obscurissime striatus, subobsolete spiralliter sulcatus; apertura semicircularis, intus lævis; labrum acutum; arca columellari lævis, leviter convexa, ad marginem minute irregulariter denticulata.

Alt.  $6\frac{1}{2}$ , diam. 9 mm.

This shell bears some resemblance to a large *Neritina fluvitilis*, while in form and substance it might almost be a miniature *Nerita Rumphii*, Recluz, but the specimens, which are fairly numerous, are very uniform in size, colour, and general characters.

The interior of the aperture is quite smooth.

#### Fam. Sculariidæ.

##### *Scularia octogona*, sp. n.

Testa pyramidalis, alba, lævis; spira elata, acuta; anfractus 8, rotundati, costis 8 acutis erectis leviter obliquis instructi; apertura circularis.

Long.  $12\frac{1}{2}$ , diam. 6 mm.

A white *Scularia* of simple pyramidal form, with eight erect sharp scarcely reflexed ribs.

##### *Scularia interstriata*, sp. n.

Testa acuminata, alba, multicostata; spira acute turrata; anfractus 9, convexi, primi 2-3 læves deinde gradatuli, costis elevatis circ. 25, leviter reflexis, superne acute angulatis instructi, spiralliter striati; apertura subcircularis; peristoma mediocriter crassum, postico angulatum.

Long. 9, diam.  $3\frac{1}{2}$  mm.



This species is easily distinguished by the large number of its prominent slightly reflexed ribs, which are acutely angularly raised near the suture, the interstices being spirally striated.

## Fam. Buccinidæ.

*Tritonidea (Cantharus) fuscopicta*, sp. n.

Testa ovato-acuminata, crassiuscula, alba, maculis parvis fuscis transversim elongatis picta; spira elata, acuta; anfractus 7, leviter convexi, spiraliter lirati, liris rotundatis, in anfractu penultimo 4, interstitiis spiraliter striatis; anfractus ultimus mediocriter amplus, superne leviter inepte canaliculatus, liris circiter 12 partim leviter erenulatis instructus, ad basin leviter contractus; apertura oblongo-ovata, intus lirata; labrum crassum, arcuatum, utrinque uni-tuberculatum; columella arcuata, ad basin plicato-contorta; canalis brevissimus, leviter recurvus.

Long. 14, diam. 7 mm.

I know of no species bearing any near resemblance to this prettily marked little shell. In proportion to the size of the body-whorl, its spire is rather unusually long and sharp for the genus, and the oblong brown markings on the spiral ridges are very striking.

## Fam. Ungulinidæ.

*Diplodonta Nevilli*, sp. n.

Testa suborbicularis, tenuis, albida, epidermide tenuis olivacea induta, leviter inflata, concentrice confertim striata; umbones obtusi; margo dorsalis posticus convexo declivis, anticus brevior, rotundatus; margo ventralis arcuatus; ligamentum parvum, immersum. Pagina interna luteo-cinerea; impressiones musculares indistincti; cardo normalis.

Diam. antero-post. 16, umbono-marg. 16, crass. 10 mm.

Compared with the typical *Diplodonta* (*D. rotundata*), the umbones are more obtuse and rather more central, the posterior dorsal margin more sloping; the shell is of a much thinner substance, and covered with a light olivaceous epidermis.

*Diplodonta (Felania) crebristriata*, sp. n.

Testa subtrigono-rotundata, compressiuscula, tenuis, albida, densissime concentrice striata; umbones acutiuseuli, clatiuseuli, antice leviter inclinati; margo dorsalis posticus rotundato declivis.

anticus valde declivis vel subtruncatus; margo ventralis arcuatus; cardo normalis.

Diam. antero-post. 12, umbono-marg.  $11\frac{1}{2}$ , crass. 7 mm.

A thin white shell of simple form and character, more elate than the typical form of *Diplodonta*, and with the whole surface of the valves finely and closely concentrically striated.

The types of all the species described in this paper are in the British Museum.

XXII.—*Description of a new Shell from the Cape Verd Islands.* By G. B. SOWERBY, F.L.S.

*Gibbula Murchlandi*, sp. n.

Testa perspective umbilicata, late conoidea, rosaceo-albida, maculis grandibus, minoribus, et minutis, rufo-fuscis ornata; spira subgradata, medioeriter elata, ad apicem acutiuscula; anfractus 6, ubique spiraliter conferte lirati, primi 3 convexo declives, cæteri angulati, ad angulum plicato-nodulosi, supra angulum leviter planulati, infra levissime convexi; anfractus ultimus latus, curtus, biseriatis nodosus; basis convexa, oblique striata, spiraliter valde lirata, liris circ. 10, retrorso complanatis; umbilicus profundus, medioeriter latus, spiraliter profunde canaliculatus, funiculo elevato crassiusculo reflexo munitus; apertura oblique subquadrata, intus argentea, lævis; labrum acutum; columella supra arcuata, deinde leviter undulata vel rectiuscula.

Alt. 14, diam. 16 mm.

*Hab.* St. Vincent, Cape Verd Islands.

At first sight this pretty and interesting shell has much the appearance of a small *Gibbula magus*, but it is more elate, the body-whorl is more nearly rectangular, the base is much more strongly ridged, and the spiral funicle entering the umbilicus much more elevated.

This species has some affinity with *Gibbula fanuloides*, Fischer, which belongs to Adams's subgenus *Forskalia*, but it distinctly connects that group with *Trochus magus*, Linn., which stands as the type of the genus *Gibbula*, showing that the subgenus proposed by H. & A. Adams is not needed.

The specimens were taken in the above-named locality by Mr. R. Murchland, after whom I have pleasure in naming the species.

The type is in the British Museum.

XXIII.—*Descriptions of new Species of Land-Shells from British New Guinea, and Remarks on Two Species from the Solomon Islands.* By EDGAR A. SMITH, I.S.O.

THE specimens described in this paper were collected by Mr. A. S. Meek, partly at Choiseul Island, one of the Solomon Group, in December 1903, and partly during the first three months of the present year, at Owgarrá on the Anabunga River, "two days" beyond Mafulu (or Mafoola), in the Owen Stanley Range, British New Guinea, at an elevation above 8000 feet.

*Papuina Meekiana.*

Testa breviter conica, acute carinata, roseo-purpurea, flavo plus minus obtecta, ad apicem nigrescens; anfractus 5, celeriter crescentes, tres superiores convexi, læves, cæteri planiusculi, oblique tenuiter corrugati, ultimus ad peripheriam acute albocarlinatus, antice prope aperturam subito descendens, infra planiusculus, corrugatus, lineisque incrementi radiatim striatus; apertura intus nigro-purpurea; peristoma saturate nigrum, nitens, marginibus callo roseo-purpureo tenui junctis, superiore bisinuato, columellari lato, planato, antice tuberculo parvo munito.

Diam. maj. 29 mm., min. 23, alt. 19.

*Hab.* British New Guinea.

This species belongs to the same group as *P. naso*, Martens, *P. gemina*, Fulton, *P. Tayloriana*, Ad. & Rve., and *P. jucunda*, Fulton. With regard to the peristome, it is very like *P. naso*,



*Papuina Meekiana.*

but the snout of the body-whorl is more pointed, and the anterior part of the basal margin of the peristome is quite different and bears a small tubercle. It is a much smaller species also. In colour it is very similar to certain forms of *P. Tayloriana*, but is subject to some variation. Sometimes the dark purple ground-colour is almost concealed by a yellowish coating which shows a disposition to be in somewhat obscure spiral zones, both on the upper and lower

surfaces. In *P. naso* and *P. gemina* the last whorl is peculiarly produced beyond the black lip. The present species has a similar kind of inflation of the keel behind the lip, but it does not project beyond the peristome. Named in honour of Mr. Meek, who at considerable personal risk collected in this dangerous country.

*Chloritis (Sulcobasis) globosa*, Preston, var. *major*.

Testa globosa, umbilicata, solidiuscula, saturate fusca, lineis incrementi oblique arcuatis striata, sub lente undique microscopice granulata; spira breviter convexa conoidea, ad apicem obtusa; anfractus 5, convexusculi, ultimus magnus, globosus, antice prope aperturam breviter descendens; apertura obliqua, late lunata, intus purpureo-fusca; peristoma album, mediocriter expansum et reflexum, marginibus callo tenui junctis, columellari dilatato, supra umbilicum partim expanso, niveo.

Diam. maj. 40 mm., min. 32, alt. 30. Apertura cum perist. 25 longa, 20 alta.

*Hab.* British New Guinea.

Like the type of *C. globosa*, Preston (Proc. Malac. Soc. vol. v. p. 17, fig.), but larger, the body-whorl being larger in proportion to the spire and the peristome more widely expanded. Occurring in a different district from that of the typical form, which was described from the "Northern Coast" of British New Guinea. *C. stirophora*, Smith, another allied form, occurs near Cloudy Bay on the south-eastern extremity of the island.

*Rhyssota bisculptilis*.

Testa depresso globosa, mediocriter tenuis, anguste perforata, supra fuscescens, haud nitida, infra flavescens, in medio pallide fuscescens, polita, epidermide tenui, flavo-olivacea, undique induta; spira depresso convexa, ad apicem obtusa; anfractus 5, supra parum convexi, striis minutis incrementi elevatis confertis pulcherrime sculpti, ultimus supra plus minus etiam malleatus, ad peripheriam obsolete obtuse carinatus, infra striis concentricis minutis confertis undulatis, et incrementi lineis concinne sculptus; apertura obliqua, late lunata, intus fuscescens; peristoma leviter incrassatum, simplex, dilute fuscescens, marginibus remotis, columellari ad insertionem breviter dilatato et reflexo.

Diam. maj. 35 mm., min. 29. Apertura 19 longa, 16 alta.

*Hab.* British New Guinea.

*Nanina campylonota*, Tapparone Canefri (Ann. Mus. Stor. nat. Genova, 1883, vol. xix. p. 199, pl. v. fig. 11), appears to be very similar in form to the present species, but is

described as a white shell, and no mention is made of the beautiful concentric striæ on the under surface, nor is the dullness of the upper side referred to in contrast to the glossy base.

*Hemiplecta Jansonii.*

Testa orbicularis, carinata, perforata, supra rufo-fusca, vix nitida, incrementi lineis striata, striisque minutis costulatis microscopice sculpta, infra medium versus sensim pallidior, subnitens, striis incrementi tenuibus sculpta, aliisque concentricis præsertim circa umbilicum concinne ornata; spira valde depressa, conoidea, planata; anfractus 5, supra fere plani, supra suturam subdepressi, ultimus acute carinatus, haud descendens, supra sulcis 2-3 spiralibus, fere obsolete, inconspicue impressus; apertura obliqua, angulatum lunata, purpureo-fusca; peristoma tenue, ad marginem pallidum, marginibus remotis, columellari leviter incrassato, ad insertionem breviter expanso et reflexo.

Diam. maj. 35 mm., min. 28. Apertura 19 longa, 14 alta.

*Hab.* British New Guinea.

*Nanina Cairni*, Smith (Ann. & Mag. Nat. Hist. 1887, vol. ix. p. 417, pl. xv. fig. 5), is closely related to the present species. The latter has a flatter, more depressed spire, a sharper peripheral keel, and stronger concentric spiral striæ on the lower surface. Owing to the depression of the spire, the form of the aperture is different. Named after Mr. Oliver Janson, through whose agency the Museum was fortunate in obtaining this and the other interesting species described in the present paper.

*Hemiplecta ougarrana.*

Testa parva, anguste perforata, orbicularis, supra subplana, fusca, infra pallidior, umbilicum versus albida; anfractus 5-5½, lente accrescentes, fere plani, ad suturam filo-carinati, minute oblique costulato-striati, quasi sericati, ultimus ad peripheriam acute et compressè carinatus, haud descendens, infra politus, incrementi lineis tenuibus striatus; apertura obliqua, angulatum lunata, intus lilacea; peristoma tenue, pallidum, marginibus remotis, columellari ad insertionem breviter expanso et reflexo.

Diam. maj. 22.5 mm., min. 20, alt. 10.5. Apertura 11.5 longa, 7.5 alta.

*Hab.* British New Guinea.

Distinguished by its small size, flattened spire, carinate suture, and very small perforation. Within the aperture and near the peristome there is a slight shelly thickening which is peculiar.

*H. infelix* (Smith \*) appears to be the nearest ally of this species. Its spire, however, is more raised, the peripheral keel even more acute, the umbilical perforation a trifle larger, and the form of the aperture rather different.

*Papuina lilium*, Fulton.

*Hab.* Choiseul, one of the Solomon Islands.

The exact locality of this species has not hitherto been recorded. It is remarkable that this very distinct species should have been considered by Dr. Cox (Proc. Zool. Soc. 1873, p. 567) as a variety of *P. xanthochila*, Pfr., quoted by Pilsbry as from Bougainville Island.

The difference in the number of volutions pointed out by Mr. Fulton is not constant, for both the two specimens in the Museum have six whorls (not  $5\frac{1}{2}$ ). Both are much finer than the shell figured by him and resemble that represented in the Proc. Zool. Soc. 1873, pl. xlvi. fig. 7.

*Papuina Dampieri* (Angas).

*Helix* (*Geotrochus*) *Dampieri*, Angas, Proc. Zool. Soc. 1869, p. 47, pl. ii. fig. 6.

*Papuina Dampieri*, Pilsbry, Man. Conch. vol. vii. p. 11.

*Hab.* Choiseul Island (*Meek*); Louisiade Archipelago (*Angas*); Choiseul Bay, Bougainville Straits (*Guppy*); Bougainville Island (*Fulton*, in *Brit. Mus.*).

I am inclined to think that the original locality assigned to this species must be erroneous, for its occurrence at such a remote place separated by three hundred miles of sea is most improbable.

XXIV.—Notes on the *Tabani* from the Palæarctic Region in the British Museum Collection. By GERTRUDE RICARDO.

WHILE going through the *Tabani* from the Palæarctic Region in the British Museum Collection I ascertained several particulars as regards the species described by Walker, and identified various species in the collection of Diptera from Algeria by the Rev. A. E. Eaton, and append a few notes which may be of use. Brauer's work on the European *Tabani* is, of course, of the greatest use, but, as has been

\* 'The Conchologist,' vol. ii. p. 109; 'Journal of Malacology,' vol. v. p. 22, pl. ii. figs. 6, 7.

remarked by others, I cannot follow him satisfactorily in many of his minute differences, chiefly in the shape of the palpi and the length of the forehead; in the females they do not seem marked enough for the identification of species such as, for example, *solstitialis* and *tropicus*.

The following species have been found in Algeria, collected by the Rev. A. E. Eaton:—

*Atylotus tomentosus*, Macq.; *Atylotus alexandrinus*, Wied.; *Atylotus rusticus*, F.; *Tabanus autumnalis*, L.; *Tabanus cordiger*, Mg.; *Tabanus pulchellus*, Loew; and one new species described below.

*Atylotus tomentosus*, Macq.

One male “near Biskra, along the route of ‘des Zibans’ in the cornfields, on ‘Ammin Visnoga,’ 18.<sup>b</sup> v. 93” (*Eaton*), 94. 114.

One female from Constantine, 28. v. 95 (*Eaton*), 96. 137.

One female “from Constantine, on the edge of the pine-plantations on the top of the hill north of Mansoura, 11. vi. 94” (*Eaton*), 95. 34.

The male agrees with the figure in Explor. d’Algér. (Lucas); the figure in Macquart’s Dipt. Exot. is different and apparently depicts a female specimen.

*Atylotus alexandrinus*, Wied.

One male from Colonne Voirol, Algiers, 5. vi. 93 (*Eaton*), 94. 114.

There is also a male from Tunis (*F. Moore*), 68. 4.

The third joint of the antennæ is wanting; the first posterior cell of the wings is narrowed at its apex, which is not mentioned as a characteristic of *A. alexandrinus* by any authors; otherwise these specimens agree with the description.

*Atylotus rusticus*, L.

? *flaviceps*, Zett.; ? *ruralis*, Zett.; *Rousselii*, Macq.

Two females “from Constantine, on the edge of the pine-plantations on the top of the hill north of Mansoura; visits ‘Ferula.’ 11. vi. 94” (*Eaton*), 94. 114.

The *Tabanus Rousselii*, Macq., a species from Algiers, is, I consider, a synonym of *Atylotus rusticus*, F.

These specimens differ from the description of *Atylotus rusticus* only by the apex of the third joint of the antennæ being blackish; the markings on the forehead, which seem



to be variable in this species, appear thus on these specimens:—Frontal callus yellowish brown, oblong, furrowed, the middle one smaller, oblong, black; in some females from Hungary these callosities are both black, and smaller. The shape of the antennæ and palpi agrees with those of *A. rusticus*.

*Atylotus Eatoni*, ♂ ♀, sp. n.

Male (type) "from Constantine, Algeria, along the route de la Corniche, visiting '*Ferula scabra*,' 2. vi. 95" (*Eaton*), 96. 137.

Male from the same place "along the Arab cliffs path between 9.15 and 10 A.M., 22. vi. 94" (*Eaton*), 94. 114.

Male from the same place "between the railway and the route de la Corniche, 18. vi. 95" (*Eaton*), 96. 137.

Male "from Bône, Algeria, by the Bône-Gmelma railway, 23. v. 96" (*Eaton*), 96. 136.

Female (type) "near the Colonne Voirol, Algiers, among bushes near the route Madeleine on '*Ferula communis*,' 18. v. 95" (*Eaton*), 94. 114.

This species may be distinguished from *Atylotus ater*, Rossi, and *Atylotus anthracinus*, Mg., by the much smaller tooth of the antennæ; from *Atylotus unbrinus*, Mg., by the absence of any brown cloud or spot on the wings behind the stigma; from *Atylotus alexandrinus*, Wied., by the hyaline wings and the short-haired eyes; from *Atylotus Letourneuxi*, Bigot, by the wholly black tibiæ, not "widely whitish yellow at base," as Bigot describes in his species.

Black. Eyes hairy, the upper facets only very slightly larger; the third joint of the antennæ with a small tooth. Wings hyaline.

*Male*.—Head not larger than in the female. Eyes with no band, the facets on the upper part on each side of the forehead slightly larger; the pubescence is sparse, the ocelligerous tubercle inconspicuous, yellow-haired, the hind part of the head with long yellow hairs; the frontal triangle is rather protruding, brownish, with silver-grey tomentum. Antennæ black, reddish brown at the base of the third joint; the first joint cylindrical, stout, with black hairs; the second cup-like in shape, with black hairs on each margin; the third joint with a moderate tooth, the annulate portion as long as the basal portion. Face blackish, with some grey tomentum near the eyes, with black hairs intermixed with some white ones on the inner side; beard blackish brown, white below; palpi black, with long black hairs. Thorax



black, with grey tomentum and fine short rufous hairs on the dorsum, some black hairs intermixed, greyer at the sides and on shoulders, breast-sides blackish brown; halteres reddish brown. Legs black, the extreme apices of femora yellowish; the pubescence is black, long on the coxæ and femora. Abdomen black, shining; pubescence black, the hairs at the sides black, fulvous on the last two segments, the underside black. Wings hyaline, narrowly yellowish brown on the fore border, the veins reddish brown; no appendix; the first posterior cell not narrowed at its apex.

Length 16, width of head 5 mm.

*Female*.—Very similar to the male. Frontal stripe blackish, with grey tomentum; the frontal callus black, shining, oval, not reaching the eyes, prolonged as a narrow stripe beyond the middle of the forehead, which is about four times as long as it is broad; no ocelligerous tubercle; the frontal triangle is black, shining, with a grey middle line and grey at the sides, rather protuberant. Hind part of the head with a black tuft of hairs in the centre and shorter yellowish hairs beyond. Palpi black, with grey tomentum and black hairs; the second joint long, rather stouter at the base, gradually tapering to a point, almost straight. Abdomen broader than in the male, with plum-coloured tomentum on the basal segments, most noticeable on the second one; the fulvous hairs on the last segments are more numerous and distributed over the dorsum of the segments; and is fainter coloured, nearly white. The hairs on the thorax are also greyer than in the male.

Length 15, width of head 5 mm.

*Tabanus autumnalis*, L.

One female "from Biskra, on the dunes 6 $\frac{1}{4}$  miles from the town, 18. v. 93" (*Eaton*), 94. 114.

*Tabanus cordiger*, Meig.

One female "from Biskra, on the dunes, caught between 7.15 and 9.30 A.M., 6 $\frac{1}{4}$  miles from the town, 31.<sup>b</sup> v. 93" (*Eaton*), 94. 114.

One female "from Biskra, near Hammam as Salahn, 14. iv. 95" (*Eaton*), 94. 114.

This species does not appear to have been recorded before from North Africa.

*Tabanus pulchellus*, Loew.

One male from Biskra, 28. v. 94 (*Eaton*), 94. 114.

One female from Biskra, 28. v. 94 (*Eaton*), 94. 114.

Two females "from Biskra on the dunes, 7.15-9.30 A.M., 6¼ miles from the town, 31. v. 93" (*Eaton*), 94. 114.

The type came from Asia Minor. These specimens answer to the description, but the femora are entirely yellow in the male and female; there are a few black hairs on the palpi of the female. In the table of the males Brauer places the species conditionally under the section with long hairs on the back of the head; this is correct as far as concerns these specimens from Algeria. Brauer remarks that this species makes the genus *Atylotus* no longer tenable, as this species is near *A. rusticus*, L., but on account of the naked (or nearly naked) eyes it must belong to *Tabanus in sensu stricto*. A note on the female gives the eyes as light sage-green in life; Brauer describes them thus, viz. as glass-green.

*Tabanus albifacies*, Loew.

Two females from Moghara, Egypt, March 1901 (*Dr. C. W. Andrews*), 1902. 20, answer to the description given by Loew; they have a narrow black, not very noticeable, band below the eyes, not mentioned by Loew.

This species, *pulverifer*, Wlk., and *pulchellus*, Loew, are all near *cordiger*. These differ by having an appendix to the wing, and may be distinguished from *pulverifer* and *pulchellus* by their black antennæ and darker legs.

The type came from Asia Minor.

The Walker types of *Tabanus macrops*, *nigrifer*, and *siccus* from Egypt, of *Tabanus terminalis* from Mount Sinai, and of *Tabanus pallescens* and *politus* from Arabia are not to be found in the British Museum Collection, and are unknown to me.

The *Tabanus transiens*, Walker, from an unnamed locality, is missing now from the Collection; it was probably a synonym of *Tabanus ater*, Rossi, and might in any event be now expunged from the Catalogue of *Tabani*.

The specimen named *Tabanus connexans*, ♀, Saunders Coll., 68. 4, by Walker, from an unknown locality, is nothing but a specimen of *Tabanus bromius*, L., and should be added to the synonyms of that species.

The specimen named *Tabanus depressus*, ♀, by Walker, from unknown locality, badly preserved, is, I believe, an

example of *Theriopectes luridus*, Fall., and should be added to the synonyms of *Th. luridus*.

*Tabanus pulverifer*, ♂ ♀, Walker.

Male (type) from Turkey in Asia (*Loftus*), 50. 105.

Three females from the same locality (co-types) are nearly related to *Tabanus cordiger*, Mg., but belong to a distinct species; they differ in the following particulars:—

Antennæ wholly red, black at the apex; frontal callus reddish brown. Coxæ and femora reddish yellow, as are the tibiæ, only the anterior tibiæ with a brown apex; tarsi reddish brown, all with white pubescence. The underside of abdomen has no median black stripe. The species is much lighter in colour and slighter in form than *cordiger*; the four specimens vary in size from 12–14 mm. In the female the band under the eyes is narrow and yellowish brown. In the male the black hairs on the hind part of the head are not present; the underside of the abdomen is reddish, greyer at the apex.

*Tabanus polygonus*, ♂ ♀, Walker.

Male (type) from Bagdad (*IV. K. Loftus*), 50. 105; and another male from the same locality.

Female (type) from same locality.

The males would come in Brauer's table near *autumnalis*, *spectabilis*, and *rectus*. The female, which is much smaller, may possibly not belong to the same species and has a slight resemblance in appearance to *Atylotus rusticus*, Z.

A redescription may prove of use:—

Reddish-brown species, with grey median triangular spots on the abdomen. Eyes bare; no long hairs on the hind part of the head.

*Male*.—Head large; facets of eyes unequal, sharply divided, the large facets yellowish, extending over more than half the eyes, surrounded by a narrow zone of small facets above and a broad zone on the basal half. Frontal triangle grey, reddish at apex. Antennæ red, with the apex darker; the third joint with a small tooth, long and slender, the annulated portion not so long as the basal joint; the ocelligerous tubercle small, brown. Face whitish, with white hairs; beard white; palpi white, the second joint oval, with white pubescence. Thorax blackish, with four grey stripes and greyish pubescence; the shoulders red; the sides reddish, with black hairs above and whitish ones below; scutellum

black, with grey tomentum. Abdomen long and narrow, reddish, with a row of median grey triangular spots, which on the second and last segments are surrounded by black margins; the hind borders of the segments narrowly white, the pubescence black; the underside brighter red, with some irregular black markings. Legs red; the coxæ and femora with longish white hairs; the tibiæ with short black pubescence on the sides and some whitish-yellow hairs on their flat surfaces; tarsi with black pubescence, pulvilli yellow. Wings longer than the abdomen, hyaline, the stigma and veins yellow; no appendix.

Length 18, width of head 5 mm.

*Female*.—Eyes not large, the facets equal, with two bands (in the male I can see no trace of bands). Frontal callus reddish brown, almost square, a little wider at its base, nearly touching the eyes; frontal stripe grey, with black markings (probably denuded), the middle callus being a black stripe not joining the frontal callus; the vertex blackish; no ocelligerous tubercle. Antennæ at base red (the rest wanting). Frontal triangle grey. Face grey, with white hairs; beard white; palpi pale yellow, the second joint long and slender, at the base stouter, gradually tapering to a point, nearly straight, with a few black hairs. On the abdomen the grey triangular spots are replaced by a broad stripe of greyish tomentum, the black pubescence is longer, the abdomen not so pointed as in the males. Wings with the first posterior cell distinctly narrowed at the apex (this is not the case in the male).

Length 14, width of head 4 mm.

There are several species of *Tabani* from Japan: a long series of *Tabanus trigonus*, Coq., male and female; this is a very nearly related species to the European *bovinus* and *sudeticus*, the brighter yellow colour of the antennæ and the larger tooth of the third joint, with an appendix to the wings, being the most striking differences. Another species (males and females) from Korea is very nearly allied to *Tabanus bovinus*, Lw., but the tooth of the antennæ is larger and brighter yellow and the wings possess an appendix; the eyes of the males having facets all equal in size distinguish it from *Tabanus trigonus*, Coq.

XXV.—*Rhynchotal Notes*.—XXXIV. By W. L. DISTANT.

Fam. Cicadidæ (continued from p. 35).

Subfam. *TIBICININÆ* (continued).

Division PARNISARIA.

This division or large group of genera is allied to that of *Taphuraria*, from which it primarily differs by the size and position of the eyes, which do not project (or, at least, not distinctly so) beyond the anterior angles of the pronotum; the abdomen is usually short, except in a few cases, not longer than the space between the apex of head and base of cruciform elevation.

Parnisaria includes a number of genera widely but sparingly distributed in all the great zoogeographical regions; in the Palæarctic region apparently confined to its extreme eastern area.

*Henicotettix*, the type of which I have not seen, probably comes in this group of genera, but is to be recognized by the character—"Tibiæ anticæ ultra insertionem tarsorum in spinam productæ."

*Synopsis of Genera.*

1. Tegmina and wings with reticulate venation, giving the appearance of numerous cellular areas . . . . . *Arcystasia.*
2. Tegmina with six, wings with four apical areas . . . . . *Derotettix.*
3. Tegmina and wings with the venation normal, not reticulate.
  - A. Wings with six apical areas.
    - a. Head (including eyes) more or less narrower than base of mesonotum.
    - b. Tegmina about or nearly three times as long as greatest breadth, costal margin above radial area neither curved nor gibbous; basal cell generally about twice as long as broad.
    - c. Head with front not prominently projecting, about as broad as length of vertical margins; margins of both more or less continuous.
    - d. Tegmina with the first and second apical areas longer than eighth. . . . . *Quintilia.*
    - dd. Tegmina with the first and second apical areas very short, not longer than eighth. *Psilotympana.*
    - cc. Head with front strongly projecting, narrower than length of vertical margins, which are convex; margins of both discontinuous, almost at right angles to each other.
    - e. Tegmina about twice as long as broad; abdomen longer than space between apex

- of head and base of cruciform elevation; opercula in male reaching base of first abdominal segment; rostrum reaching intermediate coxæ . . . . . *Diemenia*.
- ee. Tegmina about three times as long as broad; abdomen about as long as space between apex of head and base of cruciform elevation; opercula in male not reaching base of abdomen; rostrum passing intermediate coxæ . . . . . *Koranna*.
- ccc. Head with front strongly projecting, broader than the length of vertical margins, which are subangulate . . . . . *Abagazara*.
- bb. Tegmina little more than twice longer than greatest breadth.
- b<sup>1</sup>. Costal margin of tegmina above radial area neither curved nor gibbous . . . . . *Gudanga*.
- b<sup>2</sup>. Costal margin of tegmina above radial area more or less curved and gibbous.
- f. Head with front not prominently produced, margins of front and vertex continuous.
- g. Tegmina with the first and second ulnar areas narrow, very much longer than broad; basal cell broader at base than apex, not twice as long as broad . . . . *Masupha*.
- ff. Head with front prominently produced, margins of front and vertex discontinuous.
- gg. Tegmina with the first and second ulnar areas broad, only moderately longer than broad, placed somewhat obliquely to each other; basal cell about twice as long as broad . . . . . *Platypedia*.
- B. Wings with five apical areas.
- k. Ocelli well separated from base of head.
- i. Tegmina with postcostal area narrow, but distinct.
- k. Head with the margins of front and vertex more or less continuous, front not prominently projecting . . . . . *Taipinga*.
- kk. Head with front prominently projecting, the margins of front and vertex discontinuous and at right angles to each other . . . . . *Adenia*.
- ii. Tegmina with postcostal area not distinct . . . . *Calyria*.
- iii. Tegmina with postcostal area very broad and cell-like . . . . . *Parnisa*.
- hh. Ocelli placed close to base of head . . . . . *Callipsaltria*.
- C. Wings with four apical areas.
- l. Head with front not prominently produced; margins of front and vertex more or less continuous. *Mapondera*.
- ll. Head with front prominently triangularly produced; margins of front and vertex discontinuous, somewhat at right angles to each other. *Prunasis*.

## Genus QUINTILIA.

*Tibicen*, subgen. *Quintilia*, Stål, Hem. Afr. iv. p. 28 (1866).

Type, *Q. rufiventris*, Walk. (*Cicada*).

*Quintilia mogaunia*, sp. n.

♂. Body above black, finely greyishly pilose; head with a central line to front, and anterior lateral margins to vertex, pronotum with the margins, and a central longitudinal fascia (widened posteriorly, where it contains two small black spots), mesonotum with two central, discal, wedge-shaped fasciæ, the lateral margins, cruciform elevation, and abdomen with the posterior segmental margins, testaceous; body and head beneath, sternum, legs, and opercula piceous; lateral margins of face and streaks to sternum and femora testaceous; intermediate and posterior tibiæ annulated apically and basally with pale ochraceous; abdomen beneath testaceous, with central and marginal piceous spots; tegmina and wings hyaline, their basal areas pale fuscous brown, the venation fuscous; tegmina with the costal membrane and claval area, and wings with the extreme base, testaceous; opercula piceous, with their margins narrowly testaceous; rostrum reaching the intermediate coxæ; head (including eyes) a little narrower than base of mesonotum; transverse vein at base of second apical area to tegmina nearly vertical; face moderately centrally sulcate.

♀. Body beneath more testaceous than in male, and abdomen without the piceous spots.

Long., excl. tegm., ♂ 15, ♀ 18 mm.; exp. tegm., ♂ ♀, 40-44 mm.

*Hab.* China: Hong Kong (*J. C. Bowring*, Brit. Mus.).

*Quintilia maculiventris*, sp. n.

Head, pronotum, and mesonotum black; head with a small central longitudinal spot at base, pronotum with the margins and a central longitudinal fascia, mesonotum with two fasciæ on each lateral area (one marginal, the other and narrower nearer centre), and the cruciform elevation ochraceous; abdomen above ochraceous, its base and a central series of segmental spots black, the margins of the segments bright testaceous; body beneath and legs ochraceous; face, space between face and eyes, spots to acetabulæ, and central abdominal segmental spots black, segmental margins paler testaceous than above; tegmina and wings hyaline; tegmina with the veins somewhat broadly margined with fuscous, the



costal membrane ochraceous; wings pale hyaline, unspotted; head (including eyes) a little narrower than base of mesonotum; rostrum reaching the intermediate coxæ; transverse vein at base of second apical area to tegmina oblique.

Long., excl. tegm., ♂ 19, ♀ 16 mm.; exp. tegm., ♂ 39, ♀ 37 mm.

*Hab.* Transvaal (Coll. Dist.); Natal (Coll. Dist.).

This species has a wonderful resemblance to *Melampsalta leucoptera*, Germ.

#### Genus PSILOTYMPANA.

*Psilotympana*, Stål, Ann. Soc. Ent. Fr. (4) i. p. 620 (1861).

Type, *P. signifera*, Germ. (*Cicada*).

#### ABAGAZARA, gen. nov.

♀. Head considerably longer than pronotum, front longly and broadly projecting, longer than vertex, and broader than the length of the lateral margins of vertex, which are a little discontinuous; ocelli a little nearer to each other than to eyes; pronotum narrow, transverse, the posterior angles widely outwardly ampliate; mesonotum (including cruciform elevation) shorter than head and pronotum together; abdomen about as long as space between apex of head and base of cruciform elevation; tympana entirely exposed; posterior tibiæ spined on each side; anterior femora spined beneath; tegmina and wings hyaline, the first nearly three times longer than greatest breadth, and with eight apical areas; wings with six apical areas.

Type, *A. bicolorata*, Dist. (*Callipsaltria*).

#### DIEMENIA, gen. nov.

Head with the front strongly convexly projecting, narrower than length of the vertical margins, which are convex, margins of both discontinuous, almost at right angles to each other, ocelli a little nearer to each other than to eyes, head (including eyes) a little narrower than base of mesonotum; pronotum about as long as head, lateral margins a little laminate and slightly convex, posterior angles spatulately produced; mesonotum (including cruciform elevation) almost as long as pronotum and head together; abdomen robust, centrally ridged above, beneath with the disk convex, the marginal areas recurved, longer than space between apex of head and base of cruciform elevation; tympana entirely exposed; opercula in male transverse, about reaching base of first



abdominal segment ; rostrum reaching the intermediate coxæ ; tegmina almost half as broad as long, the postcostal area broad, basal cell about twice as long as broad, apical areas eight ; wings with six apical areas.

Type, *D. coleoprata*, Walk. (*Cicada*).

#### KORANNA, gen. nov.

Head with the front strongly projecting, about as broad as length of the vertical margins, which are convex, margins of both discontinuous, almost at right angles to each other, head (including eyes) narrower than base of mesonotum ; pronotum about as long as head, the lateral margins slightly laminate and convex, the posterior angles strongly spatulately produced ; mesonotum almost as long as pronotum and head together ; abdomen short, robust, as long as space between apex of head and base of cruciform elevation ; tympana completely exposed ; opercula in male short, transverse, not reaching base of abdomen ; abdomen above convex, beneath with the disk convex, the lateral areas strongly recurved ; rostrum passing the intermediate coxæ ; tegmina about three times as long as broad, postcostal area broad, basal cell broad and about twice as long as broad, apical areas eight ; wings with six apical areas.

Type, *K. analis*, Dist.

#### *Koranna analis*, sp. n.

♂. Body above black ; head with the vertical margins, inner margins of eyes, and three small basal spots ochraceous ; pronotum with the margins, *sometimes* three central longitudinal spots, and a spot on each lateral area ochraceous ; mesonotum with two small discal spots (really the apices of two obsolete obconical spots), lateral margins (narrowly), a spot at anterior angles, two lateral spots, and base of cruciform elevation ochraceous ; abdomen with the anal segment and appendage stramineous, the first with a basal black spot ; body beneath stramineous or pale ochraceous ; face, space between face and eyes, rostrum (excluding base), lateral areas of sternum and abdomen piceous and greyishly pilose ; femora and tibiae pale castaneous, tarsi piceous ; tegmina and wings semihyaline ; tegmina talc-like, the venation fuscous, a broad fuscous angulate fascia crossing bases of apical areas, and small fuscous spots at apices of longitudinal veins to apical areas ; wings with about basal halves pale ochraceous, outwardly margined with fuscous, small fuscous spots at apices of longitudinal veins to apical areas.

Long., excl. tegm., ♂ 17 mm. ; exp. tegm. 47-50 mm.

*Hab.* S. Africa (*Dr. Smith and Drège*, Brit. Mus.).

#### GUDANGA, gen. nov.

Head (including eyes) a little narrower than base of mesonotum, the front broad, depressed, broader than long, almost continuous with lateral margins of vertex, shorter than vertex ; pronotum about as long as head, its lateral margins nearly straight, its posterior angles amplified ; mesonotum (including cruciform elevation) a little shorter than head and pronotum together ; abdomen in male longer than space between apex of head and base of cruciform elevation ; tympana entirely exposed ; opercula in male short, transverse, widely separated, not extending beyond basal segment of abdomen ; rostrum almost reaching posterior coxæ ; tegmina semiopaque, a little more than twice longer than greatest breadth, costal margin neither arched nor gibbous, basal cell about twice as long as broad, apical areas eight ; wings with six apical areas (in the typical specimen on which the genus is founded one wing has six, the other five apical areas) ; anterior femora not prominently spined beneath.

Type, *G. Boulayi*, Dist.

#### *Gudanga Boulayi*, sp. n.

♂. Body black, greyishly pilose ; narrow anterior and posterior margins and a central longitudinal fascia to pronotum, cruciform elevation, posterior abdominal segmental margins both above and beneath, margins of face, and base of rostrum ochraceous ; opercula greyish ; legs piceous ; coxæ and intermediate and posterior femora beneath more or less ochraceous ; tegmina pale fuscous, mottled with darker fuscous, the venation paler, the claval area sanguineous at base, the venation fuscous.

Long., excl. tegm., ♂ 16 mm. ; exp. tegm. 36 mm.

*Hab.* West Australia : Champion Bay (*H. du Boulay*, Brit. Mus.).

#### Genus MASUPHA.

*Masupha*, Dist. Ann. & Mag. Nat. Hist. (6) ix. p. 317 (1892).

Type, *M. ampliata*, Dist.

#### *Masupha Dregei*, sp. n.

♂. Body above black ; head with the margins of front broadly castaneous, a small spot on each vertical margin and

three small spots at base ochraceous; pronotum with the margins (narrowly), a central discal longitudinal fascia, and the incisures ochraceous; mesonotum with two obsolete central obconical spots, only denoted by their outer margins and apices, lateral margins (narrowly) and anterior angles and centre of cruciform elevation ochraceous; abdomen above black (apex mutilated in type); body beneath stramineous; face piceous; space between face and eyes, and many irregular spots to sternum, black; legs pale castaneous, apices to femora ochraceous; tegmina and wings semihyaline talc-like, tegmina with the venation brownish ochraceous and on basal area spotted with fuscous, two angulated fuscous fasciæ on apical areas; wings with angulated fuscous spots on outer area, the outer margin pale hyaline; costal tegminal membrane, and extreme bases of both tegmina and wings, ochraceous.

Long., excl. tegm., ♂ (abdomen mutilated); exp. tegm. 49 mm.

*Hab.* South Africa (*Drège*, Brit. Mus.).

#### Genus PLATYPEDIA.

*Platypedia*, Uhler, Ent. Am. iv. p. 23 (1888).

Type, *P. areolata*, Uhler (*Cicada*).

#### Genus ARCYSTASIA.

*Arcystasia*, Dist. Proc. Zool. Soc. 1882, p. 133.

Type, *A. Goddefroyi*, Dist.

#### Genus DEROTETTIX.

*Derotettix*, Berg, Anal. Soc. Cient. Argent. xiv. p. 11 (1882).

Type, *D. mendosensis*, Berg.

#### *Derotettix Wagneri*, sp. n.

Head and thorax above olivaceous green; vertex of head, margins of pronotum, and cruciform elevation pale testaceous; area of the ocelli, a central longitudinal fascia to pronotum, two central, anterior, obconical spots to mesonotum, and disk of cruciform elevation black; abdomen pale olivaceous, thickly greyishly tomentose, segmental margins pale testaceous, and a central longitudinal fascia (broadest at base) piceous; body beneath and legs ochraceous, greyishly tomentose; face olivaceous; posterior margin of metanotum,

and apices of rostrum and tarsi, piceous; tegmina and wings hyaline; tegmina with the costal membrane, postcostal margin, basal cell, and base and margins of claval area virescent, venation (excluding that of apical areas) virescent; a transverse spot beneath radial area, an irregular transverse fascia crossing from end of radial area, longitudinal veins to apical area, and the apical and outer margins pale fuscous; a basal streak pale sanguineous; wings with a pale sanguineous basal streak, and the outer margins of the apical areas pale fuscous.

Long., excl. tegm., ♂ 11 mm.; exp. tegm. 26 mm.

*Hab.* Chaco de Santiago del Estero, Bords du Rio Salado (*E. R. Wagner*, Paris Mus.).

#### TAIPINGA, gen. nov.

Head (including eyes) a little narrower than base of mesonotum, front very much shorter than vertex, which is distinctly longitudinally sulcate at base, margins of front and vertex a little discontinuous, breadth of front about equal to length of margins of vertex; pronotum about equal to, or slightly longer than, head, the lateral margins slightly ampliate and convex, the posterior angles ampliate; mesonotum (including cruciform elevation) about equal in length to head and pronotum together; abdomen longer than space between apex of head and base of cruciform elevation; tympana entirely exposed; opercula in male about reaching base of abdomen; tegmina and wings hyaline, the first with the postcostal area moderately broad, the basal cell about twice as long as broad, and with eight apical areas; wing with five apical areas.

Type, *T. nana*, Walk. (*Cicada*).

This genus may be divided into two sections by the length of the upper apical area to the tegmina, which is either longer than eighth or about the same length. Further generic division may be necessary when more material can be examined.

#### ADENIA, gen. nov.

Head with the front very prominent, broadly conically produced, very much shorter than vertex, which is subquadrate and with its anterior and lateral margins straight, the first completely at right angles with front; ocelli slightly farther apart from each other than from eyes and well separated from base of head; pronotum about as long as head, its posterior angles very widely ampliate; mesonotum (including

cruciform elevation) as long as pronotum and head together, globosely convex; abdomen somewhat broad, moderately constricted at base, convex above, flattened beneath, the second, third, and fourth segments very broad, flat, and talc-like in appearance, fifth and sixth segments very compressed and short; opercula in male very short and transverse, not reaching base of abdomen; tympana entirely uncovered; rostrum short, scarcely reaching intermediate coxæ; tegmina and wings hyaline, the first nearly three times as long as broad, the postcostal area narrow but distinct, costal membrane broad and somewhat sinuate, apical areas eight, the uppermost very short and narrow; wings with five apical areas.

Type, *A. Yerburyi*, Dist.

*Adenia Yerburyi*, sp. n.

Head and thorax above piceous, thickly greyishly pilose; front of head, marginus and a central longitudinal fascia to pronotum, and the margins of two obconical spots to mesonotum obscurely ochraceous; abdomen above ochraceous, greyishly pilose, basal area piceous, margins of segments stramineous, and with a central darker longitudinal fascia; head beneath, sternum, and legs ochraceous and thickly greyishly pilose; abdomen beneath with the second, third, and fourth segments broad and talc-like, their margins and a central longitudinal fascia pale ochraceous; tegmina and wings hyaline, the venation brownish ochraceous; costal membrane to tegmina dull ochraceous.

Long., excl. tegm., ♂ 16 mm.; exp. tegm. 40 mm.

*Hab.* Aden (*Col. Yerbury*, Brit. Mus.).

Genus CALLIPSALTRIA.

*Calopsaltria*, Stål, Ann. Soc. Ent. Fr. (4) i. p. 620 (1861).

*Callipsaltria*, Stål, Hem. Afr. iv. pp. 9 & 49 (1866).

Type, *C. longula*, Stål (*Cicada*).

Genus CALYRIA.

*Calyria*, Stål, Rio Jan. Hem. ii. p. 22 (1858).

Type, *C. cuna*, Walk. (*Cicada*).

Genus PARNISA.

*Parnisa*, Stål, Rio Jan. Hem. ii. p. 21 (1858).

Type, *P. proponens*, Walk. (*Cicada*).

## MAPONDERA, gen. nov.

Allied to *Taipinga*, but differing principally by the venation of the wings, which possess only four apical areas.

Type, *M. pulchella*, Stål (*Cicada*).

In this genus I include the *Tibicen* (*Quintilia*) *abdominalis*, Stål, of which by the kindness of Dr. Aurivillius I have had the opportunity to examine a co-type which possesses four apical areas to the wings. Stål (Hem. Afr. iv. p. 37) writes of this species: "Alæ areis apicalibus numero varialibus, tribus; quattuor vel quinque"; but he appears to have been misled by the striking similarity in colour and markings of several African species belonging to different genera. These I hope to figure in my 'Insecta Transvaaliensia.'

## Genus PRUNASIS.

*Prunasis*, Stål, Rio Jan. Hem. ii. p. 22 (1858).

Type, *P. viridula*, Walk. (*Cicada*).

Stål, in his synopsis of the genera of Cicadidæ (Hem. Afr. iv. p. 9, 1866), gives as a distinguishing character of *Prunasis*: "*Alis areis apicalibus sex.*" This is erroneous, and he had previously (*supra*) correctly given in his diagnosis "*Alæ areolis apicalibus quattuor.*"

## Division CHLOROCYSTARIA.

In this division the abdomen in the males is always more or less inflated or dilated, with a central longitudinal dorsal ridge, and longer than the space between the apex of head and base of cruciform elevation; the head (including eyes) is a little narrower than base of mesonotum; tegmina always longer than body, their greatest width only about a third of their length.

*Synopsis of Genera.*

A. Tegmina with eight apical areas.

a. Wings with six apical areas.

b. Opercula in male of ordinary structure.

c. Lateral margins of pronotum obliquely straight, posterior angles very slightly ampliate.

d. Head with front not produced and much broader than long, margins of front and vertex continuous . . . . .

dd. Head with front much subconically produced, as long as broad at base.

*Stagira.*

- margins of front and vertex discontinuous . . . . . *Bavea*.
- cc. Lateral margins of pronotum a little convexly sinuate, posterior angles more or less strongly ampliate.
- ddd. Head with front triangularly produced, as long as broad at base, margins of front and vertex discontinuous.
- e. Basal segment of abdomen strongly, centrally, conically produced . . . *Musoda*.
- ee. Basal segment of abdomen not conically centrally produced . . . *Muda*.
- dddd. Head with front a little produced, a little broader than long, margins of front and vertex discontinuous . . *Bæturia*.
- bb. Opercula in male convex and inflated, projecting beyond the lateral margins of the abdomen.
- f. Head with the front short and broad, much broader than long, margins of front and vertex continuous . . . . . *Gymnotympana*.
- ff. Head with the front narrow, about as long as broad, margins of front and vertex discontinuous . . . . . *Kumanga*.
- aa. Wings with five apical areas . . . . . *Conibosa*.
- B. Tegmina with thirteen apical areas.
- g. Wings with six apical areas . . . . . *Chlorocysta*.
- C. Tegmina with eleven apical areas.
- gg. Wings with five apical areas.
- h. Apical areas of tegmina and wings of moderate length . . . . . *Mardalana*.
- ggg. Wings with seven apical areas.
- hh. Apical areas of tegmina and wings very long . . . . . *Thaumastopsaltria*.
- D. Tegmina with the venation of apical two thirds reticulate, apparently forming numerous cells; wings with nine apical areas . . . *Cystopsaltria* \*.

## Genus STAGIRA.

*Stagira*, Stål, Ann. Soc. Ent. Fr. (4) i. p. 621 (1861).

Type, *S. simplex*, Germ. (*Cicada*).

*Stagira Darwini*, sp. n.

Body pale testaceous; head beneath, sternum, femora, and a basal spot to tegmina beneath ochraceous; tarsi fuscous; tegmina and wings hyaline, the venation and costal membrane to tegmina ochraceous; lateral areas of the last two abdominal segments piceous; rostrum reaching the intermediate coxæ; space between costa and radial vein ochraceous;

\* I only know this genus from the description and figure (partial) of Goding and Froggatt.

seventh apical area to tegmina considerably longer than the eighth; apical ventral segment centrally carinate, moderately apically produced.

Long., excl. tegm., ♂ 18 mm.; exp. tegm. 38 mm.

*Hab.* Mauritius (*C. Darwin*, Brit. Mus.).

#### BAVEA, gen. nov.

♀. Head (including eyes) narrower than base of mesonotum, as long as pronotum, the front broadly subconically produced, about as long as vertex, both centrally longitudinally sulcate, their margins discontinuous, ocelli rather nearer to eyes than to each other, front ocellus near anterior margin of vertex, anterior lateral margin of vertex convexly rounded; pronotum with the lateral margins obliquely straight, posterior angles very slightly ampliate; mesonotum (including cruciform elevation) much shorter than head and pronotum together; abdomen (♀) moderately inflated; tegmina and wings hyaline; tegmina with eight apical areas and the basal cell twice as long as broad; wings with six apical areas.

Type, *B. concolor*, Walk. (*Cephaloxys*).

Walker gave no habitat to his species which forms the type of the genus, but the specimen (♀) is labelled South Africa (*Dr. Smith*).

#### Genus MUSODA.

*Musoda*, Karsch, Berl. ent. Zeitschr. xxxv. pp. 112 & 128 (1890).

Type, *M. flavida*, Karsch.

The name *flavida* is based on faded or discoloured specimens; fresh examples are bright grass-green.

#### Genus BÆTURIA.

*Bæturia*, Stål, Hem. Afr. iv. p. 9 (1866).

Type, *B. conviva*, Stål (*Cicada*).

#### Genus MUDA.

*Muda*, Dist. Ann. Mus. Civ. Genoa, (2<sup>a</sup>) xvii. p. 384 (1897).

Type, *M. concolor*, Dist.

#### Genus GYMNOTYMPANA.

*Gymnotympana*, Stål, Ann. Soc. Ent. Fr. (4) i. p. 619 (1861).

Type, *G. strepitans*, Stål (*Cicada*).



## KUMANGA, gen. nov.

Head with the front narrow, about as long as broad, including eyes narrower than the base of mesonotum; pronotum narrowed anteriorly; mesonotum (including cruciform elevation) slightly shorter than head and pronotum together; abdomen in male longer than the space between apex of head and base of cruciform elevation; tympana entirely exposed; opercula completely covering the sonorous cavities and projecting beyond the lateral margins of the abdomen as seen from above; rostrum reaching the intermediate coxæ; tegmina and wings hyaline; tegmina with eight apical areas, seventh and eighth about equally long, basal cell about twice as long as broad; wings with six apical areas.

Type, *K. sandaracata*, Dist. (*Bæturia*).

## CONIBOSA, gen. nov.

Head as long as breadth between eyes, front triangularly produced, as long as broad at base, its lateral margins and those of vertex discontinuous, vertex longer than front, ocelli well separated from basal margin and nearer to each other than to eyes; pronotum a little longer than head, its lateral margins straight, its posterior angles very little amplified; mesonotum (including cruciform elevation) scarcely longer than pronotum; abdomen somewhat strongly dilated in male, centrally arched and carinate, longer than space between apex of head and base of cruciform elevation; tympana entirely exposed; opercula in male type mutilated; rostrum reaching the intermediate coxæ; lower anal appendage to male long, projecting beyond apex of abdomen; anterior femora armed with three spines beneath; tegmina and wings hyaline; tegmina with eight, wings with five apical areas; basal cell to tegmina not twice as long as broad.

Type, *C. occidentris*, Walk. (*Cephaloxys*).

## Genus CHLOROCYSTA.

*Cystosoma*, subgen. *Chlorocysta*, Westw. Ann. & Mag. Nat. Hist. (2) vii. p. 208 (1851).

Type, *C. vitripennis*, Westw. (*Cystosoma* [*Chlorocysta*]).

## MARDALANA, gen. nov.

*Chlorocysta*, God. & Frogg. (part.), Proc. Linn. Soc. N.S. Wales, 1904, p. 658.

Allied to *Chlorocysta*, Westw., but tegmina with eleven, and wings with five apical areas; front of head more produced and less continuous with lateral margins of vertex;

ocelli much nearer to each other than to eyes; lateral margins of pronotum straighter, posterior angles much less (only slightly) amplified; abdomen in male less inflated.

Type, *M. congrua*, Walk.

*Mardalana congrua*.

*Cicada congrua*, Walk. Journ. Ent. i. p. 303 (1862).

*Chlorocysta macrula*, Stål, Tr. Ent. Soc. (3) i. p. 575 (1863); God. & Frogg. Proc. Linn. Soc. N. S. Wales, 1904, p. 660.

Although I am deferring all synonymical notes for the publication of my 'Catalogue of the Cicadidæ,' I think it right to mention that in reply to Mr. Froggatt's enquiry I stated that I could not find Walker's *C. congrua* in the Pascoe Collection (cf. Proc. Linn. Soc. N. S. Wales, 1904, p. 657). It has since been discovered, and proves to be a female specimen of Stål's species, and therefore takes precedence in nomenclature.

Genus THAUMASTOPSALTRIA.

*Acrilla*, Stål, Trans. Ent. Soc. Lond. (3) i. p. 575 (1863), nom. præocc.

*Thaumastopsaltria*, Kirk. Entomologist, 1900, p. 242, n. nom.

Type, *T. adipata*, Stål (*Acrilla*).

Genus CYSTOPSALTRIA.

*Cystopsaltria*, God. & Frogg. Proc. Linn. Soc. N. S. Wales, 1904, p. 661.

Type, *C. immaculata*, God. & Frogg.

XXVI.—*Descriptions and Records of Bees*.—I.

By T. D. A. COCKERELL, University of Colorado.

EXCEPT where the contrary is stated, it is to be understood that all the Australian species discussed in this series of papers are in the collection of the British Museum, and all others in my own collection.

*Melissodes kallstromiæ*, sp. n.

♂.—Length about  $11\frac{1}{2}$  mm.

Black, with the abundant pubescence of the vertex and thorax above orange-fulvous, without any black; that of cheeks, face, and pleura whitish; facial quadrangle not so broad as long; eyes (dry) silvery grey; clypeus (except

a black spot on each side) and a large patch on base of mandibles bright lemon-yellow; labrum yellowish white. Antennæ long (about  $8\frac{1}{2}$  mm.); third joint hardly longer than second; flagellum entirely very bright fulvous beneath; fourth joint (first long joint of flagellum) long, much longer than fifth; joints entirely without longitudinal keels. Mesothorax densely punctured; tegulæ fulvous, with fulvous hair; hair of legs pale ochraceous (no black), that of hind tibiæ and tarsi strongly but briefly plumose; hair on inner side of tarsi ferruginous; apices of middle and hind femora, apices of all the tibiæ, and the tarsi entirely, ferruginous; hind tibiæ and basal joint of tarsi with black specks. Wings strongly smoky, yellowish basally, nervures and stigma rather dark ferruginous; second submarginal cell very large, very nearly as large as the first, receiving the recurrent nervure near the end; third submarginal cell narrowed much more than half to marginal. Abdomen rather narrow, with abundant coarse hair, erect and fulvo-ochraceous on first segment; ochraceous on second to fourth, but these segments have also black hair on the apical middle, and the fourth has black hair at base; fifth and sixth segments, and apex, entirely black, with black hair, but pale hair from the venter showing as a tuft on each side; apical plate dark red; hair of venter pale, with a good deal of black on middle of fourth and fifth segments, the apical segment dark reddish, fringed with black. Easily known from *M. aurigenia* by the colour of the abdominal pubescence; from *M. grindelie* by the longer antennæ, colour of pubescence, &c.

*Hab.* Mesilla Park, New Mexico, at flowers of *Kallstræmia*; July 27 (*Cockerell*).

It had previously visited an asclepiad, as shown by pollen-masses adherent to two of the legs.

*Melissodes kallstræmiæ*, var. *phenacoides*, nov.

♂.—Abdomen broader, with the ochreous pubescence replaced by white, except that the first segment has the hair faintly yellowish; the fifth segment has, in addition to the black, a few long white hairs; the hair of the vertex and thorax above is pallid, faintly tinged with ochraceous; the third antennal joint is a little longer; the nervures are clear ferruginous; the claws are larger, those on the hind legs being very large.

*Hab.* Las Cruces, New Mexico, Aug. 25, 1894 (*Cockerell*, 2027).

This is the insect which has gone in the New Mexico list *Ann. & Mag. N. Hist.* Ser. 7. Vol. xvi. 15

as *M. communis*, Cresson, having been so determined by Mr. Fox. The total absence of black hair on the thorax, the very large second submarginal cell, and the entirely ferruginous tarsi, separate it sufficiently from *M. communis* of the Eastern States. The variety differs from the type much as *M. agilis* differs from *M. aurigena*.

*Xenoglossodes gutierreziae*, sp. n.

♀.—Agrees with *X. eriocarpi* (Ckll.), except in the following characters:—

Larger (length 10 mm. or rather more); flagellum black, and rather longer; mandibles with no yellow spot or patch; upper margin of yellow on clypeus straight; labrum black; hind margin of first abdominal segment much more narrowly pallid.

*Hab.* Fillmore Cañon, Organ Mts., New Mexico, at flowers of *Gutierreziae* (the hind legs are loaded with the bright orange pollen), Aug. 29 (*C. H. T. Townsend*).

*Diadasia enavata*, Cresson.

At Mesilla, New Mexico, July 18, I took three females at flowers of *Helianthus annuus*.

*Crocisa Wallacei*, sp. n.

♂.—Length 9 mm. (but abdomen much retracted in specimen measured); wing  $9\frac{1}{2}$  mm.

Belongs to the group of *C. histrio* (scutellum with **W**-like margin, abdomen with lateral marks not divided), and has the blue patches consisting of very bright and shining scales, in the manner of *C. cæruleifrons*. Differs from *C. nitidula* by having two blue spots on the scutellum, and the first abdominal segment with very large quadrangular lateral blue patches, leaving a black median band and the hind margin, like a reversed **T**. The entirely black tarsi, without any blue scales, and the smaller size separate it from *C. abdominalis*, Friese (from Java). The abundant blue spotting on the thorax and other characters separate it from *C. nana*, Friese. Apical half of labrum ferruginous; clypeus except anterior margin (which is broadly black and densely punctate) and sides of face up to level of ocelli covered with very brilliant silvery blue-green scales; middle of front black and punctured, the punctures of two sizes, not dense; antennæ black, the flagellum greyish; third antennal joint a little shorter than fourth; front and vertex

with black hair; thorax with blue or greenish-blue patches as follows: a very large one on upper and a small transverse one on lower part of pleura; a transverse one on each side of prothorax above, joining one on contiguous part of mesothorax; an elongate one on anterior middle, a round one on each side, and an axe-shaped one at each hind corner of mesothorax; a speck on each axilla; two spots on scutellum; interrupted bright blue bands on abdominal segments 1 to 5, that on 1 as already indicated; venter of abdomen entirely black, strongly punctate; apex truncate, faintly submarginate; tibiæ largely blue on outer side; tegulæ black, very densely punctured; wings fuliginous, with a violet lustre.

*Hab.* Ternate; with numbers 6263 and 92-44.

Named after Dr. A. R. Wallace. In British Museum Collection. It has a strong superficial resemblance to *C. cæruleifrons*.

*Crocisa lamprosoma*, Boisd.

Queensland (*E. Saunders*); three.

*Crocisa cæruleifrons*, W. F. Kirby.

Friese makes this a synonym of *C. quartina*, Gribodo, but Mr. Kirby's name appears to have priority. It is recorded from Timor Laut and Celebes; the Australian specimens before me appear to be certainly the same species, but they offer varietal or racial characters:—

Var.  $\alpha$ .—A little larger; thoracic spots well-defined; hair of middle of occiput black, with white on each side; apex of male abdomen more narrowly truncate. Queensland (*E. Saunders*), 2 ♀, 1 ♂.

Var.  $\beta$ . *Darwini*.—Smaller, not over 9 mm. long; thoracic spots greenish and less defined, confluent on anterior part of mesothorax in ♂; occiput with a complete conspicuous fringe of white hair; apex of male abdomen more broadly truncate, the truncation concave; wings rather paler. The scutellum and tarsi are without blue. Port Darwin, N. Australia, no. 90-126; one of each sex.

*Crocisa tincta*, sp. n.

♀.—Length about 15 mm.

With the abdomen rather long and acuminate; upper wings dark fuscous, lower hyaline; light spots consisting of

hair or elongated scales, which are not shiny; those on head, thorax, and legs white or practically so, on abdomen pale blue; margin of scutellum **W**-like; lateral abdominal patches not divided. A species of the *C. histrio* group, easily known by its large size, and the absence of light marks on scutellum or tarsi. Mandibles with a blunt tooth within; eyes straw-yellow; face, cheeks, and occiput with much white hair; front strongly and densely punctured; third anteanal joint conspicuously longer than fourth; upper part of pleura covered with white hair, lower part nude, strongly and closely punctured, with a small spot of white hair; mesothorax with anterior margin except in middle, and extending on to prothorax, covered with white hair; lateral margins, and posterior ones except in middle, a median stripe anteriorly, and a spot on each side, also marked with hair; tibiæ with large light patches; tegument of abdomen slightly purplish on middle of first two segments; abdominal bands all very broadly interrupted in middle, that on first segment forming a large **U**-like mark on each side, that on fifth reduced to a pair of large round spots; venter without light markings.

*Hab.* Toowoomba, Australia, no. 93. 189.

Two specimens. The locality is in S.E. Queensland.

*Trigona canifrons*, Smith.

Adelaide River, Australia, no. 92-4. New to Australia.

The specimen differs from Bingham's description of *canifrons* in having the hair of the pleura pale cinereous, and the stigma and nervures fuscous; but a series of *T. canifrons* from Ceylon, received from Mr. Green, shows these characters, just as in the Australian insect. Judging from the description, I suspect that *T. biroï*, Friese, is a synonym.

*Trigona essingtoni*, sp. n.

Worker; length 4 mm.

Black (the abdomen brown-black), smooth and shining, with pale yellow markings as follows: mandibles (except ferruginous tips), labrum, clypeus (except narrow, black, anterior and posterior margins, and two large red-brown spots on disc), wedge-shaped lateral face-marks extending to level of antennæ, tubercles, narrow stripe on each side of mesothorax, extending to axillæ, all of scutellum, and apex of abdomen, the last being thinly pubescent with white hair. Antennæ reddish brown, the flagellum ferruginous beneath;

anterior knees with a yellow spot; small joints of tarsi fulvous; face with a scanty pale pruinose pubescence; thorax with very scanty pale hair; wings hyaline, nervures and stigma flavous. Mandibles at apex with a concave truncation, or minutely bidentate.

*Hab.* Port Essington, N. Australia, with no. 42. 1.

Two specimens. Easily known from *T. australis*, Friese, by the entirely yellow scutellum, pale apex of abdomen, markings of clypeus, &c.

*Nomioides perditellus*, sp. n.

♀.—Length about 5 mm.

Head and thorax bluish green, shining; pubescence scanty, white, more abundant on apex and underside of abdomen; eyes strongly emarginate; clypeus light yellow with two broad black bars (sometimes practically obsolete); mandibles yellowish with ferruginous tips; tubercles and adjacent upper border of prothorax, and tegulæ, light yellow; wings clear, nervures pale testaceous, first recurrent nervure joining second transverso-cubital; antennæ dark above and light beneath; femora black, with the knees yellow; tibiæ and tarsi yellow, the middle and hind tibiæ largely clouded with black or brown; abdomen broad, picous, with a large transverse yellow mark on each side of segments 2 to 5, those on 5 nearly meeting to form a continuous band; venter brown.

*Hab.* Queensland, marked "Seaf. 1/90," 438, and 92-16, two specimens. A third is marked Queensland, 2200, 75. 39.

Very distinct by the marking of the abdomen; the genus is new to Australia. It is extraordinarily like some of the species of the American genus *Perdita*, agreeing even in the details of the marking on the clypeus and abdomen; but the venation agrees with *Halictus*.

*Thaumatoma Duboulayi*, Smith.

Port Darwin, N. Australia, 92-44; Bandin I., 91-82.

The latter specimen has the fourth and fifth abdominal segments broadly margined with red.

*Cælixys reginæ*, sp. n.

♀.—Length a little over 11 mm.; expanse  $19\frac{1}{2}$  mm.

Black, even to the tarsi; pubescence on eyes very short; clypeus shining, with extremely large close punctures; face covered with white hair; vertex, mesothorax, and



scutellum with extremely large punctures, as close as possible on scutellum, but well separated on middle of mesothorax; lateral teeth of scutellum well-developed, broad and pointed, not or hardly curved; sides of metathorax, tubercles, and margins of pleura with snow-white hair; cheeks and occiput also with white hair, but vertex bare; a small white hair-spot on each side of thorax above and behind tegulæ, and two short white stripes in scutello-mesothoracic suture; tegulæ black; wings strongly infuscated on apical half, the basal part nearly clear; hair on inner side of hind tarsi fulvous. Abdomen shining, with strong punctures, quite close at the sides, but widely separated above; lateral hind margins of the segments with white hair-bands, which are not continued across the disk, though on the ventral surface the bands are entire; last dorsal segment with close minute punctures, strongly keeled for rather more than two thirds of its length, the keel abruptly failing anteriorly, outline of the segment conical, the apex not turned upwards, and falling far short of the apex of the last ventral segment; last ventral segment acuminato-conical in outline, not greatly narrowed or produced, but conspicuously notched on each side, slightly concave beneath; penultimate ventral segment with the anterior part strongly and closely punctured, the posterior part finely rugose.

*Hab.* Queensland; with nos. 320 and 92-16.

Smith long ago remarked that it was singular that *Cælioxyx* should be absent from Australia, while *Megachile* is so abundant. It is therefore of special interest to record two species from that country. W. A. Schulz has recently described a species (*C. Weinlandi*) from New Guinea; it is considerably larger than *C. reginæ*, and the last ventral segment is very slender, hairy at the sides, and not notched.

*Cælioxyx albolineata*, sp. n.

♀.—Length a little over 9 mm.

Similar to *C. reginæ* in appearance, but smaller, and differing as follows: middle of mesothorax shining, with sparse *small* punctures, much smaller than those at the sides; scutellum flattened and somewhat *concave*, shining, and with *very sparse punctures*, the disk nearly impunctate, and the middle hind margin with a *deep rounded notch*; on each side of disk of scutellum, anteriorly, is a rather large oblique patch of white hair; legs with conspicuous white hair; wings not so dark; abdomen with five entire, though narrow, white hair-



bands; dorsal punctures sparser; last dorsal segment narrower, with the keel shorter and less distinct; last ventral segment *not notched at the sides*; penultimate ventral segment with rather sparse, rather elongated punctures all over, or they may be dense posteriorly.

*Hab.* Queensland (*E. Saunders*), with nos. 93-49 and 320. Another bears no locality-label, but simply the number 1904-27.

*Megachile cleomis*, var. *lippiae*, Ckll.

Mr. Wilmon Newell kindly sends me a female collected by Mr. F. Beltran at Monterey, Mexico, where the species is very destructive to rose-bushes. This extends the known range about 600 miles S.E. The specimen is peculiar in having the punctures of the middle of the mesothorax larger and less dense than normal, and the ventral scopa lacks the yellowish tinge. Possibly a series would prove that the Monterey insect should be subspecifically separated.

*Bombus gilgitensis*, sp. n.

♀.—Length about 23 mm.; wing about 16; abdomen nearly parallel-sided, about 9 mm. (or a little over) wide and almost 15 long.

Black, with black, dull white, and bright fulvo-ferruginous hair; hair of head all black, except that on occiput it has a purplish-brown tint; hair of legs black, the apices of the tarsal joints with short deep red spine-like bristles, hair on inner side of basal joint of hind tarsi a very dark reddish; thorax in front with abundant dull white hair, a very broad band of purplish-black hair between the wings; scutellum with dull white hair mixed with black; base of abdomen with dull white hair, covering first segment and basal half of second, except at sides, the rest, including apex, black, except the fourth and fifth segments, which are covered with long fulvo-ferruginous hair, the base of the fourth being overlapped by the black of the third; ventral segments with very thin fringes of long hair, black on the first three segments, fulvo-ferruginous on the fourth and fifth. Wings strongly clouded, with a warm red tint. Head not elongated; malar space broader than long. Middle of mesothorax with a large nude shining impunctate area, the region surrounding it strongly and closely punctured.

*Hab.* Gilgit, Kashmir; collector unknown to me. (British Museum Collection.)

Allied to *B. tunicatus*, Smith, but the black bands on thorax and abdomen are broader, and the last abdominal segment has black hair instead of red. The upper level of the black of the abdomen, which in *tunicatus* is straight, in *gilgitensis* is strongly concave. The apical segment in *gilgitensis* is bare above, minutely roughened but not noticeably punctate, not carinate; at the sides the segment is densely covered with brown-black tomentum. The wings are not so dark as those of *B. orientalis*, Smith.

*Xylocopa varipuncta*, Patton.

Texas, no. 1977, ♂. (Colorado Agricultural College Collection.) New to Texas.

*Xylocopa bryorum* (Fabr.), subsp. *dimidiata* (Lep.).

Six ♀s, Queensland (*E. Saunders*); Condillac I., W. Australia; Port Darwin. One ♂, Queensland (*E. Saunders*). The male is a little over 21 mm. long, and the middle tibiae and tarsi are without dark hair. The female is of the same size; the yellow pubescence spreads on to the occiput and the upper part of the pleura, but not at all on to the basal segment of the abdomen. This insect appears to be intermediate between *X. bryorum* and *X. aestuans*, as defined by Bingham; it is probable that it should be recognized as a subspecies, in which case the name *dimidiata*, Lep., is apparently available.

*Lestis ærata*, Smith.

3 ♂s, Queensland (*E. Saunders*); Sydney. 7 ♀s, Queensland (*E. Saunders*); N. S. Wales.

*Synhalonia lippiae* (Ckll.).

*Synhalonia crenulaticornis*, subsp. *lippiae*, Ckll., Ann. & Mag. Nat. Hist., July 1904, p. 25.

A female collected by Prof. Townsend at the same time and place as the original males shows that *lippiae* is a distinct species. Compared with ♀ *crenulaticornis* it is larger (about 1.2 mm. long), with much longer and ampler wings, which are not quite so dark, and the pubescence of the thorax above is white with a very faint yellowish tinge, becoming pronounced on scutellum, but with no fuscous or black, whereas *crenulaticornis* shows much dark fuscous hair on mesothorax and scutellum. The abdomen also has more white tomentum, covering the base of the second and third segments, while

the apical band on the second is broadly interrupted in the middle, and the tomentum is of a sort of bluish white, a different tint from that of *crenulaticornis*. The brush at the end of the basal joint of the hind tarsi, which is black in *crenulaticornis*, is reddish brown in *lippiae*.

I have a ♂ *S. lippiae* which I collected at flowers of *Phacelia congesta*, at Dripping Spring, Organ Mts., New Mexico, in August.

XXVII.—*A Revision of the Fishes of the American Cichlid Genus Cichlosoma and of the Allied Genera.* By C. TATE REGAN, B.A.

[Continued from p. 77.]

Section 6 (*Theraps*).

Body ovate or elongate. Upper profile of snout usually convex. Scales of the lateral line of the same size as those above and below it; scales of the thoracic region considerably smaller than those on the side of the body. Mouth small or moderate (maxillary not extending to below the eye), moderately protractile (præmaxillary processes not extending to above the eye, in the adult); maxillary not or slightly exposed; teeth of the outer series moderate, distinctly enlarged anteriorly. Dorsal XV–XVIII 10–15, the soft fin more or less distinctly scaly at the base. Anal IV–VII 8–11. Pectoral not extending to above the anal. Caudal rounded, truncate, or emarginate with rounded lobes.

Seventeen species from Mexico and Central America, one extending into Colombia.

13. *Cichlosoma Eigenmanni*.

*Cichlasoma Eigenmanni*, Meek, Zool. Pub. Columbian Mus. iii. 1902, p. 119, pl. xxx., and v. 1904, p. 220, pl. xvi.

Depth of body  $2\frac{1}{3}$ – $2\frac{3}{5}$  in the length, length of head  $3\frac{1}{4}$ – $3\frac{1}{2}$ . Snout equal to or a little shorter than postorbital part of head. Diameter of eye  $3\frac{1}{4}$ – $4\frac{1}{4}$  in the length of head, interorbital width  $2\frac{3}{5}$ –3. Depth of præorbital  $1$ – $1\frac{1}{4}$  the diameter of eye. Maxillary not extending to below the eye; lower jaw shorter than the upper; fold of the lower lip not continuous; check with 6 or 7 series of scales; 8 gill-rakers on the lower

part of anterior arch. Scales 34-35  $\frac{5\frac{1}{2}-6}{13-15}$ , 3 or  $3\frac{1}{2}$  between lateral line and base of anterior rays of soft dorsal. Dorsal XVII-XVIII 12-15, commencing above the opercular cleft, the spines subequal from about the sixth to the fifteenth, thence increasing to the last, which is  $\frac{1}{2}$  the length of head; soft fin, when laid back, extending to base of caudal. Anal V-VI 8-10. Pectoral  $\frac{3}{4}$  the length of head, not extending so far as the ventral, which nearly reaches the origin of anal. Caudal truncate. Caudal peduncle about as long as deep. Olivaceous, with obscure darker cross-bars and with a blackish longitudinal band from operculum to base of caudal, where it ends in a dark spot; vertical fins dusky.

Southern Mexico.

1 4. (112-235 mm.)                      Rio Tonto, La Raya.                      Dr. H. Gadow.

#### 14. *Cichlosoma nebuliferum*.

*Heros nebulifer*, Günth. Proc. Zool. Soc. 1860, p. 318, and Cat. Fish. iv. p. 297 (1862).

*Heros gibbiceps*, Steind. Denkschr. Ak. Wien, xxiii. 1864, p. 66, pl. v. figs. 1 & 2; Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1898, p. 1536; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 232 (1904).

*Cichlasoma nebuliferum*, Jord. & Everm. *t. c.* p. 1524; Pellegr. *t. c.* p. 216; Meek, Zool. Pub. Columbian Mus. v. 1904, p. 220.

*Cichlasoma teapae*, Everm. & Goldsborough, Bull. U.S. Fish. Comm. xxi. 1902, p. 156, fig.; Pellegr. *t. c.* p. 213.

Depth of body  $2\frac{1}{2}$ - $2\frac{2}{3}$  in the length, length of head  $3\frac{2}{3}$ -4. Snout shorter than postorbital part of head. Diameter of eye  $4-4\frac{1}{3}$  in the length of head, interorbital width 3. Depth of præorbital  $1-1\frac{1}{4}$  the diameter of eye. Maxillary not nearly extending to vertical from anterior margin of eye; lower jaw shorter than the upper; fold of the lower lip not continuous; cheek with 5 or 6 series of scales; 8 or 9 gill-rakers on the lower part of anterior arch. Scales 33-35  $\frac{6}{12-14}$ ,  $3\frac{1}{2}$  or 4 between lateral line and base of anterior part of soft dorsal. Dorsal XVII-XVIII 12-13 (14), commencing above extremity of operculum, the spines subequal from about the seventh to the fourteenth, which are  $\frac{1}{2}$  the length of head, thence increasing to the last, which is  $\frac{3}{5}$  the length of head; the soft fin, when laid back, extending to base of caudal. Anal VI 9 (10). Pectoral  $\frac{4}{5}$  the length of head; ventral as long, not quite reaching the origin of anal. Caudal truncate or subtruncate. Caudal peduncle as long as or longer than deep. Olivaceous, each scale with a dark brown intra-marginal line; a series of dark blotches

on the side, usually more or less confluent to form a longitudinal band; a dark spot on the base of caudal; vertical fins dusky, the dorsal with some light spots posteriorly.

Southern Mexico.

1-3. (147-172 mm.) types of the species. Mexico. M. Sallé.

### 15. *Cichlosoma maculicauda*, sp. n.

*Heros parma* (part.), Günth. Cat. Fish. iv. p. 285 (1862), and Trans. Zool. Soc. vi. 1869, p. 449.

*Cichlasoma parma* (part.), Jord. & Everm. Bull. U.S. Nat. Mus. xvii. 1898, p. 1519.

*Cichlasoma fenestratum*, var. *parma*, Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 210 (1904).

Depth of body  $1\frac{2}{3}$ -2 in the length, length of head  $2\frac{5}{8}$ - $3\frac{1}{3}$ . Snout as long as the postorbital part of head (in the adult), or a little shorter (in the young). Diameter of eye  $3-4\frac{3}{4}$  in the length of head, interorbital width  $2\frac{1}{3}$ - $2\frac{3}{4}$ . Depth of præorbital  $\frac{3}{5}$ - $1\frac{1}{2}$  the diameter of eye. Maxillary extending to between nostril and eye; jaws equal anteriorly; fold of the lower lip not continuous; cheek with 4 or 5 series of scales; 8 or 9 gill-rakers on the lower part of the anterior arch. Scales 32-35  $\frac{5\frac{1}{2}-7}{14-15}$ , 4 between lateral line and base of anterior part of soft dorsal. Dorsal\* XVI-XVII 12-14, commencing above the extremity of operculum, the spines only slightly increasing after the sixth, the last  $\frac{3}{4}$  or nearly  $\frac{3}{5}$  the length of head; soft fin, when laid back, extending to anterior  $\frac{1}{3}$  (young) or beyond the middle (adult) of caudal. Anal VI-VII 9-10. Pectoral a little shorter than the head, extending to above the vent; ventral extending to the origin of anal or beyond. Caudal subtruncate. Caudal peduncle  $\frac{1}{2}$ - $\frac{3}{4}$  as long as deep. Sides of body and vertical fins usually with dark spots; a large dark blotch on the caudal peduncle.

Central America.

1-4. (135-189 mm.) types of the species.	Lake Yzabal.	O. Salvin, Esq.
5. (223 mm.)	Rio Motagua.	O. Salvin, Esq.
6-10. (205-301 mm.)	Rio Chagres.	O. Salvin, Esq.
11-13. (68-90 mm.)	Rio Chagres.	O. Salvin, Esq.

### 16. *Cichlosoma fenestratum*.

*Chromis fenestrata*, Günth. Proc. Zool. Soc. 1860, p. 318.

*Heros parma* (part.), Günth. Cat. Fish. iv. p. 285 (1862), and Trans. Zool. Soc. vi. 1869, p. 449.

\* Of 13 specimens 10 have XVII 13, 2 have XVII 12, and 1 has XVI 14 dorsal rays. 8 have VI 10, 4 have VI 9, and 1 has VII 10 anal rays.

*Heros fenestratus*, Günth. t. c. p. 286; Steind. Denkschr. Ak. Wien, xxiii. 1864, p. 68, pl. i. fig. 2.

*Cichlasoma fenestratum*, Jord. & Everm. Bull. U.S. Nat. Mus. xvii. 1898, p. 1518.

*Cichlasoma parma* (part.), Jord. & Everm. t. c. p. 1519.

*Cichlasoma fenestratum* (part.), Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 210 (1904).

*Cichlasoma parma*, Meek, Zool. Pub. Columbian Mus. v. 1904, p. 218, pl. xv.

Depth of body  $1\frac{3}{4}$ -2 in the length, length of head  $2\frac{5}{8}$ - $3\frac{1}{4}$ . Snout shorter than the postorbital part of head. Diameter of eye  $3\frac{1}{5}$ - $4\frac{2}{3}$  in the length of head, interorbital width  $2\frac{1}{5}$ - $2\frac{3}{4}$ . Depth of preorbital  $\frac{2}{3}$ - $1\frac{1}{3}$  the diameter of eye. Maxillary extending to between nostril and eye; jaws equal anteriorly; fold of the lower lip not continuous; cheek with 5 or 6 series of scales; 8-10 gill-rakers on the lower part of the anterior arch. Scales 31-33  $\frac{5-6}{12-14}$ , 3 or  $3\frac{1}{2}$  between lateral line and base of anterior part of soft dorsal. Dorsal \* XVII-XVIII 11-13, commencing above the opercular cleft, the spines only slightly increasing after the sixth, the last  $\frac{1}{2}$  the length of head; soft fin, when laid back, extending to anterior part (young) or beyond the middle (adult) of caudal. Anal VI-VII 8-9. Pectoral a little shorter than the head, extending to above the vent; ventral extending nearly to origin of anal or slightly beyond. Caudal subtruncate. Caudal peduncle  $\frac{1}{2}$ - $\frac{3}{4}$  as long as deep. Brownish, usually with 6 to 8 dark cross-bars and with a dark longitudinal band from operculum to the basal part of caudal. Sometimes this band is very strongly marked, and the cross-bars may then be confined to the upper part of the body, or may be wanting.

#### Mexico.

1-2. (98 and 145 mm.) types of the species.	Mexico.	M. Sallé.
3-5. (77-103 mm.)	Mexico.	M. Sallé.
6-8. (186-228 mm.) types of <i>H. parma</i> .	Mexico.	Berlin Mus.
9. (57 mm.)	Chimalapa.	Dr. A. C. Buller.
11-16. (52-181 mm.)	Rio Tonio, La Raya.	Dr. H. Gadow.
17. (128 mm.)	Motzorongo.	Dr. H. Gadow.

#### 17. *Cichlosoma bifasciatum*.

*Heros bifasciatus*, Steind. Denkschr. Ak. Wien, xxiii. 1864, pt. ii. p. 60, pl. ii.

*Cichlasoma bifasciatum*, Jord. & Everm. Bull. U.S. Nat. Mus. xvii. 1898, p. 1521; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 217 (1904).

\* Of 17 examples 8 have XVII 12, 3 have XVII 11, 2 have XVII 13, 3 have XVIII 12, and 1 has XVIII 13 dorsal rays. 10 have VI 9, 5 have VI 8, one has VII 8, and one VII 9 anal rays.

Depth of body 2 in the length, length of head  $3\frac{1}{3}$ . Snout as long as the postorbital part of head. Diameter of eye 5 in the length of head. Depth of præorbital  $1\frac{1}{3}$  the diameter of eye. Maxillary not extending to below the eye; jaws equal anteriorly; fold of the lower lip not continuous; cheek with 5 or 6 series of scales; 9 or 10 gill-rakers on the lower part of the anterior arch. About 34 scales in a longitudinal series. Dorsal XVII 13, commencing above the opercular cleft, the spines subequal from the sixth, the last  $\frac{1}{2}$  the length of head. Anal VI 9. Pectoral not extending to above the anal. Caudal truncate. Caudal peduncle as long as deep. Two broad dark longitudinal bands, the upper from a little behind the origin of the lateral line to the end of the base of the dorsal fin, the lower from the pectoral to the base of the caudal.

Mexico.

The type measures 240 mm. in total length.

#### 18. *Cichlosoma guttulatum*.

*Heros guttulatus*, Günth. Proc. Zool. Soc. 1864, p. 152, and Trans. Zool. Soc. vi. 1869, p. 466, pl. lxxviii. fig. 3.

*Cichlasoma guttulatum*, Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 214 (1904).

Depth of body  $2\frac{1}{4}$ – $2\frac{3}{5}$  in the length, length of head  $2\frac{5}{6}$ – $3\frac{2}{5}$ . Snout as long or nearly as long as the postorbital part of head. Diameter of eye  $3$ – $4\frac{2}{3}$  in the length of head, interorbital width  $2\frac{1}{3}$ – $2\frac{4}{5}$ . Depth of præorbital  $\frac{3}{4}$ – $1\frac{1}{3}$  the diameter of eye. Maxillary not extending to the vertical from anterior margin of eye; jaws equal anteriorly; fold of the lower lip not continuous; cheek with 5 series of scales; 8–10 gill-rakers on the lower part of anterior arch. Scales  $31$ – $34$   $\frac{5-6}{12-13}$ ,  $3\frac{1}{2}$ – $4\frac{1}{2}$  between lateral line and base of anterior part of soft dorsal. Dorsal XVI–XVIII 12–14, commencing above or in front of the axil of pectoral, the spines subequal from the fifth or sixth to the fourteenth or fifteenth, which are  $\frac{1}{3}$  the length of head, the last  $\frac{2}{5}$  the length of head; the soft fin, when laid back, extending to anterior  $\frac{1}{4}$  of caudal. Anal VI–VII 9–10. Pectoral  $\frac{3}{4}$  the length of head, not extending as far as the ventral, which nearly or quite reaches the origin of anal. Caudal subtruncate or rounded. Caudal peduncle as long or nearly as long as deep. Brownish, a broad dark band extending from above pectoral to base of caudal; sides of head spotted; body often spotted; sometimes 5 or 6 cross-bars on the upper part of the body, or a series of blotches along the lateral line; vertical fins dusky, often with dark spots.

Guatemala; Southern Mexico.



1-9. (69-176 mm.) types of the species.	Lake Amatitlan.	O. Salvin, Esq.
10. (150 mm.)	Nr. Pacific Coast of C. America.	O. Salvin, Esq.
11-19, 20-25. (62-221 mm.)	Lake Nacasil.	O. Salvin, Esq.
26. (211 mm.)	Rio de Sarabia.	Dr. A. C. Buller.

### 19. *Cichlosoma microphthalmus*.

*Heros microphthalmus*, Günth. Cat. Fish. iv. p. 295 (1862), and Trans. Zool. Soc. vi. 1869, p. 464; Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1898, p. 1536; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 232 (1904).

Depth of body  $2\frac{1}{3}$ - $2\frac{1}{2}$  in the length, length of head  $3\frac{1}{5}$ - $3\frac{2}{5}$ . Snout nearly as long as postorbital part of head. Diameter of eye  $4\frac{1}{3}$ - $5\frac{1}{4}$  in the length of head, interorbital width  $2\frac{2}{5}$ - $2\frac{3}{4}$ . Depth of præorbital  $1\frac{1}{6}$ - $1\frac{2}{5}$  the diameter of eye. Maxillary extending to the vertical from anterior margin of eye; jaws equal anteriorly; fold of the lower lip continuous; cheek with 5 or 6 series of scales; 7 or 8 gill-rakers on the lower part of the anterior arch. Scales 32-34  $\frac{5\frac{1}{2}-6\frac{1}{2}}{13-15}$ ,  $3\frac{1}{2}$  or 4 between lateral line and base of anterior part of soft dorsal. Dorsal XVIII 11-13, commencing above the axil of pectoral, the spines subequal from the seventh to the fourteenth, which are  $\frac{1}{3}$  the length of head, thence increasing to the last, which is more than  $\frac{2}{5}$  the length of head; the soft fin, when laid back, extending to anterior part or middle of caudal. Anal V-VI\* 9-11. Pectoral  $\frac{3}{4}$  the length of head, not extending so far as the ventral, which does not reach the origin of anal. Caudal subtruncate. Caudal peduncle  $\frac{4}{5}$ - $\frac{7}{8}$  as long as deep. Brownish, usually with 4 or 5 irregular dark cross-bars; a dark spot on the base of caudal; vertical fin with series of dark spots or dark undulating lines.

R. Motagua, Guatemala.

1-3, 4-5. (165-195 mm.) types of the species.	R. Motagua.	O. Salvin, Esq.
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### 20. *Cichlosoma sexfasciatum*, sp. n.

Depth of body  $2\frac{1}{4}$  in the length, length of head  $3\frac{2}{5}$ . Snout as long as postorbital part of head. Diameter of eye  $5\frac{1}{2}$  in the length of head, interorbital width  $2\frac{1}{3}$ . Depth of præorbital  $1\frac{2}{3}$  the diameter of eye. Maxillary extending to between nostril and eye; jaws equal anteriorly; fold of the lower lip not continuous; cheek with 6 series of scales; 7 or 8 gill-rakers on the lower part of the anterior arch.

\* One specimen only has 5 anal spines.



Scales  $33\frac{6}{14}$ ,  $3\frac{1}{2}$  between lateral line and base of anterior part of soft dorsal. Dorsal XVIII 11, commencing above the extremity of operculum, the spines slightly increasing in length to the last, which is a little more than  $\frac{2}{3}$  the length of head; soft fin, when laid back, extending to anterior  $\frac{1}{3}$  of caudal. Anal VI 9. Pectoral  $\frac{3}{4}$  the length of head, not extending to above the vent; ventrals extending to the vent. Caudal subtruncate. Caudal peduncle  $\frac{2}{3}$  as long as deep. Olivaceous, with small dark spots; 6 dark cross-bars on the side, and a dark longitudinal band from operculum to base of caudal.

Guapote, Mexico.

1. (223 mm.) type of the species. Guapote. Mexico Mus.

### 21. *Cichlosoma melanurum*.

*Heros melanurus*, Günth. Cat. Fish. iv. p. 288 (1862), and Trans. Zool. Soc. vi. 1869, p. 450, pl. lxxii. fig. 3.

*Heros melanopogon*, Steind. Denkschr. Ak. Wien, xxiii. 1864, p. 72, pl. i. fig. 3.

*Cichlasoma melanopogon*, Jord. & Everm. Bull. U.S. Nat. Mus. xvii. 1898, p. 1523.

*Cichlasoma melanurum*, Jord. & Everm. l. c.; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 212 (1904).

Depth of body  $2\frac{1}{5}$ – $2\frac{2}{3}$  in the length, length of head 3– $3\frac{1}{4}$ . Snout as long as postorbital part of head. Diameter of eye 3–5 in the length of head, interorbital width  $2\frac{3}{5}$ –3. Depth of præorbital  $\frac{2}{3}$ – $1\frac{1}{2}$  the diameter of eye. Maxillary not extending to below the eye; jaws equal anteriorly; fold of the lower lip subcontinuous or not continuous; cheek with 5 or 6 series of scales; 7 or 8 gill-rakers on the lower part of anterior arch. Scales 31– $34\frac{5-6}{13-14}$ , 3 between lateral line and base of anterior rays of soft dorsal. Dorsal (XVI) XVII–XVIII 11 (12), commencing above the opercular cleft, the spines subequal from about the sixth to the tenth, thence sometimes slightly decreasing to the fourteenth or fifteenth and increasing again to the last, which is  $\frac{2}{5}$ – $\frac{1}{2}$  the length of head; soft fin, when laid back, extending a little beyond base of caudal. Anal V–VI 8–9. Pectoral about  $\frac{3}{4}$  the length of head, extending about to above the vent; ventral extending to origin of anal. Caudal subtruncate. Caudal peduncle  $\frac{3}{4}$ – $\frac{5}{6}$  as long as deep. Olivaceous, with 2 series of blackish spots which may unite to form continuous longitudinal bands, the first below the spinous dorsal and above the lateral line, the second from the middle of the side to the base of caudal; vertical fins dusky.

Guatemala; Southern Mexico.

- 1–5. (85–260 mm.) types of the species. Lake Peten. O. Salvin, Esq.

22. *Cichlosoma Gadovii*, sp. n.

? *Cichlasoma melanoaurum* (non Günth.), Meek, Zool. Pub. Columbian Mus. v. 1904, p. 219.

Depth of body  $2\frac{1}{3}$ - $2\frac{2}{5}$  in the length, length of head  $3$ - $3\frac{1}{2}$ . Snout a little shorter than postorbital part of head. Diameter of eye  $4$ - $4\frac{1}{2}$  in the length of head, interorbital width  $2\frac{1}{4}$ - $2\frac{2}{5}$ . Depth of præorbital  $1$ - $1\frac{1}{4}$  the diameter of eye. Maxillary not extending to below the eye; jaws equal anteriorly; fold of the lower lip not continuous; cheek with 5 series of scales; 8 gill-rakers on the lower part of anterior arch. Scales  $30\frac{5}{13}$ , 3 between lateral line and base of anterior rays of soft dorsal. Dorsal XVI-XVII 12, commencing above the extremity of operculum, the spines subequal from the sixth or seventh to the thirteenth or fourteenth, thence increasing to the last, which is a little less than  $\frac{1}{2}$  the length of head; the soft fin, when laid back, extending to anterior  $\frac{1}{3}$  of caudal. Anal VI 9. Pectoral  $\frac{5}{6}$  the length of head, extending nearly to above the vent; ventral extending nearly to origin of anal. Caudal subtruncate. Caudal peduncle  $\frac{3}{4}$ - $\frac{4}{5}$  as long as deep. Olivaceous, with obscure darker cross-bars and a dark longitudinal band from operculum to base of caudal; vertical fins dusky.

Southern Mexico.

1-2. (190 and 241 mm.) types of Motzorongo. Dr. H. Gadow.  
the species.

23. *Cichlosoma intermedium*.

*Heros intermedius*, Günth. Cat. Fish. iv. p. 298 (1862), and Trans. Zool. Soc. vi. 1869, p. 468, pl. lxxviii. fig. 1.

*Heros angulifer*, Günth. l. c. and t. c. p. 469, pl. lxxxv. fig. 1.

*Acara rectangularis*, Steind. Denkschr. Ak. Wien, xxiii. 1864, p. 57, pl. i. fig. 1.

*Cichlasoma rectangulare*, Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1898, p. 1515; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 205 (1904); Meek, Zool. Pub. Columbian Mus. v. 1904, p. 216.

*Cichlasoma anguliferum*, Jord. & Everm. t. c. p. 1517.

*Cichlasoma intermedium*, Jord. & Everm. l. c.; Pellegr. t. c. p. 209.

Depth of body  $2\frac{1}{4}$ - $2\frac{3}{5}$  in the length, length of head  $3$ - $3\frac{1}{4}$ . Snout as long or nearly as long as postorbital part of head. Diameter of eye  $3\frac{3}{4}$ -5 in the length of head, interorbital width  $2\frac{1}{3}$ - $2\frac{4}{5}$ . Depth of præorbital  $\frac{5}{6}$ - $1\frac{2}{5}$  the diameter of eye. Maxillary not extending to the vertical from anterior margin of eye; jaws equal anteriorly; fold of the lower lip not continuous; cheek with 4-6 series of scales; 7 or 8 gill-rakers on the lower part of anterior arch. Scales  $31$ - $33\frac{5-6}{12-13}$ ,

2 or  $2\frac{1}{2}$  between lateral line and base of anterior part of soft dorsal. Dorsal (XVI-XVII) XVIII 10-12 (13), commencing above the axil of pectoral, the spines subequal from about the seventh to fourteenth, which are about  $\frac{1}{3}$  the length of head, thence increasing to the last, which is  $\frac{2}{5}$  the length of head or more; the soft fin, when laid back, extending to anterior  $\frac{1}{4}$  of caudal. Anal (IV) V-VI 8-10 (11). Pectoral  $\frac{4}{5}$ - $\frac{5}{6}$  the length of head, usually not extending so far as the ventral, which does not quite reach the origin of anal. Caudal subtruncate. Caudal peduncle a little deeper than long. Brownish, with a broad dark band running from the operculum to the middle of the side and then upwards to the posterior part of the spinous dorsal; vertical fins usually with dark stripes or series of spots.

Guatemala.

a. *C. intermedium*.

Scales forming the dark band each light at the base and with a blackish vertical stripe near the posterior margin; a narrow longitudinal band from the angle of the broader band to the base of caudal, where it forms a vertically expanded spot.

1-3. (133-155 mm.) types of the Lake Peten. O. Salvin, Esq.  
species.

b. *C. anguliferum*.

Scales forming the dark band nearly uniformly blackish; a dark blotch on the caudal peduncle.

1-2. (96 and 113 mm.) types Rio de Santa Isabel. O. Salvin, Esq.  
of *H. angulifer*.

3-5. (134-177 mm.). R. Sta, near Cajabon. J. C. Sarg, Esq.

24. *Cichlosoma Guentheri*.

*Heros oblongus* (non Casteln.), Günth. Trans. Zool. Soc. vi. 1869, p. 464;  
Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1898, p. 1535.

*Cichlasoma Güntheri*, Pellegr. Mém. Soc. Zool. France, xvi. 1903,  
p. 215 (1904).

Depth of body  $2\frac{2}{3}$ - $2\frac{5}{6}$  in the length, length of head  $3\frac{1}{6}$ - $3\frac{2}{3}$ . Snout as long or nearly as long as postorbital part of head. Diameter of eye  $3\frac{2}{3}$ - $4\frac{1}{2}$  in the length of head, interorbital width  $2\frac{1}{2}$ -3. Depth of præorbital  $1-1\frac{1}{3}$  the diameter of eye. Maxillary not extending to the vertical from anterior margin of eye; jaws equal anteriorly; fold of the lower lip continuous or not; cheek with 5 series of scales; 7 or 8 gill-rakers on the lower part of anterior arch. Scales  $32-33\frac{5\frac{1}{2}}{13}$ ,

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$3\frac{1}{2}$  or 4 between lateral line and base of anterior part of soft dorsal. Dorsal XVIII 13, commencing above or slightly before axil of pectoral, the spines subequal from about the sixth to the fourteenth, which are  $\frac{1}{3}$  the length of head, thence increasing to the last, which is more than  $\frac{2}{3}$  the length of head; soft fin, when laid back, extending to anterior part or even to middle of caudal. Anal VI 9-10. Pectoral  $\frac{4}{5}$  the length of head, not extending as far as the ventral, which nearly or quite reaches the origin of anal. Caudal subtruncate. Caudal peduncle nearly as long as deep. Brownish, with 5 or 6 obscure darker cross-bars, and with a more or less distinct longitudinal band ending in a dark spot on the base of caudal; vertical fins with series of dark spots or dark undulating lines.

Rio Motagua, Guatemala.

- |   |              |                 |
|---|--------------|-----------------|
| 1-2. (186 and 209 mm.) types of<br>the species. | Rio Motagua. | O. Salvin, Esq. |
| 3-4. (108 and 131 mm.)                          | Rio Motagua. | O. Salvin, Esq. |

### 25. *Cichlosoma pavonaceum*.

*Heros pavonaceus*, Garman, Bull. Mus. Comp. Zool. viii. 1881, p. 93;  
Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1898, p. 1538; Pellegr.  
Mém. Soc. Zool. France, xvi. 1903, p. 230 (1904).

*Cichlasoma pavonaceum*, Meek, Zool. Pub. Columbian Mus. v. 1904,  
p. 209.

Depth of body equal to length of head,  $2\frac{2}{3}$  in the length. Eye large, its diameter greater than depth of præorbital. Maxillary not extending to below anterior margin of eye; jaws equal anteriorly; fold of the lower lip not continuous; cheek with 5 series of scales; 7 or 8 gill-rakers on the lower part of the anterior arch. Scales 32 ( $\frac{4}{12}$ ). Dorsal XVI 12, the spines subequal from the fifth, the last  $\frac{2}{5}$ - $\frac{1}{2}$  the length of head; soft fin, when laid back, extending beyond base of caudal. Anal V 8. Pectoral extending to above the vent; ventral to or nearly to origin of anal. Caudal rounded. Brownish, with 10 or 11 obscure dark cross-bars, and with a series of 4-6 blackish spots, usually ocellated and vertically expanded, below the dorsal fin in the posterior part of the body; a blackish ocellated spot on the upper half of the base of caudal.

Monclova, Mexico.

The types measure from 30-85 mm. The species is said to be allied to *C. intermedium*.

26. *Cichlosoma Sieboldii*.

*Heros Sieboldii*, Kner & Steind. Abhandl. Bayern Ak. x. 1864, p. 13, pl. ii. fig. 2.

*Cichlasoma Sieboldii*, Jord. & Everm. Bull. U.S. Nat. Mus. xvii. 1898, p. 1516.

Depth of body about  $2\frac{1}{3}$  in the length, length of head about  $3\frac{1}{4}$ . Snout as long as postorbital part of head. Diameter of eye 4-5 in the length of head and  $1\frac{1}{2}$ - $2\frac{1}{2}$  in the interorbital width. Maxillary not extending to below the eye; jaws equal anteriorly; fold of the lower lip not continuous; cheek with 5 series of scales; 8 or 9 gill-rakers on the lower part of the anterior arch. Scales 30-32  $\frac{4}{13}$ ,  $2\frac{1}{2}$  between lateral line and base of anterior part of soft dorsal. Dorsal XVII 11, the spines increasing in length to the last, which is about  $\frac{1}{3}$  the length of head; soft fin, when laid back, extending nearly to middle of caudal. Anal V 8. Pectoral  $\frac{2}{3}$ - $\frac{3}{4}$  the length of head; ventral extending to the vent. Caudal subtruncate or slightly rounded. Caudal peduncle about  $\frac{4}{5}$  as long as deep. Reddish brown; each scale with a dark spot; 5 or 6 dark cross-bars forming a series of blotches on the upper lateral line and a second larger series on the middle of the side; vertical fins dark greyish with series of blackish spots.

Panama; Colombia.

The types measure from 125 to 200 mm. in total length.

*Cichlosoma Deppii*, Heckel, from Mexico, appears to be closely allied to this species. D. XVI-XVII 10-11. A. V-VI 8. Sc. 30  $\frac{4\frac{1}{2}}{12-14}$ . Brownish, with 5 or 6 dark cross-bars posteriorly, the last forming a spot at the base of caudal. The synonymy of this species is as follows:—

*Heros Deppii*, Heck. Ann. Mus. Wien, ii. 1840, p. 382; Günth. Cat. Fish. iv. p. 296 (1862).

*Heros Montezuma*, Heck. t. c. p. 383; Günth. l. c.

*Cichlasoma Deppii*, Jord. & Everm. Bull. U.S. Nat. Mus. xvii. 1898, p. 1524; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 215 (1904); Meek, Zool. Pub. Columbian Mus. v. 1904, p. 221.

*Cichlasoma Montezuma*, Jord. & Everm. t. c. p. 1528; Meek, l. c.

27. *Cichlosoma Godmanni*.

*Heros Godmanni*, Günth. Cat. Fish. iv. p. 296 (1862), and Trans. Zool. Soc. vi. 1869, p. 466, pl. lxxiv. fig. 5.

*Cichlasoma Godmanni*, Jord. & Everm. Bull. U.S. Nat. Mus. xvii. 1898, p. 1516; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 208 (1904).

Depth of body  $2\frac{2}{3}$ - $2\frac{3}{4}$  in the length, length of head  $3\frac{1}{4}$ . Snout slightly shorter than postorbital part of head.

Diameter of eye  $4\frac{2}{3}$  in the length of head, interorbital width  $2\frac{4}{5}$ . Depth of præorbital  $1\frac{1}{4}$  the diameter of eye. Maxillary not extending to the vertical from anterior margin of eye; jaws equal anteriorly or the lower shorter than the upper; fold of the lower lip continuous or not; cheek with 6 or 7 series of scales; 7 or 8 gill-rakers on the lower part of anterior arch. Scales 32-33  $\frac{4\frac{1}{2}-5\frac{1}{2}}{13-14}$ , 3 or  $3\frac{1}{2}$  between lateral line and base of anterior part of soft dorsal. Dorsal XVI-XVII 12-13, commencing above axil of pectoral, the spines slightly increasing in length to the last, which is  $\frac{1}{3}$  the length of head, the soft fin, when laid back, extending to anterior  $\frac{1}{4}$  of caudal. Anal V 10. Pectoral  $\frac{3-\frac{1}{2}}{4-\frac{1}{2}}$  the length of head, not extending so far as the ventral, which does not reach the origin of anal. Caudal subtruncate. Caudal peduncle a little deeper than long. Olivaceous, with a dark longitudinal band along the middle of the side, ending in a blackish spot on the base of the caudal; a blackish spot above the origin of the band and below the lateral line; vertical fins with series of dark spots.

Guatemala.

1-2. (175 and 176 mm.) types of Rio Cahabon. O. Salvin, Esq.  
the species.

### 28. *Cichlosoma irregulare*.

*Theraps irregularis*, Günth. Cat. Fish. iv. p. 284 (1862); Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1898, p. 1540.

*Heros irregularis*, Günth. Trans. Zool. Soc. vi. 1869, p. 467, pl. lxxviii. fig. 2.

*Cichlasoma irregulare*, Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 204 (1904).

Depth of body 3- $3\frac{1}{2}$  in the length, length of head  $3\frac{1}{3}$ - $3\frac{2}{3}$ . Snout longer than postorbital part of head (in the adult). Diameter of eye 4-5 in the length of head, interorbital width 3-4. Depth of præorbital 1- $1\frac{1}{3}$  the diameter of eye. Maxillary not extending to below the eye; lower jaw shorter than the upper; fold of the lower lip not continuous; cheek with 6 or 7 series of scales; 9-11 gill-rakers on the lower part of anterior arch. Scales 33-36  $\frac{5-6}{13-15}$ , 3 between lateral line and base of anterior rays of soft dorsal. Dorsal XV-XVII 12-14, commencing behind the axil of pectoral, the spines subequal from about the fifth to the thirteenth, thence usually increasing to the last, which is  $\frac{1}{3}$ - $\frac{2}{5}$  the length of head; soft fin, when laid back, not extending to base of caudal. Anal\* IV-V 9-10. Pectoral about  $\frac{2}{3}$  the length

\* 4 anal spines in the type specimen only.

of head, not extending so far as the ventral, which nearly reaches the origin of anal in the young, but not in the adult. Caudal subtruncate. Caudal peduncle  $1\frac{1}{2}$ – $1\frac{2}{3}$  as long as deep. Brownish, with blackish cross-bars bearing a series of blotches below the lateral line, which may be more or less confluent to form a longitudinal band; some light blue spots on the side of the head. Vertical fins dusky.

Guatemala; Chiapas.

1. (144 mm.) type of the species.	Guatemala.	O. Salvin, Esq.
2. (150 mm.)	Guatemala.	Q. Salvin, Esq.
3–5. (112–124 mm.)	Rio Geronimo.	O. Salvin, Esq.
6. (114 mm.)	Lake Yzabal.	O. Salvin, Esq.
7–12. (88–193 mm.)	Rio Usamacineta.	O. Salvin, Esq.
13–14. (168 and 260 mm.)	Lake San Cristobal.	F. C. Sarg, Esq.

### 29. *Cichlosoma lentiginosum*.

*Heros lentiginosus*, Steind. Denkschr. Ak. Wien, xxiii. 1864, p. 62, pl. iii. fig. 1.

*Cichlasoma lentiginosum*, Jord. & Everm. Bull. U.S. Nat. Mus. xvii. 1898, p. 1524; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 217 (1904).

Depth of body  $2\frac{2}{3}$ – $2\frac{4}{5}$  in the length, length of head  $3\frac{1}{3}$ . Snout about as long as postorbital part of head. Diameter of eye nearly 5 in the length of head, interorbital width  $2\frac{1}{2}$ . Depth of præorbital  $1\frac{1}{3}$  the diameter of eye. Maxillary not nearly extending to below the eye; jaws equal anteriorly; fold of the lower lip not continuous; cheek with 6 series of scales; 10 gill-rakers on the lower part of the anterior arch. Scales  $34\frac{7}{14}$ . Dorsal XVII 13, commencing above the extremity of operculum, the last spine  $\frac{1}{2}$  the length of head; soft fin, when laid back, extending a little beyond the base of caudal. Anal VI 9. Pectoral  $\frac{3}{4}$  the length of head, extending nearly to above the vent; ventral extending nearly to origin of anal. Caudal slightly emarginate, with rounded lobes. Caudal peduncle a little longer than deep. Olivaceous, with 6 or 7 obscure darker cross-bars and with numerous small dark brown spots; vertical fins with dark spots.

Mexico.

The typical example measures 215 mm. in total length.

### Section 7.

Two species from Lake Nicaragua agree with those of the preceding section in all essential characters, but have a



somewhat longer pectoral, which extends to above the origin of the anal in one, a little beyond in the other. The teeth of the outer series in the upper jaw are moderate, regularly increasing in size anteriorly. In the lower jaw the 5 or 6 anterior teeth on each side are distinctly enlarged and differentiated from the smaller lateral teeth. Dorsal XVIII-XIX 10-11. Anal VII-VIII 7-9.

### 30. *Cichlosoma balteatum*.

*Heros balteatus*, Gill & Bransford, Proc. Ac. Philad. 1877, p. 184.

*Cichlasoma balteatum*, Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1898, p. 1521; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 220 (1904).

Depth of body  $2\frac{1}{2}$  in the length, length of head  $3\frac{1}{4}$ . Snout a little longer than postorbital part of head. Diameter of eye 3 in the length of head and equal to the interorbital width. Depth of præorbital a little less than the diameter of eye. Maxillary not extending to below the eye; jaws equal anteriorly; fold of the lower lip not continuous; cheek with 4 or 5 series of scales; 9 or 10 gill-rakers on the lower part of the anterior arch. Scales  $34\frac{5}{14}$ ,  $2\frac{1}{2}$  between lateral line and base of anterior rays of soft dorsal. Dorsal XVIII (10) 11, the spines subequal from the sixth to the sixteenth, the last  $\frac{1}{2}$  the length of head. Anal VII (7) 8. Pectoral nearly as long as the head, extending to above the origin of anal; ventral extending beyond the origin of anal. Caudal truncate or slightly emarginate. Caudal peduncle nearly as long as deep. A blackish longitudinal band from operculum to base of caudal; fins unspotted.

Lake Nicaragua.

1. (130 mm.) one of the types      L. Nicaragua.      Smithsonian Inst.  
of the species.

### 31. *Cichlosoma nicaraguense*.

*Heros nicaraguensis*, Günth. Proc. Zool. Soc. 1864, p. 153, and Trans. Zool. Soc. vi. 1869, p. 465, pl. lxxvii. fig. 1; Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1898, p. 1532.

*Cichlasoma nicaraguense*, Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 221 (1904).

Depth of body  $2\frac{1}{4}$ - $2\frac{2}{5}$  in the length, length of head  $3\frac{1}{4}$ . Snout with nearly vertical profile, shorter than postorbital part of head. Diameter of eye  $3\frac{1}{3}$ - $3\frac{2}{3}$  in the length of head, interorbital width  $2\frac{1}{5}$ - $2\frac{1}{3}$ . Depth of præorbital a little greater than diameter of eye. Maxillary extending nearly



to below the anterior margin of eye; jaws equal anteriorly or the lower shorter than the upper; fold of the lower lip not continuous; cheek with 5 or 6 series of scales; 9 gill-rakers on the lower part of the anterior arch. Scales  $35 \frac{5-6}{14-15}$ ,  $2\frac{1}{2}$  between lateral line and base of anterior rays of soft dorsal. Dorsal XVIII-XIX 10-11, commencing above the opercular cleft, the spines subequal from the eighth to the fifteenth or sixteenth, thence increasing to the last, which is a little more than  $\frac{1}{2}$  the length of head; soft fin, when laid back, extending to anterior  $\frac{1}{4}$  of caudal. Anal VII-VIII 8-9. Pectoral nearly as long as the head, extending to above the second or third anal spine; ventral extending beyond origin of anal. Caudal truncate or slightly emarginate. Caudal peduncle nearly as long as deep. Upper half of body brownish, with 5 or 6 dark cross-bars; vertical fins with dark spots.

Lake Nicaragua.

- |                                      |                 |                   |
|--------------------------------------|-----------------|-------------------|
| 1. (176 mm.) type of the<br>species. | Lake Nicaragua. | Capt. J. M. Dow.  |
| 2. (157 mm.)                         | Lake Nicaragua. | O. Salvin, Esq.   |
| 3. (156 mm.)                         | Lake Nicaragua. | Smithsonian Inst. |

#### Section 8 (*Astatheros*).

Body rather deep (depth  $1\frac{1}{2}$ - $2\frac{1}{3}$  in the length). Upper profile of snout straight, oblique. Scales of the lateral line of the same size as those above and below it; scales of thoracic region considerably smaller than those on the sides of the body. Mouth moderate, moderately protractile; maxillary slightly exposed; teeth of the outer series in both jaws rather small (16-22 on each side in the upper jaw), well-developed laterally and only slightly increasing in size anteriorly. Dorsal XIV-XVI 10-15, the soft fin more or less distinctly scaly at the base. Anal V-VII 8-9. Caudal rounded, subtruncate, or slightly emarginate with rounded lobes.

Six species from Southern Mexico, Central America, and Colombia, which resemble *C. bimaculatum* in their generalized dentition.

#### 32. *Cichlosoma Robertsoni*, sp. n.

Depth of body  $2\frac{1}{4}$  in the length, length of head  $2\frac{3}{5}$ . Snout as long as postorbital part of head. Diameter of eye  $3\frac{1}{5}$  in the length of head, interorbital width  $3\frac{1}{3}$ . Depth of præorbital nearly  $\frac{3}{4}$  the diameter of eye. Maxillary not

extending to below the eye; præmaxillary processes extending to above anterior margin of eye; jaws equal anteriorly or the lower very slightly projecting; fold of the lower lip not continuous; cheek with 6 series of scales; 11 gill-rakers on the lower part of anterior arch. Scales  $29\frac{5}{13}$ ,  $2\frac{1}{2}$  between lateral line and base of anterior rays of soft dorsal. Dorsal XVI 11, commencing above the opercular cleft, the spines subequal from the fourth to the sixth, which are the longest, thence decreasing to the thirteenth and increasing again to the last, which is nearly  $\frac{1}{2}$  the length of head; soft fin, when laid back, extending to anterior  $\frac{1}{3}$  of caudal. Anal VI 9. Pectoral nearly as long as the head, extending to above last anal spine; ventral extending beyond origin of anal. Caudal subtruncate. Caudal peduncle  $\frac{2}{3}$  as long as deep. Olivaceous, with a blackish blotch on the side below the lateral line and a dark spot on the upper  $\frac{1}{2}$  of the base of caudal; some light blue spots on the cheek; fins unspotted.

British Honduras.

1. (64 mm.) type of the species. Stann Creek. Rev. J. Robertson.

### 33. *Cichlasoma longimanus*.

*Heros longimanus*, Günth. Trans. Zool. Soc. vi. 1869, p. 453, pl. lxxii. fig. 2.

*Cichlasoma longimanus*, Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1898, p. 1520; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 212 (1904).

Depth of body  $2\frac{1}{8}$  in the length, length of head  $2\frac{3}{5}$ . Snout as long as postorbital part of head. Diameter of eye  $3\frac{1}{4}$  in the length of head and equal to the interorbital width. Depth of præorbital equal to diameter of eye. Maxillary extending nearly to the vertical from anterior margin of eye; præmaxillary processes extending to above anterior margin of eye; lower jaw very slightly projecting; fold of the lower lip not continuous; cheek with 4 series of scales; 12 gill-rakers on the lower part of anterior arch. Scales  $28\frac{5}{12}$ ,  $2\frac{1}{2}$  between lateral line and base of anterior rays of soft dorsal. Dorsal XVI 10, commencing above the opercular cleft, the fifth and sixth spines somewhat longer than the succeeding ones and  $\frac{1}{2}$  the length of head; the soft fin, when laid back, extending to the middle of caudal. Anal VI 8. Pectoral longer than the head, extending to the last ray of anal; ventral extending beyond origin of anal. Caudal slightly emarginate, with rounded lobes. Caudal peduncle  $\frac{2}{3}$  as long

as deep. Olivaceous, with a large blackish blotch on the side, connected to the orbit by an indistinct dark band; posterior part of dorsal with oblique stripes or series of spots.

Lake of Nicaragua.

1. (133 mm.) type of the Lake of Nicaragua. O. Salvin, Esq. species.

### 34. *Cichlosoma macracanthus*.

*Heros macracanthus*, Günth. Proc. Zool. Soc. 1864, p. 153, and Trans. Zool. Soc. vi. 1869, p. 451.

*Cichlasoma macracanthus*, Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1898, p. 1518; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 207 (1904).

Depth of body  $1\frac{1}{2}$  (adult) to 2 (young) in the length, length of head  $2\frac{2}{3}$ -3. Snout shorter than postorbital part of head. Diameter of eye  $3-4\frac{1}{2}$  in the length of head, interorbital width  $2\frac{1}{4}$ -3. Depth of præorbital  $\frac{2}{3}$ - $1\frac{1}{2}$  the diameter of eye. Maxillary not extending to below the eye; præmaxillary processes not extending to above the eye; jaws equal anteriorly; fold of the lower lip continuous or not; cheek with 4 to 6 series of scales; 11 gill-rakers on the lower part of anterior arch. Scales 29-31  $\frac{5-6}{14-16}$ , 3 or 4 between lateral line and base of anterior rays of soft dorsal. Dorsal XIV-XV 12-14, commencing above the opercular cleft, the spines increasing in length to the last, which is  $\frac{1}{2}$  (young) to  $\frac{2}{3}$  (adult) the length of head; soft fin, when laid back, extending to anterior part (young) or posterior edge (adult) of caudal. Anal V 9-10. Pectoral as long as the head, extending to above third anal spine; ventral extending nearly to origin of anal. Caudal subtruncate. Caudal peduncle  $\frac{2}{5}$ - $\frac{3}{5}$  as long as deep. Olivaceous, with 6 darker cross-bars, the third bearing a blackish blotch below the lateral line; a blackish spot on the upper part of the base of caudal; fins dusky. Adult with nearly uniform coloration.

Southern Mexico; Guatemala.

- |   |               |                 |
|---|---------------|-----------------|
| 1-7. (69-168 mm.) types of the species. | Huamuchal.    | O. Salvin, Esq. |
| 8-11. (188-224 mm.)                     | Chiapas.      | O. Salvin, Esq. |
| 12-13. (53 and 76 mm.)                  | Tequesixtlan. | Dr. H. Gadow.   |

### 35. *Cichlosoma heterodontus*.

*Heros (Cichlasoma) heterodontus*, Vaill. & Pellegr. Bull. Mus. Paris, 1902, p. 86.

*Cichlasoma heterodontus*, Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 225 (1904); Meek, Zool. Pub. Columbian Mus. v. 1904, p. 215.

*Cichlasoma Evermanni*, Meek. t. c. p. 214, fig. 70.

Depth of body about 2 in the length, length of head  $2\frac{3}{4}$ – $2\frac{1}{2}$ . Snout shorter than postorbital part of head. Diameter of eye  $3\frac{1}{2}$ –4 in the length of head. Maxillary not extending to below the eye; jaws equal anteriorly; fold of the lower lip continuous or not; cheek with 5 series of scales; 11 gill-rakers on the lower part of anterior arch. Scales about  $30\frac{5}{14}$ . Dorsal XIV–XV 12–15, the spines subequal from the fifth, the last  $\frac{1}{3}$  the length of head; soft fin, when laid back, extending beyond the middle of caudal, in the adult. Anal V 8–9. Pectoral  $\frac{3}{4}$ – $\frac{4}{5}$  the length of head, extending nearly to above origin of anal; ventral extending to origin of anal or beyond. Caudal subtruncate. Caudal peduncle  $\frac{2}{3}$ – $\frac{3}{4}$  as long as deep. Olivaceous, with 6 darker cross-bars; a blackish spot on the upper part of the base of caudal; fins dusky, the vertical ones sometimes with small dark spots.

Tehuantepec, Southern Mexico.

The specimens described by Meek measure up to 200 mm. in total length.

As in the closely allied *C. macracanthus*, and in some other species of the genus, in adult examples many of the teeth of the outer series may be worn and end in a flat circular surface, but this feature is not even of specific, much less of subgeneric, value.

### 36. *Cichlosoma altifrons*.

*Heros altifrons*, Kner & Steind. Sitzb. Ak. Bayern, 1863, p. 223, and Abhandl. Ak. Bayern, x. 1866, p. 11, pl. ii. fig. 1; Günth. Trans. Zool. Soc. vi. 1869, p. 459; Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1893, p. 1538; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 228 (1904).

Depth of body about  $2\frac{1}{3}$  in the length, length of head nearly 3. Snout longer than postorbital part of head. Diameter of eye 4–5 in the length of head and  $1\frac{1}{2}$  in the interorbital width. Depth of præorbital greater than diameter of eye. Maxillary not extending to below the eye; jaws equal anteriorly; cheek with 4 or 5 series of scales; 12 gill-rakers on the lower part of anterior arch. Scales about  $30\frac{5}{13}$ ,  $2\frac{1}{2}$  between lateral line and base of anterior rays of soft dorsal. Dorsal XVI 11, the spines increasing in length to the last, which is nearly  $\frac{1}{2}$  the length of head; soft fin, when laid back, extending to anterior third of caudal. Anal V 8–9. Pectoral  $\frac{3}{4}$  the length of head, extending nearly to above origin of anal; ventral extending a little beyond origin of anal. Caudal slightly rounded. Caudal

peduncle  $\frac{3}{4}$  as long as deep. Olivaceous with 5 or 6 dark brown cross-bars; light blue spots on the body and soft vertical fins.

The types from Colombia measure from 115 to 200 mm. in total length.

37. *Cichlosoma rostratum.*

*Heros rostratus*, Gill & Bransford, Proc. Ac. Philad. 1877, p. 481.

*Cichlasoma rostratum*, Jord. & Everm. Bull. U.S. Nat. Mus. xvii. 1898, p. 1529.

Depth of body  $2\frac{1}{4}$  in the length, length of head  $2\frac{3}{5}$ . Snout longer than postorbital part of head. Diameter of eye 4 in the length of head, interorbital width  $3\frac{3}{5}$ . Depth of præorbital  $1\frac{1}{4}$  the diameter of eye. Maxillary extending to midway between nostril and eye; præmaxillary processes not extending to above the eye; jaws equal anteriorly; fold of the lower lip not continuous; cheek with 5 or 6 series of scales; 12 or 13 gill-rakers on the lower part of the anterior arch. Scales  $33\frac{6}{13}$ ,  $3\frac{1}{2}$  between lateral line and base of anterior rays of soft dorsal. Dorsal XVI 11, commencing above the opercular cleft, the spines subequal from the sixth to the fourteenth, the last  $\frac{2}{3}$  the length of head. Anal VII 8. Pectoral as long as the head, extending to above the last anal spine; ventral extending beyond the origin of anal. Caudal subtruncate. Caudal peduncle  $\frac{5}{7}$  as long as deep. A blackish blotch below the fourteenth to the seventeenth scales of the lateral line; a dark spot at the base of caudal; soft dorsal, anal, and caudal with alternate light and dark bars or series of spots.

Lake Nicaragua.

1. (186 mm.) one of the types L. Nicaragua. Smithsonian Inst. of the species.

This species is very closely allied to *C. altifrons*.

[To be continued.]

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XXVIII.—*On the Bats of the Rhinolophus philippinensis Group, with Descriptions of Five new Species.* By KNUD ANDERSEN.

THE conclusions recorded in the present paper are based on the material in the British Museum, together with some specimens from the United States National Museum. The latter were sent for inspection and identification by Mr. Gerrit S. Miller, Jr., Washington.

*General Characters of the Rh. philippinensis Group.*

*Diagnosis.*—Median anterior nasal swellings large. Palatal bridge long, on an average more than, and generally considerably more than,  $\frac{1}{3}$  the length of the maxillar tooth-row; median anterior point opposite the front (or anterior half) of  $p^4$ . Posterior connecting-process extremely low and rounded off, starting from a point considerably below the summit of the sella. Base of central nose-leaf forming cup-like or wing-like expansions.

*Remarks.*—So far as my material goes, the above diagnosis holds good for all members of the group, the most primitive (*philippinensis*, *achilles*), as well as the highest developed (*trifoliatus*, *luctus*, and all their allies). In these latter the skull is rather modified, and some of the modifications are obviously correlated to the enormous enlargement of the nose-leaves and ears. The postnasal depression is deeply hollowed out, more than in other *Rhinolophi*. In front of the median anterior swellings is formed a narrow, thin brim of bone, the object of which is evidently to increase the surface of the facial part of the skull (which supports the large nose-leaves); in *Rhinolophi* with nose-leaves of normal size there is no such brim of bone, the median anterior swellings partaking immediately in the formation of the margin of the nasal openings. The interorbital constriction is narrower than in other *Rhinolophi*. The cochleæ are, proportionately, *slightly* larger, the basioccipital, between them, consequently *slightly* narrower; but neither are the cochleæ as large nor the basioccipital as narrow (linear) as in *Rh. hipposiderus* and its allies.

In most, if not all, species the position of the lower  $p_3$  is *individually* variable (as in other primitive *Rhinolophi*): in the tooth-row, or more or less external to the row. The upper  $p^2$  is invariably in the row.

*Subdivision of the Group.*

The group may conveniently be divided into three sections:—the *philippinensis* section, the *sedulus* section, and the *trifoliatus* section. The first of these sections is represented by *Rh. philippinensis* and *achilles* \*; the second by *Rh. sedulus* and *lanosus*; the third by *Rh. trifoliatus*, *solitarius*, *luctus*, *perniger*, *geminus*, and *Beddomei*. They differ as follows:—

\* On *Rh. mitratus* and *Maclaudi*, see the "General Remarks" on p. 254.

(1) In the *philippinensis* section the sagittal crest is low in front, gently sloping towards the postnasal depression (fig. 1). In the *trifoliatus* section the crest is high in front, and abruptly descending towards the postnasal depression (fig. 2): this causes a very different side view of the skull.



Fig. 1.



Fig. 2.



Fig. 1 a.

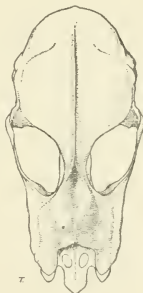


Fig. 2 a.

Fig. 1. Skull of *Rh. philippinensis*, side view. 1 a. The same skull, upper view. 2. Skull of *Rh. trifoliatus*, side view. 2 a. The same skull, upper view. The specimens figured are of the same age (teeth unworn). ♀.

In the *philippinensis* section the teeth are smaller, the maxillar width narrower, the coronoid process of the mandible somewhat lower, the temporal fossa narrower, the zygomatic arches, therefore, very slightly projecting laterally, making the zygomatic width of the skull but very slightly, or not at all, larger than the mastoid width (fig. 1 a). In the *trifoliatus* section the teeth are larger, the maxillar width broader; the stronger teeth involve an increase in size of the temporal muscle, this again a slight heightening of the coronoid process, a considerable widening out of the temporal



fossa, a projecting of the hinder part of the zygomatic arches, making the zygomatic width of the skull considerably larger than the mastoid width (fig. 2 a).

In the *philippinensis* section the base of the sella forms, together with the internasal lobes, a cup-like expansion. In the *trifoliatus* section the internasal lobes are quite, or almost quite, normal, the lateral expansions confined to the sella and wing-like, giving the sella some resemblance to a *Trifolium* leaf (hence the name "*trifoliatus*") or a Maltese cross.

In the *philippinensis* section the wing-structure\* is very primitive, quite as in other primitive species of the genus (*megaphyllus*, *borneensis*, *minor*, and many others): the fourth metacarpal slightly longer than the fifth and the third; IV.<sup>2</sup> † and V.<sup>2</sup> but slightly longer than IV.<sup>1</sup> and V.<sup>1</sup>. In the *trifoliatus* section the wing-structure is considerably modified:—the third metacarpal is much shortened, the fourth slightly lengthened, the fifth more so, making as a final result the fifth metacarpal decidedly the longest of all, and very much longer than the third (supposing the length of the forearm, in all species of the group, to be exactly 1000 mm., the fifth metacarpal, in the *trifoliatus* section, is no less than 133 mm. longer than the third, in *philippinensis* and *achilles* 18 mm. only) ‡. At the same time the first phalanx of the third finger, in the *trifoliatus* section, is much lengthened, chiefly by a removing, in proximal direction, of the joint between the metacarpal and the first phalanx; in other words, the piece by which the third metacarpal has been shortened has been added to the length of the first phalanx of the same finger. Thirdly, III.<sup>2</sup>, IV.<sup>2</sup>, and V.<sup>2</sup>, in the *trifoliatus* section, are considerably lengthened.

The mechanical reason for this modification of the wing is, probably, the following:—A lengthening of the distal phalanges gives a broader wing, consequently an increased power of flight; the third finger, as being the longest of all and the nearest to the front margin of the wing (when expanded), has to sustain the heaviest pressure of the air;

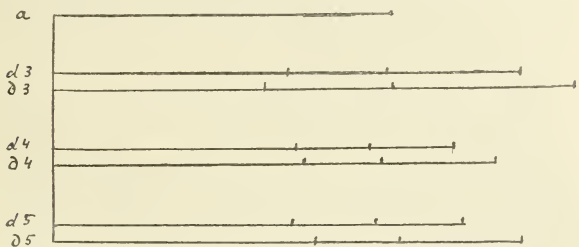
\* The remarks on the wing-structure to be compared, point for point, with the diagram on p. 247 and the wing-indices on p. 257.

† For brevity's sake I call the distal phalanges of the 3rd, 4th, and 5th fingers III.<sup>2</sup>, IV.<sup>2</sup>, and V.<sup>2</sup>, the proximal phalanges of the same fingers III.<sup>1</sup>, IV.<sup>1</sup>, and V.<sup>1</sup>.

‡ An almost exact parallel to this modification of the wing-structure is seen in *Rh. ferrum-equinum* compared with the primitive forms of the group to which that species belongs (f. i. *Rh. megaphyllus*, *borneensis*, &c.).



a considerable increase in the length of III.<sup>2</sup> involves, therefore, an increase in the length of the phalanx which supports III.<sup>2</sup>, viz. III.<sup>1</sup>, and this increase is effected not by a lengthening of III.<sup>1</sup> in *distal* direction (which would make an unproportionately long third finger), but by a lengthening



a. Forearm. *d* 3, *d* 4, *d* 5. Third, fourth, and fifth fingers in the *philippinensis* section. ∂ 3, ∂ 4, ∂ 5. The same fingers in the *trifoliatus* section, reduced to the same length in proportion to the forearm. Subdivisions of *d* and ∂, in direction from left to right, indicate the metacarpal, first and second phalanx.

in *proximal* direction, *i. e.* by a removing backwards of the joint between the third metacarpal and III.<sup>1</sup>, which again makes a shorter third metacarpal.

(2) The *sedulus* section has the skull and the teeth *essentially* as in *philippinensis*, but the nose-leaves and the wing-structure as in *trifoliatus*.

Only the species of the *sedulus* and *trifoliatus* sections will be described below.

### 1. *Rhinolophus sedulus*, sp. n.

*Diagnosis*.—Cranial characters much as in *Rh. philippinensis*, but postnasal depression considerably deeper. Nose-leaves and wing-structure: the *trifoliatus* type. Forearm 43.5–49.2 mm.

*Skull*.—Sagittal crest and maxillar width very much as in *philippinensis*; temporal fossa but slightly larger; postnasal depression deeply hollowed out as in *trifoliatus*.

*Dentition* (two skulls).— $p_3$  external;  $p_2$  and  $p_4$  almost or quite in contact;  $p^2$  in row, cusp so minute as to be scarcely observable.

*Colour*.—♀ ad., Sarawak; distal epiphyses of metacarpals ossified; teeth unworn; skin: General impression a shade of dark brown, slightly varied with greyish tips to the hairs.

Analysis of colour: the tips of the hairs of the upperside have a grey iridescence; when keeping the skin so that the reflections disappear, the true colour proves to be a deep brown shade of "drab"; base of hairs scarcely lighter. Underside of the same general colour as the upperside, but without, or almost without, grey reflection. Interfemoral between the tip of the tail and the calcar, narrowly bordered with yellow.

*Measurements*\*.—On p. 257.

*Type*.—♀ ad. (skin). Sarawak. Collected by Dr. A. R. Wallace. Tomes Collection (no. 19).

*Distribution*.—Sarawak (Brit. Mus.); Pahang (Un. St. Nat. Mus.).

*Remarks*.—Externally this species is exceedingly like a very small *Rh. trifoliatum*, but the tibia is shorter. In the shape of the skull it is very much nearer to *Rh. philippinensis* and *achilles*.

## 2. *Rhinolophus lanosus*, sp. n.

*Diagnosis*.—Similar to *Rh. sedulus*, but very much larger. Forearm 71.5 mm.

*Skull*.—In the shape of the sagittal crest, the small temporal fossa, the narrow maxillary width, and the small teeth, this very large species bears much resemblance to *Rh. philippinensis*. But the postnasal depression is deeply hollowed out as in the *sedulus* and *trifoliatum* type (corresponding to the enormously developed nose-leaves).

*Dentition* (one skull).— $p_3$  in row;  $p_2$  and  $p_4$  well separated;  $p^2$  in row, cusp extremely small.

*Colour*.—♀ ad.; teeth slightly worn; skin: as in *Rh. sedulus*.

*Type*.—♀ ad. (skin). Kuatun †, N.W. Fokien, China; April 4th, 1898. Presented by J. D. La Touche, Esq. Brit. Mus. no. 98. 11. 1. 1.

*Remarks*.—As proved by the skull, this fine species is an

\* Only the following measurements require some explanation:—*Ears*, length from base of inner margin to tip. *Second phalanx*, exclusive of the cartilaginous terminal rod. *Skull, total length*, inion to front of canines. *Width of brain-case*, above root of zygomatica. *Maxillary width*, across antero-external corner of  $m^3$ . *Supraorbital length*, from posterior point of postnasal depression to median anterior point of nasals. *Mandible*, condylus to front of incisors. *Upper and lower teeth*, exclusive of incisors.

† An excellent characteristic of this Chinese village and its surroundings was contributed by Mr. La Touche to the Proc. Zool. Soc. for 1898 (pp. 769-70).

offshoot of the *sedulus*-type, differing in all important cranial characters from the species of the *trifolius* section. But externally it is exceedingly like a small *Rh. perniger*.

### 3. *Rhinolophus trifolius*, Temm.

*Diagnosis*.—Cranial and external characters: the *trifolius*-type (above pp. 245–47). Forearm 47–55 mm.

*Skull*.—As described and figured above (p. 245).

*Dentition* (eleven skulls).— $p_3$  “vacillating” in position: in row (one skull), or almost in row (one), or half in row (two), or almost external (one), or quite external (six). Corresponding to this,  $p_2$  and  $p_4$  well separated (five), or almost in contact (one), or quite in contact (five).  $p^2$  always in row. Upper canine and  $p^4$  well separated. In one example there is a marked interspace between  $p^2$  and  $p^4$  (the former place of  $p^3$ , lost in all recent species of the genus).

*Colour*.—Five skins; ad.; teeth unworn or slightly worn: Very light-coloured. Upperside, a “wood-brown” shade of “drab,” somewhat darker on the hinder back; base of hairs more distinctly light “drab.” Underside “drab,” somewhat varying in the intensity of the colour, and washed with “ceru-drab” on the throat and breast. Interfemoral, between the tip of the tail and the calcar, narrowly bordered with yellow.

*Size*.—The great variation in the size of this species (forearm 47–55 mm.) is independent of the geographical habitat and of the sex:—(1) The shape of the skull is identically the same in all the individuals examined; (2) the size of the skull is much less subject to variation than the external dimensions (*cf.* the measurements); (3) the smallest and the largest individuals examined are both from N. Borneo; (4) the smallest individual in the series (forearm 47 mm., teeth slightly worn) and one of the very largest (54.3 mm., teeth unworn) are, both of them, males. All the specimens are full-grown (distal epiphyses of metacarpals ankylosed).

*Distribution*.—N. Borneo (Paitan, Kina Balu, Mt. Dulit, Mt. Mulu, Sarawak); Singapore; Lower Siam (Trong); Tenasserim (Mergui). ? Java (*cf.* below).

*Technical name*.—The type specimen of *Rh. trifolius*, as described by Temminck\*, is stated to be from Bantam, W. Java. I have seen no specimen of this Bat from Java. It is rather easy indeed to point out some discrepancies between Temminck’s figure (natural size) and the series

\* Temminck, Mon. Mamm. ii. 8<sup>e</sup> monogr. (1835) pp. 27–28, pl. xxxi.  
Ann. & Mag. N. Hist. Ser. 7. Vol. xvi. 17

here under consideration:—The horseshoe is very narrow (9 mm., as against 10·5–12·4 in the series examined by me); the tail extremely short (about 21–23 mm., as against 29–36); also in the letterpress the tail is stated to be only “de la longueur du tibia,” whereas in all the individuals I have seen it is from  $\frac{1}{5}$  to  $\frac{1}{3}$  longer than the tibia. On the other hand, the length of the forearm of the type (“1 pouce 10 lignes” = about 50 mm.) and of the metacarpals, phalanges, and tibia (on the figure) are quite as in several Bornean specimens. Also it should be remembered that the type is a mounted specimen and, according to Jentink \*, only “à-peu-près adulte”; the differences pointed out above are of such kind that they may *perhaps* be due to shrinkage. At all events, in the absence of more conclusive evidence, I think it advisable to retain the name *trifolius* for the species described above. If not identically the same as the Bornean and Malaccan bat, the Java form is probably extremely closely related †.

#### 4. *Rhinolophus solitarius*, sp. n.

*Diagnosis*.—Allied to *Rh. trifolius*, but slightly smaller, with very short tail and tibia. Forearm 46·5 mm.

*Skull*.—Smaller than in *trifolius*, but *proportionately* broader (compare *maxillary*, *zygomatic*, *mastoid* breadth, and breadth of brain-case with the measurements of the *trifolius* skulls, p. 257).

*Dentition* (one skull).— $p_3$  *completely wanting*, without any trace of the alveoli (teeth but very slightly worn);  $p_2$  and  $p_4$  in contact. This is the only instance, within the present group, of a complete obliteration of the middle lower premolar; the aberration from the general rule † is rather surprising, and I must leave it open to question if it is, really, a constant (or almost constant) peculiarity of the present species.

\* Jentink, “Cat. syst. Mamm.,” Mus. d’Hist. nat. Pays-Bas, xii. (1888) p. 160.

† The following statements in the original description of *Rh. trifolius* are, evidently, accidental errors only:—“Deux grosses verrues triangulaires à la mâchoire supérieure”; must be “inférieure.” “Dans l’adulte point d’incisives supérieures”; they must have been overlooked. “Point de petite dent anormale entre la canine et la première molaire de la mâchoire supérieure”; it is extremely improbable that  $p^2$ , which is present in all species of this group and always situated in the tooth-row, should be wanting in the type of *trifolius*.

‡ As a *general* rule, in the genus, the lower  $p_3$  does not completely disappear until the dentition has arrived at the stage that the upper  $p^2$  is external, and even then it is still very often present. In all species of the present group  $p^2$  is quite in the tooth row.

Also the upper  $p^2$  is slightly smaller than in *trifoliatus*, and consequently the interspace between the canine and  $p^4$  a little narrower.

*External characters.*—In all important respects as *Rh. trifoliatus*, but a trifle smaller than the smallest individuals I have seen of that species; tail and tibia extremely short. Colour (of a spirit-specimen) much as in *trifoliatus*.

*Type.*—♂ ad. (in alcohol). Tanjong Panuja, Banka; June 18th, 1904. Collected by Dr. W. L. Abbott. Un. St. Nat. Mus. no. 124767.

### 5. *Rhinolophus luctus*, Temm.

*Diagnosis.*—*Trifoliatus* type. Forearm 65.3–68 mm.

*Skull.*—As in *trifoliatus*, but very much larger.

*Dentition* (five skulls).— $p_3$  generally external (four skulls), sometimes almost in row (one).  $p_2$  and  $p_4$  separated (two), or almost or quite in contact (three).  $p^2$  always in row, cusp rudimentary or altogether wanting. Interspace between the upper canine and  $p^4$  rather narrow.

*Colour.*—(1) ♀, rather young, but quite full-grown; distal epiphyses of metacarpals ossified; teeth almost unworn; Selangor, November; skin: Above and below, an exceedingly dark shade of “drab,” approaching blackish; grey iridescence on the hairs of the upperside.

(2) Aged individuals; teeth slightly worn or well worn; N. Borneo; four skins: Same style of colour, but decidedly browner. Details as in *Rh. sedulus*.

*Distribution*—N. Borneo (Mt. Dulit, Baram, Lawas); Singapore; Selangor (Semangton). ? Java (*cf.* below).

*Temminck's Rh. luctus*\*.—The type specimen † of *Rh. luctus* is stated to be from Tapos, Java. I have seen no example of this species from Java, but the original description of *luctus*, the measurements (forearm and tail only), and the figure (natural size) agree very closely ‡ with the species

\* Temminck, Mon. Mamm. ii. 8<sup>e</sup> monogr. (1835) pp. 24–26, pl. xxx.

† According to Dr. Jentink (“Cat. syst. Mamm.,” Mus. d’Hist. nat. Pays-Bas, xii. (1888) p. 160) there are two type specimens of *Rh. luctus* in the Leiden Museum. Technically only one of these examples is the “type,” viz. no. “b” (the adult female); *cf.* Temminck (*l. c.*): “mesure et description d’une adulte femelle” (p. 25); “nos voyageurs n’en trouvèrent qu’une femelle” (p. 26). The specimens “a” and “c” in Jentink’s Catalogue are, perhaps, those referred to by Temminck in a later appendix to the description (*op. cit.* pp. 30, c, d).

‡ The measurements given by Temminck are: forearm 63 mm. (“2 pouces 4 lignes”), tail 45 mm. (“1 pouce 8 lignes”). Dr. Jentink has kindly re-examined the type, and found the length of the forearm as stated by Temminck.

here under consideration. If by further examination Java specimens should prove to differ from the Borneo-Malacca form, the former will have to stand as *Rh. luctus*, the latter as *Rh. morio*, Gray.

*Gray's Rh. morio* \*.—The type (adult, Singapore; sent to Gray in alcohol, subsequently mounted) is in the British Museum. The light colour, approaching that of *Rh. trifolius* (and which caused Gray to give it a new name), is probably due to fading in alcohol; the colour of all the species of the present group seems to be unusually liable to fading; in every other respect *Rh. morio* is indistinguishable from Selangor and Borneo specimens.

*Alleged occurrence on the Philippine Islands.*—Eydoux and Gervais's "*Rh. luctus, varietas rufus*," from Manila, is characterized by the authors as follows:—"Dans la variété que nous décrivons, quoique la feuille soit parfaitement la même [as in Temminck's *Rh. luctus*], le pelage est généralement roussâtre" †. No further description, no measurements, no figure. By subsequent writers ‡, none of whom seem to have seen the specimen, the name proposed by Eydoux and Gervais has been referred as a synonym to "*Rh. luctus*." I very much doubt that this is correct. Neither before 1839 nor since has any bat of the *luctus* type been recorded from any of the Philippine Islands. Considering the time at which Eydoux and Gervais wrote, I should find it very hazardous to lay much stress on the statement that the nose-leaves were "parfaitement" as in *luctus*. Of much more importance is, I think, the fact that in 1839 *Rh. philippinensis* was not yet described. Perhaps "*Rh. luctus, var. rufus*" is nothing but *Rh. philippinensis*; and, if so, the name "*rufus*" (1839) unfortunately antedates "*philippinensis*" (1843). An examination of the type (presumably in the Paris Museum) would decide the matter.

#### 6. *Rhinolophus perniger*, Hodgs.

*Diagnosis.*—Allied to *Rh. luctus*, but much larger. Fore-arm 71.5–78 mm.

*Skull.*—Quite of the *luctus* shape, but considerably larger and with markedly broader nasal swellings.

\* J. E. Gray, Ann. & Mag. Nat. Hist. (1) x. (Dec. 1842) p. 257.

† Eydoux and Gervais, 'Voyage autour du monde . . . la Favorite,' v. pt. ii. (1839) p. 9.

‡ In his "Kritische Durchsicht der Ordnung der Flatterthiere" (SB. Akad. Wien, Bd. lxi. Abth. i., Feb. 1870, p. 194) Dr. Fitzinger, without having seen the example here under consideration, gives it a new name—*Aquias Eydouxii*—on account of "die durchaus verschiedene Heimath, so wie auch der grosse Unterschied in der Färbung."

*Dentition* (five skulls).— $p_2$  generally external (four skulls), sometimes almost in row (one);  $p_2$  and  $p_4$  separated (three, or almost in contact (two));  $p^2$  in row, cusp rudimentary and soon worn down. Interspace between the upper canine and  $p^4$  generally rather narrow.

*External characters*.—Considerably larger than *Rh. luctus*, with, also proportionately, much longer ears and tibia. It is in every respect the extreme of the “*trifolius* type” and the largest species in the genus. Colour as in *Rh. luctus*.

*Distribution*.—The Himalayas: Sikkim, Nepal, Masuri.

*Technical name*.—The types of Hodgson’s *Rh. peruijer*\* (three adult specimens, Nepal) are in the British Museum.

*Remarks*.—This species has hitherto wrongly been confounded with *Rh. luctus*.

#### 7. *Rhinolophus geminus*, sp. n.

*Diagnosis*.—Similar to *Rh. peruijer*, but with shorter ears and much shorter tail. Forearm 73 mm.

*Skull*.—Much as in *peruijer*, but with markedly narrower nasal swellings.

*Dentition* (one skull).— $p_3$  almost in row;  $p_2$  and  $p_4$  well separated;  $p^2$  in row, cusp extremely small. Interspace between the upper canine and  $p^4$  rather wide.

*Colour*.—The *luctus* style.

*Type*.—♀, slightly immature (in alcohol). Kediri, E. Java, 2000–3000 feet, between March and May, 1878. Presented by Baron v. Hügel. Brit. Mus. no. 79. 11. 15. 10.

*Remarks*.—As might be expected, from the general character of the mammalian fauna of Java, this species is much more closely related to the Himalayan form (*perniger*) than to *Rh. luctus* from Borneo and the Malay Peninsula.

#### 8. *Rhinolophus Beddomei*, sp. n.

*Diagnosis*.—Allied to *Rh. luctus*, but rather smaller, with excessively short metacarpals and tail. Forearm 63·8 mm.

*Skull*.—Of the *luctus* type, but extremely small.

*Dentition* (one skull).— $p_3$  external;  $p_2$  and  $p_4$  almost in contact;  $p^2$  in row, cusp almost imperceptible (teeth unworn).

*External characters*.—This species is almost of the same size as *Rh. luctus*, but the metacarpals and tail are much shorter.

*Type*.—♂ ad. (in alcohol). Wynaad, Mysore, S. India. Collected and presented by Colonel Beddome. Brit. Mus. no. 82. 3. 3. 1.

\* Hodgson, J. A. S. B. xii. pt. 1, no. 137 (May 1843), p. 414.



*General Remarks on the Rh. philippinensis Group* \*.

In the Philippine Islands and the Austro-Malayan Sub-region we find preserved the most primitive members of the whole group.

In all the more important points, cranial and external, *Rh. philippinensis* (Luzon) and *achilles* † (Key Islands) are either much like or quite on the same level as other primitive *Rhinolophi*:—In the general shape of the skull; in the narrow temporal fossa and low sagittal crest; in the long palatal bridge; in the dentition— $p^2$  less reduced in size, its cusp well developed, the interspace between the canine and  $p^1$  very wide; in the wing-structure—the ratio between the metacarpals, as well as the proportional length of the distal phalanges, practically quite as in *Rh. megaphyllus* (and its closer allies) or *Rh. lepidus* (and its modifications); in the number of mental grooves—three, as in all primitive species of the genus; in the general shape of the ears—very blunt, emargination of outer margin below the tip very shallow, the ear therefore not attenuated below the tip. But the nose-leaves are peculiarly modified ‡ and the ears unusually large.

This type of bat has found its way to N. India: *Rh. mitratus* (Chaibassa, on the border of Orissa and Bengal). The same cup-like expansion of the central nose-leaf, formed by the base of the sella and the internasal lobes; the same shape and proportionate size of the ears. But the wing-structure seems to be more advanced § and the lateral mental grooves are obliterated. The skull and dentition are unknown.

We find the *philippinensis*-type so far away as Conakry Island, off the coast of Senegambia: *Rh. Maclaudi* ||. Identically the same cup-like (not wing-like) expansion of the central nose-leaf; the same shape of the upper (not expanded) part of the sella—very broad, parallel-margined, the summit

\* To be compared with the diagram on p. 247.

† Thomas, Ann. & Mag. Nat. Hist. (7) v. (1900) p. 145.

‡ It is worth noticing that the connecting-process in *Rh. philippinensis* and *achilles*, although quite of the same style as in the other members of the group, is slightly less reduced in size, consequently nearer to the "normal" type.

§ Detailed measurements of the wing of *Rh. mitratus* are unknown. According to Blyth (J. A. S. B. xiii. (1844) p. 483) the length of the forearm is 57 mm., the length of the third finger, as a whole, 84.5 mm.; this is sufficient to convince me that there must be a considerable lengthening of III.<sup>2</sup>.

|| E. de Pousargues, Bull. Mus. d'Hist. nat. 1897, no. 8, pp. 358-331 (Feb. 1898).



broadly rounded off, almost truncate'd; the same connecting-process; the same lancet—peculiarly long, narrow, cuneate; the same size and shape of the horseshoe; the enormously enlarged ears—proportionately of the same size as in *achilles* and essentially of the same shape; *the same ratio between the metacarpals* (third metacarpal not shortened). But the distal phalanges are much lengthened\*; the lateral mental grooves are obliterated (as in *Rh. mitratus*); and the general size of the animal is much increased. The dentition of *Rh. Maclaudi* is more highly developed than in *philippinensis* and *achilles*, and on the same level as in the *sedulus* and *trifoliatus* section— $p^2$  in the tooth-row, very small, the interspace between the canine and  $p^1$  narrow†. The skull is unknown.—In short: *Rh. Maclaudi* is an Ethiopian offshoot of the *philippinensis*-type, more highly developed than that species *at least* in the dentition, the wing-structure, and the mental grooves.

The bats of the *sedulus* section have retained, in all important respects, the cranial characters of *philippinensis* and *achilles*. But the postnasal depression is deeply hollowed out (as in the *trifoliatus* type), and externally, *i. e.* in the nose-leaves (wing-like expansions of the sella), in the wing-structure, in the mental grooves (one only), and in the more pointed ears, they are like *trifoliatus* and *luctus*. Two species only are known—*Rh. sedulus* from N. Borneo and the Malay Peninsula, and *Rh. lanosus* from S. China.

The series of evolution culminates in the *trifoliatus* section: also the skull is modified. The six species known are distributed from N. Borneo to S. India, from Banka and Java to the Himalayas.

\* In the *trifoliatus* section the lengthening of III.<sup>2</sup> (as pointed out above) has involved a lengthening of III.<sup>1</sup> in *proximal* direction, and consequently a shortening of the metacarpal. In *Rh. Maclaudi* the lengthening of III.<sup>2</sup> has involved a lengthening of III.<sup>1</sup> in *distal* direction; consequently the metacarpal retains its original length. The great increase in the total length of the third finger resulting herefrom seems to have been counterbalanced by a lengthening *also* of the first phalanx of the other (fourth and fifth) fingers. These remarks are based on Pousargues's measurements of the third and fifth fingers (those of the fourth finger are unknown).

† I am indebted to M. A. Ménégaux, Paris Museum, for the above details on the dentition of *Rh. Maclaudi*, as well as for the following information:—"M. de Pousargues s'est trompé en disant qu'il y a un espace entre la canine supérieure et la  $p^2$  [ $p^1$  in this paper]; à leur base la première prémolaire [ $p^2$ ] touche en avant la canine, en arrière la  $p^2$  [ $p^1$ ]." By this important correction the dentition of *Rh. Maclaudi* is shown to be *perfectly* in accordance with the usual scheme in the present group.

One of these modifications of the skull, in the *trifoliatus* section, is very instructive. When, as is the case in other *Rhinolophi* beyond a certain low level of development, the temporal muscle increases in size, the sagittal crest creeps more *forwards* (as in many other Mammalia), reducing the length of the supraorbital crests, consequently also the length of the postnasal depression, which is bordered laterally by the supraorbital crests. In the *trifoliatus*-type the shape and size of the nose-leaves seem to require a rather long and very deep postnasal depression; therefore the temporal muscle, when growing larger, cannot very well push the sagittal crest much farther *forwards*; instead of that it pushes the crest *upwards*, making it unusually high in front. This accounts for the peculiar shape of the sagittal crest, as figured on p. 245 (fig. 2).

The subjoined diagram gives a view of the probable inter-relations of the species:—



Table of Measurements.

	<i>Rh. scdulus.</i>	<i>Rh. lanosus.</i>	<i>Rh. trifoliatus.</i>	<i>Rh. solitarius.</i>	<i>Rh. lucius.</i>	<i>Rh. perniyer.</i>	<i>Rh. geminus.</i>	<i>Rh. Beddomei.</i>
	2 spems., 2 skulls.	♀ ad. Type.	15 spems., 11 skulls.	♂ ad. Type.	7 spems., 5 skulls.	6 spems., 5 skulls.	♀ imm. Type.	♂ ad. Type.
	Min. Max. mm. mm.	mm.	Min. Max. mm. mm.	mm.	Min. Max. mm. mm.	Min. Max. mm. mm.	mm.	mm.
Ears, length .....	22.5	...	22	24.2	...	36.7	34.5	29
" greatest breadth .....	16	...	17	17.8	...	25	25	21
Nose-leaves, length .....	18.8	...	18.2	19.5	...	26	28	23.5
" breadth of horseshoe .....	...	...	10.5	11.3	...	14.2	14	14
Forearm.....	43.5	71.5	47	46.5	65.3	71.5	73	63.8
3rd metacarpal.....	27	45	30.5	29.8	40.2	46	46.2	37.5
III. <sup>1</sup> .....	15.2	26.3	17.8	16.2	24.7	26.8	26	22.9
III. <sup>2</sup> .....	21.5	37	25	24	33	36.2	35	31.2
4th metacarpal.....	31.7	53	35.5	33.5	47.2	53	52.5	45
IV. <sup>1</sup> .....	9	16	10.5	9.5	13.2	15	15	12.7
IV. <sup>2</sup> .....	14.2	23.2	14.8	15	20.5	23.2	23	20.3
5th metacarpal.....	32.3	54.3	37	35.8	48.2	55.2	53.5	46.2
V. <sup>1</sup> .....	10	17	11	10.2	14.2	16	15	14.8
V. <sup>2</sup> .....	15.2	25	15	16.5	21.5	26	24.7	22.1
Tail .....	...	51	29.3	25.7	43	50	55.2	35
Lower leg .....	22.8	37.5	23.2	21.2	32.5	34.2	35.2	31.2
Skull, total length .....	...	30.2	22.6	21.7	28.7	30	31.2	27.7
" mastoid width .....	...	13.2	10.7	10.8	12.9	13.2	13.5	12.5
" width of brain-case .....	8.5	11.9	9.5	9.8	12.2	12.8	13	11.7
" zygomatic width .....	10	14.2	11.4	12	14.8	16.2	15.5	14.8
" maxillar width .....	7.5	9.8	8.2	9	11	11.8	11	10.5
" supraorbital length .....	6.8	10.8	7.2	8.2	9.2	10.8	10.5	8.7
" width of nasal swellings .....	5.7	8.2	6.1	6	7.8	8.2	9	7.5
Mandible .....	14	22	15.7	15	20.8	22.5	22.7	19.7
Upper teeth .....	7.8	11.1	8.7	8.7	11.1	12.1	...	12
Lower teeth .....	8.2	11.8	9.2	9.2	12	13	12.8	11.3

## Wing-indices.

	Forearm.	3rd metac.	III. <sup>1</sup> .	III. <sup>2</sup> .	4th metac.	IV. <sup>1</sup> .	IV. <sup>2</sup> .	5th metac.	V. <sup>1</sup> .	V. <sup>2</sup> .
<i>Rh. philippinensis</i> and <i>achilles</i> ...	1000	634	230	386	716	205	248	712	221	248
<i>The scdulus</i> and <i>trifoliatus</i> sections.	1000	629	371	525	734	211	325	762	232	343

## BIBLIOGRAPHICAL NOTICES.

*Preliminary Report on the Geology and Water Resources of Nebraska, west of the One-hundred-and-third Meridian.* By N. H. DARTON. 71 pages, with 43 plates and 23 text-figures. 4to. Government Printing Office, Washington. 1903.

THIS is one ("No. 17") of the valuable "Professional Papers" issued by the U.S. Geological Survey, and designed for the supply of information on the geological structure of the country, and the prospect of obtaining underground water by boring, and surface water in large quantity by dams and irrigation.

The subject-matters in this memoir are treated in the following order:—

Topography, pp. 9-14.

Geology, pp. 14-43. The formations taken separately.

1. General Geology of Nebraska, pp. 14-21.

2. Geology of the region west of the 103rd meridian, pp. 21-43.

Underground water, pp. 43-47.

1. General conditions.

2. Water horizons.

3. Deep-seated waters.

Springs, p. 48; Streams, pp. 50-54; Irrigation, pp. 54-62.

Climate, p. 62; Timber, p. 62; List of Elevations, pp. 62-66; Index, p. 67.

The limits of the district concerned are first of all defined. It is the north-western part of Nebraska; bounded on the north by South Dakota, by Wyoming on the west, and by Colorado on the south. The region is a characteristic part of the Great Plains, which extend from the Rocky Mountains eastward. It may be referred to as having originally sloped gently to the east, and, when uplifted in early pleistocene times, the rivers excavated valleys across it, making the chief existing features, portions of the plain remaining as high tablelands between the valleys.

PLEISTOCENE	{	Alluvium.	}	
		Sand-hills.		
		Loess.		
		Drift.		
	{	<i>Equus</i> -beds.	}	
NEOCENE	{	Ogalalla formation (Pliocene).	}	= Loup Fork beds.
		Arikaree formation (Miocene).		
		Gering formation (Miocene).		
EOCENE (Oligocene?)	{	Brule Clay.	}	= White River group. <i>Titanotherium robustum</i> , pl. xxxv.
		Chadron formation.		
CRETACEOUS	{	Laramie formation.	}	= Montana group. <i>Inoceramus labiatus</i> , Schloth., and <i>Ostrea congesta</i> Conrad, [p. xxxvi.
		Pierre Clay.		
		Niobrara formation.		
		Benton Shales.		
	{	Dakota Sandstone.	}	
CARBONIFEROUS	{	Permian limestone.	}	
		Cottonwood limestone.		
		Wabaunsee limestone.		

The relative positions, range, and thickness of these formations are well illustrated by maps and sections: the geography and geology of the region being shown in plates i. & ii. and ix. to xi, xxxvii. & xxxviii.; physical features being richly represented by numerous figures in the text and in plates.

The Alluvium is chiefly noticeable in the valleys, particularly in that of the Platte and its tributaries. The "Great Sand-hill district," in Central Nebraska (of 24,000 square miles), is composed of wind-borne sand largely derived from the Arikaree formation. Wide plains of Loess occupy nearly one third of Nebraska, and consist largely of Boulder-clay. The Ogalalla beds consist of calcareous grit and pebbles; and they have formed gravel when disintegrated. The Arikaree formation (about 430 feet) of sand and concretions, with conglomerate at base, contains also volcanic ash, and yields abundance of the curious *Demonidæ* or "Devil's Corkscrews." The concretions are frequently tubular, and there are channels in the sand filled with conglomerate. This formation weathers into the frequent upstanding and isolated pinnacles, stacks, chimneys, as well as butts and bluffs, forming remarkable and picturesque features in the region, as shown in many of the plates and figures. The Gering Sandstone varies considerably in thickness and in colour and hardness, and has conglomerate at the base.

The hard pinkish Brule Clay is about 600 feet thick, thinning eastwards. Then greenish sandy clay (Chadron formation) follows below, and is said to have yielded remains of *Titanotherium*.

Equivalents of the Laramie formation, extending for some way under South-western Nebraska, are sandstone and clay. The Pierre Clay, under the central-western part of the State, is at least 2000 feet thick. The Niobrara Chalky limestones and the Benton Shales are 450 feet thick to the east and thicker to the west. The Dakota Sandstone (with a basal Lower Cretaceous sandstone), about 400 feet thick, underlies nearly all Nebraska. "This formation carries the great artesian-water supplies, which are so extensively developed by wells in eastern South Dakota, and on low lands in Knox, Cedar, and Boyd counties, Nebraska" (page 9).

Volcanic ash constitutes two widespread beds in the Brule Clay, some limited and some thick beds in the Gering formation, and a general admixture as well as several thick beds in the Arikaree. It is rare in the Ogalalla, and it occurs in the lower portion of the Loess in the central and western parts of the State. The ash was probably blown over from volcanoes in the Rocky Mountains (pages 42 & 43).

Carboniferous limestones, shales, and sandstones underlie all Nebraska. The Cottonwood *Fusulina* limestone has been recognized. In the south-eastern corner of the State the sinkings have proved about 1200 feet, of which 200 is Permian.

At Lincoln the Lower Limestones (partly Devonian) are at 1635 feet; then Trenton Limestone to 1947. Then follow magnesian limestones 143 feet, then red sandstone (Cambrian) and red quartzite (Algonian, pierced for 270 feet), resting on granite.

A vast amount of valuable information, both special and general in character, has been collected and published by the State Survey, as exemplified in this volume; but it is not yet sufficiently easy to make a complete and definite judgment on the different districts, as to the possible underground water-supply, without the further experience and opinion of experts.

*The Land and Sea Mammals of Middle America and the West Indies.*

By DAVID GIRAUD ELLIOT, F.R.S.E. &c. Vol. IV. Parts I. & II. *Zoological Series, Field Columbian Museum.* Chicago, U.S.A., 1904.

THESE two bulky parts will prove of inestimable value to mammalogists, and form a lasting monument to the credit of the author. The more carefully they are studied, the more one becomes impressed by the amount of labour and research which must have been expended on their production.

The present work contains a description of all the mammals from the northern boundary of Mexico to the Province of Cauca, S. America, including the islands of the coast, as well as of the Bahamas and the West Indies.

A feature of these parts, as compared with that already issued on the mammals north of the area now dealt with, is the addition of short accounts of the habits of all the more important species, and many new facts will be found in these statements.

The author will gain the sympathy of a large number of zoologists in that he has chosen to protest vigorously against the system now in fashion of multiplying species—a system calculated to do an immense deal of harm. With some systematists, in fact, it is carried to the very verge of absurdity. Names, the author trenchantly remarks, “are useful for the recognition of specimens possessing independent distinctive characters, but if an example has none of these its appellation is of little assistance.” And, again, “It is, of course, not to be conceived . . . that the mere bestowal of a name upon a specimen would make it recognisable; and that the act of naming examples that are separated from their fellows on account of . . . minute variations cannot be fairly regarded as an ‘accurate statement of the results of organic evolution.’” As he points out, “Many specimens have been named whose cranial characters consist altogether in being ‘longer or shorter,’ ‘broader or narrower’ than the corresponding parts of some other example, and it is easily comprehended how slight is the probability that any specimen can be accurately determined whose characters are such as those given (the colour of the pelage also being nearly the same), no topotypes of the forms with which these are compared by their describer being available, and in many instances no measurements of the crania having been given.” The lengths to which some have carried this principle of bestowing names on what are at most individual variations is appalling. Evidence of this can be found in plenty in these volumes.

Illustrations have been lavishly distributed, and many, especially of the crania, are extremely beautiful.

*Guide to the Gallery of Birds in the Department of Zoology of the British Museum (Natural History).* Pp. 228; 24 plates and 7 text-figures. London: Printed by Order of the Trustees of the British Museum, 1905. Price 2s. 6d.

THE Bird-Gallery of the British Museum of Natural History is, without doubt, one of the finest in the world; and this not on account of any architectural beauties which it possesses, but solely because of the remarkable character of the specimens selected for exhibition and the method of their display. Inasmuch as the arrangement of the Gallery is the work of Mr. W. R. Ogilvie-Grant, it was but fitting that the preparation of the Guide thereto should also be entrusted to him. How admirably he has fulfilled his task will best be appreciated by those who use this book in the Museum. But the value of this volume is by no means confined to its use there. On the contrary, it will prove of the greatest service even to those who have never seen the specimens herein described. Profusely and beautifully illustrated and crammed with information, much of which is not to be found elsewhere, it will form a welcome addition to the library of many a bird-lover throughout the country. Museum Curators will find it indispensable.

As the visitor works his way down the Gallery, book in hand, he will find each Order of birds briefly diagnosed, and following this a description of all the more important species, their habits, and so on.

The wonderful Nesting-Series of British Birds is described separately; and, in addition to this, there is an appendix wherein will be found a general introduction to the study of birds, which should prove most valuable to those who are not experts.

The beautiful plates which illustrate this Guide have been photographed by Mr. R. B. Lodge from specimens actually exhibited in the Gallery.

*House, Garden, and Field.* By I. C. MIALL, F.R.S.  
London: Edward Arnold, 1904.

PROFESSOR MIALL has an established reputation as a writer on Natural History subjects, and this reputation is amply sustained in his latest work 'House, Garden, and Field.' In the space of some three hundred pages he has crowded a vast amount of information, in the form of short essays, on themes of the most varied description.

Designed more especially for teachers who are compelled, without special qualification, to give lessons in "Nature Study," Prof. Miall has endeavoured rather to give his readers an insight into what to observe, and how to observe, than to provide him with ready-made lessons. As he rightly remarks, the teacher must himself be an observer if his teaching is to be stimulating. If, as he says, he "gets all his knowledge without effort, then the so-called Nature Study which he dispenses has no more power to



excite the love of nature or the spirit of enquiry than a printed list of the Kings of England with dates." The introduction, indeed, to this volume forms an admirable dissertation on the teaching of this much-abused subject, and should be carefully studied by all those for whom it is written. The present demand for books on Nature Study has unfortunately produced an abundant crop of most pernicious rubbish, which, strange as it may appear, has been greedily absorbed by those responsible for the education of our children. Professor Miall's book is therefore to be welcomed as an antidote to this poisonous stuff.

We cannot do more here, by way of indicating the nature of these essays, than particularize one or two. As especially helpful we may mention that on "A School Course on the Structure and Life of Insects." Though short, it is altogether admirable; and his hints on methods of displaying insect-structures to many people at once will doubtless be gladly adopted. School Museums; Buttercups—a Study of Species; Vacation Rambles; The Summer droop of Boughs; The Rock-Barnacle; and The Natural History Excursion, are all essays of real excellence and full of helpful suggestions.

In short, this is a book which we most cordially recommend—not only to teachers, but to dwellers alike in town and country who have a love of Nature and but little training or practice in the way to observe.

The illustrations are numerous and good, and the size of the volume is sufficiently small to be carried conveniently as a guide to practical work out of doors.

W. P. P.

## MISCELLANEOUS.

*Note on the 'Museum Humfredianum,' 1779.*

By C. DAVIES SHERBORN.

THE rarity of sale-catalogues of the early collections in which zoological specimens were preserved is well-known. After diligent search during the time I was compiling my 'Index Animalium,' one by one fell into my hands, until at last the 'Museum Humfredianum' was the only one to escape me.

Mentioned first by Cobres in his 'Deliciæ Cobresianæ,' 1782, p. 148; then by Fox in his 'Synopsis Newcastle Museum,' 1827, p. 179; it was again listed by Engelmann in 'Bibl. Hist. Nat.' 1846, p. 11. These, so far as I know, are the only references to the Catalogue, though the Museum itself has been referred to many times (see Murray, 'Museums,' 1904, ii. p. 293 *etc.*). There is no doubt that Cobres actually saw the tract, for he gives the pagination correctly, although he is in error as to the size; but it is highly probable that Engelmann copied from Cobres. Fox, too,



must have handled the book, though he misspells the name, 'Humphredianum.'

The reference to Fox and subsequent recovery of the tract I owe to Dr. David Murray, whose excellent book on 'Museums,' published in 1904, I eagerly perused on its appearance as likely to give me a clue. A letter from Dr. Murray further assisted me, and I found the Catalogue still preserved in the Hancock Museum, Newcastle-on-Tyne. It was no doubt the copy marked by George Allan himself when purchasing from Humphrey's Museum, as there are lines in the margin as mentioned by Mr. Fox.

I much regret that I had not found Fox's reference to this Catalogue before, as the 'Mus. Humf.' has been my "old man of the sea" for fifteen years, and I am exceedingly thankful to be able to shake him off. It is also a somewhat remarkable circumstance that no one has informed me of the existence of this copy at Newcastle, more especially as I advertised every week for nearly three years for the loan of a copy in a publication which is, or should be, in every library or museum of importance.

Considering that I could not see this tract before publishing my 'Index Animalium,' it now gives me peculiar satisfaction to announce to zoologists that the 'Museum Humfredianum' has no zoological value whatsoever. It is merely an auction sale-catalogue of a general collection of curiosities, without systematic arrangement of the zoological portion, and without generic headings or binominal nomenclature of any sort or description.

Indeed, it is now certain that George Humphrey did not employ definite terms in print until he published his 'Museum Calonnianum' in 1797, and this fact alone will account for the rarity of the 'Mus. Humf.' and the comparative abundance of the 'Mus. Calonn.' The former was useless the day after the sale, the latter, being full of new names, became at once a book of reference.

As the Catalogue has never been properly described, I give the following as the full text of the title:—

(No. 9, 1779.) | MUSEUM HUMFREDIANUM: | [a line] | A |  
 CATALOGUE | Of the LARGE and VALUABLE | MUSEUM | of |  
 Mr. GEORGE HUMPHREY; | Which is presumed to be the most  
 capital of the kind | ever offered to public Sale in this King-  
 dom: | Comprehending many Thousand curious Subjects in  
 NATURAL | HISTORY, collected with great Judgment and Expence,  
 from most | Parts of the known World, during a Course of upwards  
 of thirty | Years: particularly Shells, Corals, and other beautiful  
 Marine Pro- | ductions; Reptiles, Insects, and other Animals, both  
 dried and in | Spirits; most of the Species in the Fossil Kingdom;  
 among them | many rare and elegant Spars, Crystals (some of them  
 matchless) | Marbles, Agates, and other Stones; Ores and Minerals;  
 a great | Variety of uncommon Petrefactions of Animals and  
 Vegetables; | some elegant Compositions in Shell-work, consisting  
 of Vases with | Flowers, Temples, &c. the best and most extensive  
 Collection of the | Cloths, Garments, Ornaments, Weapons of War,

Fishing Tackle, and | other singular Inventions of the Natives of *Otaheite, New Zealand,* | and other new discovered Islands in the South Seas; A Variety of | Mahogany and other Cabinets, adapted for containing Subjects in | Natural History: a large Range of elegant Mahogany Cases of the best | Jamaica Wood, nine Feet high, glazed with large Panes, and might | easily be altered to Library Cases; a Mahogany Table, near thirty | Feet long, with large Show Glasses on the Top, and near 300 Drawers | beneath, all glazed; a Range of Mahogany Shelves with Cabinets, | containing 128 Drawers, glazed; a perpetual Motion, an artificial Hail | Storm; sundry Books in Natural History, a Set of six Columns four- | teen Feet high, and a great Number of other Articles. | Which will be sold by AUCTION, | By Mr. PATERSON, | On the PREMISES, | No. 70, *St. Martin's Lane,* opposite *Slaughter's* | Coffee House, | (By Order of the ASSIGNEES,) | On *Monday, April 5,* 1779, and the Twenty-nine | following Days, | To be viewed on *Monday, March* the 29th, and to the | Time of Sale. | Catalogues may be had (Price ONE SHILLING), at | *Mr. Paterson's, No. 6 King-Street, Covent Garden;* | and at the *Museum* aforesaid. |

The Catalogue is printed in quarto (not octavo, as invariably stated), measures  $9 \times 5\frac{3}{4}$  inches; has a Titlepage with "conditions of sale" on back, and pp. 1-168. The sale occupied the thirty-six days for which it was catalogued (the titlepage being incorrect on this point), the last day taking books, of which Humphrey had a poor lot, the only rarities being seven copies of his own 'Conchologie,' of which Allan seems to have purchased one. As this book is stated in the 'Mus. Humf.' itself to be "Humphrey's Conchologie," it confirms the opinion expressed in my 'Index Animalium,' 1902, p. xxx, that Humphrey, and not E. M. Da Costa, was the author of the book.

The Council of the Hancock Museum has generously agreed to an exchange with me for this tract, feeling, with me, that so interesting a curiosity should be in a more accessible position. I have therefore arranged to deposit the 'Mus. Humf.' in the General Library of the British Museum (Natural History), where it can be seen by anyone interested.

#### *Where are the Types?*

GENTLEMEN,—May I ask if any of your readers can kindly give me information as to where may be found the types of S. P. Pratt (Kelloway Ammonites from Christian Malford) and Young and Bird (Lias fossils in 'Geol. of Yorkshire')? The information is required for the purposes of the '*Palæontologia Universalis.*'

S. S. BUCKMAN.

Westfield, Thame, Oxon.



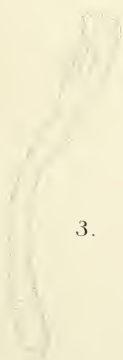




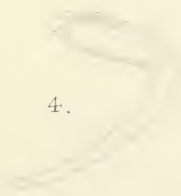
1.



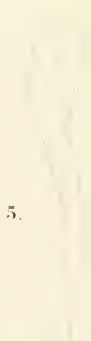
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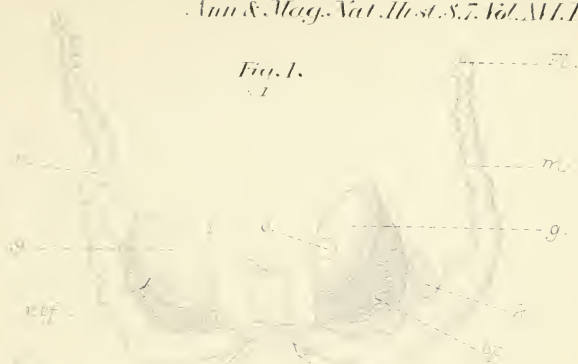
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5.



*Fig. 1.*  
x 1



*Fig. 4.*  
x 100

*Fig. 3.*  
x 12



*Fig. 2.*  
x 1



















# THE ANNALS

AND

## MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

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XXIX.—*Rhynchotal Notes*.—XXXV. By W. L. DISTANT.

Fam. Cicadidæ (continued from p. 216).

Subfam. *TIBICININÆ* (concluded).

THIS communication concludes my efforts to revise and systematize the genera of the family Cicadidæ. There are a few genera with which I am still unacquainted—*Nosola*, Stål, *Nablistes*, Karsch, *Plautilla*, Stål, *Paectira*, Karsch, and *Triglena*, Fieb.,—but these will, I hope, be located in a subsequent synonymical catalogue of the family.

Division TETTIGOMYIARIA.

Tegmina broad and short, not or scarcely longer than the body, sometimes scarcely longer than the abdomen; abdomen usually inflated, always thickened.

*Synopsis of Genera.*

- A. Bases of upper vein to lower ulnar area and lower vein to radial area distinctly and well separated at apex of basal cell.
- a. Wings with six apical areas.
- b. Tegmina about as long as body.
- c. Head as long as breadth between eyes; front produced and as long as broad ..... *Xosopsaltria*.
- cc. Head considerably shorter than space between eyes; front not produced, short, transverse, broader than long ..... *Inyamana*.
- Ann. & Mag. N. Hist.* Ser. 7. Vol. xvi. 18

- ccc. Head slightly shorter than space between eyes; front slightly produced, about as long as broad. . . . . *Saticula*.
- aa. Wings with five, sometimes only four, apical areas.
- bb. Tegmina only about two thirds the length of body . . . . . *Gazuma*.
- B. Bases of upper vein to lower ulnar area and lower vein to radial area with almost a common origin at apex of basal cell . . . . . *Tettigomyia*.

## Genus XOSOPSALTRIA.

*Pydna*, Stål, Ann. Soc. Ent. Fr. (4) i. p. 621 (1861), nom. præocc.  
*Xosopsaltria*, Kirk. Entomologist, 1904, p. 280, nom. n.

Type, *X. lutea*, Oliv. (*Cicada*).

*Xosopsaltria fuliginosa*, sp. n.

♂. Head and pronotum sordidly ochraceous; head with marginal and submarginal lines to front, spots at lateral margins of vertex, and area of the ocelli, pronotum with two central fasciæ with a curved discal fascia on each side, the incisures and lateral margins, black; mesonotum sordidly ochraceous, with four large obconical spots (the two central shortest), a large spot in front of cruciform elevation and the outer margins of same, black; abdomen sordidly ochraceous, the posterior segmental margins narrowly testaceous, with two central longitudinal series of piceous spots; body beneath sordidly ochraceous; transverse striæ to face, disk of sternum, legs, and base of metasternum piceous; tibiæ (excluding apices) ochraceous; tegmina pale shining fuliginous, becoming more or less hyaline in the various areas, the venation pale fuscous; wings hyaline, the venation fuscous; tegmina broad, not longer than the body, their greatest breadth little less than half their length; abdomen prominently centrally ridged above; opercula inwardly oblique, not passing base of abdomen.

Long., excl. tegm., 21 mm.; exp. tegm. 45 mm.

*Hab.* Brit. E. Africa (*C. S. Belton*, Brit. Mus.).

## INYAMANA, gen. nov.

Head (including eyes) almost as wide as base of mesonotum, shorter than breadth between eyes, lateral margins of vertex convex and projecting slightly beyond front, which is short, transverse, broader than long, concave, and medially sulcate, ocelli a little nearer to each other than to eyes; pronotum longer than head, the lateral margins a little convex, nearly straight, the posterior angles broadly ampliate;



mesonotum (including cruciform elevation) about as long as head and pronotum together; abdomen dilated, considerably longer than space between apex of head and base of cruciform elevation; tympana entirely exposed; opercula in male obliquely convex, longer than broad, not passing base of abdomen; rostrum passing the anterior coxæ; tegmina and wings hyaline; tegmina short, broad, about as long as body; basal cell twice as long as broad, postcostal area moderately broad and cell-like, apical areas eight; wings with six apical areas.

Type, *I. hemaris*, Dist.

*Inyamana hemaris*, sp. n.

Body ochraceous; head with some small pale fuscous spots and two short black lines at inner margin of ocelli; pronotum with two central longitudinal lines united posteriorly, on each side of which is a curved discal line, the outer incisures and lateral margins, piceous or black; mesonotum with four long obconical spots, the two central shortest and placed close together, and two small spots in front of the cruciform elevation black; abdomen with two central broken macular fasciæ and a lateral broken macular fascia on each side black; body beneath with the disk of sternum, inner areas of opercula, and two central, broken, macular fasciæ to abdomen piceous or black; tegmina and wings hyaline, the venation mostly fuscous, costal membrane to tegmina ochraceous.

Long., excl. tegm., ♂ ♀ 14–16 mm.; exp. tegm. 34–35 mm.

Hab. Brit. East Africa: Samburu (C. S. Betton, Brit. Mus.); Kondoa (*Bloyet*, Paris Mus.).

*Inyamana ochracea*, sp. n.

Body and legs ochraceous, concolorous; tegmina and wings hyaline, the venation brownish ochraceous; costal membrane to tegmina ochraceous.

Allied to *I. hemaris*, but smaller, colour totally different; postcostal area to tegmina much broader, lower apical area much shorter.

Long., excl. tegm., ♂ ♀, 11–14 mm.; exp. tegm. 25–30 mm.

Hab. Brit. East Africa: Samburu (C. S. Betton, Brit. Mus.).

Genus SATICULA.

*Saticula*, Stål, Berl. ent. Zeitschr. x. p. 172 (1866).

*Cicada*, 5. Gruppe, Hagen, Stett. ent. Zeit. xvii. p. 138 (1856).

Type, *S. coriaria*, Stål.

## GAZUMA, gen. nov.

♀. Body elongate, robust; head (including eyes) slightly narrower than base of mesonotum, about as long as space between eyes, front moderately produced, a little broader than long, margins of front and vertex discontinuous, vertex longitudinally sulcate; pronotum about as long as head, lateral margins obliquely sinuate, posterior angles moderately ampliate; mesonotum (including cruciform elevation) about as long as head and pronotum together; abdomen much longer than space between apex of head and base of cruciform elevation; tympana entirely exposed; rostrum passing the anterior coxæ; tegmina and wings hyaline; tegmina short, broad, only about two thirds the length of body, apical areas short, eight in number, in some specimens less; wings with five, in some specimens only four, apical areas.

This description is founded on a series of female specimens.

Type, *G. Barrettae*, Dist.

*Gazuma Barrettae*, sp. n.

♀. Body and legs ochraceous, concolorous; tegmina and wings hyaline, the venation ochraceous; tegmina with a slight ochraceous tint, the costal membrane ochraceous; third ulnar area very much shorter than fourth; anterior femora armed with three strong spines beneath.

Long., excl. tegm., ♀ 10–12 mm.; exp. tegm. 19–20 mm.

Hab. South Africa: Annshaw (*Miss F. Barrett*, Brit. Mus.).

*Gazuma Delalandei*, sp. n.

Uniformly brownish ochraceous; tegmina and wings hyaline, the first a little tinted with very pale brownish, the venation and costal membrane brownish ochraceous; wings with the venation dull ochraceous.

Allied to *G. Barrettae* by venation of tegmina, which are, however, a little shorter, front of head a little more prominent; pronotum deeply, centrally, longitudinally sulcate.

Long., excl. tegm., ♀ 13 mm.; exp. tegm. 19 mm.

Hab. S. Africa (*Delalande*, Paris Mus.).

*Gazuma pretoriae*, sp. n.

Closely allied to *G. Barrettae* in general appearance, but virescent, not ochraceous, and differing structurally from that species by the length of the third ulnar area, which is

nearly twice as long as in *G. Barrettæ* and almost as long as the fourth.

Long., excl. tegm., ♀ 12 mm. ; exp. tegm. 21 mm.

*Hab.* Transvaal: Pretoria.

#### Genus TETTIGOMYIA.

*Tettigomyia*, Amy. & Serv. Hist. Hém. p. 482 (1843).

Type, *T. vespiformis*, Amy. & Serv.

#### Division MELAMPSALTARIA.

This division, though at present containing only three genera, embraces a large number of species. It is easily recognized by the venation of the tegmina, in which the bases of the upper vein to lower ulnar area and the lower vein to radial area are fused or the first emitted at some distance from the base of the second. The distribution of the Melampsaltaria is in the Old World, though there is a Nearctic representative; but it is in Australia where the greatest number of species is found and where the headquarters of the division is clearly indicated.

#### *Synopsis of Genera.*

- |                                       |                      |
|---------------------------------------|----------------------|
| A. Wings with six apical areas.....   | <i>Melampsalta</i> . |
| B. Wings with five apical areas.....  | <i>Pauropsalta</i> . |
| C. Wings with four apical areas ..... | <i>Urabanana</i> .   |

#### Genus MELAMPSALTA.

*Melampsalta* (*Melampsalte*), Amy. Ann. Soc. Ent. Fr. (2) v. p. 155 [351] (1847).

*Melampsalta*, Kolenati, Mém. Ent. vii. p. 27 (1857).

Type, *M. musiva*, Germ. (*Cicada*).

Considerable difficulty appertains as to the nomenclature of this genus. It was first named by Amyot (scarcely described), *supra*, and takes precedence of the name *Cicadetta* which he used on a succeeding page. Kolenati described the genus, but had previously also described *Cicadetta*, which, if we take Kolenati as the real founder, must have priority. However, I follow Stål, Karsch, and other writers in giving the name *Melampsalta* precedence, as given by Amyot. I have failed to separate *Cicadetta* from *Melampsalta*: if we compare the type of the first, the *Cicada montana*, Scop., with the type of *Melampsalta* (*supra*), a difference appears in the position of emergence of the upper vein of the lower ulnar area; but much as I endeavoured to thus break

up a congested genus, my efforts failed, and the differences became evanescent when a long series of species were examined.

*Melampsalta Godingi.*

*Melampsalta umbrimargo*, God. & Frogg. Proc. Linn. Soc. N. S. Wales, 1904, p. 632, t. xviii. fig. 12.

Head black; a central line to front, a spot on each lateral margin, an elongate central basal spot, a small spot near inner margin of each eye, and the posterior margin of vertex ochraceous; pronotum ochraceous; two central fasciæ united posteriorly and amplified anteriorly, some irregular discal markings, inner posterior margin, and lateral and sublateral margins black; mesonotum black; the margins of two central obconical spots, the lateral margins, and cruciform elevation ochraceous, the last with a black spot on each anterior angular prolongation; abdomen black, posterior segmental margins ochraceous; sternum very thickly greyish pilose; face black, its lateral margins ochraceous; opercula in male greyish yellow, bases piceous; abdomen beneath ochraceous, with a central and lateral segmental series of black spots; tegmina and wings hyaline, venation brownish ochraceous; tegmina with the costal membrane, apical margin, bases of second, third, fifth, and seventh apical areas, longitudinal veins to fifth, sixth, and seventh apical areas, and spots at apices of longitudinal veins to upper four ulnar areas umber-brown.

Long., excl. tegm., ♂ 18½ mm.; exp. tegm. 56 mm.

*Hab.* Australia: Ardrossan, Yorke Peninsula (*Tepper*); Gawler, S.A. (Macleay Mus.).

A much smaller species than the *Cicada umbrimargo*, Walk.; tegmina much shorter and their apices more rounded; colour and markings also different.

*Melampsalta athiopica*, sp. n.

Body above black, sparingly palely ochraceously pilose; ocelli castaneous; lateral margins of pronotum, lateral margins of metanotum (narrowly), and posterior angles of cruciform elevation pale ochraceous; body beneath and opercula pale ochraceous, strong suffusions to femora and anterior and intermediate tibiæ, tarsi (more or less), and a broad, central, longitudinal fascia to abdomen piceous or black; tegmina and wings hyaline, the venation fuscous; the tegmina with the costal membrane more or less castaneous, the upper vein of the lower ulnar area emitted at a

very short distance from base of radial area, the costal margin moderately arched to apex of radial area, margin of postcostal area straight; opercula in male somewhat long, their apices convex and reaching the apex of the second abdominal segment; rostrum just passing the intermediate coxæ.

Long., excl. tegm., ♂ 12 mm.; exp. tegm. 30 mm.

Hab. Brit. East Africa: Zomba (*A. Whyte*, Brit. Mus.).

*Melampsalta Waterhousei*, sp. n.

Body above black, sparingly greyish pilose; head with a central fascia (broadened posteriorly) to front, a small spot on each lateral margin and one at base of vertex, ochraceous; pronotum much suffused with ochraceous on the disk of each lateral area, its extreme posterior margin of the same colour; disk of cruciform elevation, central margin (interrupted medially) of metanotum, a spot on each side of anal segment, and anal appendage (excluding base) pale ochraceous; posterior margins of third, fourth, and fifth abdominal segments dull ochraceous; head beneath, sternum, legs, and rostrum piceous; streaks and apices to anterior and intermediate femora, intermediate tibiæ, posterior femora and tibiæ, opercula in male, and abdomen beneath stramineous; posterior femora with some piceous lines; tegmina with a slight brownish-ochraceous tinge, the venation ochraceous, fuscous towards apices, the upper vein of lower ulnar area attached to lower vein of radial area at a short distance from base; opercula in male short, transverse, not extending beyond base of abdomen.

Long., excl. tegm., ♂ 13 mm.; exp. tegm. 37 mm.

Hab. Australia: Adelaide (*F. Waterhouse*, Brit. Mus.).

*Melampsalta lactea*, sp. n.

Body above black, somewhat strongly ochraceously pilose; head with a spot on front and the lateral margins of vertex and a central basal incised spot to same, margins and a central linear spot to pronotum, lateral margins of mesonotum, and the cruciform elevation ochraceous; head beneath, sternum, and legs piceous or black; margins and a spot at base of face, apices and streaks to femora, and annulations (more or less broad) to tibiæ ochraceous; abdomen beneath pale ochraceous, lateral marginal and central segmental series of spots piceous; tegmina talc-like, suffused with pale fuscous; base and apex of radial area, the last continued to apex of lower ulnar area, postcostal area, and some pale

suffusions at bases of apical areas lacteous; a black streak in basal cell, costal membrane, and about basal half of venation ochraceous, remaining venation brownish ochraceous, costal edge of postcostal area fuscous, upper vein of lower ulnar area connected with lower vein of radial area for some distance from base; wings hyaline, venation ochraceous, base and anal area lacteous; opercula in male black, transverse, posteriorly rounded, not passing base of abdomen.

Long., excl. tegm., ♂ 17 mm.; exp. tegm. 39 mm.

*Hab.* Australia: Melbourne (Brit. Mus.).

### *Melampsalta issoides.*

*issoides*, Walk., MS.

Head black, with a linear spot to front and a small rounded spot at base of vertex ochraceous; pronotum dull testaceous, the submargins and two central lines dilated posteriorly, black, the incisures piceous; mesonotum black, with two very obscure central obconical spots, the margins of which are dull testaceous, lateral margins, cruciform elevation, and margins of metanotum, pale testaceous; posterior segmental margins obscurely testaceous; body beneath and legs thickly ochraceously pilose; tegmina and wings hyaline, the venation fuscous, a somewhat broad (broadest at apex) oblique fuscous fascia crossing tegmina at bases of apical areas, more or less broken posteriorly, the upper vein of lower ulnar area emitted at only a short distance from base of radial area; opercula in male small, posteriorly rounded, not extending beyond base of abdomen.

Long., excl. tegm., ♂ 12 mm.; exp. tegm. 27 mm.

*Hab.* Australia: New South Wales; Swan River (Brit. Mus.). West Australia: Perth (*H. J. Turner*, Brit. Mus.).

### Genus PAUROPSALTA.

*Pauropsalta*, God. & Frogg. Proc. Linn. Soc. N. S. Wales, 1904, p. 615.

Type, *P. mneme*, Walk. (*Cicada*), = *P. leurensis*, God. & Frogg.

Mr. Froggatt has very kindly sent me a number of co-types of the species he described and identified in conjunction with Mr. Goding in their monograph of the Australian Cicadidæ. I am thus enabled to fix the exact nomenclature of the type of their genus. All further synonymy will appear in my synonymic catalogue. It is scarcely to be expected that Walker's descriptions allow identifications to be made with

certainty when his types are not available for comparison. The figure of *P. leurensis* given by Goding and Froggatt is imperfect in the neuration of the tegmina, where the upper margin of the lower ulnar area is represented by the artist as emerging close to the apex of the basal cell, whereas it bifurcates some distance from it.

*Pauropsalta stigmatica*, sp. n.

♀. Head black; a central longitudinal line to front, a small central spot at base, and a similar spot on each lateral margin of vertex ochraceous; pronotum ochraceous, with two central, longitudinal, piceous lines, angularly united posteriorly and ampliately united anteriorly, the incisures and lateral margins fuscous; mesonotum black, with two central pale ochraceous fasciæ, which are widened and inwardly angulated on disk, the lateral margins and cruciform elevation ochraceous, the last with a central line and apices of the anterior angles piceous or black; abdomen black, the posterior segmental margins broadly ochraceous, that on the posterior segment medially interrupted; anal segment testaceous, centrally black; body beneath ochraceous; head beneath black, lateral margins and an anterior spot to face ochraceous; legs more or less suffused with piceous, the anterior legs most strongly so; tegmina and wings hyaline, the venation mostly fuscous; tegmina with the costal membrane pale ochraceous, the postcostal area fuscous and appearing as a dark stigma; wings with five apical areas.

Long., excl. tegm., ♀ 11 mm.; exp. tegm. 29 mm.

*Hab.* Adelaide (*F. Waterhouse*, Brit. Mus.).

*Pauropsalta Dameli*, sp. n.

♂. Body above black; central sulcation at base of vertex ochraceous; a spot on each lateral margin of vertex, margins and a central fascia to pronotum, an irregular discal spot (mutilated in type by pin) and lateral margins of mesonotum, cruciform elevation, posterior area of metasternum, abdominal segmental margins, and disk of anal segment, testaceous red; body beneath testaceous; head beneath (excluding margins of face) and discal suffusions to sternum piceous; legs, rostrum (excluding apex), lateral margins of sternum, and the opercula pale ochraceous; tegmina and wings hyaline, the venation ochraceous; tegmina distinctly arched above the radial area, with the costal membrane and postcostal area ochraceous; wings with five apical areas.

Long., excl. tegm., 9½ mm.; exp. tegm. 22 mm.

*Hab.* "Australia" (*Edw. Damel*, Brit. Mus.).



## Genus — ?

*Cicada complex*, Walk. List Hom. i. p. 203 (1850).

The type is unlocalized, without abdomen, and with one wing mutilated, the remnants preserved being gummed on a card. The shape and venation of the tegmina resemble those of *Pauropsalta dubia*, God. & Frogg., but the one wing retained possesses only three apical areas. Under such circumstances it is scarcely possible to generically identify it.

## URABUNANA, gen. nov.

Head considerably shorter than pronotum, the front broad and rounded, its margins discontinuous to, and almost at right angles with, the lateral margins of vertex, which are also rounded, vertex much longer than front and with a central incision at base, ocelli a little nearer to each other than to eyes, which project beyond the anterior pronotal angles; pronotum somewhat quadrangular, its lateral margins straight, its posterior angles a little amplified; mesonotum about as long as pronotum; abdomen about as long or slightly longer than space between apex of head and base of cruciform elevation; tympana entirely exposed; opercula in male obliquely directed inwardly, but not extending beyond the base of the abdomen; rostrum reaching the intermediate coxæ; anterior femora strongly spined beneath; tegmina and wings hyaline; tegmina with eight apical areas, the upper vein of lower ulnar area emitted at some distance from base of radial area, where they are fused, postcostal area moderately broad; wings with four apical areas.

Type, *U. sericeivitta*, Walk. (*Cicada*).

*Urabunana segmentaria*, sp. n.

Body above black, sparingly greyishly pilose; a small spot at apex and the basal narrow margin of front, a small spot on each lateral margin, and a central spot at base of vertex, lateral and posterior margins of pronotum, cruciform elevation, posterior margin of metasternum, and lateral margins and posterior segmental margins of abdomen ochraceous; body beneath ochraceous; head beneath (excluding margins of face), clypeus, disk of sternum, basal margins of opercula, suffusions to coxæ and femora, anterior tibiæ and tarsi, and base of abdomen black; tegmina and wings hyaline, bases of both narrowly ochraceous; tegmina with the costal membrane, postcostal area, and basal veins pale



ochraceous, remaining venation fuscous; venation of wings ochraceous or fuscous; wings with four apical areas; anterior femora with two strong black spines.

Long., excl. tegm., ♂ 10 mm.; exp. tegm. 24 mm.

Hab. Queensland: Peak Downs (Coll. Dist.).

### Division HEMIDICTYARIA.

The principal divisional character of the Hemidictyaria is to be found in the narrow head, which (including eyes) is about or scarcely more than half the width of mesonotum at base; the abdomen (especially in the males) is more or less globose and usually longitudinally dorsally ridged.

*Lacetas*, Karsch, from the figure illustrating the description, apparently belongs to this division, but I have not yet seen a representative of the genus, and therefore cannot locate it in the synopsis.

### Synopsis of Genera.

- A. Venation of tegmina normal, not reticulate.
- a. Front of head triangular, deeply and angularly inserted in vertex.
    - b. Head longer than space between eyes.
    - c. Ocelli placed as near eyes as to each other.
    - d. Apical areas of tegmina and wings almost as long as half their length . . . . . *Arfaka.*
  - aa. Front of head conical, moderately but not angularly inserted in vertex.
    - bb. Head about as long as space between eyes.
    - cc. Ocelli placed nearer to each other than to eyes.
    - dd. Apical areas of tegmina and wings shorter than half their length.
    - e. Lateral margins of pronotum more or less sinuate.
    - f. Fourth ulnar area of tegmina of normal shape . . . . . *Sapantanga.*
    - ff. Fourth ulnar area of tegmina with its anterior margin at base of third ulnar area inwardly angulated and emitting a short rudimentary vein . . . . . *Jacatra.*
    - ee. Lateral margins of pronotum obliquely straight . . . . . *Iruana.*
  - ccc. Ocelli placed as near to eyes as to each other.
    - g. Tegmina with the first ulnar area much longer than third; fourth ulnar area much shorter than radial area.
    - h. No rudimentary vein at base of second ulnar area . . . . . *Prasia.*
    - gg. Tegmina with the first ulnar area about as long as third; fourth ulnar area about or nearly as long, or a little longer than radial area.

- hh.* Rudimentary vein at base of second ulnar area connecting it more or less imperfectly with apex of fifth ulnar area, sometimes almost obsolete ..... *Lembeja*.
- B. Venation of tegmina more or less reticulate.
- i.* Bases of upper vein to lower ulnar area and lower vein of radial area not amalgamated, the first alone emitted from end of cell, contiguous to emergence of second ..... *Cystosoma*.
- ii.* Bases of upper vein to lower ulnar area and lower vein of radial area amalgamated.
- j.* Reticulated area of tegmina not more than half their length and sharply defined by a transverse line\* ..... *Hemidictya*.
- jj.* Reticulate area of tegmina more than half their length and not defined by a transverse line .... *Ilovana*.

## ARFAKA, gen. nov.

Head longer than space between eyes, front long, about as long as vertex, deeply inserted in vertex and angulate anteriorly and posteriorly, breadth (including eyes) little more than half the breadth of mesonotum at base, eyes large and oblique, ocelli almost as near to eyes as to each other; pronotum about as long as head, its lateral margins moderately convex, its posterior angles widely amplified; mesonotum (including cruciform elevation) longer than pronotum; abdomen moderately inflated, attenuated posteriorly, dorsally medially ridged, longer than space between apex of head and base of cruciform elevation; tympana entirely exposed; opercula in male extremely small, leaving the cavities almost entirely exposed; anterior femora only moderately spined beneath; face much compressed and prominent; rostrum reaching the intermediate coxæ; tegmina and wings hyaline; tegmina with eight, wings with six apical areas, which in both cases are long and occupy at least half their length.

Type, *A. fulva*, Walk. (*Cephaloaxys*).

## SAPANTANGA, gen. nov.

Head about as long as space between eyes, front long, about as long as vertex, conical, not angulately immersed in vertex, breadth (including eyes) about two thirds the width of mesonotum at base; pronotum about as long as head, its lateral margins a little convex, its posterior angles moderately amplified; mesonotum (including cruciform elevation) considerably longer than pronotum; abdomen short, robust,

\* Characters taken from Westwood's figure.

attenuated posteriorly, not longer than space between apex of head and base of cruciform elevation; tympana entirely exposed; opercula in male very small, the cavities almost entirely exposed; rostrum about reaching the anterior coxæ; face moderately compressed, strongly longitudinally sulcate; tegmina and wings hyaline; tegmina with eight, wings with six apical areas, which in both cases are shorter than half their length.

Type, *S. nutans*, Walk. (*Cephaloxys*).

#### JACATRA, gen. nov.

Head (including eyes) about half the breadth of base of mesonotum, about as long as broad, front moderately produced, subtriangular, considerably shorter than vertex, its lateral margins and those of vertex discontinuous, ocelli nearer to each other than to eyes, well separated from base of head; pronotum about as long as head, its posterior angles somewhat strongly ampliate; mesonotum (including cruciform elevation) longer than pronotum; abdomen robust, centrally longitudinally ridged, longer than space between apex of head and base of cruciform elevation; tegmina hyaline, apical areas eight, first ulnar area longer than third, fourth ulnar area shorter than radial area, the transverse vein at base of third ulnar area strongly angulated and emitting a short rudimentary vein halfway across fourth ulnar area; wings with six apical areas.

Type, *J. typica*, Dist.

#### *Jacatra typica*, sp. n.

Body, legs, tegmina, and wings pale dull ochraceous; head slightly tinged with virescent; pronotum with the margins and a central longitudinal fascia virescent; mesonotum with two anterior central obconical spots, denoted only by their pale margins, and with a broad virescent fascia on each lateral area; posterior segmental margins (excluding basal and apical segments) pale testaceous; tegmina with a dull ochraceous tint, the venation and costal membrane a little darker, the veins also alternately marked with elongate darker and lighter spots; wings with a dull ochraceous tint, the veins darker; *tegmina with the additional curved rudimentary vein very distinct and perfect for halfway across the apical area of fourth ulnar area.*

Long., ♂, 20 mm.; exp. tegm. 47 mm.

Hab. Java (Brit. Mus.).

## IRUANA, gen. nov.

Head triangular, considerably shorter than the pronotum, including eyes about half the width of base of mesonotum; front a little shorter than vertex, somewhat triangular, centrally finely sulcate, lateral margins of front and vertex almost continuous; vertex with two central longitudinal ridges, exhibiting a deep sulcation between them; front ocellus placed very near anterior margin, the other two on each side of ridges, a little nearer to each other than to eyes, lateral margins and eyes oblique; pronotum narrowed anteriorly, lateral margins oblique, posterior angles a little subangularly ampliate, centrally, finely, longitudinally sulcate; mesonotum (including cruciform elevation) a little longer than pronotum; abdomen short, prominently, centrally, dorsally ridged; tympana entirely exposed; opercula in male small, short, not entirely covering the sonorous apertures; tegmina semiopaque, costal membrane somewhat broad and concave, postcostal area broad and distinct, apical areas eight; wings with six apical areas.

Allied to *Lacetas*, Karsch, differing principally by the number of apical veins to the tegmina.

Type, *I. sulcata*, Dist.

*Iruana sulcata*, sp. n.

Somewhat uniformly pale ochraceous; tegmina semiopaque, with an ochraceous tint; wings semihyaline, with the venation ochraceous; head and pronotum more or less centrally longitudinally sulcate, the front finely, the vertex most strongly sulcate; rostrum reaching the intermediate coxæ; other characters as in generic diagnosis.

Long., excl. tegm., ♂ ♀ 15-16 mm.; exp. tegm. 48-50 mm.

*Hab.* Brit. E. Africa: Lagari (*C. S. Betton*, Brit. Mus.).

## Genus PRASIA.

*Prasia*, Stål, Tr. Ent. Soc. Lond. (3) i. p. 574 (1863).

*Drepanopsaltria*, Bredd. Hem. Celebes, p. 113 (1902).

Type, *P. faticina*, Stål.

I am unable to follow our Prussian colleague in separating his genus *Drepanopsaltria* from *Prasia*. (1) He relies on the presence or absence of the opercula, and gives a figure representing a species of *Prasia* without stating what that species is. Now the type of *Prasia*—*P. faticina*, Stål—is in the British Museum, and is a female specimen, consequently

we cannot refer to the opercula, and I have never seen a male specimen. Stål, in describing his *P. fatiloqua*, certainly writes "*operculis nullis*," but this cannot be accepted as the type of *Prasia*, and the true female type has all the appearance of what Breddin refers to as typical *Drepanopsaltria*. (2) To add to the confusion, Breddin gives as the type of *Drepanopsaltria*, *Lembeja culta*, Dist., a species I have never described; but it is probable he was referring to my *Prasia culta* (Ann. & Mag. Nat. Hist. (7) i. p. 97, 1898).

#### Genus LEMBEJA.

*Lembeja*, Dist. Mon. Orient. Cicad. pp. 103 & 147 (1892), n. nom.

*Perissoneura*, Dist. Proc. Zool. Soc. Lond. 1883, p. 189, nom. præocc.

Type, *L. maculosa*, Dist. (*Perissoneura*).

In reference to this genus, Herr Breddin (Hem. Celebes, p. 113, 1902) has formulated the dogma "*Genus Lembejam Dist. a Prasia Stål naturaliter distingui non posse existimo*." But this is more of a criticism on the veteran entomologist Dr. Karsch, of his own Berlin Museum, who has described two species in that genus.

#### Genus CYSTOSOMA.

*Cystosoma*, Westw. Arc. Ent. i. p. 92 (1842).

Type, *C. Saundersi*, Westw.

#### Genus HEMIDICTYA.

*Hemidictya*, Burm. Handb. ii. 1, p. 178 (1839); Amy & Serv. Hist. Hém. p. 461 (1843).

Type, *H. frondosa*, Burm.

#### HOVANA, gen. nov.

Head triangular, about as long as the pronotum, including eyes about half the width of mesonotum, front and vertex subequal in length, eyes outwardly truncate, in a line with lateral margins of head, base of head truncate; pronotum with the lateral margins obliquely straight, narrowing to head, posterior angles prominent, obtusely angulate; mesonotum about as long as pronotum; metanotum triangularly posteriorly produced; abdomen (♀) short, robust, shorter than space between apex of head and posterior angle of metanotum; face obliquely compressed; rostrum robust, reaching intermediate coxæ; tegmina opaque, broad, acuminate at apex, greatest breadth more than half their length, costal

membrane very broad, more than apical half with the venation reticulate and forming very many cellular areas, upper vein of lower ulnar area amalgamated at base with lower vein of radial area; wings hyaline, with eight apical areas.

Type, *H. Distanti*, Brancsik (*Hemidictya*).

#### Division TETTIGARCTARIA.

A division at present only represented by one remarkable genus, in which the pronotum differs from that in any other genus of the family by its large size, produced posteriorly and almost covering the mesonotum.

#### Genus TETTIGARCTA.

*Tettigarcta*, White, Eyre's Trav. in Australia, Append. i. p. 412 (1845).

Type, *T. tomentosa*, White.

### APPENDIX.

#### TAPHURARIA.

#### DULDERANA, gen. nov.

Head broad, eyes projecting beyond the anterior angles of the pronotum, front broad, considerably shorter than vertex and centrally longitudinally finely sulcate, margins of front and vertex moderately discontinuous, ocelli nearer to each other than to eyes; pronotum about as long as broad, its lateral margins slightly convex, its posterior angles angularly ampliate; mesonotum (including cruciform elevation) about as long as head and pronotum together; metanotum posteriorly and laterally produced behind the exposed tympana; abdomen in male very short, not so long as space between apex of head and base of cruciform elevation; rostrum reaching the posterior coxæ; opercula narrow, convexly transverse, obliquely curved inwardly, a posterior metasternal process occupying the space between their inner angles; anterior femora with three strong spines beneath; tegmina about half as long again as the body, costal margin suddenly arched near base, third ulnar area very broad and long, second ulnar area very short, oblique, only about half the greatest length of first, lower ulnar area very narrow, its upper margin well separated from lower vein of radial area, upper vein of penultimate ulnar area emitted at some distance

from base of radial area, apical areas eight; wings with six apical areas.

Type, *D. truncatella*, Walk. (*Cicada*).

The principal characters of this genus are to be found in the structure of the tegmina.

*Abricta Elseyi*, sp. n.

Head black, the front castaneous, the ocelli and a central spot at base of vertex ochraceous; pronotum pale castaneous, with a central longitudinal ochraceous fascia, which is much amplified posteriorly and a little so anteriorly, posterior margin more or less piceous; mesonotum ochraceous, with four obconical castaneous spots, of which the two outermost are much the largest and occupy the whole lateral areas, cruciform elevation castaneous; abdomen castaneous, greyishly pilose; body beneath and legs castaneous, greyishly pilose, head beneath (excluding face) black; tegmina and wings hyaline; tegmina with the veins and costal membrane brownish ochraceous; wings with the venation ochraceous, the whole anal area pale golden yellow, posteriorly margined with fuscous; rostrum passing the intermediate coxæ; opercula in male obliquely directed inwardly, but scarcely extending beyond base of abdomen.

Long., excl. tegm., ♂ 19 mm.; exp. tegm. 60 mm.

*Hab.* North Australia: Victoria River (*Dr. J. R. Elsey*, Gregory Exploration Exped., Brit. Mus.).

Allied to *A. ruber*, God. & Frogg., but tegmina apically unspotted, different colour of head and anal area to wings, shorter ulnar areas to tegmina, &c.

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XXX.—On the Bats of the *Rhinolophus arcuatus* Group, with Descriptions of Five new Forms. By KNUD ANDERSEN.

*General Characters of the Group.*

*Brief diagnosis.*—Median anterior nasal swellings large and abruptly projecting. Sella approximately ovate in shape. Tail much shorter than tibia.

*Skull.*—Chiefly characterized by the large, almost semi-globular, and strongly projecting median nasal swellings. Palatal bridge rather short, between  $\frac{1}{4}$  and  $\frac{1}{3}$  the length of

the maxillar tooth-row; median anterior point opposite front of  $m^1$ , median posterior point level with middle of  $m^2$ . Basioccipital not unusually narrowed.

In *Rh. arcuatus* the premolars and molars are comparatively small, the temporal fossa narrow; the zygomatic breadth of the skull, therefore, practically the same as the mastoid breadth; the sagittal crest low, very gradually passing into the supraorbital ridges. *Rh. euryotis* shows the other extreme: the larger teeth have caused a stronger development of the temporal muscle, a widening out of the temporal fossa, therefore a markedly larger zygomatic width of the skull, a heightening of the sagittal crest, especially in front, making the declivity of this latter towards the post-nasal depression more abrupt\*. These two extremes are connected together by several intermediate stages.

*Teeth*.—Throughout the whole group the dentition is rather uniform. All the species have passed the primitive stage:  $p_3$  in the tooth-row, this premolar being invariably external to the row, when not completely wanting. As a general rule,  $p_2$  and  $p_4$  are in contact, not rarely so strongly so that their cingula overlap each other; but sometimes individuals occur in which  $p_2$  and  $p_4$  are distinctly separated, reminiscent of the time when  $p_3$  was situated in the tooth-row. The upper  $p^2$  is small and always in row.

*Nose-leaves*.—Chief characters: the shape of the sella and the connecting-process.

The sella is approximately ovate or ovate-pyriform. The connecting-process strongly arcuate, almost semicircular in outline, and starting from the very summit of the sella. The internasal lobes slightly larger than usual in the genus. The sella is peculiarly modified in *Rh. inops*, the connecting-process in *Rh. Creaghi*.

There are two well-marked "types" of horseshoe in this group. In the more primitive species the median longitudinal groove separating the two halves of the horseshoe in front is narrow (linear); in the higher developed forms it is broad, more or less pentangular in shape. The former condition is characteristic of the species inhabiting the Philippine Islands and N.E. Borneo (*arcuatus*, *subrufus*, *inops*, *Creaghi*), the latter of the forms distributed over Batchian, Amboina, Timor Laut, and the Key Islands (*euryotis* and its local representatives).

\* For similar cranial differences in the *Rh. philippinensis* group, see Ann. & Mag. Nat. Hist. for August 1905, p. 245.



*Mental grooves*.—No species passes beyond the primitive stage: three mental grooves.

*Wing-structure* (compare the wing-indices below, on p. 287).—It is a general rule in the genus *Rhinolophus* that in the most primitive species the fourth and fifth metacarpals are equal in length, or, if anything, the fifth a trifle shorter, and III.<sup>2</sup> less than  $1\frac{1}{2}$  the length of III.<sup>1</sup>. All the members of the *Rh. arcuatus* group exhibit the slightly more advanced stage in which the fifth metacarpal is a little longer than the fourth, and III.<sup>2</sup> more than  $1\frac{1}{2}$  the length of III.<sup>1</sup>.

*Tail*.—The tail is extremely short, on an average but  $\frac{2}{3}$  the length of the lower leg.

*Rhinolophus arcuatus exiguus*, subsp. n.

*Diagnosis*.—Similar to the typical *Rh. arcuatus* (from Luzon), but with narrower horseshoe and nasal swellings. Forearm 44·8–46·2 mm.

*Skull*.—General characters as described above (pp. 281–282). Width of nasal swellings 5–5·2 mm., in typical *arcuatus* 5·6–5·7 mm.

*Dentition* (three skulls).— $p_3$  external (one skull, teeth unworn), or quite wanting on one side (one, teeth slightly worn), or on both sides (one, teeth slightly worn).  $p_2$  and  $p_4$  strongly in contact, their cingula overlapping each other.

*External characters*.—All essential points as in the typical form, but horseshoe decidedly narrower (7·7–8·2 mm., as against 9–10 mm.). Plagiopatagium inserted 1–2·5 mm. above the ankle. Colour (of spirit-specimens) a shade of dark brown, as in the dark phase of *arcuatus typicus*.

*Type*.—♀ ad. (in alcohol). Zamboanga. Collected by A. Everett, Esq. Brit. Mus. no. 79. 5. 3. 13.

*Range*.—Zamboanga. Guimarás.

*Rhinolophus subrufus*, sp. n.

*Diagnosis*.—Like *Rh. arcuatus*, but much larger. Forearm 53·8–57 mm.

*Skull*.—As compared with *Rh. arcuatus* premolars and molars comparatively larger; temporal fossa wider, making the zygomatic width decidedly larger than the mastoid width; sagittal crest somewhat higher in front.

*Dentition* (four skulls).— $p_3$  external;  $p_2$  and  $p_4$  in contact or slightly separated.

*External characters.*—In all essential points like a giant modification of *arcuatus*.

*Colour.*—(1) Red phase. Two skins, adult; Manila; teeth unworn. Above and below “cinnamon-rufous,” a little lighter on the fore part of the back; base of hairs almost “orange-rufous.”

(2) Dark phase. One skin, adult; Mindanao, July; teeth practically unworn. Upperside a very dark shade of “Prout’s brown”; base of hairs and underside “drab.”

*Type.*—Ad. (skin). Manila. Presented by J. Gould, Esq. Brit. Mus. no. 58. 3. 29. 4.

*Range.*—Luzon (Manila). Mindanao.

*Remarks.*—This is the species described by Prof. Peters as “*Rh. rufus*”\*. The name *rufus* is preoccupied by Eydoux and Gervais’s “*Rh. luctus*, var. *rufus*”†.

#### *Rhinolophus inops*, sp. n.

*Diagnosis.*—Summit of sella forming a triangular pouch. Forearm 53·8 mm.

*Skull.*—The *arcuatus* type, but with slightly wider temporal fossa; sagittal crest somewhat higher in front and a little more abruptly descending towards the postnasal depression.

*Dentition* (one skull).— $p_3$  external;  $p_2$  and  $p_4$  in contact.

*External characters.*—The horseshoe, the connecting-process, and the lancet quite of the *subrufus* type, but *summit of sella modified into a small triangular pouch, turning the opening downwards*; greatest depth of the pouch about 1·5 mm. Plagiopatagium inserted 1 mm. above the ankle. Colour (in alcohol) a shade of dark brown.

*Type.*—♂ ad. (in alcohol). Mt. Apo, at Jodaya, Mindanao, 4000 feet; July 8th, 1904. Collected by Dr. E. A. Mearns (no. 5713). “Bogobo name: Kohs’-set.” U.S. Nat. Mus. no. 125314.

*Remarks.*—The shape of the sella, *unique in the whole genus*, makes this species readily distinguishable.

\* Peters, MB. Akad. Berlin, 1861, p. 710.

† *Conf.* Andersen, Ann. & Mag. Nat. Hist., August 1905, p. 252.

Measurements\* of *Rh. arcuatus*, *subrufus*, and *inops*.

	<i>Rh. arcuatus.</i>				<i>Rh. subrufus.</i>		<i>Rh. inops.</i> Type.
	<i>typicus.</i> 2 spems., 2 skulls.		<i>exiguus.</i> 4 spems., 3 skulls.		4 spems., 4 skulls.		
	Min.	Max.	Min.	Max.	Min.	Max.	mm.
Ears, length .....	17·8	19	17·2	19·7	22	23	23·3
„ greatest breadth .....	13·2	14·7	13	14	18·8	19	18·3
Nose-leaves, length .....	15		13·8	14	20		? 18·8
„ breadth of horseshoe .....	9	10	7·7	8·2	11·5	12·8	12·7
Forearm .....	45·8	47·8	44·8	46·2	53·8	57	53·8
Tail .....	17	17·8	15	16·2	23	25	16
Lower leg .....	20·7	22·7	20·7	21	26·2	29·2	24·7
Skull, total length .....	21·2	21·7	20	20·8	25		24·2
„ mastoid width .....	9·8	10·2	9·5	9·8	11·3	11·8	11
„ zygomatic width .....	9·8	9·9	9·5	9·9	12	12·4	11·5
„ width of nasal swellings ..	5·6	5·7	5	5·2	7	7·1	6·5
Mandibles .....	14·5	14·8	13·4	14·2	17·8	18·6	17·5
Upper teeth .....	8·2	8·6	7·9	8	10·3	10·7	10
Lower teeth .....	8·8	9·2	8·5	8·7	11·2	11·5	10·9

*Rhinolophus euryotis timidus*, subsp. n.

*Diagnosis.*—Horseshoe narrower (as compared with the typical form): 10·2–10·7 mm. Forearm 55–57·2 mm. Range: Batchian.

This race is characterized externally by the narrower horseshoe and smaller ears. The brain-case is slenderer, the mandible shorter, and the teeth slightly smaller than in *Rh. e. typicus* and *præstans*. Plagiopatagium inserted 3–4·5 mm. above the ankle.

*Colour.*—Ad. skin; teeth unworn. Next to “Prout’s brown” above; base of hairs “drab”; underside brownish “drab.” Another skin (ad., teeth unworn) is essentially of the same colour, but more tinged with “Mars brown” above and with “wood-brown” below.

*Type.*—♀ ad. (in alcohol). Batchian. Collected by Dr. A. R. Wallace. Brit. Mus. no. 60. 1. 10. 5.

\* For explanation of measurements, see Ann. & Mag. Nat. Hist., August 1905, p. 248, footnote.

*Rhinolophus euryotis*, Temm., *typicus*.

*Diagnosis*.—Horseshoe broad: about 12 mm. Forearm about 57 mm. Range: Amboina.

The Amboina race of *Rh. euryotis* differs from the Batchian form by the broader brain-case, the longer mandible, longer tooth-rows, broader horseshoe, and larger ears; from the Key Island race by the smaller and slenderer skull, narrower nasal swellings, shorter mandible and tooth-rows, and narrower horseshoe. Plagiopatagium inserted 2-5 mm. above the ankle.

*Rhinolophus euryotis præstans*, subsp. n.

*Diagnosis*.—Horseshoe very broad: about 13 mm. Forearm 58 mm. Range: Key Islands.

This is the extreme in the size of the horseshoe and the width of the skull and nasal swellings. Plagiopatagium inserted very nearly on the ankle.

*Type*.—♂ ad. (in alcohol). Key Islands. Purchased. Brit. Mus. no. 99. 12. 4. 4.

*Measurements of Rh. euryotis and Subspecies.*

	<i>Rh. euryotis</i> .			
	<i>timidus</i> . 3 spems., 3 skulls.		<i>f. typica</i> . ♂ ad.	<i>præstans</i> . ♂ ad. Type.
	Min. mm.	Max. mm.	mm.	mm.
Ears, length .....	20·5		22·8	23
„ greatest breadth .....	17		19	18
Nose-leaves, length .....	17		17·5	19
„ breadth of horseshoe.	10·2	10·7	11·8	13
Forearm .....	55	57·2	56·8	58
Tail .....	18·5		20	21·5
Lower leg .....	25·7	27·8	28	28
Skull, total length .....			25·1	25·4
„ mastoid width .....			11·7	12
„ width of brain-case .....	10·4	10·4	10·8	11·1
„ zygomatic width .....	11·8	12·2	12·2	12·8
„ maxillar width .....	8·9	9	8·7	9·8
„ width of nasal swellings ..	6·8	6·9	6·8	7·2
Mandible .....	17·1	17·5	18	18
Upper teeth .....	9·7	9·7	10·2	10·2
Lower teeth .....	10·3	10·5	11	11

## Wing-indices.

	<i>Rh. arcuatus</i> , <i>subrufus</i> . 12 spems.	<i>Rh. Creaghi</i> . 1 spem.	<i>Rh. inops</i> . 1 spem.	<i>Rh. euryotis</i> . 6 spems.
Forearm . . . . .	1000	1000	1000	1000
3rd metacarpal.	706	707	703	702
III. <sup>1</sup> . . . . .	286	281	292	289
III. <sup>2</sup> . . . . .	458	454	481	436
4th metacarpal.	728	717	725	721
IV. <sup>1</sup> . . . . .	197	211	199	196
IV. <sup>2</sup> . . . . .	270	263	279	265
5th metacarpal.	742	741	740	734
V. <sup>1</sup> . . . . .	221	217	205	226
V. <sup>2</sup> . . . . .	237	217	240	233

## General Remarks on the Group.

All the species known of the *Rh. arcuatus* group are so far developed as to have the median anterior nasal swellings more abruptly projecting than usual in the genus, the middle lower premolar ( $p_3$ ) situated external to the tooth-row or quite obliterated, the fifth metacarpal slightly longer than the fourth, and the second phalanx of the third finger lengthened. All these are secondary characters. We lack the direct information as to the affinities of the group, which could have been derived from species on a more primitive level of development. Nevertheless, there can scarcely be any doubt that *the arcuatus group is more closely related to Rh. philippinensis and Rh. macrotis than to any other now existing types of the genus.* The strong development of the nose-leaves, the size of the internasal lobes, the shape of the connecting-process and the lancet, the broad ears, are characters which seem to point in that direction.

*Rh. arcuatus* is unquestionably the most primitive species of the group, as proved by the slightly less projecting nasal swellings, the small teeth, the narrow temporal fossa, the very low sagittal crest, the normal shape of the horseshoe, the somewhat less pronounced "ovate" shape of the sella. Of the two local forms here discriminated the southern (*Rh. e. exiguus*) is a little higher developed in dentition:  $p_3$  is very often lost; the narrow horseshoe is probably a secondary character.

*Rh. subrufus* is a modification of the *arcuatus* type: more

projecting nasal swellings, larger premolars and molars, therefore wider temporal fossa and higher sagittal crest; considerably larger size. There is a certain tendency in the genus *Rhinolophus* to a development of a large and a small representative of quite the same "type"; the difference in size is so well marked and without any intergradation that we cannot but recognize them as distinct "species," although they sometimes, as in the present case, inhabit the very same island; thus *Rh. subrufus* (Luzon) bears very much the same relation to *Rh. arcuatus* (Luzon) as *Rh. acuminatus* (Java) to *Rh. minor* (Java), *Rh. Rouxi* (Himalayas) to *Rh. borneensis*, *Rh. megaphyllus* (Australia) to *Rh. simplex* (Lombok).

*Rh. Creaghi*\*, from the extreme north-east of British N. Borneo (Sandakan), is very closely related to the Philippine *Rh. arcuatus*: the same type of skull, if anything a trifle more advanced in the size of the temporal fossa, but the difference is extremely small indeed; the same shape and size of the nasal swellings; the dentition on quite the same stage as in *arcuatus exiguus* ( $p_3$  rudimentary or wanting); the same shape of the horseshoe, the sella, and the lancet, but more rounded internasal lobes; the broad ears characteristic of the group; the three mental grooves; the same wing-structure; the short tail. But it is unique in the following points:—The connecting-process is obliterated; the median portion of the posterior nose-leaf is peculiarly inflated and provided with a conical tuft of coarse hairs; when pressed backwards the sella leans against *this hair-tuft*, which therefore *practically replaces the missing connecting-process*.

*Rh. inops* is in every respect, cranial and external (apart from the size), very much like *Rh. arcuatus*, but highly peculiar in the shape of the summit of the sella. The mental grooves do not reach the free border of the lower lip; it would seem to indicate a beginning obliteration of the grooves.

The essential cranial character of the group, viz. the abruptly projecting nasal swellings, culminates in the large and broad-skulled *Rh. euryotis*, in which the front part of the horseshoe is slightly modified. The species reviewed above are confined to the Philippines and N.E. Borneo, *Rh. euryotis* to the islands between Celebes and New Guinea.

The *Rh. arcuatus* group, as here defined, has no representatives in the Ethiopian Region.

\* Thomas, Ann. & Mag. Nat. Hist. (6) xviii. (1896) p. 244.

XXXI.—On the Bats of the *Rhinolophus macrotis* Group, with Descriptions of Two new Forms. By KNUD ANDERSEN.

*Rhinolophus hirsutus*, sp. n.

*Diagnosis*.—Allied to *Rh. macrotis*, but with considerably larger ears and longer tail. Forearm 44.7 mm. *Hab.* Central Philippine Islands (Guimarás).

Length of ears 24, greatest breadth of ears about 18 mm.; in two adult *Rh. macrotis* from Masuri the measurements are 19–20.8 (length) and 15.5–16.5 mm. (breadth). Tail equal to  $1\frac{1}{3}$  the length of the lower leg (24 as against 19 mm.); in *Rh. macrotis* scarcely equal to the lower leg (17 as against 18.8 mm.).

The skull is slightly larger than in *Rh. macrotis*, but quite of the same shape.  $p_3$  half in row;  $p^2$  in row, with a distinct, pointed cusp.

*Type*.—♀ ad. (in alcohol). Guimarás, Central Philippine Islands. Collected by J. B. Steere, Esq. U.S. Nat. Mus. no. 105487.

*Rhinolophus Pearsoni chinensis*, subsp. n.

*Diagnosis*.—Similar to *Rh. Pearsoni* from Darjeeling and Masuri\*, but with markedly shorter tibia, slightly smaller skull, narrower maxillar width, shorter mandible and tooth-rows. Forearm 52.7 mm. *Hab.* Fokien (China).

Length of lower leg 26 mm. (in the typical form 29); maxillar width 9.2 (9.7–9.8); length of mandible 16.8 (17.7–17.9); maxillar tooth-row 9.5 (9.8–10.2); mandibular tooth-row, exclusive of incisors, 10.3 (10.8–11.1). Dentition as in the typical form:  $p_3$  external;  $p_2$  and  $p_4$  almost in contact;  $p^2$  in the tooth-row.

*Type*.—♂ ad. (skin). Kuantun, Fokien, April 16th, 1898. Collected and presented by J. De La Touche, Esq. Brit. Mus. no. 98. 11. 1. 2.

\* To judge from descriptions and figures of Dobson's *Rh. yunanensis*, from Hotha, Yunan (J. A. S. B. xli. pt. 2 (1872), p. 336; and Yunan Exp. i. (1879) p. 95, pl. iv. fig. 1), and A. Milne-Edwards's *Rh. larvatus*, from Moupin, Szechuan (Mamm. Tibet (1872), p. 248, pl. xxxvii. fig. 1, pl. xxxvii. c. fig. 1), these bats are indistinguishable from the typical *Rh. Pearsoni*. They are, at all events, different from the Chinese form described above.

## Wing-indices.

	<i>Rh. macrotis</i> , <i>Rh. hirsutus</i> . 4 spems.	<i>Rh. Pearsoni</i> . 4 spems.	<i>Rh. æthiops</i> , <i>Rh. Hildebrandti</i> , <i>Rh. fumigatus</i> . 25 spems.
Forearm.....	1000	1000	1000
3rd finger, metacarpal ..	703	656	692
"  1st phalanx..	304	333	306
"  2nd phalanx .	371	452	537
4th finger, metacarpal ..	736	715	726
"  1st phalanx..	213	213	191
"  2nd phalanx .	245	296	349
5th finger, metacarpal ..	734	739	742
"  1st phalanx..	243	239	238
"  2nd phalanx .	243	327	269

General Remarks on the *Rh. macrotis* Group.

The skull of *Rh. macrotis* is of the general shape characteristic of all the more primitive species of the genus: very narrow temporal fossa and low sagittal crest; nasal swellings not especially modified, the median anterior swellings but a trifle larger than usual; basioccipital not more strongly narrowed than in the majority of species. *The palatal bridge is remarkably long*, equal to  $\frac{1}{2}$  or  $\frac{3}{7}$  of the maxillar tooth-row. Dentition primitive: upper canine and  $p^4$  widely separated;  $p^2$  small (as usual), but with a distinct cusp.

The essential external characters are the long and broad, almost parallel-margined (tongue-shaped) sella; *the long and dense hairing on the front face of the sella*; the very slightly projecting, rounded connecting-process, *starting from a point below the summit of the sella*; the cuneate lancet; the broad horseshoe; the three mental grooves; the broad ears; the quite primitive wing-structure: fifth metacarpal a trifle shorter than the fourth, III.<sup>2</sup> (as well as the other distal phalanges) very short.

Among the now existing types of the genus *Rh. macrotis* has no closer relatives than the *Rh. philippinensis* group. We find in this group an unusually long palatal bridge; the same tendency to enlargement of the nose-leaves; the shape of the sella (apart from the lateral expansions, of course) strongly recalls that of *macrotis*; the connecting-process is broadly rounded and starting from a point below the summit of the sella, as in *macrotis*; the lancet long and cuneate; the ears very much of the *macrotis* type; the mental grooves



and wing-structure on practically the same stage as in *macrotis*. But *philippinensis* has retained a somewhat more primitive dentition ( $p^2$  unusually well developed), and the base of the central nose-leaf is peculiarly modified.

*Rh. hirsutus* is but a Philippine representative of the *macrotis* type; the ears are still larger, the tail longer.

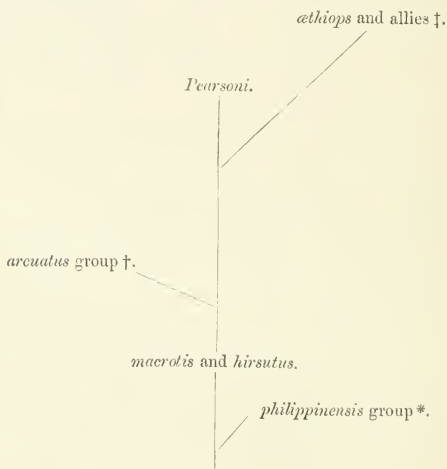
*Rh. Pearsoni* is closely related to *Rh. macrotis*, but in several respects considerably more highly developed. The temporal fossa is decidedly wider; the sagittal crest higher; the palatal bridge shortened. The shape of the nasal swellings very much as in *macrotis*. The only progress in dentition is a slight reduction of  $p^2$ ; also the cusp is less distinct; but the tooth is still completely in row. The lateral borders of the sella are peculiarly crenulate; the ears smaller; the lateral mental grooves quite obliterated. *The third metacarpal is much shortened*, the fourth less so, making the fifth metacarpal decidedly the longest of all; all the terminal phalanges are much lengthened. On the whole this wing-structure is rather similar to that of *Rh. ferrum-equinum*, a species with which *Rh. Pearsoni* has no closer affinities.

*Rh. aethiops* (Angola), *Hildebrandti* (Mazoe to Uganda), and *fumigatus* (Kitui to Abyssinia) are Ethiopian representatives of *Rh. macrotis*. There is a most striking resemblance in the nose-leaves; the horseshoe, the sella, the connecting-process, the lancet, differ in nothing but the larger size; *the long and dense hairing on the front face of the sella, characteristic of macrotis, is retained in the African species*; the shape of the ears is the same. As in *Rh. Pearsoni*, the mental grooves are reduced to one. The wing-structure differs from that of *Rh. macrotis* in having the fifth metacarpal somewhat longer than the fourth and third (by the combined effect of a slight shortening of these latter and a slight lengthening of the former), and the second phalanx of the third and fourth fingers much lengthened. The modification of the skull noticed above when passing from *Rh. macrotis* to *Rh. Pearsoni* is found again in the Ethiopian species: wide temporal fossa, more projecting sagittal crest, shortening of the palatal bridge. In front of the anterior nasal swellings is developed a very narrow thin brim of bone, forming the upper border of the nasal openings (as in the more differentiated members of the *philippinensis* group). The dentition is extremely highly developed:  $p_3$  and  $p^2$  pushed out to the external side of the tooth-row, or completely lost.

As will be observed from the above, the Ethiopian species

here under consideration are on a higher level of development than the Oriental *Rh. macrotis*: in several important cranial characters, in the dentition, in the wing-structure. I have pointed out elsewhere that also the other Ethiopian *Rhinolophi*, without any exception, have their *more primitive* relations in the Oriental Region. Thus the general conclusion arrived at may now be briefly formulated as follows:—*All the Ethiopian representatives of the genus Rhinolophus are of Oriental origin.*

The subjoined diagram gives a view of the probable inter-relations of the species and groups reviewed above:—



XXXII.—*Descriptions and Records of Bees.*—II.

By T. D. A. COCKERELL, University of Colorado.

*Euryglossa ephippiata*, Smith.

Queensland, no. 94. 61, also labelled Ridg. 11.93; 701. ♀.

Except for the smaller size, it has a strong superficial resemblance to *Callomelitta picta*. The character of the

\* Ann. & Mag. Nat. Hist., August 1905, p. 243.

† *Suprà*, p. 281.

‡ *Op. cit.* (7) xv. (1905) pp. 75-76 ("Remarks").

relative lengths of the submarginal cells, given by authors to separate *Euryglossa* from *Prosopis*, is hardly distinctive; much better is the rounded head of *Euryglossa*, with the broad face lacking the characteristic markings of *Prosopis*.

*Euryglossa rubricata*, Smith.

Queensland, no. 94. 61, also labelled Ridg. 11.93; 859. ♀.

Close to *E. ephippiata*, but easily separated by the red antennæ (even the scape red), the black axillæ, the light testaceous tegulæ, the red tibiæ and tarsi (anterior tibiæ with a large black spot), and the mainly dull red abdomen.

*Euryglossa subsericea*, sp. n.

♀.—Length between 7 and 8 mm.

Head and thorax shining black; abdomen very dark blue with a satiny gloss, hind margins of segments narrowly black. Mandibles black, with a dark red stain in the middle; clypeus with scattered rather feeble punctures; front dullish, densely striato-punctate; facial foveæ linear, as in *E. ephippiata*; antennæ dark, flagellum brownish beneath, the extreme tip reddened; mesothorax with distinct but scattered punctures, dense at the sides, the three longitudinal grooves distinct; tegulæ piceous. Wings perfectly hyaline; stigma dilute brown, nervures paler; venation as in *E. ephippiata* (in both the first submarginal cell is very much longer than second, though the second is very much broader than high). Enclosure of metathorax smooth and shining; sides of metathorax with scanty whitish hair; legs black, with white hair; hind spur with large saw-like teeth; scanty hair at sides of abdomen white; apical fimbria black.

*Hab.* Queensland, no. 94. 61, also labelled Ridg. 11.93; 702.

Close to *E. depressa*, Smith, but smaller, the clypeus less strongly punctured, the facial foveæ not broad. The vertex has a few whitish hairs (a fringe of pale yellow hairs in *depressa*), and the hair on the inner side of the tarsi is very pale. In *E. subsericea*, *rubricata*, and *ephippiata* the basal nervure is strongly curved, and falls considerably short of the transverso-medial.

*Euryglossa calliopsisiformis*, sp. n.

♀.—Length a little over 6 mm.

Black; head, thorax, and legs marked with bright yellow, in the manner of a *Calliopsis*; face broad, with the clypeus (except four small black marks, one on each side and two on

the disk), a broad and low supraclypeal mark, a large suboval mark on front, and broad band-like lateral face-marks ending abruptly about the level of the middle of the scape, all bright chrome-yellow; the moderately broad and rather short facial foveæ begin where the lateral marks leave off; front granular, dull; clypeus shining, sparsely punctured; labrum and mandibles (except the dark ferruginous tips, which are bidentate) pale yellowish; posterior orbital margins very broadly yellow; antennæ dark, flagellum pale yellowish-ferruginous beneath; upper margin of prothorax with a yellow band (interrupted in middle), continued to tubercles, which, with a patch below, are yellow; mesothorax dull, gibbous, with a pair of fine yellowish streaks on the disk and a yellowish line over each tegula; scutellum with the posterior margin and a triangular spot on each side yellow; post-scutellum with a median yellow spot; pleura black, with a broad transverse yellow band beneath the wings; region between wings and hind legs pale yellowish; the four posterior trochanters, the hind femora, a patch on middle femora behind, the anterior and middle knees, the anterior and middle tibiæ in front and a streak behind, all yellow; anterior and middle tarsi reddish; tegulæ reddish brown, with a yellow spot. Wings clear; stigma large, it and the nervures dilute sepia; second recurrent nervure joining second submarginal cell a short distance before its end, first joining the cell slightly beyond the end of its first third; basal nervure very strongly bent. Abdomen broad, with a dull satiny surface, very dark brown, with a whitish mark on each side of the first segment near the base, a large lanceolate whitish mark at lateral bases of segments 2 to 4, and a spot in the same region on 5; no hair-bands, but the apex and venter with a thin pale pilosity; venter dark; hind spur serrate.

*Hab.* Queensland, no. 94. 61, also labelled Ridg. 11.93; 864. One ♀.

Allied to *E. quadrimaculata*, Smith; the two species form a group standing apart from typical *Euryglossa*.

*Callomelitta picta*, Smith.

Victoria, no. 83. 100; and Franklin, Tasmania, nos. 91-155 and 3468.

The Victoria specimen has a red spot on the middle of the postscutellum.

*Allodape simillima*, Smith.

Townsville, Queensland, 5.3.03 (*F. P. Dodd*); Cossack,

W.A., no. 91-155; Mor. [=Moreton?] Bay, 1893 (*W. W. Froggatt*); Queensland, no. 319; Queensland (*E. Saunders*).

*Allodape unicolor*, Smith.

Queensland, no. 4312; Baudin I., no. 91-82; Montalivet I., N.W. Australia, no. 90-126.

The last-mentioned specimen differs in having the second recurrent nervure joining the second submarginal cell almost at its tip, but it does not appear to be a distinct species.

*Anthophora æuginosa*, Smith.

Of this wonderful species I have before me a male from De Freycinet I., N.W. Australia (no. 90-126), and females from Queensland (*E. Saunders*, *F. P. Dodd*), Adelaide River, and Port Darwin. The following particulars should be added to Smith's description:—

♀.—Green hair of vertex and above strongly mixed with black; pleura with light bluish-green hair; black on clypeus more extensive than Smith's description suggests.

♂.—Clypeus yellow, with the upper lateral margins broadly black.

*Anthophora concinna* (Klug).

Queenstown, Cape Colony (*E. T. Wells*). ♀. In British Museum.

The second s.m. is very broad below. Superficially the insect looks like a fulvous edition of *A. æuginosa*.

*Lithurgus rubricatus*, Smith.

Queensland (*E. Saunders*); nos. 93-19 and 324. ♀.

*Lithurgus atratiformis*, sp. n.

♀.—Length about 14 mm.

Black, without the distinct hair-bands or red apex of abdomen seen in *L. rubricatus*. Head large and round; hair at sides of face dull white, of region between antennæ and cheeks mixed black and white, of vertex and occiput black, of anterior middle of clypeus long and reddish, of mandibles (which are short and obtusely tridentate) reddish; frontal tubercle rather prominent, wrinkled and shining, not bifid, its form much as in *L. rubricatus*; vertex as densely punctured as possible; antennæ dark, flagellum faintly brownish beneath; hair of prothorax and anterior margin of mesothorax dull white, of pleura black, of sides of metathorax

partly black and partly dull white; mesothorax anteriorly very coarsely tuberculate, its posterior third, and the scutellum, dull and densely rugoso-punctate; tegulæ dark reddish brown. Wings smoky, nervures black; second recurrent nervure almost meeting second transverso-cubital. Legs black, with black hair, hind tibiæ coarsely tuberculate on outer side; a small pulvillus present. Abdomen shining black; the first two segments sericeous and scarcely punctured, the others with minute close punctures; hair-bands white, but reduced to hardly visible rudiments, the most distinct appearing as a fine line on the hind margin of segment 5; hair of apical segment black, the extreme apex dark ferruginous; ventral scopa dark, appearing reddish in some lights, a sort of purplish black or dark brown in others; venter, underneath the scopa, with three rather narrow clean-cut white hair-bands.

*Hab.* N.W. Coast of Australia, no. 69-59.

Allied to the Indian *L. atratus*, Smith, but larger and more rugose.

*Saropoda bombiformis*, Smith.

Toowoomba, no. 93. 189; ♀. Queensland, "Ridg. 2.92; 691," and 94. 61. ♂.

The hair of the head and thorax above is strongly mixed with black in both sexes, but this is not apparent unless the insect is examined from the side.

*Stilpnosoma levigatum*, Smith.

Queensland, no. 94. 61, "Ridgw. 11.93; 430." 2 ♀.

Facial foveæ linear, rather short. Thorax with median and lateral linear grooves. Abdomen varying to dark purple-blue. The insect is not like a *Prosopis*, but very closely resembles *Euryglossa*, from which it appears to be an offshoot. The venation is like that of *Euryglossa*, except that the second recurrent nervure joins the second submarginal cell a considerable distance from its end, whereas in *Euryglossa* it joins it at the end.

*Parasphecodes talchius*, Smith.

Victoria, Australia, no. 85. 108. ♂.

The first r. n. meets second t.-c.; antennæ entirely black.

*Parasphecodes Froggatti*, sp. n.

♂.—Length about 9½ mm.

Head and thorax black, covered with white lanose pubescence; face narrow; lower half of clypeus (except brownish

edge) pale yellow, this sending a pointed projection upwards in the middle; mandibles dark, reddish in the middle; antennæ broken at fourth joint in type, but apparently all dark except a small reddish spot at extreme base of flagellum beneath; thorax dull, minutely roughened; base of metathorax irregularly ruguloso-plicate, with a sharp rim; tegulæ rufo-fulvous. Wings slightly dusky, a little yellowish, not darkened apically; nervures and stigma sepia-brown; first r. n. meeting second t.-c. Legs black, the anterior and middle knees, the anterior tibiæ broadly in front, and the anterior and middle tarsi more or less, ferruginous; abdomen deep but bright chestnut-red, broad like that of a female (much broader than in *P. talchius*), very closely and minutely punctured, a suffused T-like area on first segment, a suffused median area on third, and all of fourth and following ones black.

*Hab.* Bathurst, N.S.W., Jan. 18, 1893, no. 124 (*Froggatt*).

Very distinct by its great hairiness and stout abdomen. Nearest, I think, to *P. altichus*. The second r. n. and third t.-c. are strong, not at all weakened as in *P. tilachus*.

*Parasphcodes lichatus*, Smith.

Perth, W. Australia; 93-198. ♀.

This and the next three species are superficially very similar; they may be distinguished as follows:—

Abdomen smooth and shining, hind legs clear red ..	<i>adelaidæ</i> , Ckll.
Abdomen not so shining, hind legs not red .....	1.
1. Vertex and mesothorax above with much black hair;	
abdomen very dark .....	<i>lichatus</i> , Sm.
Vertex and mesothorax not so .....	2.
2. Abdomen black beyond third segment .....	<i>Loweri</i> , Ckll.
Fourth segment red .....	<i>Tepperi</i> , Ckll.

*Parasphcodes adelaidæ*, sp. n.

♀.—Length about 9 mm.

Head and thorax black, with thin whitish pubescence, dense and ochreous on margin of tubercles; head large and broad; clypeus very sparsely punctured, depressed in the middle, and with a reddish spot; middle of mandibles reddish; flagellum dark reddish beneath; mesothorax shining, with very minute punctures of different sizes; area of metathorax slightly irregularly wrinkled, but not conspicuously sculptured, its rim rather weak; tegulæ shining dark reddish. Wings faintly dusky, not clouded apically;



nervures and stigma reddish; first r. n. joining second s.m. almost at its end; second s.m. not far from square; second r. n. and third t.-c. much weakened. Anterior and middle legs dark red, hind legs clear red, hair of legs tinged with yellowish; hind spur simple; abdomen convex, shining, dark chestnut-red strongly suffused with black, from the middle of the third segment to the apex practically black, except the coppery hind margins; surface of abdomen not punctate.

*Hab.* Adelaide; 54-55.

In my table of *Parasphécodes* (Ann. & Mag. Nat. Hist., Sept. 1904, p. 209) this runs to *P. tuchilas* and *P. lichatus*, but it is distinct by the very dark and shining abdomen, wherein, as also in the weakened outer nervures, it resembles rather *P. tilachus*.

*Parasphécodes Loweri*, sp. n.

♀.—Length about  $9\frac{1}{2}$  mm.

Robust; head and thorax black, rather pubescent, the hair white beneath, yellowish cinereous above, forming a little dense light patch on the anterior middle of the scutellum; head broad, but facial quadrangle longer than broad; clypeus shining, with numerous large punctures; mandibles entirely black; flagellum faintly reddish beneath; front, vertex, mesothorax, and scutellum minutely roughened, glistening; area of metathorax scarcely defined, with irregular longitudinal wrinkles only on the basal part; upper corners of posterior truncation rounded; tegulæ rather large, dull dark reddish, the anterior margins narrowly hyaline. Wings with a rather strong yellowish tinge; nervures and stigma ferruginous; first r. n. meeting second t.-c., but a little on the inner side; second s.m. higher than broad, somewhat narrowed above. Legs dark reddish brown, with abundant pale pubescence; basal joint of hind tarsi with an apical fulvous tuft; hind spur simple. Abdomen broad, thinly pubescent, very minutely and closely punctured; first three segments chestnut-red, the others black, first segment with a blackish anchor-shaped mark; hind margins of first three segments orange. The second r. n. and third t.-c. are weakened.

*Hab.* Adelaide, Australia; 52. 124.

Differs from *P. tuchilas* by the hind margins of abdominal segments 1 and 2 not darkened, clypeus with numerous punctures, &c. It approaches *P. melbournensis* in having the enclosure of metathorax diversely sculptured, but differs in other particulars.



*Parasphcodes Tepperi*, sp. n.

♀.—Length about 9 mm.

Not so robust as the last species, the abdomen being noticeably narrower. The following differences are also apparent on comparison:—Head shorter; clypeus with the punctures hardly so strong; flagellum pallid beneath except at base; tegulæ light rufo-fulvous; scutellum without a light patch; area of metathorax rather coarsely longitudinally wrinkled all over; stigma and nervures dark reddish; second s.m. nearly square; abdomen rather more shiny, entirely red, the apex faintly blackish; venter also red; legs black.

*Hab.* Adelaide, Australia; 53. 56. Another is marked simply "Australia."

Runs in my table to *P. lucthius*, Sm., but that has rufo-testaceous legs and the fourth abdominal segment fuscous. The names of this and the last species are given in recognition of the work of two well-known Australian entomologists.

*Sphcodes tasmaniæ*, sp. n.

♂.—Length about  $5\frac{1}{2}$  mm.

Head and thorax black; head broad, facial quadrangle broader than long; face with yellowish pubescence; mandibles simple, black basally, pale yellowish in the middle, ferruginous at tips; front and vertex dull, minutely roughened; antennæ long, entirely black, scape long, joint 3 a trifle longer than 4, 5 about as long as 3 and 4 together, flagellar joints very distinct; mesothorax and scutellum nude except for a few pale fulvous hairs (mainly on scutellum), smooth and shining, with scattered inconspicuous very minute punctures, only visible with a good lens; sides of thorax with a very thin griseous or whitish pubescence; area of metathorax large, semilunar, dull, with extremely fine thread-like longitudinal striæ; tegulæ shining reddish, marked with darker. Wings clear, strongly iridescent; stigma large, it and the nervures rufous; first s.m. much longer than the other two united; second very narrow, much higher than broad, narrowed above, receiving the first r. n. at its middle; third higher than broad, but larger than second; second r. n. and third t.-c. weakened, and lower boundary of third s.m. almost obsolete. Legs bright ferruginous, the coxæ, trochanters, and basal half or more of femora black; outer edge of hind tibiæ and the last two joints of their tarsi darkened; abdomen shining, quite without hair-bands, black

basally and apically, with the apical margin of first segment, the second except a median stain, and the greater part of the third chestnut-red; apical plate red, broadly truncate, much broader than long, suggestive of the genus *Proteranea*; venter red, stained with blackish.

*Hab.* Hobart, Tasmania, no. 91-155.

Because of the smooth mesothorax, this cannot be the male of *S. antipodes*, Smith.

The following three species of *Halictus* resemble *Parasphecodes* and *Sphecodes* in having red abdomens:—

*Halictus punctatus*, Smith, var. *exlautus*, nov.

♀.—Abdomen broad, entirely orange-fulvous (apricot-colour), except a faint dusky median stain and a small black spot on extreme side of segments 3 and 4. Mandibles ferruginous: facial quadrangle about square; mesothorax green, dullish, with large well-separated punctures, median and lateral grooves distinct; metathorax black, the enclosure large but ill-defined, covered with fine raised lines; tubercles reddish; pleura black; stigma very large, honey-colour; first r. n. joining second s.m. not far from its end; outer nervures weak as in *Chloralictus*; legs red, hind spur simple.

Length about or not quite 6 mm.

*Hab.* Australia (no other details known), from F. Smith's collection (no. 79.22).

The typical *punctatus* has the abdomen dark rufo-piceous in the middle, red at the sides.

*Halictus sphecodopsis*, sp. n.

♂.—Very minute; length scarcely 4 mm.

Head and thorax yellowish green, the metathorax a bluer green; face broad, covered with yellowish hair; broad anterior margin of clypeus, labrum, and mandibles (except ferruginous tips) cream-colour; antennæ long, lively ferruginous, the flagellum dusky above; vertex and mesothorax granular, the latter with a little yellowish pubescence, most abundant at the anterior corners; area of metathorax obscurely roughened and wrinkled basally, bounded by a shining margin; tegulæ shining fulvous. Wings rather narrow, clear, strongly iridescent; stigma dark reddish brown, nervures pale; first r. n. joining second s.m. near its end; outer nervures (as in *Chloralictus*) much weakened, in fact almost obsolete. Legs entirely clear orange-ferruginous.

Abdomen small, fusiform, very shiny, bright ferruginous, the apical third strongly infuscated; apex broadly rounded; no hair-bands; suture between first and second segments a little depressed.

*Hab.* Queensland: no. 94.61; "Ridg. 11.91; 710."

Close to *H. sphecodoides*, Smith, but the colour of the head and legs is different, and I do not feel justified in treating it as the male of that insect, hitherto known only in the female.

*Halictus vitripennis*, Smith.

A ♀ from Queensland (Ridg. 11.93; 711) agrees with Smith's too brief description and my notes on the type; but there is just a possibility that actual comparison would reveal differences.

XXXIII.—*Descriptions and Records of Bees.*—III.

By T. D. A. COCKERELL, University of Colorado.

PHENACOLLETES, gen. nov.

Tongue and paraglossæ as in *Colletes*; labial palpi small, 4-jointed, the joints subequal, but the two middle ones the shortest; distance between paraglossæ and labial palpi greater than length of former; blade of maxilla about  $2\frac{1}{2}$  times as long as wide, rounded at end; maxillary palpi very small, not half the length of maxilla-blade, the six joints stout, the first not easily seen, the second and third cylindrical, the fourth and fifth short, the sixth narrow and pointed; pubescence short, very finely plumose; abdomen free from hair, except a very fine pruinosity, and shaped like that of a *Tachytes* or *Bembecid*; stigma small and narrow (about as in *Leioproctus* as figured by Smith); marginal cell lanceolate, tapering apically; three submarginal cells—the first, on cubital nervure, at least as long as the other two together; the second large, almost square, receiving the first recurrent nervure at the end of its first third; the third about twice as long as the second below, but only as long above, its outer margin regularly curved; the second recurrent nervure enters it a little before the beginning of its last fourth, and is practically straight, with only a slight irregular curvature; basal nervure falling a very little basad of transverso-medial.

*Phenacolletes minus*, sp. n.

♂.—Length about 14 mm.; of anterior wing just over 10. Black, with the large scutellum red varying to black; head large, circular seen from in front; cheeks broad; vertex convex; ocelli well developed, in a low triangle; mandibles dark reddish, bidentate, but the inner tooth quite small; *labrum with a shining elevated C placed with the back upwards*, rather suggestive of a hog's snout; *face broad, with the eyes practically parallel (slightly diverging below)*; the whole face, up to the ocelli, covered with dense snow-white pubescence, as also are the cheeks and occiput; interocellar region with a tuft of white hair; vertex and mesothorax exposed, finely granular; *antennæ short*, entirely dark except that the apical margin of the scape is reddish, or the scape may be entirely reddish; *flagellum thick, the middle joints broader than long, and strictly cylindrical*; tubercles more or less red; pleura, postscutellum, and metathorax with much white hair; metathorax with a thick white fringe on each side; *its basal enclosure large, shining, and hairless, with a deep basal pit*, and bounded by a strong sulcus; mesothorax with three impressed lines in front, and the parapsidal lines fairly distinct; tegulæ yellowish ferruginous. Wings variably dusky, inclined to be yellowish; stigma and nervures dark brown, or the stigma practically black. Legs normal, dark reddish, with fine white pruinosity, only the anterior femora having behind a fringe of white hair; *hind knee-plates well developed*; hind tibiæ rather slender and nearly cylindrical, *the hind legs being quite long*; *anterior tibial spurs with a fine comb*, hind spurs simple; abdomen rather shiny, with very minute punctures, *quite without pubescence except a fine white pruinosity*, especially noticeable at sides; *sutures not depressed*; *seventh dorsal segment with a broad flattened pygidial area; from the apex projects a small rounded plate*. The characters italicized are likely to be of generic significance, in addition to those given in the generic diagnosis.

*Hab.* Turtle Bay, 91–82; three specimens, numbered 1421, 1423, and 1424. Turtle Bay is on the coast of Australia; I believe off the N.W. coast. The specimens were collected by Commander J. J. Walker, R.N., on the 'Penguin' Expedition.

This remarkable insect caused me much perplexity. The general appearance and structure of the abdomen resemble those of some wasp allied to *Tachytes*; the legs also are very wasp-like. On the other hand, the venation is quite that of a bee, and the mouth-parts are of the Colletid type, which,

however, is nearly the same as that of *Tachytes* and its allies. With a lens, I could not detect any plumosity in the pubescence, which is very short and like that of a wasp; but the compound microscope shows that all the hairs are minutely plumose, and this settles the reference of the genus to the bees. It is by all means the most wasp-like bee I know, and I think it affords very strong evidence in favour of the origin of the Colletid bees from a wasp of the *Tachytes*-group. It appears to follow that the bees with pointed tongues have had a quite different origin, as I have formerly suggested.

*Lithurgus atratiformis*, Ckll.

♀.—A specimen marked 92. 16 and 304 shows that when quite fresh the second to fifth segments of the abdomen have extremely narrow but conspicuous white hair-fringes. Another, with the face narrower than the type, but clearly the same species, is from Queensland (*Gilbert Turner*), labelled also 304.

*Bombus terrestris* (L.).

New Zealand (*E. Saunders*); one worker, in British Museum.

*Bombus terrestris*, var. *audax* (Harris).

New Zealand (*E. Saunders*); one female, in British Museum.

*Bombus hortorum*, var. *fidens* (Harris).

New Zealand (*E. Saunders*); three females and a worker, in British Museum. There is also a female labelled "Queensland (*E. Saunders*)."

*Bombus hortorum*, var.

Similar to var. *fidens*, but prothorax, scutellum, and penultimate abdominal segment more or less distinctly reddish yellow. I have not found a varietal name for this form.

New Zealand (*E. Saunders*); two females in British Museum.

Of course, all these *Bombi* are the progeny of introduced individuals. I have credited these and other specimens to Mr. E. Saunders, following the labels, but I gather that

Mr. Saunders did not collect them, but only presented them to the Museum\*.

*Nomia tenuihirta*, Ckll.

Both sexes were taken in Queensland by Gilbert Turner. The ♀ is labelled "Ridg. 4.92" and 869. It differs from the male by its more robust form, but is in general similar. Both spurs of the hind tibia are strongly curved at the end.

*Nomia Gilberti*, sp. n.

*Hab.* Queensland (*Gilbert Turner*); no. 869, and labelled "Ridg. 3.92."

♀.—Length about  $8\frac{1}{2}$  mm.

Black, with white or yellowish-white pubescence, and scattered erect black hairs on vertex and occiput; abdomen in a bright light appearing very dark reddish, and having broad but rather thin white hair-bands on the broadly depressed apical margins of segments 2 to 4, and a patch on each side of the first segment; fringe of fifth segment dark grey or blackish; anterior spur of hind tibia strongly curved, posterior spur minutely pectinate; legs black, even to the tarsi, hair on inner side of tarsi black. Mandibles bidentate, largely dark reddish; face broad, with coarse yellowish-white pubescence; median raised line extending nearly to apex of clypeus, the latter shining, and curiously longitudinally ridged in an irregular way; antennæ entirely dark; vertex and mesothorax granulo-punctate. Wings faintly dusky, the apex conspicuously smoky; third submarginal cell much longer than first; second much higher than broad, but almost or quite parallel-sided, receiving the first recurrent nervure near its end.

Superficially, this looks exactly like *N. tenuihirta*, and from the fact that the collector gave both the same number it is probable that he regarded them as the same. They are, however, clearly distinct, and may be separated as follows:—

\* I learn from Mr. Chas. O. Waterhouse that all specimens in the Australian Collection labelled 92. 44, 91. 82, 91. 155, and 90. 126 were collected by J. J. Walker, on the 'Penguin' Expedition; all labelled 94. 61 and 93. 49, from Queensland, were collected by Gilbert Turner; all labelled 93. 198 by H. W. J. Turner; all labelled 85. 108 by F. DuBoulay; all labelled 85. 42 by W. R. Salter; and 1903. 356 by P. F. Dodd.

*N. Gilberti*, ♀.

Basal enclosure of metathorax nearly or quite as broad (antero-posteriorly) at sides as the width of the second submarginal cell; shining, with irregular but very distinct cross-ridges.

Tegulae piceous, with a whitish spot on outer margin.

Raised facial line extending far down clypeus.

Stigma honey-colour.

Wings more hyaline, with the apex obviously darkened.

*N. tenuihirta*, ♀.

Basal enclosure of metathorax almost linear at sides; dull, granular, without distinct cross-ridges.

Tegulae pale testaceous, fuscous basally, and with a whitish patch posteriorly.

Raised facial line hardly invading clypeus.

Stigma dark reddish-piceous.

Wings more dusky, the apex uniform with the rest.

In *N. Gilberti* the triangular area forming the lower extension of the metathoracic enclosure is perfectly smooth and shining, and cut off from the ridged area by a transverse keel; in *N. tenuihirta* this part is minutely granular like the rest, and not conspicuously cut off from it.

*Nomia semiaurea*, sp. n.

♀.—Length about 10 mm.

Rather broad, the abdomen top-shaped; black, with sometimes a green tint on middle of first abdominal segment; pubescence entirely fulvous or golden, except a very few scattered dark hairs on mesothorax. Face not very broad; inner orbital margins strongly concave above; clypeus densely covered with elongate punctures (strawberry-surface); face with fulvous tomentum; supraclypeal area convex; longitudinal line very fine, extending from middle ocellus to beyond middle of clypeus; mandibles bidentate, more or less stained with dark reddish; flagellum dull dark brown, delicately pruinose, light at tip; vertex and front with very minute punctures; mesothorax only sparingly hairy, the pubescence quite inconspicuous, its surface minutely roughened but rather shining, with the punctures large and deep, close at the sides, larger and more separated in the middle; tubercles densely covered with fulvous tomentum, as also the postscutellum (which may, however, be denuded); sides of metathorax with long pale fulvous hair; posterior face very well-defined, shining, with strong large punctures, and only covered with a very fine tomentum; upper part bare and strongly and closely punctured, but the true enclosure is reduced almost to nothing; tegulae rather large, orange-fulvous. Wings dusky, especially the apical part, stigma and nervures brown; second submarginal cell



small and narrow, receiving the first recurrent nervure a little before its end; third with an appendicular apical point. Tarsi and knees red, and tibiæ largely so; basal joint of hind tarsi very broad and flat; abdomen shining, but strongly and quite closely punctured, hind margins of segments 1 to 4 broadly depressed and fulvous, those of segments 2 to 4 with bands of golden-orange appressed hair; fifth segment with a redder band.

It is not altogether impossible that this may be the ♀ of *N. rufocognita*, Ckll., but in that species (♂) the middle of the mesothorax is densely punctured all over, and the first abdominal segment is much more coarsely and closely punctured. The enclosure of the metathorax in *rufocognita*, though a mere line laterally, is divided by little ridges, which makes it look beaded; this is not at all the case in *semiaurea*.

*Hab.* Queensland (*Gilbert Turner*); two, both labelled Ridg. 4.91 and 617.

From the description, this must be near to *Nomia cincta*, Smith, discovered by Wallace on Great Key Island.

*Nomia halictella*, sp. n.

♀.—Length about  $8\frac{1}{2}$  mm.

Looking very much like a small *Halictus calceatus*; the shining, fulvous-banded abdomen broad in the middle and narrowing basally, so that in some positions it looks subclavate. Black, with rather light ochreous pubescence; head broad, eyes strongly converging below; mandibles dark reddish in the middle; antennæ dark, the flagellum red at apex; median raised line extending downwards only to level of antennæ; front below ocelli delicately striatulate; mesothorax dull, very minutely and closely punctured, appearing quite hairy when seen from the side, but not so when seen from above, except at the extreme lateral margins, and at the scutello-mesothoracic suture, which is full of ochreous tomentum; upper border of prothorax, tubercles, and postscutellum covered with ochreous tomentum; basal area of metathorax very narrow (short), with numerous very fine cross-ridges; posterior face of metathorax dull and granular, bounded laterally by a ridge only below; tegulæ shining rufous, fuscous basally. Wings strongly dusky; stigma and nervures light dull brown, stigma large; marginal cell very blunt and broadly rounded at apex; first submarginal cell longer than third; second quite large, somewhat broader than high, receiving the first recurrent



nervure near the beginning of its last third. Tarsi dark reddish; hair on inner side of basal joint of hind tarsi (which is rather broad, with the outer apical corner produced to an acute angle) shining ochreous; second joint of hind tarsi triangular, the apex produced like that of first joint. Abdomen shining, with a rather sericeous surface, the punctures obscure; hind margins of segments rufescent, those of third and fourth with broad, dense, entire fulvo-ochraceous hair-bands; on the first and second these bands only appear laterally, or the band may be nearly complete on the second; fringe on fifth segment redder; ventral segments fringed with very long hair.

*Hab.* Queensland, four specimens (*Gilbert Turner*). They all bear the collector's number 313.

*Nomia halictella*, var. *triangularis*, nov.

♀.—A little larger (expanse of wings 18 mm.). Stigma dark reddish; basal enclosure of metathorax much larger in the middle, being produced behind to form a large triangle, which is covered with longitudinal ridges, which are not so fine as those of the type.

This insect is a very puzzling one: the enclosure of metathorax is so different from that of typical *halictella*, that one would take it for a distinct species; but in all other respects the insect is essentially *halictella*.

*Hab.* Queensland (*Gilbert Turner*), marked 311 Hy.

*Halictus urbanus baudinensis*, subsp. n.

♀.—Length about 5 mm. Similar to *urbanus*, with the same peacock-green mesothorax; but tibiae and tarsi, and apical third or fourth of femora, all bright ferruginous; hind spur with two long spines; hind femora somewhat deformed, appearing as though bent near the middle; stigma very dark reddish brown; first r. n. meeting second t.-c.; tegulae shining fulvous; abdomen beyond the first segment delicately white-pruinose.

*Hab.* Baudin I., N.W. Australia (*J. J. Walker*, 675). Collected on the 'Penguin' Expedition.

This is very likely a distinct species, but it is very close to *H. urbanus*, and may be treated as a subspecies until more material has been collected. It has the outer nervures weakened, as in *Chloralictus*.

*Paracolletes obscurus* (Smith).

♀.—W. Australia (*C. M. Worsfold*). The locality is an

unexpected one, but the insect runs to *obscurus* in the table I made from the types, and agrees sufficiently with Smith's description. The abdomen, however, has a narrow white marginal hair-band on segments 2 to 4. The long black hair of the head and thorax above is very strongly plumose.

University of Colorado,  
Boulder, Colorado, U.S.A.,  
May 23, 1905.

XXXIV.—*New Neotropical* Chropterus, Sciurus, Neacomys,  
Coendou, Proechimys, and Marmosa. By OLDFIELD  
THOMAS.

*Chropterus auritus guianæ*, subsp. n.

Ends of wings broadly white for more than an inch at their tips, both the terminal phalanges of the middle finger and the membrane itself white, contrasting markedly with the dark colour of the rest of the membrane; the edge of the membrane between the fourth and fifth digits also white, and a slight trace of a whitish edging to the membrane leading to the foot. Base of thumb almost without hairs. Fur of body and forearms not extending on to the membranes, which are practically naked throughout.

Other characters as described by Peters, Tomes, and Dobson. Forearm of type 82 mm.

*Hab.* Venezuela and Guiana. Type from La Vuelta, Lower Orinoco, Venezuelan Guiana.

*Type.* Adult male. B.M. no. 4. 5. 7. 20. Collected 24th April, 1903, by Mr. S. M. Klages.

*Chropterus auritus australis*, subsp. n.

White tipping to wings much reduced as compared with *C. a. guianæ*; the terminal phalanx of the third digit only whitened, and the membrane only lighter, not white, for about half an inch at the tip; no whitish line extending along the hinder edge of the wing-membrane beyond the end of the fourth digit. Base of thumb with a distinct patch of woolly fur on the metacarpus. Fur of body extending on to the wing-membrane behind the elbows below, and on the interfemoral membrane above behind the thighs and knees.

Forearm of type 83 mm.

*Hab.* Paraguay and Southern Brazil. Type from Concepcion, Paraguay; alt. 300 m.

*Type.* Adult male. B.M. no. 1. 3. 11. 1. Collected 6th May, 1900, by Mr. J. Insley. Several specimens also obtained in Paraguay by Mr. W. Foster.

The differences above described in the amount of white on the tips of the wings and in the distribution of the fur seem to be so constant as to indicate a local difference between the specimens from Guiana and Southern Brazil. I have seen no examples from Mexico, whence came Peters's type, but in his most careful and detailed description he mentions no white at all on the tips of the wings, nor is any shown in the plate, and I therefore conclude that the Mexican *Chrotopterus* is again different from either of the two races now described, as was indeed to be expected.

The specimen described and figured by Tomes in 1861\*, and recently acquired with the Tomes collection, proves to be the southern form, with but little white at the ends of the wings.

*Sciurus Boothiæ annalium*, subsp. n.

General characters as in *S. Boothiæ*, but belly grey instead of white.

Colour of body above as in true *Boothiæ*, but less heavily blackened. Under surface and inner sides of limbs uniformly dull grizzled greyish (between "drab-grey" and "hair-brown"), not defined laterally from the colour of the sides. Ears with a narrow black edging; the small patch behind their posterior bases dull greyish white. Upper surface of hands and feet black. Tail-hairs black, annulated along the middle line below with dull whitish, and tipped with white, but less broadly than in true *Boothiæ*.

Skull as in true *Boothiæ*.

Dimensions of the type (measured in the skin):—

Head and body 250 mm.; tail 250; hind foot, s. u. 51, c. u. 55 (the second specimen larger: hind foot, s. u. 57, c. u. 61).

Length of upper tooth-row, exclusive of small premolar, 10.

*Hab.* Honduras.

*Type.* Female. B.M. no. 45. 8. 5. 12. Collected by D. Dyson. Two specimens.

These specimens are those referred to by Gray in his second description of *S. Boothiæ*†, but are so markedly different, by their greyish bellies, from the type and from a

\* P. Z. S. 1861, p. 102, pl. xviii.

† Ann. & Mag. Nat. Hist. (3) xx. p. 424 (1867).

number of adult examples that I have lately had the opportunity of examining that I think they should receive a special subspecific name. In his admirable monograph of Central American Squirrels Mr. Nelson has also referred to these specimens\*.

*Neacomys guianæ*, sp. n.

Very similar to *N. spinosus*, but conspicuously smaller.

Fur of medium length; hairs and spines of back about 8 mm. long. General colour dark fulvous, heavily lined with blackish; head and fore-quarters darker; sides brighter fulvous, especially in front of the hips. Lower flanks greyer, an ochraceous line edging the white of the belly. Under surface pure sharply defined white throughout, the hairs white to their bases. Lips and chin also white. Outer side of fore limb greyish fulvous, of hind limb clearer fulvous; inner side of limbs white. Upper surface of hands and feet dull white. Tail of medium length, nearly naked, brown above, whitish below proximally, darkening terminally.

Skull similar to that of *N. spinosus*, but smaller throughout.

Dimensions of type (measured in the flesh):—

Head and body 64 mm.; tail 67; hind foot 18.5.

Skull: greatest length 20; basilar length 15; length of nasals 7; interorbital breadth 4; breadth of brain-case 10; diastema 5.5; palatal foramina 3; length of upper molar series 2.5.

*Hab.* Demerara River, British Guiana. Alt. 120 feet.

*Type.* Old male. Original number 27. Collected 21st July, 1905, by Mr. S. B. Warren. One specimen.

The occurrence of *Neacomys* in Guiana is quite a new discovery, the nearest locality from which the genus has been recorded being Bogota. The species may be readily recognized by its small size, and especially by its small skull and teeth.

*Coendou pruinosus*, sp. n.

A small thickly furred black-and-grey species, with two sorts of spines as in *C. vestitus*.

Size about as in *C. couiy*. Pelage consisting of (1) the normal spines, about 25 mm. in length, confined to the upper surface and sides, not occurring on the belly; (2) long bristle-spines, attaining 100 mm. in length, at base nearly as thick as the true spines, but tailing off terminally into a long

\* P. Wash. Acad. Sci. i. p. 78 (1899).

slender point far overtopping the fur ; and (3) a thick coat of woolly hair some 50 mm. in length. General colour of the animal, as a whole, hoary blackish, the fur (which entirely hides the spines) uniformly blackish brown, but profusely lined by the long whitish ends to the bristles. Individually, on the body, (1) the spines are straw-yellow with blackish ends ; (2) the bristles are yellowish white basally, have a broad blackish ring rather beyond their middle, their long ends being white or yellowish white, contrasting markedly with the dark fur ; (3) the fur is light brown basally, darkening to blackish brown, and tipped slightly on the dorsal and broadly on the ventral surface with hoary whitish.

Head with its spines whitish for their basal halves, then with a broad black ring followed by a white one, the extreme tip again black ; bristles shorter than on the body, their median dark ring extending downwards nearly to their bases. Hands and feet blackish, more or less lined with hoary grey. Tail-base yellowish white above, from the broad whitish ends to the numerous bristles ; below black ; the thinly haired terminal point brown or blackish brown all round.

Skull, as usual, most variable, no two examples resembling each other, but the dimensions below will give an idea of its size and shape.

Dimensions of the type (measured by Sr. Briceño in the flesh) :—

Head and body 380 mm. ; tail 190 ; hind foot, s. u. 40, c. u. 50.

Skull : greatest length 68 ; basilar length 59 ; greatest breadth 40 ; nasals  $20 \times 11.5$  ; interorbital breadth 20 ; breadth of brain-case 29 ; palate length 30 ; diastema 18 ; palatal foramina 6 ; length of upper tooth-series 15.

*Hab.* Merida, Venezuela (Montañas de la Pedregosa). Alt. 2500 m.

*Type.* Adult male. B.M. no. 5. 7. 5. 9. Original number 4. Collected 14th January, 1905, by Sr. Briceño. Five specimens.

This well-marked porcupine agrees with *C. vestitus*, Thos. \*, alone of all described species in the possession of long spinous bristles in addition to both the normal short spines and a thick coat of woolly fur. From that animal, however, it may be readily distinguished by the light colour of the long ends to these bristles, which in *C. vestitus* are black.

\* Ann. & Mag. Nat. Hist. (7) iv. p. 284 (1899).

*Proechimys Warreni*, sp. n.

A small species related to *P. Cherriei*, Thos.

Size quite small, as in *P. Cherriei*, the hind foot conspicuously shorter than in the better-known species of the *P. trinitatis* group. Spines thick and strong, about 1·3 mm. broad by 19 mm. long, very numerous on the back, but practically absent on the rump and lower flanks. General colour of the usual dark fulvous, heavily lined with blackish, the hairs with fulvous subterminal rings, and the spines greyish white basally, black terminally. Head more greyish brown. Under surface pure sharply defined snowy white, as are the hips and inner sides of the limbs. Areas along inner aspect of forearms and of lower leg thinly haired, almost naked. Upper sides of hands and feet white. Tail fulvous like body for its basal inch, then blackish brown above and white below, the two colours more sharply separated than in *P. Cherriei*; thinly haired, the hairs two or three scales in length.

Skull very like that of *P. Cherriei*, agreeing with it in size and in the smoothness of the brain-case, there being, even in the oldest specimens, no trace of ridges running across the parietals. But the palatal foramina are much shorter, widely open mesially, tapering posteriorly as well as anteriorly, ending further from the molars, and without any raised parallel ridges leading back from their edges towards the front of  $p^4$ . Pterygoid processes spatulate, about 0·8 mm. broad at their basal neck, broadening out to 2 mm. at their widest point; in *P. Cherriei* they are almost equally narrow throughout (0·8 mm. at the neck, 1·0 mm. at broadest point).

Molars rather small, all quadrilaminar as usual.

Dimensions of the type (measured in the flesh):—

Head and body 228 mm.; tail 185; hind foot (s. u.) 41; ear 25.

Skull: greatest length 51; basilar length 36·8; greatest breadth 24·5; nasals 19·5; interorbital breadth 11·3; diastema 16·2; palatal foramina 5·1 × 3; length of upper cheek-tooth series 7.

*Hab.* Comackka, 80 miles up the Demerara River, British Guiana. Alt. 50 feet.

*Type.* Old male. Original number 17. Collected 1st July, 1905, by Mr. S. B. Warren. Five specimens.

This series of old and young specimens is of interest as confirming the status of *P. Cherriei*, which was founded on a single specimen, whose small size and smooth skull suggested youth, though the molars were fully worn. From the

Orinocan species *P. Warreni*, though very closely allied, may be distinguished by its shorter, unrimmed palatal foramina and broadly spatulate pterygoid processes.

*Marmosa cinerea nicaraguæ*, subsp. n.

Similar to the Costa Rican *M. c. Alstoni*, Allen \*, in size and general characters. Fur shorter and closer, hairs of back about 8-9 mm. in length, instead of 11-14, and those of tail-base only about 7 mm. in length as compared with 12-14. General colour above greyish brown (nearest to sepia of Ridgway). Under surface cream-buff, the hairs of the chest, middle line of belly, and of inguinal region buffy to their bases. Hands and feet pale greyish white. Tail very long, decidedly longer than in *Alstoni*, dull blackish for about three fifths of its length, then white, the junction of the two colours gradual, without marbling; in *Alstoni* only about one third of the tail is blackish.

Skull as in the Costa Rica form.

Dimensions of the type (measured in the flesh):—

Head and body 167 mm.; tail 281; hind foot, s. u. 28.5, c. u. 30; ear 29.

Skull: basal length 42.7; greatest breadth 25; combined length of three anterior molariform teeth 7.7.

*Hab.* Bluefields, Nicaragua: sea-level.

*Type.* Adult male. Original number 5. Collected 9th January, 1905, by Mr. G. Palmer.

Compared with half a dozen Costa Rican specimens—practically topotypes—of Dr. Allen's *M. Alstoni*, this *Marmosa* is readily distinguishable by its shorter fur, especially on the furry tail-base, its longer tail, and the much greater extension of the black down the latter organ.

*Marmosa cinerea demerarae*, subsp. n.

Size a little smaller than in the other members of the *cinerea* group. Fur of medium length; hairs of back about 10 mm. long. General colour above as usual, near "broccoli-brown." Under surface broadly washed with "cream-buff," not sharply defined laterally, the hairs on the chin and down the centre of the abdomen buffy to their bases. Dark orbital rings narrow and ill-defined. Muzzle and cheeks pale buffy.

\* *Caluromys Alstoni*, Allen, Bull. Am. Mus. xiii. p. 189 (1900). I am still of the opinion that *cinerea* and its allies should be placed in *Marmosa* rather than in *Caluromys*. For the time being also I prefer to treat both the Central American forms as subspecies of the Brazilian *cinerea*.



Hands and feet dull buffy whitish. Tail very long; the hairs of the basal furry part comparatively short, about as in *M. c. nicaraguae*; naked part brown to within 65 mm. of the tip, then abruptly white.

Skull as usual, but the molar teeth decidedly smaller than in the other subspecies.

Dimensions of the type (measured in the flesh):—

Head and body 166 mm.; tail 250; hind foot (s. u.) 24.

Skull: greatest length 41; basal length 37.3; zygomatic breadth 23.5; combined length of three anterior molariform teeth 7.1.

*Hab.* Comackka, 80 miles up Demerara River, British Guiana.

*Type.* Adult female. Original number 16. Collected 29th June, 1905, by Mr. S. B. Warren.

This local representative of the *M. cinerea* group differs from true *cinerea* by the greater extent of the brown part of its tail and by its smaller teeth. In the former character it agrees with the Nicaraguan race described above, but by its small teeth it differs from that as from the other members of the group. It was quite to be expected that a special race of *M. cinerea* should be found in Guiana.

XXXV.—On a remarkable new Squirrel from Burma.

By OLDFIELD THOMAS.

THE British Museum owes to the kindness of Capt. H. H. Harington, of the 90th Punjabis, two specimens, from the Upper Chindwin River, of a very remarkable squirrel, quite unlike anything we have seen before. I would propose to call it

*Sciurus Haringtoni*, sp. n.

A pale creamy-buff species with a buffy belly and a whitish tail.

Size medium. Fur of back rather over 20 mm. in length. General colour of upper surface "cream-buff" along the dorsal area, the buff fading out on the sides, which are dull whitish. Individually the hairs of the back are whitish grey basally, with a broad cream-buff subterminal band and a minute black point. Head creamy whitish, with a slight buffy suffusion on the crown; the cheeks dull white. Ears



whitish, both outside and in. Under surface, from chin to anus, bright sharply contrasted ochraceous buff (in the type; the second specimen nearer tawny ochraceous). Lateral line of demarcation very sharply marked in both specimens, and in the type emphasized by a blackish line which runs from the middle of the front of the forearm, across the shoulders, down the sides and legs to the back of the heel. Fore limbs on outer side above this line of demarcation creamy whitish, like the flanks; beyond it, including the hands and the whole of the inner aspect, ochraceous buffy like the belly, or slightly paler. Back of upper part of hind leg whitish like body; inner side, ankles, and feet buffy like belly, rather paler on the digits. Tail above and below creamy buff proximally (the extreme tips of the hairs blackish), lightening to white terminally.

Skull of the general proportions of that of *S. Finlaysoni*, *erythraeus*, &c., but there is only one upper premolar in the single specimen of which the skull has been preserved. This has the milk-premolar still in place, and the large permanent premolar just coming up below it, but no trace of the small  $p^3$ , which usually at this stage is readily discernible.

Dimensions of the type (measured in the flesh):—

Head and body 250 mm.; tail 265; hind foot (s. u.) 54; ear 22.

Skull: zygomatic breadth 32; back of postorbital process to tip of nasals 32.5; nasals 16.4 × 7.2; interorbital breadth 18; palate length 23; length of upper tooth-series 10.

*Hab.* Upper Chindwin River, Burma. Type from Mounkan; a second specimen from Homalin. About 25° N., 95° E.

*Type.* Immature male. B.M. no. 5. 8. 11. 1. Collected 14th December, 1904, and presented by Capt. H. H. Harington.

This very peculiar squirrel is so entirely unlike any known species that I do not know with what to compare it. Its pale creamy-buff colour and whitish tail are quite unique, while no other Oriental squirrel of its size is without the small upper premolar. This latter character also indicates that *Sciurus Haringtoni* is not merely a partially albinistic variation of some known species, an explanation which its pale colour might at first sight suggest.

Capt. Harington is to be congratulated on the discovery of so striking a new form.

XXXVI.—*A Revision of the Fishes of the American Cichlid Genus Cichlosoma and of the Allied Genera.* By C. TATE REGAN, B.A.

[Continued from p. 243.]

Section 9.

Two species from Central America agree in most respects with those of the preceding section, but differ in the somewhat fewer teeth, which are more distinctly enlarged anteriorly. Dorsal XVI–XVII 11–12. Anal VII 8–9.

38. *Cichlosoma margaritiferum.*

*Heros margaritifer*, Günth. Cat. Fish. iv. p. 287 (1862), and Trans. Zool. Soc. vi. 1869, p. 450, pl. lxxi. fig. 2.

*Cichlasoma margaritiferum*, Jord. & Everm. Bull. U.S. Nat. Mus. xvii. 1898, p. 1519; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 211 (1904).

Depth of body  $2\frac{1}{5}$  in the length, length of head 3. Snout slightly longer than postorbital part of head. Diameter of eye  $4\frac{1}{4}$  in the length of head, interorbital width 3. Depth of præorbital  $1\frac{1}{3}$  the diameter of eye. Maxillary not extending to the vertical from anterior margin of eye; præmaxillary processes not extending to above eye; jaws equal anteriorly; fold of the lower lip slightly interrupted; cheek with 5 series of scales; 12 gill-rakers on the lower part of anterior arch. Scales  $31\frac{6}{13}$ , 3 between lateral line and base of anterior rays of soft dorsal. Dorsal XVII 11, commencing above the opercular cleft, the spines subequal from the sixth, the last less than  $\frac{1}{2}$  the length of head; the soft fin, when laid back, extending to the anterior part of caudal. Anal VII 9. Pectoral a little shorter than the head, extending to the third or fourth anal spine; ventral extending to second anal spine. Caudal slightly emarginate, with rounded lobes. Caudal peduncle deeper than long. Brownish, with 6 or 7 dark cross-bars and a dark spot at the base of caudal; each scale of the side of the body with a white pearl-like spot; fins, except the pectoral, dusky, the dorsal with some oblique stripes, the caudal with clear spots.

Guatemala.

1. (164 mm.) type of the species. Guatemala. O. Salvin, Esq.

39. *Cichlosoma citrinellum.*

*Heros citrinellus*, Günth. Proc. Zool. Soc. 1864, p. 153, and Trans. Zool. Soc. vi. 1869, p. 458, pl. lxxi. fig. 1; Jord. & Everm. Bull. U.S. Nat.

Mus. xlvii. 1898, p. 1534; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 237 (1904).

*Heros lobochilus* (part.), Günth. Trans. Zool. Soc. vi. 1869, p. 457.

*Heros basilaris*, Gill & Bransford, Proc. Ac. Philad. 1877, p. 182; Pellegr. t. c. p. 238.

*Cichlasoma basilare*, Jord. & Everm. t. c. p. 1532.

Depth of body  $2-2\frac{1}{4}$  in the length, length of head  $2\frac{1}{5}-3$ . Snout a little shorter than postorbital part of head. Diameter of eye  $3\frac{3}{4}-4\frac{1}{4}$  in the length of head, interorbital width  $2\frac{2}{3}-3$ . Depth of præorbital about equal to the diameter of eye. Maxillary not extending to below the eye; præmaxillary processes extending to above anterior margin of eye; jaws equal anteriorly; fold of the lower lip continuous or subcontinuous; cheek with 4 or 5 series of scales; 9 or 10 gill-rakers on the lower part of anterior arch. Scales 31-33  $\frac{6-7}{12-14}$ ,  $2\frac{1}{2}-3\frac{1}{2}$  between lateral line and base of anterior rays of soft dorsal. Dorsal XVI-XVII 11-12, commencing above the opercular cleft, the spines subequal from the sixth to the fourteenth, thence increasing to the last, which is  $\frac{1}{2}$  the length of head; soft fin, when laid back, extending to the middle of caudal or beyond. Anal VII 8-9. Pectoral as long as the head, extending to above the third or fourth anal spine; ventral extending beyond the origin of anal. Caudal rounded. Caudal peduncle  $\frac{2}{3}-\frac{1}{2}$  as long as deep. Olivaceous or yellowish, the back darker, the dark colour sometimes extending as cross-bars on the sides of the body; sometimes a dark blotch on the middle of the side and a dark spot at the base of the caudal. Fins pale yellow or wholly or partly dark, sometimes spotted or barred.

Nicaragua.

1-3. (175-189 mm.) types of the species.	Lake Nicaragua.	O. Salvin, Esq.
4. (190 mm.)	Lake Managua.	Capt. J. M. Dow.
5. (180 mm.) one of the types of <i>H. basilaris</i> .	Lake Nicaragua.	Smithsonian Inst.
6. (138 mm.)	Lake Nicaragua.	Smithsonian Inst.

#### Section 10.

Three species from Nicaragua have the general form of those of the two preceding sections and are evidently closely allied to *C. citrinellum*, from which they differ in the exceptionally thick lips and in the dentition. Upper jaw with the anterior pair of teeth strongly enlarged; lower jaw with the two anterior pairs strong, subequal. Dorsal XVII 11-12. Anal VII-VIII 8-9. Caudal rounded or subtruncate.

40. *Cichlosoma erythraeum*.

*Heros erythraeus*, Günth. Trans. Zool. Soc. vi. 1869, p. 457, pl. lxxv. fig. 2; Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1898, p. 1531; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 239 (1904).

Depth of body  $2\frac{1}{4}$  in the length, length of head  $2\frac{1}{5}$ . Snout as long as postorbital part of head. Diameter of eye  $4\frac{1}{3}$  in the length of head, interorbital width 3. Depth of præorbital equal to diameter of eye. Maxillary not extending to below the eye; præmaxillary processes extending to above anterior  $\frac{1}{4}$  of eye; jaws equal anteriorly; lips thick, the lower with a continuous fold; cheek with 5 series of scales; 8 gill-rakers on the lower part of anterior arch. Scales  $31\frac{7}{15}$ , 3 between lateral line and base of anterior rays of soft dorsal. Dorsal XVII 12, commencing above the opercular cleft, the spines subequal from the sixth to the fifteenth, thence increasing to the last, which is a little more than  $\frac{1}{3}$  the length of head. Anal VII 8. Pectoral nearly as long as the head, extending to above the fourth anal spine; ventral extending beyond origin of anal. Caudal peduncle  $\frac{2}{3}$  as long as deep. Brownish, obscurely marbled with darker, and with some dark spots on the posterior part of the body; fins pale yellow.

Lake Managua, Nicaragua.

1. (180 mm.) type of the species. Lake Managua. Capt. J. M. Dow.

41. *Cichlosoma lobochilus*.

*Heros lobochilus* (part.), Günth. Trans. Zool. Soc. vi. 1869, p. 457, pl. lxxv. fig. 1; Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1898, p. 1530; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 240 (1904).

Depth of body  $2\frac{1}{4}$  in the length, length of head nearly 3. Snout as long as postorbital part of head. Diameter of eye  $4\frac{1}{4}$  in the length of head, interorbital width 3. Depth of præorbital equal to diameter of eye. Maxillary not extending to below the eye; præmaxillary processes extending to above anterior  $\frac{1}{3}$  of eye; jaws equal anteriorly; upper and lower lip each forming a large fleshy triangular flap; cheek with 5 series of scales; 9 gill-rakers on the lower part of anterior arch. Scales  $31\frac{7}{15}$ ,  $2\frac{1}{2}$  between lateral line and base of anterior rays of soft dorsal. Dorsal XVII 11, commencing above the opercular cleft, the spines subequal from the seventh to the fourteenth, thence increasing in length to the last, which is  $\frac{1}{2}$  the length of head; soft fin, when laid back, extending to middle of caudal. Anal VII 9. Pectoral nearly as long as the head, extending to above third anal

spine; ventral extending to middle of anal. Caudal rounded. Caudal peduncle  $\frac{5}{7}$  as long as deep. Olivaceous, with 7 dark cross-bars, the fourth bearing a darker blotch below the lateral line; a dark spot on the upper  $\frac{1}{2}$  of base of caudal; vertical fins dusky, the soft dorsal with obscure darker spots. Lake Managua, Nicaragua.

1. (196 mm.) type of the species. Lake Managua. Capt. J. M. Dow.

#### 42. *Cichlosoma labiatum*.

*Heros labiatum*, Günth. Proc. Zool. Soc. 1864, p. 27, pl. iv. fig. 1. and Trans. Zool. Soc. vi. 1869, p. 456; Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1898, p. 1530; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 239 (1904).

Depth of body  $2\frac{1}{3}$  in the length, length of head  $2\frac{1}{2}$ - $2\frac{3}{5}$ . Snout as long as or longer than postorbital part of head. Diameter of eye  $4\frac{1}{3}$ - $4\frac{2}{3}$  in the length of head, interorbital width 3- $3\frac{2}{5}$ . Depth of præorbital equal to or a little more than diameter of eye. Maxillary not extending to below the eye; præmaxillary processes extending to above anterior  $\frac{1}{3}$  of eye; jaws equal anteriorly; upper and lower lip each forming a large fleshy triangular flap; 4 or 5 series of scales on the cheek; 11 or 12 gill-rakers on the lower part of anterior arch. Scales  $30\frac{6}{13-14}$ , 3 between lateral line and base of anterior rays of soft dorsal. Dorsal XVII 11-12, commencing above the opercular cleft, the spines subequal from the seventh to the fourteenth, thence increasing to the last, which is  $\frac{1}{3}$ - $\frac{3}{8}$  the length of head; soft fin, when laid back, extending to posterior part of caudal. Anal VII-VIII 8-9. Pectoral  $\frac{4}{5}$  the length of head, extending to above the fourth or fifth anal spine; ventral extending beyond origin or nearly to middle of anal. Caudal rounded or subtruncate. Caudal peduncle  $\frac{3}{4}$ - $\frac{1}{2}$  as long as deep. Some specimens uniformly pale yellow, others brownish with obscure darker cross-bars and dark spots on the vertical fins.

Nicaragua.

1-3. (178-190 mm.) types of the species.	Lake Nicaragua.	Capt. J. M. Dow.
4 5. (162 and 178 mm.)	Lake Managua.	Dr. P. L. Slater.

#### Section 11 (*Thorichthys*).

Body deep or moderately elongate (depth 2- $2\frac{2}{3}$  in the length). Upper profile of snout straight, oblique. Scales of the lateral line of the same size as those above and below

it; scales of thoracic region considerably smaller than those on the side of the body. Mouth moderate, moderately protractile; maxillary slightly exposed; teeth of the outer series small or moderate, in the upper jaw moderately increasing in size anteriorly, in the lower with 4 or 5 anterior teeth on each side distinctly enlarged. Dorsal XV-XVII 8-12. Anal VI-IX 6-9. Dorsal and anal fins entirely scaleless. Caudal slightly emarginate, with pointed lobes.

Three species from Mexico and Central America are allied to *C. macracanthus* &c., but differ from all other members of the genus in the scaleless dorsal and anal fins and in the form of the caudal.

#### 43. *Cichlosoma aureum*.

*Heros aureus*, Günth. Cat. Fish. iv. p. 292 (1862), and Trans. Zool.

Soc. vi. 1869, p. 455, pl. lxxiii. fig. 2; Jord. & Everm. Bull. U.S.

Nat. Mus. xlviii. 1898, p. 1533; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 238 (1904).

*Heros Helleri*, Steind. Denkschr. Ak. Wien, xxiii. 1864, p. 64, pl. iv. fig. 1.

*Heros maculipinnis*, Steind. t. c. p. 69, pl. iv. fig. 2; Jord. & Everm.

Bull. U.S. Nat. Mus. xlvii. 1898, p. 1530; Pellegr. t. c. p. 240.

*Cichlasoma Helleri*, Jord. & Everm. t. c. p. 1521; Pellegr. t. c. p. 220.

*Thorichthys Helleri*, Meek, Zool. Pub. Columbian Mus. v. 1904, p. 223.

*Thorichthys Elioti*, Meek, l. c. fig. 72.

Depth of body  $2-2\frac{2}{3}$  in the length, length of head  $2\frac{2}{3}-3$ . Snout straight, as long as postorbital part of head. Diameter of eye  $2\frac{2}{3}-3\frac{1}{2}$  in the length of head, interorbital width  $3-3\frac{1}{2}$ . Depth of præorbital equal to the diameter of eye or less. Maxillary not quite extending to below the eye; præmaxillary processes extending to above anterior  $\frac{1}{4}$  of eye; jaws equal anteriorly; fold of the lower lip continuous or not; cheek with 4-6 series of scales; 9 or 10 gill-rakers on the lower part of anterior arch. Scales 29-32  $\frac{5-6}{12-15}$ , 2 or 3 between lateral line and base of anterior rays of soft dorsal. Dorsal XV-XVII 9-12, commencing above the opercular cleft, the spines subequal from the sixth, the last about  $\frac{1}{2}$  the length of head; soft fin, when laid back, extending to anterior  $\frac{1}{3}$  or middle of caudal. Anal VII-VIII 7-8 (VI-IX 6-9). Pectoral as long as the head, extending to above middle anal spines; ventral extending beyond origin of anal. Caudal slightly emarginate with pointed lobes. Caudal peduncle a little deeper than long. Olivaceous, with 6 dark cross-bars, the third bearing a blackish blotch on or below the lateral line; suboperculum usually blackish; head and anterior part

of the body with blue spots; vertical fins dusky, often with clear spots.

Guatemala; Southern Mexico.

1. (108 mm.) type of the species.	Lake Yzabal.	O. Salvin, Esq.
2. (95 mm.)	R. Motagua.	O. Salvin, Esq.
3. (44 mm.)	Mexico.	M. Sallé.
4. (126 mm.)	R. de Sarabia.	Dr. A. C. Buller.
5. (92 mm.)	San Domingo de Guzman.	Dr. A. C. Buller.
6-9. (83-113 mm.)	Motzorongo.	Dr. H. Gadow.
10-11. (80 and 109 mm.)	R. Tonto.	Dr. H. Gadow.

#### 44. *Cichlosoma affine*.

*Heros affine*, Gunth, Cat. Fish. iv. p. 292 (1862), and Trans. Zool. Soc. vi. 1869, p. 455, pl. lxxix. fig. 1; Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1898, p. 1529; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 241 (1904).

Depth of body about  $2\frac{1}{4}$  in the length, length of head  $2\frac{3}{5}$ - $2\frac{3}{4}$ . Snout longer than postorbital part of head. Diameter of eye  $3\frac{1}{4}$ - $3\frac{2}{3}$  in the length of head, interorbital width  $3\frac{1}{2}$ - $3\frac{2}{3}$ . Depth of præorbital  $1-1\frac{1}{3}$  the diameter of eye. Maxillary not extending to the vertical from anterior margin of eye; præmaxillary processes not extending to above the eye; lower jaw projecting; fold of the lower lip continuous or not; cheek with 4 or 5 series of scales; 11 or 12 gill-rakers on the lower part of anterior arch. Scales 27-29  $\frac{5}{11}$ , 2 between lateral line and base of anterior rays of soft dorsal. Dorsal XVI-XVII 8-9, commencing above the opercular cleft, the spines subequal from the fifth, the last nearly  $\frac{1}{2}$  the length of head; the soft fin, when laid back, extending to anterior  $\frac{1}{3}$  of caudal. Anal VIII-IX 7-8. Pectoral as long as the head, extending to first soft ray of anal; ventral extending beyond origin of anal. Caudal slightly emarginate, with pointed lobes. Caudal peduncle a little deeper than long. Olivaceous, with 6 dark cross-bars, the third bearing a large blackish blotch on the lateral line; suboperculum usually blackish; blue spots on the head and anterior part of body; fins, except the pectoral, dusky, the unpaired ones with light bluish spots enclosed in dark rings.

Guatemala; British Honduras.

1-4. (98-130 mm.) types of the species.	Lake Peten.	O. Salvin, Esq.
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#### 45. *Cichlosoma callolepis*.

*Heros callolepis*, Regan, Ann. & Mag. Nat. Hist. (7) xiii. 1904, p. 258; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 238 (1904).

Depth of body about  $2\frac{2}{3}$  in the length, length of head 3.



Snout longer than postorbital part of head. Diameter of eye  $3\frac{1}{2}$  in the length of head and equal to the interorbital width. Depth of præorbital equal to diameter of eye. Maxillary not extending to below the eye; præmaxillary processes extending to above anterior margin of eye; jaws equal anteriorly; fold of the lower lip continuous or not; cheek with 4 or 5 series of scales; 10 gill-rakers on the lower part of anterior arch. Scales 28-29  $\frac{4\frac{1}{2}}{12}$ ,  $1\frac{1}{2}$  or 2 between lateral line and base of anterior rays of soft dorsal. Dorsal XV 9-10, commencing above or behind axil of pectoral, the spines subequal from the fifth, the last  $\frac{2}{5}$  the length of head or less; the soft fin, when laid back, extending to anterior  $\frac{1}{4}$  of caudal. Anal VI-VII 7-8. Pectoral  $\frac{3}{4}$  the length of head, extending to above origin of anal; ventral extending beyond origin of anal. Caudal slightly emarginate, with pointed lobes. Caudal peduncle as long as deep. Brownish, with faint traces of darker cross-bars and with a dark blotch on the lateral line below the last dorsal spines; small light blue spots on the head and at the base of each scale on the body; fins, except the pectoral, dusky.

San Domingo de Guzman, Mexico.

1-2. (93 and 100 mm.) San Domingo de Guzman. Dr. A. C. Buller. types of the species.

#### Section 12 (*Heros*).

Body deep. Scales of the lateral line of the same size as those below it, but rather larger than those above it; scales of thoracic region considerably smaller than those on the side of the body. Mouth rather small, moderately protractile; maxillary slightly exposed; teeth of the outer series moderate, distinctly increasing in size anteriorly. Dorsal XV-XVII 13-14, the soft fin scaly at the base. Anal VII-VIII 12-14. Pectoral extending beyond origin of anal. Caudal subtruncate.

The single species, from Brazil and Guiana, is probably derived from the type represented by *C. facetum*. It leads to the genera *Symphysodon* and *Pterophyllum*.

#### 46. *Cichlosoma severum*.

*Heros severus*, Heck. Ann. Mus. Wien, ii. 1840, p. 362.

*Heros coryphaeus*, Heck. t. c. p. 364.

*Heros modestus*, Heck. t. c. p. 366.

*Heros spurius*, Heck. t. c. p. 368; Günth. Cat. Fish. iv. p. 293 (1862); Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 236 (1904).

*Heros efasciatus*, Heck. t. c. p. 372; Günth. t. c. p. 294.

*Chromys appendiculata*, Casteln. Anim. Am. Sud, Poiss. p. 15, pl. vii. fig. 3 (1855).



*Chromys fasciata*, Casteln. o. c. p. 17, pl. ix. fig. 2.

*Uaru centrarchoides*, Cope, Proc. Ac. Philad. 1872, p. 253, pl. xi. fig. 2.

*Acara (Heros) spuria*, Steind. Sitzb. Ak. Wien, lxx. 1874, p. 507, pl. iv., and lxxi. 1875, p. 83.

*Astronotus (Cichlosoma) severus*, Eigenm. & Bray, Ann. Ac. N. York, vii. 1894, p. 619.

Depth of body  $1\frac{3}{5}$ – $1\frac{4}{5}$  in the length, length of head  $2\frac{3}{4}$ –3. Snout longer than postorbital part of head. Diameter of eye 3– $3\frac{1}{2}$  in the length of head, interorbital width 2  $2\frac{2}{3}$ . Depth of præorbital  $\frac{3}{4}$ – $1\frac{1}{3}$  the diameter of eye. Maxillary not extending to below the eye; præmaxillary processes not extending to above the eye (in the adult); jaws equal anteriorly; fold of the lower lip continuous, somewhat produced; cheek with 5 or 6 series of scales; 9–11 gill-rakers on the lower part of anterior arch. Scales 36–42  $\frac{7-8}{13-16}$ , 28–30 in a longitudinal series below the lateral line, 4 or 5 between lateral line and base of anterior rays of soft dorsal. Dorsal (XV) XVI–XVII 13–14, commencing above the opercular cleft, the spines subequal from the seventh or slightly increasing in length to the last, which is  $\frac{1}{2}$ – $\frac{2}{3}$  the length of head; soft fin, when laid back, extending to posterior part of caudal. Anal VII–VIII 12–13 (14). Pectoral as long as the head, extending to above the fifth anal spine; ventral extending to middle of anal. Caudal subtruncate. Caudal peduncle  $\frac{1}{3}$ – $\frac{2}{5}$  as long as deep. Olivaceous, with obscure darker cross-bars; a blackish bar from soft dorsal to posterior part of anal, and sometimes another on the base of caudal; head and body with spots or vermiculations; vertical fins with dark stripes or series of spots.

Brazil; Guiana.

1–2. (89 and 158 mm.)	Rio Cupai.	
3. (163 mm.)	Guiana.	Sir R. Schomburgk.
4. (131 mm.)		Zoological Society.
5–6. (174 and 192 mm.)	Teffé.	Prof. A. Agassiz.
7 8. (81 and 111 mm.)	Teffé.	Dr. J. Bach.
9. (190 mm.)	Teffé.	Paris Museum.

#### Section 13 (*Hoplarchus*).

Body ovate. Scales of the lateral line larger than those above and below it. Dorsal XV 12–13. Anal V 8–10.

The single species, from South America, appears to be related to *C. severum*. It leads to the genus *Uaru*.

#### 47. *Cichlosoma psittacum*.

*Heros psittacus*, Heck. Ann. Wien Mus. ii. 1840, p. 369; Gunth. Cat. Fish. iv. p. 290 (1862); Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 242 (1904).

*Pomotis fasciatus*, Schomb. Fish. Guiana, ii, p. 169, pl. xvii. (1843).  
*Hoplarchus pentacanthus*, Kaup, Arch. Nat. 1860, p. 129, pl. vi. fig. 1.  
*Acara (Heros) psittacus*, Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 87.

Depth of body about 2 in the length, length of head about  $2\frac{3}{4}$ . Diameter of eye 3-4 in the length of head and nearly equal to the interorbital width. Depth of præorbital equal to diameter of eye. Maxillary not extending to below the eye; fold of the lower lip continuous; cheek with 10-14 series of scales; 7 gill-rakers on the lower part of anterior arch. Scales 44-48 (probably more if counted above the lateral line)  $\frac{10-11}{18-20}$ . Dorsal XV 12-13, the spines increasing in length to the last, which is  $\frac{1}{2}$  the length of head. Anal V 8-10. Pectoral nearly as long as the head. Caudal rounded. Caudal peduncle deeper than long. Yellowish or reddish, with a dark longitudinal band from eye to base of caudal, where it forms a spot.

R. Amazon; R. Orinoco.

Heckel's type measures 130 mm. in total length.

#### PARAPETENIA, subgen. nov.

Typically with larger, more oblique and more protractile mouth than in other groups of *Cichlosoma* and usually with maxillary more distinctly exposed distally; but none of these features are constant. Upper jaw with the anterior pair of teeth slightly enlarged in the more generalized forms, strongly enlarged in the more specialized ones. Lower jaw with the 3 anterior teeth on each side more or less canine-like, with the anterior pair somewhat smaller than the others (corresponding to the enlargement of the anterior pair in the upper jaw) in the more generalized forms. The anterior pair wanting, the next pair strong, and the third pair forming very strong canines in the more specialized forms. Scales of lateral line of the same size as those below it on the side of the body; scales of the thoracic region much smaller than those on the side of the body. Dorsal XV-XIX 8-13; posterior part of spinous dorsal and soft fin with a scaly sheath at the base and with short series of scales on the interradiial membranes. Anal IV-X 7-10. Caudal rounded or subtruncate.

#### 48. *Cichlosoma adpersum*.

*Acara adpersa*, Günth. Cat. Fish. iv. p. 282 (1862).

*Heros adpersus*, Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 227 (1904).

Depth of body  $2\frac{2}{5}$  in the length, length of head  $2\frac{1}{5}$ . Snout

as long as postorbital part of head. Diameter of eye  $5\frac{1}{3}$  in the length of the head, interorbital width  $3\frac{1}{2}$ . Depth of præorbital  $1\frac{2}{5}$  the diameter of eye. Maxillary slightly exposed, extending nearly to below the eye; præmaxillary processes extending to above anterior  $\frac{1}{4}$  of eye; jaws equal anteriorly, the anterior pair of teeth in the upper jaw the largest and in the lower jaw somewhat smaller than the next 2 on each side, which are slightly enlarged; fold of the lower lip continuous; cheek with 7 series of scales; 9 gill-rakers on the lower part of anterior arch. Scales  $31\frac{6}{15}$ ,  $3\frac{1}{2}$  between lateral line and base of anterior rays of soft dorsal. Dorsal XV 12, the spines subequal from the sixth to the twelfth, thence increasing to the last, which is a little more than  $\frac{1}{3}$  the length of head; soft fin, when laid back, extending to middle of caudal. Anal IV 10. Pectoral less than  $\frac{2}{3}$  the length of head, not extending to above the anal; ventral extending to origin of anal. Caudal rounded. Caudal peduncle nearly as long as deep. Olivaceous, with numerous small blackish spots on head, body, and dorsal and caudal fins.

## Barbadoes.

1. (218 mm.) type of the Barbadoes. Sir R. Schomburgk.  
species.

49. *Cichlosoma tetracanthus*.

*Centrarchus tetracanthus*, Cuv. & Val. Hist. Nat. Poiss. vii. p. 460 (1831).

*Chromis fuscomaculatus*, Guichen. Hist. Cuba, Poiss. p. 78, pl. ii. fig. 3 (1853).

*Acara fuscomaculata*, Günth. Cat. Fish. iv. p. 282 (1862).

*Acara tetracanthus*, Steind. Denkschr. Ak. Wien, xxiii. 1864, p. 60.

*Heros tetracanthus*, Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1898, p. 1539; Eigenm. Bull. U.S. Fish. Comm. 1902, p. 230, figs. 12 & 13.

*Heros fuscomaculatus*, Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 227 (1904).

*Heros tetracanthus torralbasi*, Eigenm. l. c. fig. 11.

*Heros tetracanthus griseus*, Eigenm. t. c. p. 233, fig. 14.

*Heros tetracanthus latus*, Eigenm. t. c. p. 234, fig. 15.

*Heros tetracanthus cinctus*, Eigenm. l. c. fig. 16.

*Heros nigricans*, Eigenm. t. c. p. 235, fig. 17.

Depth of body  $2-2\frac{3}{5}$  in the length, length of head  $2\frac{1}{2}-3$ . Snout shorter than postorbital part of head. Diameter of eye  $3-4\frac{1}{3}$  in the length of head, interorbital width  $3\frac{1}{3}-3\frac{3}{4}$ . Depth of præorbital  $\frac{2}{5}-\frac{4}{5}$  the diameter of eye. Maxillary slightly exposed, extending to below anterior margin of eye; præmaxillary processes extending to above anterior  $\frac{1}{3}$  of eye; jaws equal anteriorly, or the lower slightly projecting; anterior

pair of teeth in the upper jaw and 2-3 on each side in the lower enlarged, forming weak canines; fold of the lower lip continuous; check with 7-10 series of scales; 8-10 gill-rakers on the lower part of anterior arch. Scales 28-31  $\frac{6-7}{13-15}$ , 3 or 4 between lateral line and base of anterior rays of soft dorsal. Dorsal XV-XVI 10-12, the spines slightly increasing in length to the last, which is  $\frac{1}{3}-\frac{2}{5}$  the length of head, or sometimes the middle spines subequal; soft fin, when laid back, extending to anterior  $\frac{1}{3}$  of caudal. Anal\* IV 8-10. Pectoral  $\frac{3}{5}-\frac{3}{4}$  the length of head, usually not extending to above the anal; ventral not extending to origin of anal. Caudal subtruncate or rounded. Caudal peduncle  $\frac{3}{5}-\frac{3}{4}$  as long as deep. Olivaceous, with dark spots on head, body, and vertical fins; sometimes dark cross-bars on the body and a dark spot below the origin of the lateral line, another on the middle of the side, and a third on the base of the caudal.

## Cuba.

1. (151 mm.)	Cuba.	Zoological Society.
2. (86 mm.)	Puñar del Rio.	Prof. C. H. Eigenmann.
3-4. (80 and 97 mm.)	Calabazar.	Prof. C. H. Eigenmann.
5-6. (98 and 118 mm.)	San Antonio.	Prof. C. H. Eigenmann.
7-12. (102-154 mm.)	Palacios.	Prof. C. H. Eigenmann.
13-27. (64-121 mm.)	San Cristobal.	Prof. C. H. Eigenmann.

50. *Cichlosoma istlanum*.

? *Cichlasoma Steindachneri*, Jord. & Snyder, Bull. U.S. Fish. Comm. xix. 1899, p. 143, fig. 20; Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1900, p. 3173; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 206 (1904); Meek, Zool. Pub. Columbian Mus. v. 1904, p. 211, fig. 67.

*Heros istlanus*, Jord. & Snyder, *t. c.* p. 144; Jord. & Everm. *t. c.* p. 3174; Pellegr. *t. c.* p. 228.

*Cichlasoma istlanum*, Meek, *t. c.* p. 213, fig. 69.

Depth of body  $2\frac{3}{5}-2\frac{2}{5}$  in the length, length of head  $2\frac{3}{4}-2\frac{1}{5}$ . Snout as long as postorbital part of head. Diameter of eye  $4\frac{1}{4}$  in the length of head, interorbital width  $3\frac{1}{3}-3\frac{1}{2}$ . Depth of præorbital a little less than the diameter of eye. Maxillary slightly exposed, not extending to below the eye; præmaxillary processes extending nearly to above middle of eye; jaws equal anteriorly; fold of the lower lip subcontinuous; upper jaw with the 2 anterior teeth of the outer series more or less distinctly differentiated as a pair of canines; lower jaw with 2 or 3 pairs of rather weak canines;

\* Two specimens from San Cristobal have curiously malformed anal fins. In each case the posterior part of the fin is wanting; in one there are 10 spines and no soft rays, in the other 8 spines and 3 soft rays.

cheek with 6 series of scales; 8 gill-rakers on the lower part of the anterior arch. Scales 30-31  $\frac{5\frac{1}{2}-6}{14-15}$ ,  $2\frac{1}{2}$  between lateral line and base of anterior rays of soft dorsal. Dorsal XVI 10, the spines subequal from about the sixth to the thirteenth, thence increasing to the last, which is  $\frac{2}{3}$  the length of head; soft fin, when laid back, extending to middle of caudal. Anal V 8. Pectoral  $\frac{2}{3}$  the length of head or more, not extending to above the anal; ventral extending to origin of anal or a little beyond. Caudal rounded. Caudal peduncle as long as deep. Olivaceous, each scale with a small dark spot at the base; obscure traces of dark cross-bars; a dark spot below the origin of the lateral line and another on the middle of the side; vertical fins with small dark spots.

Rio Ixtla, Mexico.

1-2. (137 and 143 mm.) co-types Rio Ixtla. Dr. D. S. Jordan.  
of the species.

With these I have compared several small examples (30-40 mm.), co-types of *C. Steindachneri* from the Rio Verde, which appear to me to present all the characters which might be expected in young specimens of *C. istlanum*. The general form of the body and the number of scales and fin-rays seem to be the same. The larger eye, shorter snout, smaller mouth, less produced soft dorsal and anal fins, &c. are differences due to size. There are several dark cross-bars on the body and an interrupted longitudinal band bearing a dark blotch on the middle of the side. The lower lip has the same structure as in the larger specimens named *C. istlanum*. I have retained the name *C. istlanum* until actual comparison of adult fish from the two rivers has been made.

### 51. *Cichlosoma Bartoni*.

*Acara Bartoni*, Bean, Proc. U.S. Nat. Mus. 1892, p. 286, pl. xlv. fig. 3.  
*Cichlasoma Bartoni*, Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1898, p. 1515, fig. 587; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 206 (1904); Meek, Zool. Pub. Columbian Mus. v. 1904, p. 211, fig. 68.  
\* *Heros (Cichlasoma) labridens*, Pellegr. Bull. Mus. Paris, 1903, p. 122.  
*Cichlasoma labridens*, Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 207, pl. vi. fig. 1 (1904).

Depth of body  $2\frac{1}{5}$ - $2\frac{2}{3}$  in the length, length of head  $2\frac{3}{4}$ -3. Snout nearly as long as postorbital part of head. Diameter of eye  $4\frac{1}{2}$ - $5\frac{1}{2}$  in the length of head. Depth of præorbital greater than diameter of eye. Maxillary not extending to below the eye; lower jaw projecting; fold of the lower lip

\* In placing *Heros labridens* in the synonymy of *C. Bartoni*, I follow Dr. Meek, who has examined a number of specimens.

not continuous; anterior teeth forming canines; cheek with 5 or 6 series of scales; 7 gill-rakers on the lower part of anterior arch. Scales about  $30 \frac{5\frac{1}{2}}{12-13}$ . Dorsal XV-XVI 10-11, the spines increasing in length to the last, which is  $\frac{1}{3}$  the length of head; soft fin extending a little beyond base of caudal. Anal V (IV-VI) 8-9. Pectoral  $\frac{2}{3}$  the length of head, not extending to above the anal; ventral extending to the vent. Caudal rounded. Caudal peduncle as long as deep. Brownish, with about 6 indistinct cross-bars on the sides; a dark spot at the base of caudal.

Rio Panuco and its tributaries, Mexico.

The types of the species measure from 90-180 mm. in total length, those of *C. labridens* 200-220 mm.

### 52. *Cichlosoma Beani*.

*Heros Beani*, Jord. Proc. U.S. Nat. Mus. 1888, p. 332, and Proc. Cal. Ac. Sci. 1895, p. 473; Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1898, p. 1538; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 230 (1904). *Cichlasoma Beani*, Meek, Zool. Pub. Columbian Mus. v. 1904, p. 210.

Depth of body  $2-2\frac{1}{3}$  in the length, length of head  $2\frac{3}{4}-3$ . Snout more than  $\frac{1}{3}$  the length of head (in the adult), less in the young. Diameter of eye  $3\frac{1}{2}-5$  in the length of head, interorbital width  $3-3\frac{1}{2}$ . Depth of præorbital a little greater than diameter of eye (adult),  $\frac{2}{3}$  diameter of eye (young). Maxillary slightly exposed, not extending to below the eye; præmaxillary processes extending nearly to above middle of eye; lower jaw slightly projecting; fold of the lower lip continuous; upper jaw with the 2 anterior teeth of the outer series more or less distinctly differentiated as a pair of canines; lower jaw with the 2 or 3 anterior teeth on each side forming more or less distinct canines; cheek with 6 or 7 series of scales; 8 or 9 gill-rakers on the lower part of anterior arch. Scales  $30-31 \frac{4\frac{1}{2}-5\frac{1}{2}}{13-14}$ , 3 between lateral line and base of anterior rays of soft dorsal. Dorsal XVI 11-12, the spines slightly increasing in length to the last, which is about  $\frac{2}{5}$  the length of head, or the middle spines sometimes subequal; soft fin, when laid back, extending to anterior  $\frac{1}{3}$  of caudal or beyond. Anal V 8-10. Pectoral nearly  $\frac{3}{4}$  the length of head, not extending to above origin of anal; ventral extending to origin of anal. Caudal subtruncate or rounded. Caudal peduncle about  $\frac{2}{3}$  as long as deep. Olivaceous, each scale with a brown spot; a dark spot on the lateral line below the posterior dorsal spines and another on the upper part of the base of caudal; about 8 dark cross-bars in the young; vertical fins with small dark spots.

## Rivers of Sinaloa and Jalisco, Mexico.

- |  |               |                   |
|--|---------------|-------------------|
| 1. (67 mm.) co-type of<br>the species. | Rio Presidio. | Dr. D. S. Jordan. |
| 2-4. (104-180 mm.)                     | Rio Presidio. | Herr A. Forrer.   |

53. *Cichlosoma mento*.

*Heros mento*, Vaill. & Pellegr. Bull. Mus. Paris, 1902, p. 83; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 229 (1904).

*Cichlasoma mento*, Meek, Zool. Pub. Columbian Mus. v. 1904, p. 207.

Depth of body  $2\frac{1}{2}$ - $2\frac{2}{5}$  in the length, length of head  $2\frac{1}{5}$ -3. Snout shorter than postorbital part of head. Diameter of eye  $4-1\frac{1}{2}$  in the length of head and  $1\frac{1}{2}$  in the interorbital width. Maxillary not extending to below the eye; lower jaw projecting; anterior teeth forming canines; fold of the lower lip continuous; cheek with 6-8 series of scales; 8 gill-rakers on the lower part of anterior arch. Scales 29-30  $\frac{6\frac{1}{2}}{14-15}$ . Dorsal XVI 10, the spines only slightly increasing in length after the fifth, the last  $\frac{1}{3}$  the length of head. Anal V 7-8. Pectoral  $\frac{2}{3}$  the length of head. Caudal rounded. Caudal peduncle as long as deep. Violaceous; soft vertical fins spotted.

Southern Mexico.

The types, from the Rio Negro, measure from 98 to 180 mm.

54. *Cichlosoma Festæ*.

*Heros Festæ*, Bouleng. Boll. Mus. Torin. xiv. 1899, No. 335, p. 6; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 230 (1904).

Depth of body  $2\frac{2}{5}$  in the length, length of head  $2\frac{2}{5}$ . Snout nearly  $\frac{1}{2}$  the length of head. Diameter of eye  $5\frac{1}{4}$  in the length of head, interorbital width 3. Depth of præorbital  $1\frac{1}{2}$  the diameter of eye. Maxillary exposed distally, not extending to below the eye; præmaxillary processes extending to above anterior  $\frac{1}{3}$  of eye; lower jaw slightly projecting; fold of the lower lip continuous; upper jaw with the 2 anterior teeth of the outer series differentiated as a pair of canines; lower jaw with the anterior 2 or 3 teeth on each side forming distinct canines; cheek with 5 or 6 series of scales, with a naked area between the lowest series and præoperculum (probably covered in the young with 1 or 2 additional series of scales); 9 gill-rakers on the lower part of anterior arch. Scales 30  $\frac{5\frac{1}{2}}{12}$ ,  $3\frac{1}{2}$  between lateral line and base of anterior rays of soft dorsal. Dorsal XVI (11) 12, the spines subequal from the sixth to the fourteenth, thence



increasing to the last, which is  $\frac{3}{8}$  the length of head; the soft fin, when laid back, extending nearly to middle of caudal. Anal V (8) 9. Pectoral  $\frac{5}{7}$  the length of head, extending to above origin of anal; ventral extending to origin of anal. Caudal rounded. Caudal peduncle a little more than  $\frac{2}{3}$  as long as deep. Brownish, with 8 blackish cross-bars; a blackish ocellated spot on the upper  $\frac{1}{2}$  of base of caudal; vertical fins dusky, the soft dorsal with some indistinct light spots.

W. Ecuador.

1. (255 mm.) one of the types Rio Guayas, Guayaquil. Dr. H. Festa. of the species.

55. *Cichlosoma ornatum*, sp. n.

Depth of body  $2\frac{1}{3}$  (young)– $2\frac{7}{8}$  (adult) in the length, length of head  $2\frac{4}{5}$ – $2\frac{7}{8}$ . Snout nearly  $\frac{1}{2}$  the length of head (in the adult). Diameter of eye  $3\frac{3}{4}$ –6 in the length of head, interorbital width 3– $3\frac{1}{2}$ . Depth of præorbital  $\frac{5}{6}$ – $1\frac{2}{3}$  the diameter of eye. Maxillary slightly exposed, not extending to below the eye; premaxillary processes extending to above anterior  $\frac{1}{4}$  of eye (adult) or a little beyond (young); jaws nearly equal anteriorly (in the young), or the lower a little shorter than the upper (in the adult); fold of the lower lip continuous; upper jaw with the 2 anterior teeth of the outer series differentiated as a pair of canines; lower jaw with the 2 or 3 anterior teeth on each side forming canines; cheek with 6 series of scales, the lowest deciduous in the adult; 8 or 9 gill-rakers on the lower part of anterior arch. Scales 30–32  $\frac{5}{11}$ ,  $2\frac{1}{2}$ –3 between lateral line and base of anterior rays of soft dorsal. Dorsal XV–XVI 12–13, the spines subequal from the sixth or seventh to the twelfth to fourteenth, thence increasing to the last, which is about  $\frac{1}{3}$  the length of head ( $\frac{3}{8}$  in the young,  $\frac{2}{7}$  in the adult), the soft fin, when laid back, extending nearly to middle of caudal. Anal V 9. Pectoral  $\frac{3}{4}$ – $\frac{5}{6}$  the length of head, extending nearly to above origin of anal; ventral extending to origin of anal. Caudal rounded. Caudal peduncle as long or nearly as long as deep. Olivaceous, with some blackish cross-bars on the sides of the body; sides of the head with light blue spots; each scale with a light blue spot, the spots of the lower part of the body larger and almost white; a blackish spot at the base of pectoral and another on the upper  $\frac{1}{2}$  of the base of caudal; 3 large blackish spots on the basal part of the dorsal fin, the first at the base of the 9th to 11th spines (absent in one specimen), the second at



the base of the last 2 spines and the first soft ray, the third on the posterior soft rays; vertical fins with light spots.

N.W. Ecuador.

- 1-3. (118-300 mm.) types of the Rio Durango. Mr. Rosenberg.  
 species.  
 4. (119 mm.) St. Javier. Mr. Rosenberg.

In the adult examples the teeth are obtuse, many ending in a flat circular surface. On dissection the stomach was found to be full of broken shells.

These specimens had been referred by Boulenger to *C. Festæ*, but they differ considerably from that species in coloration and in the more slender caudal peduncle. Moreover, in *C. Festæ*, when the mouth is closed, the anterior canines of the upper jaw fit in between the anterior teeth of the lower jaw; in *C. ornatum*, on the contrary, the anterior teeth of the upper jaw are external to those of the lower when the mouth is closed, this being especially marked in the adult fish. In *C. Festæ* the occipital region is more elevated and convex, and this difference is due neither to age, sex, nor method of preservation, for the largest specimen of *C. ornatum* is a male, and in both cases the occipital crest can be felt just beneath the skin. Young examples of *C. ornatum* (118 to 119 mm. in total length) resemble the adult of *C. Festæ* in so far as they have a deeper body and longer dorsal spines than have the adult specimens of their own species, but the differences between adult examples of the two species will be evident from the following measurements:—

	<i>C. Festæ</i> (♂).	<i>C. ornatum</i> (♂).
	mm.	mm.
Length to base of caudal .....	205	245
Depth of body .....	86	86
Length of head .....	76	87
Length of caudal peduncle .....	22	30
Depth of caudal peduncle .....	30	30
Last dorsal spine .....	28	25

### 56. *Cichlosoma octofasciatum*.

*Heros octofasciatus*, Regan, Revue Suisse Zool. xi. 1903, p. 417, pl. xiii. fig. 1; Ann. & Mag. Nat. Hist. (7) xiii. 1904, p. 258.

*Cichlasoma octofasciatum*, Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 223 (1904); Meek, Zool. Pub. Columbian Mus. v. 1904, p. 218.

*Cichlasoma Hedricki*, Meek. t. c. p. 208, fig. 66.

Depth of body 2-2 $\frac{2}{3}$  in the length, length of head 2 $\frac{2}{3}$ -3. Snout shorter than postorbital part of head. Diameter of eye 3-4 $\frac{1}{3}$  in the length of head, interorbital width about 3.

Depth of præorbital  $\frac{1}{2}$ – $\frac{4}{5}$  the diameter of eye. Maxillary scarcely exposed, extending to below the anterior margin of eye; præmaxillary processes extending to above anterior margin of eye or a little beyond; jaws equal anteriorly or the lower slightly projecting; fold of the lower lip interrupted or subcontinuous; upper jaw with the 2 anterior teeth of the outer series more or less distinctly differentiated as a pair of canines; lower jaw with the 3 anterior teeth on each side forming more or less distinct canines; cheek with 5 or 6 series of scales; 7 or 8 gill-rakers on the lower part of anterior arch. Scales 28–31  $\frac{4\frac{1}{2}$ – $5\frac{1}{2}}$ <sub>12–14</sub>,  $3\frac{1}{2}$  or 4 between lateral line and base of anterior rays of soft dorsal. Dorsal XVII–XIX 8–10, the spines subequal from about the sixth to the fourteenth, thence increasing to the last, which is about  $\frac{2}{5}$  the length of head; soft fin, when laid back, extending to middle of caudal or beyond. Anal VIII–X 7–8. Pectoral  $\frac{3}{4}$ – $\frac{4}{5}$  the length of head, extending to above third anal spine; ventral extending well beyond origin of anal. Caudal rounded. Caudal peduncle  $\frac{1}{2}$ – $\frac{2}{3}$  as long as deep. Body with about 8 dark cross-bars, which become obscure in the adult, the third bearing a blackish blotch below the lateral line; sometimes a longitudinal band from eye to lateral blotch; usually some light blue spots on the head and one on each scale of the side of the body; a dark spot, often ocellated, on the upper part of the base of caudal; vertical fins with series of dark spots.

Southern Mexico; British Honduras (? Jamaica).

1–14, 15–18. (61–130 mm.)	British Honduras.	Rev. J. Robertson.
19–22. (81–107 mm.)	Rio de Sarabia.	Dr. A. C. Buller.

### 57. *Cichlosoma urophthalmus*.

*Heros urophthalmus*, Günth. Cat. Fish. iv. p. 291 (1862), and Trans. Zool. Soc. vi. 1869, p. 454, pl. lxxii. fig. 1; Steind. Denkschr. Ak. Wien, xxiii. 1864, p. 66, pl. v. fig. 3; Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1898, p. 1537; Everm. & Goldsborough, Bull. U.S. Fish. Comm. xxi. 1902, p. 157, fig.; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 233 (1904).

*Heros Troscheli*, Steind. Sitzb. Ak. Wien, lv. 1867, p. 524, pl. iv.; Jord. & Everm. *l. c.*; Pellegr. *l. c.*

Depth of body 2– $2\frac{2}{3}$  in the length, length of head  $2\frac{2}{3}$ – $2\frac{7}{8}$ . Snout as long as eye, the diameter of which is  $3\frac{1}{3}$ – $3\frac{3}{4}$  in the length of head, interorbital width 3– $3\frac{1}{4}$ . Depth of præorbital  $\frac{2}{3}$ – $\frac{7}{8}$  the diameter of eye. Maxillary more or less exposed distally, extending to below anterior margin of eye; præmaxillary processes extending to above anterior  $\frac{1}{3}$  of eye or slightly beyond; lower jaw slightly projecting; fold

of the lower lip continuous; upper jaw with the anterior pair of teeth distinctly differentiated as canines; lower jaw with the 2 or 3 anterior teeth on each side forming similar canines; cheek with 6 series of scales; 8-10 gill-rakers on the lower part of anterior arch. Scales 28-31  $\frac{4\frac{1}{2}-5\frac{1}{2}}{12-13}$ ,  $2\frac{1}{2}$  or 3 between lateral line and base of anterior rays of soft dorsal. Dorsal XV-XVII 10-12, the spines subequal from the sixth, or else slightly decreasing from the sixth to the fourteenth and increasing again to the last, which is nearly  $\frac{1}{2}$  the length of head; the soft fin, when laid back, extending to anterior  $\frac{1}{3}$  of caudal or beyond. Anal VI 8-9. Pectoral  $\frac{4}{5}$ - $\frac{5}{8}$  the length of head, extending to above origin of anal or anterior anal spines; ventral extending to origin of anal. Caudal rounded. Caudal peduncle about  $\frac{2}{3}$  as long as deep. Olivaceous, with 6 or 7 blackish cross-bars; a blackish ocellated spot on the upper half of the base of caudal; vertical fins dusky.

Guatemala; British Honduras; Yucatan.

- |   |                   |                    |
|---|-------------------|--------------------|
| 1-4. (121-171 mm.) types<br>of the species. | Lake Peten.       | O. Salvin, Esq.    |
| 5. (92 mm.)                                 | British Honduras. | Rev. J. Robertson. |

#### 58. *Cichlosoma trimaculatum*.

*Heros trimaculatus*, Günth. Trans. Zool. Soc. vi. 1869, p. 461, pl. lxxvi.;  
Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1898, p. 1529; Pellegr.  
Mém. Soc. Zool. France, xvi. 1903, p. 239 (1904).

Depth of body  $1\frac{5}{6}$  (adult)- $2\frac{1}{3}$  (young) in the length, length of head  $2\frac{1}{2}$ -3. Snout shorter than postorbital part of head. Diameter of eye  $3\frac{1}{4}$ - $4\frac{3}{4}$  in the length of head, interorbital width  $2\frac{1}{2}$ - $3\frac{1}{2}$ . Depth of præorbital equal to (adult) or  $\frac{1}{2}$  (young) the diameter of eye. Maxillary exposed distally, extending to below anterior margin of eye; præmaxillary processes extending to above middle of eye or beyond; lower jaw slightly projecting; upper jaw with the 2 anterior teeth of the outer series differentiated as a pair of canines; lower jaw with the anterior 2 or 3 teeth on each side the strongest, forming canines; cheek with 5 or 6 series of scales; 8 or 9 gill-rakers on the lower part of anterior arch. Scales 30-31  $\frac{5-5\frac{1}{2}}{14}$ ,  $2\frac{1}{2}$  or 3 between lateral line and base of anterior rays of soft dorsal. Dorsal XVI-XVII 11-12, the spines subequal from about the sixth to the fourteenth, thence increasing to the last, which is  $\frac{1}{2}$  or nearly  $\frac{1}{2}$  the length of head; soft fin, when laid back, extending to middle (young) or posterior end (adult) of caudal. Anal VI-VIII 8-9. Pectoral  $\frac{3}{4}$ - $\frac{7}{8}$  the length of head, extending

to above origin of anal; ventral extending a little beyond origin of anal. Caudal rounded. Caudal peduncle nearly  $\frac{1}{2}$  as long as deep. Olivaceous, with a blackish spot above the origin of the lateral line, another on the middle of the side, and a third on the upper part of the base of caudal; vertical fins dusky.

Guatemala; Southern Mexico.

- |                                   |            |                 |
|-----------------------------------|------------|-----------------|
| 1. (280 mm.) type of the species. | Chiapas.   | O. Salvin, Esq. |
| 2-4. (68-225 mm.)                 | Huamuchal. | O. Salvin, Esq. |

### 59. *Cichlosoma Salvini*.

*Heros Salvini*, Günth. Cat. Fish. iv. p. 294 (1864), and Trans. Zool. Soc. vi. 1869, p. 460, pl. lxxiii. fig. 3; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 241 (1904).

*Heros triagramma*, Steind. Denkschr. Ak. Wien, xxiii. 1864, p. 70, pl. iii. fig. 2.

*Cichlasoma Salvini*, Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1898, p. 1528; Meek, Zool. Pub. Columbian Mus. v. 1904, p. 207.

*Cichlasoma mojarra*, Meek, t. c. p. 217, fig. 71.

Depth of body  $2\frac{1}{3}$ - $2\frac{2}{5}$  in the length, length of head  $2\frac{3}{4}$ - $2\frac{5}{6}$ . Snout as long as postorbital part of head (in the adult). Diameter of eye 3-4 in the length of head, interorbital width 3- $3\frac{2}{3}$ . Depth of præorbital  $\frac{3}{5}$ - $\frac{7}{8}$  the diameter of eye. Maxillary exposed distally, extending about to below anterior margin of eye; præmaxillary processes extending to above middle of eye or beyond; lower jaw projecting; fold of the lower lip continuous; upper jaw with the 2 anterior teeth of the outer series forming a strong pair of canines; lower jaw with 2 pairs of strong canines; cheek with 5 series of scales; 8 or 9 gill-rakers on the lower part of anterior arch. Scales 28-31  $\frac{4\frac{1}{2}-5\frac{1}{2}}{10-12}$ , 2 or  $2\frac{1}{2}$  between lateral line and base of anterior rays of soft dorsal. Dorsal \* XVI-XVII 9-12, the spines subequal from the sixth to the fourteenth, thence increasing in length to the last, which is  $\frac{1}{2}$  or nearly  $\frac{1}{2}$  the length of head; the soft fin, when laid back, extending about to middle of caudal. Anal † VIII-IX 7-9. Pectoral  $\frac{3}{4}$  the length of head, extending to above anterior anal spines; ventral extending beyond origin of anal. Caudal rounded. Caudal peduncle  $\frac{1}{2}$ - $\frac{3}{5}$  as long as deep. Brownish, with darker cross-bands which form a series of blackish blotches along the base of the dorsal and another series below the lateral line, the latter usually confluent in the adult to form a longitudinal band from eye to caudal; blue spots on the

\* Dorsal with 16 spines in 1 specimen only.

† Anal with 9 spines in 2 specimens only.

cheeks ; sometimes a blackish spot on suboperculum ; vertical fins often with small dark spots.

Young specimens have the cross-bars more prominent and the blotches less distinct, except for one on the middle of the side and another on the base of the caudal.

Guatemala ; Southern Mexico ; British Honduras.

1-3. (86-115 mm.) types of the species.	Rio de Santa Isabel.	O. Salvin, Esq.
4-7. (83-120 mm.)	Lake Peten.	O. Salvin, Esq.
8-10. (139-153 mm.)	Nr. Cajabon.	F. C. Sarg, Esq.
11-14. (70-92 mm.)	British Honduras.	Rev. J. Robertson.

*Cichlasoma mojarra*, Meek, is founded on a very small specimen with malformed spinous dorsal. I have carefully compared the smallest examples in the British Museum Collection with Dr. Meek's figure, and I am quite certain as to the identity of *C. mojarra* with *C. Salvini*.

#### 60. *Cichlosoma multifasciatum*, sp. n.

*Heros Friedrichstahli* (part.), Günth. Trans. Zool. Soc. vi. 1869, p. 459.

Depth of body  $2\frac{1}{4}$ - $2\frac{1}{3}$  in the length, length of head  $2\frac{3}{5}$ - $2\frac{1}{2}$ . Snout as long as or shorter than eye, the diameter of which is  $3-3\frac{1}{2}$  in the length of head, interorbital width  $3\frac{1}{2}$ - $3\frac{3}{4}$ . Depth of præorbital  $\frac{1}{3}$ - $\frac{1}{2}$  the diameter of eye. Maxillary exposed distally, extending to below anterior  $\frac{1}{4}$  of eye ; præmaxillary processes extending to above posterior  $\frac{1}{3}$  of eye ; lower jaw projecting ; fold of the lower lip continuous ; upper jaw with a pair of strong canines situated close together ; lower jaw with 1-2 pairs of canines, which are well-separated ; cheek with 7 series of scales ; 8 gill-rakers on the lower part of anterior arch. Scales  $30-31$   $\frac{4-4\frac{1}{2}}{12-13}$ , 2 or  $2\frac{1}{2}$  between lateral line and base of anterior rays of soft dorsal. Dorsal XVIII-10, the spines slightly increasing in length to the last, which is  $\frac{2}{5}$  the length of head or a little more ; the soft fin, when laid back, extending to anterior  $\frac{1}{3}$  of caudal or beyond. Anal VII-VIII 8-9. Pectoral  $\frac{3}{4}$  the length of head, extending to above anterior anal spines ; ventral extending beyond origin of anal. Caudal rounded. Caudal peduncle  $\frac{1}{2}$ - $\frac{2}{3}$  as long as deep. Olivaceous, with about 10 blackish cross-bars ; a more or less distinct dark stripe from upper part of eye to operculum and another from lower part of eye to suboperculum ; cheeks and opercular bones, lower part of body and vertical fins with dark spots.

Guatemala ; British Honduras.

- 1 2. (91 and 134 mm.) types Lake Peten. O. Salvin, Esq.  
of the species.
3. (68 mm.) Stann Creek, British Honduras. Rev. J. Robertson.

### 61. *Cichlosoma Friedrichstahli*.

*Heros Friedrichstahli*, Heck. Ann. Mus. Wien, ii. 1840, p. 381; Günth.

Cat. Fish. iv. p. 294 (1862).

*Heros Friedrichstahli* (part.), Günth. Trans. Zool. Soc. vi. 1869, p. 459.

*Heros motaguensis* (part.), Pellegr. Mém. Soc. Zool. France, xvi. 1903,  
p. 234 (1904).

Depth of body  $2\frac{1}{2}$ – $2\frac{3}{5}$  in the length, length of head  $2\frac{3}{5}$ – $2\frac{2}{3}$ . Snout only a little longer than eye, the diameter of which is nearly 4 in the length of head, and equal to the interorbital width. Depth of præorbital  $\frac{1}{2}$ – $\frac{3}{5}$  diameter of eye. Maxillary exposed distally, extending to below anterior margin of eye; præmaxillary processes extending to above posterior  $\frac{1}{3}$  of eye; lower jaw projecting; fold of the lower lip continuous; upper jaw with a pair of strong canines situated close together; lower jaw with 2 pairs of canines, which are well-separated; cheek with 7 series of scales; 6 or 7 gill-rakers, sometimes preceded by 2–3 rudiments, on the lower part of anterior arch. Scales 30  $\frac{4\frac{1}{2}}{13}$ ,  $2\frac{1}{2}$  between lateral line and base of anterior rays of soft dorsal. Dorsal XVIII 9–10, the spines slightly increasing in length to the last, which is a little more than  $\frac{1}{3}$  the length of head; the soft fin, when laid back, extending to anterior  $\frac{1}{3}$  of caudal. Anal VII–VIII 8. Pectoral  $\frac{2}{3}$  the length of head, extending to above origin of anal; ventral extending to origin of anal. Caudal rounded. Caudal peduncle  $\frac{3}{5}$  as long as deep. Olivaceous, with 7 or 8 irregular dark cross-bars forming a series of blotches below the lateral line; a dark stripe from upper part of eye to operculum, and another from lower part of eye to suboperculum; cheeks, opercular bones, and lower part of body with dark spots; vertical fins with dark spots.

Lake Peten, Guatemala.

- 1-2. (121 and 129 mm.) Lake Peten. O. Salvin, Esq.

### 62. *Cichlosoma motaguense*.

*Heros motaguensis*, Günth. Trans. Zool. Soc. vi. 1869, p. 462, pl. lxxvii.  
fig. 2; Jord. & Everm. Bull. U.S. Nat. Mus. xlvi. 1898, p. 1534.

*Heros motaguensis* (part.), Pellegr. Mém. Soc. Zool. France, xvi. 1903,  
p. 234 (1904).

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

Snout longer than eye, the diameter of which is 4-5 in the length of head, interorbital width  $3\frac{2}{5}$ - $3\frac{1}{5}$ . Depth of præorbital  $\frac{2}{3}$  the diameter of eye (young) or equal to it (adult). Maxillary more or less exposed distally, extending to below anterior margin or anterior  $\frac{1}{4}$  of eye; præmaxillary processes extending to above posterior  $\frac{1}{3}$  of eye; lower jaw projecting; fold of the lower lip continuous; upper jaw with a pair of strong canines, situated close together; lower jaw with 1 or 2 pairs of canines, which are well-separated; cheek with 7 or 8 series of scales; 7 or 8 gill-rakers on the lower part of anterior arch. Scales  $32\frac{4\frac{1}{2}}{12-13}$ , 2 or  $2\frac{1}{2}$  between lateral line and base of anterior rays of soft dorsal. Dorsal XVII-XVIII 10-11, the spines slightly increasing in length to the last, which is  $\frac{1}{3}$  the length of head; the soft fin, when laid back, extending to anterior  $\frac{1}{3}$  of caudal or beyond. Anal VII-VIII 8-9. Pectoral rather more than  $\frac{2}{3}$  the length of head, extending nearly to above origin of anal in the young, but not in the adult; ventral extending to origin of anal or beyond. Caudal rounded. Caudal peduncle  $\frac{2}{3}$ - $\frac{1}{2}$  as long as deep. Olivaceous, with dark cross-bands forming a series of blotches, which may unite to form a continuous longitudinal band, below the lateral line; a dark stripe from upper part of eye to operculum, and another from lower part of eye to suboperculum; cheeks, opercular bones, lower part of body, and vertical fins usually with dark spots.

Guatemala.

- |                             |                       |                   |
|-----------------------------|-----------------------|-------------------|
| 1, 2-4. (115-240 mm.) types | Rio Motagua.          | O. Salvin, Esq.   |
|                             | of the species.       |                   |
| 5. (137 mm.)                | Pacific Slope of Cen- | Smithsonian Inst. |
|                             | tral America.         |                   |

### 63. *Cichlosoma managuense*.

*Heros managuensis*, Günth. Trans. Zool. Soc. vi. 1869, p. 463, pl. lxxvii. fig. 3; Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1898, p. 1533.

*Heros motaguensis* (part.), Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 234 (1904).

Depth of body  $2\frac{1}{2}$  in the length, length of head  $2\frac{3}{4}$ . Snout only a little longer than eye, the diameter of which is  $4\frac{1}{2}$ - $4\frac{3}{4}$  in the length of head, interorbital width  $3\frac{1}{3}$ - $3\frac{1}{2}$ . Depth of præorbital  $\frac{2}{5}$ - $\frac{1}{2}$  the diameter of eye. Maxillary scarcely exposed distally, extending to below middle of eye; præmaxillary processes extending to above posterior margin of eye; lower jaw projecting; fold of the lower lip continuous; upper jaw with a pair of rather strong canines situated



close together; lower with 1 or 2 pairs of canines, which are well-separated; cheek with 8 or 9 series of scales; 8 gill-rakers and 2 rudiments on the lower part of anterior arch. Scales 33-34  $\frac{4\frac{1}{2}}{13}$ ,  $2\frac{1}{2}$  or 3 between lateral line and base of anterior part of soft dorsal. Dorsal XVIII 10-11, the spines slightly increasing in length to the last, which is  $\frac{1}{3}$  the length of head; the soft fin, when laid back, extending to anterior  $\frac{1}{3}$  of caudal. Anal VII 8. Pectoral  $\frac{2}{3}$  the length of head or a little more, extending to above origin of anal; ventral extending to origin of anal. Caudal rounded. Caudal peduncle  $\frac{3}{5}$ - $\frac{2}{3}$  as long as deep. Olivaceous, with 7 irregular dark brown cross-bars forming a series of blotches below the lateral line; a dark stripe from upper part of eye to operculum, and another from lower part of eye to suboperculum; vertical fins with dark spots.

Lakes Managua and Nicaragua.

1. (187 mm.) type of the species. Lake Managua. Capt. J. M. Dow.
2. (195 mm.) Lake Nicaragua. Smithsonian Inst.

#### 64. *Cichlosoma Dovii*.

*Heros Dovii*, Günth. Proc. Zool. Soc. 1864, p. 154, and Trans. Zool. Soc. vi. 1869, p. 461, pl. lxxiii. fig. 4; Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1898, p. 1535; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 234 (1904).

Depth of body equal to length of head,  $2\frac{3}{5}$  in the length. Snout longer than eye, the diameter of which is  $4-4\frac{1}{3}$  in the length of head and greater than the interorbital width. Depth of præorbital  $\frac{2}{3}$ - $\frac{3}{4}$  diameter of eye. Maxillary exposed distally, extending to below anterior  $\frac{1}{3}$  of eye; præmaxillary processes extending to above posterior margin of eye; lower jaw projecting; fold of the lower lip continuous; upper jaw with a pair of strong canines situated close together; lower jaw with 1 or 2 pairs of canines, which are well separated; cheek with 10 series of scales; 8 gill-rakers on the lower part of anterior arch. Scales 34-35  $\frac{5\frac{1}{2}}{14}$ ,  $3\frac{1}{2}$  between lateral line and base of anterior rays of soft dorsal. Dorsal XVIII 12, the spines increasing in length to the last, which is  $\frac{1}{3}$  the length of head; the soft fin, when laid back, extending to anterior  $\frac{1}{4}$  of caudal. Anal VI 9-10. Pectoral  $\frac{2}{3}$  the length of head, extending nearly to above origin of anal; ventral extending to origin of anal. Caudal rounded. Caudal peduncle  $\frac{4}{5}$ - $\frac{7}{8}$  as long as deep. Brownish, with darker cross-bars forming a series of blotches below the lateral line; a dark stripe from upper part of eye to



operculum, and another from lower part of eye to suboperculum; vertical fins obscurely spotted.

Lake Nicaragua.

1-2. (140 and 144 mm.) types of the species. Lake Nicaragua. O. Salvin, Esq.

### 65. *Cichlosoma spectabile*.

*Petenia spectabilis*, Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 96, pl. iv.  
Eigenm. & Bray, Ann. Ac. N. York, vii. 1894, p. 615; Pellegr.  
Mém. Soc. Zool. France, xvi. 1903, p. 244 (1904).

Depth of body  $1\frac{5}{6}$ -2 in the length, length of head  $2\frac{3}{5}$ - $2\frac{2}{3}$ . Snout as long as eye, the diameter of which is  $3\frac{1}{2}$ -4 in the length of head and equal to the interorbital width. Depth of præorbital  $\frac{1}{2}$  the diameter of eye. Maxillary exposed, extending to below the middle of eye; præmaxillary processes extending about to above posterior margin of eye; lower jaw projecting; anterior canines strong; cheek with 7 or 8 series of scales. Scales  $30\frac{5-6}{11-12}$ . Dorsal XV 12-13, the last spine  $\frac{1}{2}$  the length of head, the soft fin in great part covered with small scales. Anal VI 9-10. Pectoral nearly as long as the head. Caudal rounded. Caudal peduncle about  $\frac{2}{3}$  as long as deep. A large dark spot on the middle of the side, a smaller one on the upper part of the base of caudal.

R. Amazon.

The types measure up to about 160 mm. in total length.

This species is closely allied to *C. managuense* and *C. Dovii*, and must certainly be regarded as congeneric with them.

### 66. *Cichlosoma Kraussi*.

*Petenia Kraussi*, Steind. Denkschr. Ak. Wien, xxxix. 1879, p. 28, pl. ii.; Eigenm. & Bray, Ann. Ac. N. York, vii. 1894, p. 615; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 244 (1904).

Depth of body  $2\frac{1}{5}$ - $2\frac{1}{3}$  in the length, length of head  $2\frac{3}{5}$ - $2\frac{2}{3}$ . Snout a little longer than eye, the diameter of which is  $3\frac{3}{4}$ - $4\frac{1}{4}$  in the length of head, interorbital width  $3\frac{1}{2}$ -4. Depth of præorbital  $\frac{1}{2}$  the diameter of eye. Lower jaw projecting; maxillary exposed, extending to below middle of eye; præmaxillary processes extending to above the anterior part of operculum; anterior canines strong. Cheek with 7 or 8 series of scales; 10 or 11 gill-rakers on the lower part of anterior arch. Scales above the lateral line smaller than those below it, about 42 in a longitudinal series above, about 30 below the lateral line; scales in a transverse

series  $\frac{6\frac{1}{2}-7\frac{1}{2}}{13}$ . Dorsal (XV) XVI (10) 11, the last spine a little less than  $\frac{1}{2}$  the length of head, the soft fin scaly at the base. Anal VI (8) 9. Pectoral nearly as long as the head. Caudal rounded. Caudal peduncle about  $\frac{2}{3}$  as long as deep. Body with obscure dark cross-bars; a dark spot on the origin of the lateral line, another on the operculum, a third on the middle of the side, and a fourth on the upper part of the base of caudal; vertical fins with dark spots.

Colombia; Venezuela.

1-2. (128 and 188 mm.) Baranquilla, Colombia. Kay Thomson, E-q.

[To be continued.]

XXXVII.—*On new Species of Histeridæ and Notices of others.*

By G. LEWIS, F.L.S.

[Plate X.]

THE object of this paper—the twenty-fifth of the series—is to make a few observations on the ‘Catalogue of the Histeridæ’ published last March, to describe a few species of interest, and to explain the contents of the Plate now published.

In the ‘Catalogue’ I did not include the “catalogue-names” of Dejean or Marseul. Marseul gave over fifty duplicate names to species in his Catalogue of 1862, because he considered that no two species of the same family should bear similar names; but this rule only obtains generally as regards genera. The names of Dejean and Marseul are entered in the Munich Catalogue. Some authors, again, have given varietal names to specimens, often unique, and therefore names of individuals, not of races; these names were treated as synonymic.

I think that Marseul did not always attach sufficient importance in his arrangement of the genera to the form of the mesosternum in the Histeridæ; he placed, for instance, *Tachycrærus* and *Phelister*, which have a projecting mesosternum, between *Platysoma* and *Omalodes*, in which the mesosternum is emarginate; but by associating the two former genera with *Probolosternus* and *Monoplus*, as I have done, the species seem to occupy a more natural position.

When we find an emargination in the mesosternum of a species of this family we see an insect with a different mode of life to those in which the mesosternum is acuminate or bisinuous, and we can understand the several advantages

attached to these structures. The mechanical action of the emarginate mesosternum is that a species, such as those of *Hololepta*, *Hister*, and *Paromalus*, can move the thorax easily sideways, as the rounded-off base of the prosternum works freely to and fro in the mesosternal incision; and the mechanical utility of a projecting mesosternum with a corresponding incision in the keel of the prosternum, such as that in *Trypanæus* and *Pachycræus*, is that by the close fitting of the segments the one in the other the column of the body is strengthened in forcing a way in a direct line through any obstructed passage they may seek to enter. *Trypanæus* especially finds obstacles in the holes of the *Platypi* and other wood-boring species on which they feed. Marseul, in his monograph, at first placed the "*Trypanéens*" after the "*Sapriiniens*," but in 1862 he installed them after the "*Hololeptiens*," leaving the genus *Teretrius* in the "*Abréens*"; but I think *Teretrius* and its allies cannot be separated from the *Trypanæi*.

I have not overlooked the fact that the genus *Hister*, as now constituted with its 365 species, has sometimes a truncate mesosternum, sometimes a sinuous outline, and sometimes it is markedly emarginate. Thomson founded the genus *Atholus*, of which *Hister corvinus*, Germ., is the type, but he associated with it other very different species, such as *H. bimaculatus*, L., and these, I think, cannot be set together. *Hister truncatisternus*, Lew., from Central America, *H. obtusisternus*, Sch., from East Africa, and others from widely distant places have truncate sterna, but are very dissimilar to *H. corvinus*. In the genus *Hister* the mesosternum varies in form; in other genera, as in *Omalodes*, it is similar in all the species.

*Hister orientalis*, Payk. (Mon. p. 17, pl. xiii. fig. 7, 1811), a common species in India and Ceylon, was omitted by an oversight in my Catalogue.

#### *List of Species, arranged generically.*

<i>Hololepta obtusipes</i> , Mars.	<i>Eblisia tenuipes</i> , sp. n.
<i>Pygocelis</i> sp.	<i>Macrolister striatisternus</i> , sp. n.
<i>Teretriosoma sexuale</i> , Schaeffer.	<i>Hister dauphini</i> , sp. n.
<i>Plesius hamatus</i> , sp. n.	<i>Coryphæus violaceus</i> , sp. n.
— <i>asperimargo</i> , sp. n.	<i>Notodoma saturum</i> , Lew.
— <i>striatipectus</i> , sp. n.	<i>Lissosternus gracilipes</i> , sp. n.
<i>Platysoma rimæ</i> , sp. n.	<i>Saprius sinaiticus</i> , Crotch.
<i>Cylistosoma epilissum</i> , sp. n.	<i>Abræus fakir</i> , sp. n.

*Hololepta obtusipes*, Mars.

Marseul only knew the female of this species; the male has a carina on the mentum, but it has no thoracic fossettes. It occurs in Java, Sumatra, and in the Malay Peninsula.

## PYGOCÆLIS, Lewis.

The first species of this genus came from Togoland, Kamerun, and German East Africa, and I have now a species from Madagascar. A genus extending over so wide an area is likely to contain very numerous species.

*Teretriosoma sexuale*, Schaeffer, Journ. N. York Ent. Soc. xii, p. 203 (1905).

This species differs from *T. conigerum*, Lew., in the punctuation of the sternal plates, and it is more robust. The paper containing the description did not reach me in time for a reference to it in my Catalogue.

*Plæsius hamatus*, sp. n.

Oblongo-ovalis, subdepressus, niger, nitidus; fronte stria interrupta; pronoto stria marginali antice juncta, laterali valida antice hamata; elytris striis 1 dorsali integra, 2-5 apicalibus, margine postice punctulata; propygidio in medio sparse punctato; pygidio dense punctato; prosterno bistriato; mesosterno antice profunde marginato.

L. 10½-11 mill.

This species is similar to *P. lævigatus*, Mars., but it is larger and broader; the frontal stria is distinctly interrupted and widens out on either side of the interruption into a shallow and rather rugose depression; the thorax is straighter along the sides than that of *lævigatus* and the lateral stria or sulcus reaches as far again round the anterior angle; the elytral striæ, the outer humeral is complete and not widened out like that of *lævigatus*, the inner humeral is apical and evanescent near the middle, the first dorsal is complete and less crenulate, the other striæ are less defined but do not differ much from those of *lævigatus*, the apices are distinctly but rather narrowly punctulate; the propygidium is much less closely punctured in the middle; the prosternum has a few punctures on its lobe and the striæ are wider apart than those of *lævigatus*; the mesosternal margination is closely similar in both species.

This is the third species known with a deep marginal stria or furrow in the mesosternum.

*Hab.* Tongking (*A. Weiss*, 1901). Two examples in the Museum of Paris and one in my own collection.

*Plæsius asperimargo*, sp. n.

Oblongus, subconvexus, niger, nitidus; fronte transversim punctata, stria obsoleta; pronoto lateribus conspicue rugoso-punctato; elytris striis dorsalibus, 1 integra, 2 striato-punctata; propygidio utrinque grosse, in medio minor, punctato; prosterno bistriato, lobo grosse et profunde punctato.

L. 11 mill.

This species differs from *P. Mouhoti*, Lew., in being more oblong and less convex, and the sculpture of the lateral thoracic margin is close and rugose, resembling that figured for *Platysoma frontale*, Payk., in Marseul's Mon. fig. 13 (1853), and the second dorsal stria and the inner humeral stria are more punctiform. The thoracic punctuation of *P. Mouhoti* is scattered and irregular. The general outline of *P. asperimargo* is similar to *Placodes caffer*, Er. It is the eleventh species of *Plæsius* now known.

*Hab.* Burma.

*Plæsius striatipectus*, sp. n.

*P. cossyphi* simillimis, sed prosterno bistriato et propygidio pygidioque multo minus punctatis.

L.  $9\frac{1}{2}$ – $10\frac{1}{2}$  mill.

This species is extremely similar to *P. cossyphus*, Mars., but the frontal striæ are less marked, the lateral thoracic stria is less deep, the first dorsal stria is represented by punctures at the base of the elytra, the apical margin of the elytra is less punctulate, the pygidia are finely and more moderately punctured, and the prosternum is bistrate.

The trivial name points to a very important character.

*Hab.* New Britain (*A. Willey*, 1895–97). Two examples.

*Platysoma rimæ*, sp. n.

Oblongum, depressum, nigrum, nitidum; fronto punctulata in medio impressa; pronoto lateribus punctato; elytris striis 1–3 integris, 4–5 brevissimis; mesosterno marginato; tibiis anticis 4-dentatis.

L.  $3\frac{1}{4}$ – $3\frac{3}{4}$  mill.

Oblong, depressed, black and shining; the head, surface finely punctulate, the transverse stria is somewhat obscure

but complete; the thorax, the lateral stria is feebly sinuous and hamate at the basal angle, anteriorly it continues behind the head, but is obscurely broken behind the eyes, laterally the thorax is distinctly punctulate; the elytra, the humeral striæ are wanting, dorsal 1-3 complete, 4-5 apical and very short and partly punctiform; the propygidium is impressed on either side and its punctures are irregular in size and placement; the pygidium is less distinctly impressed on each side, but the punctuation is more regular, there is no raised rim; the prosternum, keel is without striæ; the mesosternum is marginate and widely sinuous; the anterior tibiæ are 4-dentate.

This species, with *P. rimarium*, Er., and *P. novum*, Lew., belong to an Indian section of the genus in which the thorax is punctured laterally. *P. rimæ* is distinctly less broad than *P. rimarium*.

*Hab.* N.W. India (*E. P. Stebbing*). Many examples.

*Cylistosoma epilissum*, sp. n.

Cylindricum, parum elongatum, nigrum, nitidum; fronte excavata, stria late interrupta; pronoto stria marginali integra; elytris striis brevissimis, suturali evanescenti; tibiis anticis 4-5-spinosis.  
L. 3 mill.

Cylindrical, somewhat elongate, black and shining; the head, forehead, and clypeus are excavated and the lateral stria ceases at the edge of the excavation, the surface has a few fine punctures and a few large ones irregularly mingled together; the thorax, marginal stria is complete and somewhat carinate at the base, the surface is punctured like the head, and there is a fine antescutellar puncture a little distant from the edge; the scutellum is narrow, elongate, and triangular; the elytra, outer humeral stria is interrupted in the middle, inner very short, rather deep, and basal, the first dorsal is basal and nearly dimidiate, 2-3 are represented by two punctures at the base, the sutural stria is apical, very faint, and composed of fine points, which cease near the middle of the dorsum; the pygidia have fine and large scattered points; the prosternum is bistriate; the mesosternum is widely sinuous, not margined anteriorly, but laterally there is a well-marked stria; the metasternum is canaliculate; the tibiæ are all 4-5-spinose.

There are two species in the Museum of Paris similar to the above in structure and sculpture; one of them is coloured above like a species of *Pachycrurus* and the other is somewhat metallic.

*Hab.* Imanombo, Madagascar (*Dr. J. Decorse*, 1901). In the Museum of Paris and my own collection. Six examples.

*Eblisia tenuipes*, sp. n.

Oblonga, parallela, depressa, picea, nitida; fronte impressa, tenuiter punctulata; pronoto antice biimpresso; elytris striis 1-4 integris, 5 basi abbreviata, suturali nulla; pedibus brevibus.

L.  $3\frac{1}{2}$  mill.

Oblong, parallel, depressed, piceous and shining; the head is very finely punctulate, impressed in the middle, the lateral stria is well marked, but it does not reach the anterior angle of the head, the frontal stria is much less distinct and abbreviated on either side; the thorax is wider than long, the lateral stria is sinuous, shallow, and there are slight impressions and rugosities along its course, the stria is continued behind the head, where it is irregularly crenulate; the elytra, there are two fine epipleural striæ, but no humeral, the dorsal striæ 1-4 are complete, 5 is parallel to the suture, shortened before the base, where there is a small puncture; the propygidium is feebly impressed on either side and its punctures are shallow, not closely set, and some are oval; the pygidium is more evenly punctured, punctures are circular and on each side it is somewhat deeply impressed, with the outer rim raised; the prosternum has a fine marginal stria round its base, but the stria does not pass the coxæ; the mesosternum is emarginate behind the keel and has a fine marginal stria; the anterior tibiæ are 5-dentate, the tarsal groove is short and shallow, and not curved, corresponding in length to the tarsi, which are all somewhat short; the legs are rather long and slender.

I cannot compare this species with any other known. It is convenient at present to place it in the genus *Eblisia* on account of its tarsal grooves; but *Eblisia* and its members require revision.

*Hab.* Yunnan (*Donckier*). One example.

*Macrolister striatisternus*, sp. n.

Oblongo-ovatus, convexiusculus, niger, nitidus; fronte lævi, stria integra antice subrecta; pronoto striis lateralibus integris, stria interna haud interrupta; elytris striis 1-3 integris, suturali basi abbreviata; propygidio pygidioque dense punctatis; prosterno inter coxas bistriato; mesosterno emarginato; tibiis anticis 3-dentatis.

L. 11 mill.



Oblong-oval, rather convex, black and shining; the head is smooth, with the frontal stria complete and nearly straight anteriorly and somewhat lightly impressed; the thorax is slightly ciliate on the lateral edges, the two lateral striæ are parallel to each other and well marked, the inner stria continues, and is rather fine, behind the head; the elytra, striæ, inner humeral apical and dimidiate, 1-3 complete and strong, with the edges feebly crenulate, 4 short, apical, and almost obsolete, sutural fine, shortened apically, and scarcely reaches the middle; the pygidia are densely punctured; the prosternum has two striæ between the coxæ, which widen out behind, but do not reach the base, and apparently join base anteriorly; the mesosternum is emarginate and the stria is complete and rather fine, and it does not follow the outline of the emargination; the anterior tibiæ are strongly 3-dentate.

In outline this species agrees with *M. intrepidus*, Lew., but the dense punctuation of the pygidia and the prosternal striæ are good distinguishing characters.

*Hab.* Bihé, Angola.

*Hister dauphini*, sp. n.

Breviter ovatus, convexiusculus, niger, nitidus; stria frontali integra antice subrecta; pronoto stria laterali externa brevi, interna integra; elytris striis validis, 1-3 dorsalibus integris, humerali interna dimidiata, cæteris nullis; propygidio pygidioque parce punctatis; mesosterno emarginato, stria integra; tibiis anticis 3-dentatis.

L. 8 mill.

Shortly oval, somewhat convex, black and shining; the head impunctate and very feebly impressed on its vertex, stria complete and strong, almost straight in front; the thorax smooth, outer lateral stria is short and confined to the anterior angle, inner complete, somewhat deep and a little sinuous, continued and somewhat crenulate behind the head; the elytra, inner humeral stria strong, apical, and dimidiate, 1-3 dorsal similarly strong but complete, 4 is represented by an apical puncture, all the striæ have crenulate edges; the propygidium and pygidium are moderately punctured; the prosternum is smooth; the mesosternum is emarginate in the middle, with a rather fine marginal stria; the anterior tibiæ are strongly 3-dentate.

This species is considerably larger than *H. sikoræ*, Lew., also from Madagascar.

*Hab.* Diego Suarez, Madagascar.



*Coryphæus violaceus*, sp. n.

Oblongo-ovatus, subconvexus, violaceus, nitidus, haud pilosus; pedibus antennisque brunneis; fronte in medio foveolata; pronoto lateribus conspicue rugoso-punctato ad angulos lævibus; elytris striis humerali interna brevi arcuata, dorsalibus 1-3 integris; pygidio læviter punctulato; prosterno bistriato.

L. 6 mill.

Oblong-oval, somewhat convex, violet-blue, shining, not pilose; legs and antennæ obscurely brown, with the thighs slightly bluish; the head is foveolate on its vertex, with the frontal stria strong and complete and angulate at the eyes, surface finely punctulate except in the fovea and in two anterior impressions, where the points are large; the thorax, median area very finely punctulate, with a broad lateral band of "grater-like" punctures, the punctures continue narrowly behind the neck, but the anterior angles are free of points; the elytra, surface finely punctulate, striæ, inner humeral well-marked, short and bent, dorsal 1-3 complete and rather strong, 4 traceable throughout but punctiform on the posterior half, 5 obsolete, sutural wanting; the pygidia are very finely punctulate, with a few larger points in the middle of the base of the propygidium; the mesosternum is obscurely marginate; the prosternum, anterior lobe markedly sinuous on the anterior edge, bistrate, striæ meeting anteriorly.

*Coryphæus Wallacei*, Mars., the type of the genus, is from Dorei, N. New Guinea, and it is also recorded by Marseul from the Fly River; it has five dorsal striæ complete and the sutural stria is entire also, but not well marked at the base. I have a fourth species of this genus, but the specimen is not in good condition and the locality is not known to me.

*Hab.* Mount Kina Balu, N. Borneo.

*Notodoma saturum*, Lew. (Pl. X. fig. 9.)

This species is figured chiefly to show the metasternal arched stria. *N. bullatum*, Mars., has no such stria, and in *N. nigrum*, Lew., the only other dark-coloured species known, the metasternal stria is represented by punctures only. In Marseul's description of *N. globatum*, the type of the genus, this important character is not noticed, nor is it given in his figure of the species.

## LISSOSTERNUS, gen. nov.

Body ovate, convex; head retractile; mandibles large and incurved, acuminate at the tips; antennæ, scape dilated,

joint 1 globose, 2-7 small and gradually becoming more transverse, club oval and somewhat elongate; thorax widest at the base, sulcate laterally; elytra feebly striate; propygidium rather wide and semicircular in outline; pygidium nearly circular; the prosternum, the keel is relatively wide and the base has an arched outline to receive the mesosternum, which is obtusely projected; the legs are long, with the tibiæ slightly dilated, tarsal grooves scarcely traceable.

*Lissosternus gracilipes*, sp. n. (Pl. X. fig. 10.)

Ovatus, convexus, rufo-brunneus; fronte antice sinuata; pronoto minute tuberculato, stria laterali valida impressa; elytris striis tenuissimis; prosterno vix lato, bistriato.

L. 1 mill.

Oval, convex, reddish brown, and shining; the head is sinuous anteriorly in outline; the thorax, anterior edge bisinuous, lateral stria well marked, with the outer edge clearly punctured, on the vertex there are a few minute tubercles, the four in front of the scutellum are set transversely; the elytra, the dorsal striæ are very faint and shortened, except the sutural, which is more marked and complete; the propygidium is semicircular posteriorly, with small tubercles along the edge and some less defined on its surface; the prosternum is rather wide, the keel is smooth and polished, with two lateral striæ, which widen out towards the base, the anterior lobe has shallow punctures; the mesosternum, along the anterior edge are a few punctures and on either side a very fine stria which terminate in a small excavation behind the acumination, laterally there are two very fine striæ and there is no visible suture to it and the metasternum.

The figure of this species is an excellent drawing; the insect is probably formicicolous.

*Hab.* Bahia.

Crotch reported a species of *Saprinus* from Syria in the 'Ordnance Survey of Sinai,' published at Southampton in 1869, in these words:—

"*Saprinus sinaiticus*, sp. n. The only difference that I can discover, from description [between it and *S. figuratus*, Mars.], is in the punctuation of the thorax; in *figuratus* there are three separate defined smooth patches, here all three are united into one, showing only faint indentations to indicate its possible division."

At present it is best to consider *S. sinaiticus* a nondescript. The prosternal striæ in *S. figuratus* are so peculiar that I

think Crotch would have found good specific characters in the sterna if his species was really distinct; but there is no evidence that Crotch examined the undersides of his specimens.

*Abræus fakir*, sp. n.

Circularis, convexus, niger, subnitidus, supra dense subrugose punctatus, setulis erectis seriatim; antennis pedibusque obscure rufo-brunneis; fronte punctata haud impressa; mesosterno postice crenulato, laterali marginato; metasterno in medio tenuissime canaliculato.

L.  $1\frac{1}{4}$ - $1\frac{1}{2}$  mill.

Body nearly circular in outline, convex, black, densely and somewhat rugosely punctate, with erect setæ arranged in lines on the upper surface; the head is less coarsely punctured than the thorax and is not impressed on its vertex; the thorax, the basal transverse line is vaguely shown by the disposition of the punctures; the propygidium is setose, like the elytra, but the pygidium is without setæ and the punctuation is smaller and clearer; the prosternum is wide and nearly straight at the base; the mesosternum is crenulate along its basal edge, the crenulations are about twelve in number, it is marginate laterally, and the marginal stria continues half down the metasternum; the metasternum is very feebly canaliculate longitudinally in the middle; all the sterna have similar large punctures, which are somewhat densely set.

This species may be placed near *A. coheres*, Lew., but it is smaller and has a crenulate edge to the base of the mesosternum. Paykull's Indian species *exilis* has a fine dorsal punctuation, but it is a species I have not seen.

*Hab.* Khandesh District, India (*T. R. Bell*, 1903). Many examples.

EXPLANATION OF PLATE X.

- Fig.* 1. *Hololepta Fœæ*, Lew.  
*Fig.* 2. *Lioderma intersectum*, Lew.  
*Fig.* 3. *Hister aino*, Lew.  
*Fig.* 4. — *latistrius*, Lew.  
*Fig.* 5. *Pachycærus sulcicollis*, Lew.  
*Fig.* 6. Ditto. Side view of pygidia.  
*Fig.* 7. *Pachycærus princeps*, Lew.  
*Fig.* 8. *Chalcurgus brevipennis*, Lew.  
*Fig.* 9. *Notodoma saturum*, Lew.  
*Fig.* 10. *Lissosternus gracilipes*, sp. n.  
*Fig.* 11. *Saprimus inversus*, Lew. { Outlines of the sulci in the pygidia of  
*Fig.* 12. — *aterrimus*, Er. { the females.

Except for the new species the references will be found in the Catalogue published last March.

XXXVIII.—*Notes on the Satin Bower-bird* (*Ptilonorhynchus violaceus*). By ARTHUR G. BUTLER, Ph.D., F.L.S., F.Z.S., &c.

IN a paper which I published in the 'Zoologist' for July, 1902, p. 257, I called attention to a statement made by Mr. A. A. C. Le Souëf, Director of the Zoological Gardens at Melbourne, and stated that the idea that the males of this species only assumed their full plumage in old age was contrary to all our experience of bird-life; and on pp. 251, 252, I suggested that the birds studied by Mr. Le Souëf were not cocks, but old hens which had assumed male plumage owing to abortion of the functional ovary, a circumstance not uncommon in birds in captivity, and possibly less so than in wild birds.

Mr. Le Souëf's statement is as follows (*vide* Campbell's 'Nests and Eggs of Australian Birds,' p. 192, footnote):—  
 "Many years ago I caged a number (at least a dozen) of these birds at the gardens here, young green birds, caught at Gembrook, and it was only after the expiration of nearly *eight* years they began to change colour. I think four or five birds put on the beautiful blue-black plumage, and in a year or two died off. It is therefore evident that the birds only come to their full plumage in old age, and that accounts for the fact that in a flock of say one hundred birds, which we often used to see at Gembrook, some years ago, there would be only a very few, not half a dozen, black ones among them. They die off shortly after the change."

It is well known that during certain months of the year many birds travel about in flocks consisting wholly of one sex, which would explain the occurrence of only six per cent. hens in male plumage in a flock, without the necessity for arriving at so improbable a conclusion as that the male of this species (unlike all others) assumed its attractive plumage towards the end of its life.

My own experience of *Ptilonorhynchus* is directly opposed to Mr. Le Souëf's view:—On September 18th, 1899, I purchased a pair of young Satin Bower-birds in the spotted green plumage, which vaguely resembles the adult hen plumage (only the latter is not of the same pale-spotted character). By the end of the following September (1900) both sexes had attained their full adult plumage—the male blue-black, the female olive-green, cinnamon, and yellow; both sexes with brilliant ultramarine eyes.

The late Mr. Abrahams was of opinion that this species assumed its full plumage when three years old; but judging

by the size of the birds when I bought them and the slight, though perfectly noticeable, increase of size during the year in which they emerged from their nestling dress, I am more inclined to believe that the adult feathering is perfected by the end of the second year.

If Mr. Le Souëf's view were correct, my cock bird ought to have died in 1901 or 1902, yet we are well advanced in 1905, and he shows not the least symptom of failing vigour; but, how about the hen?

In the years 1901-4 the cock bird frequently picked up sticks and straws and pursued the hen, singing vigorously and going through all the comical contortions and wing-flappings, side-jumps and dances, peculiar to the species; occasionally the hen would chase the cock, with very similar actions and song: but the aviary in which I kept the pair was too small for them to make up their minds to serious nest-building, although they made several attempts to construct a bower by driving twigs into the earth in two rows converging at the top.

In 1904 the cock bird began to render the life of the hen unpleasant by frequently pulling out her flight-feathers. After pursuing her for a time, if he succeeded in catching her upon the earth, she would immediately turn upon her back and oppose him with beak and claws: he would then lie on his side close to her; and as she turned each would grasp the other's claws and pluck viciously at the wings and breast. I never knew any other bird to fight in this curious fashion.

In the present year the tables were completely turned, the hen had perfect mastery over the cock, and plucked every feather out of his wings and tail, so that I had to cage him up to preserve his life, as the constant drain on his strength was beginning to make him weak on his legs. In July the hen began to assume male plumage, which is rapidly developing; the median and greater coverts are already black, forming a broad belt across the wings, and the underparts are splashed with black blotches. It will not surprise me if this bird dies within the next year or two, but the cock shows no indications of impending dissolution.

The difference in plumage between nestling and adult birds is much greater than Gould's description would lead one to suppose, the under surface not only being yellower, but having a distinctly pale-spotted character, owing, perhaps, to greater width and diffusion of the crescentic markings on the feathers; moreover, this difference is not confined to the males, but is, I believe, found in all young birds: I have examined eight or nine at various times.

XXXIX.—On *Cucumaria Montaguï*, Fleming.  
By CANON A. M. NORMAN.

[Plate XI.]

IN 1808 Montagu described from the coast of Devon a Holothurian which he named *Cucumaria pentactes*, var.

In 1828 Fleming, in his 'Hist. Brit. Anim.,' named this Holothurian *Cucumaria Montaguï*.

In 1841 Forbes, in his 'Hist. Brit. Starfishes, &c.,' made *Cucumaria Montaguï* a synonym of *Cucumaria pentactes*; and the left-hand figure of his woodcut possibly represents the species of Fleming. In 1892 this lead was followed by Jeffrey Bell in his 'Cat. British Echinoderms in B.M.'

In 1893 I published a paper "*Cucumaria Montaguï* (Fleming) and its Synonymy" (Ann. & Mag. Nat. Hist. ser. 6, vol. xii. p. 469). In that paper I described what I believed to be this species with great minuteness, especially as regards the spicula; and inasmuch as I found considerable differences between the spicula of the largest and the smaller examples, those differences were pointed out. I presumed that the smaller specimens were the young state of the larger, though I purposely abstained from making the direct statement that they were so, leaving it to future observers to clear up this matter.

Mr. S. Pace has recently written a paper entitled "Note on two Species of *Cucumaria* from Plymouth, hitherto confused as *C. Montaguï*, Fleming: *C. Normani*, n. sp., and *C. saxicola*, Brady and Robertson" (Journ. Mar. Biol. Assoc. vol. vii. Dec. 1904, p. 305). I much regret the publication of that paper, and did what I could to bring Mr. Pace to my view as regards my specimen A (= *C. Montaguï*); and when he wrote to ask if he might name it after me, my reply was that of course he could do so if he wished; but I feared it would necessitate my committing the act of "Felo de se." That act I am about to be guilty of. I cannot call it "happy despatch"; for I unwillingly criticize Mr. Pace's paper as I am compelled to do.

Mr. Pace writes: "*Holothuria Montaguï*, Fleming, affords a remarkable instance of how much confusion may gather around a specific name; the species was itself founded on a misconception, and almost every author who has since made use of Fleming's name, or who has attempted to unravel its synonymy, has but made matters rather more involved."

Yet still more involved by the publication of Mr. Pace's paper.

Mr. Pace writes: "In 1808 Montagu described and figured as '*Holothuria pentactes*, var.,' a species of *Cucumaria* which he had found on the south coast of Devonshire. This species from Montagu's excellent description must certainly have been one of the two forming the subject of this paper; and which has among other names been known as *C. Montagu*, Fleming. Now whatever *C. Montagu* really may be, it certainly is not conspecific with Montagu's supposed variety of *C. pentactes*. Of course, it was undoubtedly Fleming's intention to honour Montagu by bestowing his name upon the species discovered by that naturalist, but, unfortunately, the description of *C. Montagu* is based upon specimens of another species collected in the Firth of Forth. Fleming makes reference under the name *Montagu* to Montagu's description of the Devonshire Cucumarian, but Montagu's actual form is probably the one that is described as *Holothuria pentactes* in the 'History of British Animals.' Fleming's name appears to have dropped into almost complete disuse until revived by Dr. A. M. Norman. Norman, however, overlooked the fact that Fleming was not dealing with the same species as Montagu: and in addition he has failed to realize that there are two species of *Cucumaria* of somewhat similar outward appearance living upon the South Devon coast. Norman's *Cucumaria Montagu* is, in fact, a complex, and it is mainly as a result of this that subsequent authors have experienced so much difficulty in reconciling their ideas as to the identity of *C. Montagu*."

It is inconceivable to me how such a view of Fleming's species could have been entertained by Mr. Pace in the presence of the passages I now proceed to quote from the descriptions of Montagu and Fleming. From the former author the passages only are given which bear upon the description of Fleming; but the passage from Fleming includes all that he wrote upon the subject, and embraces all that is important in the description by Montagu.

Montagu, 1808.—*Cucumaria pentactes*, var. "Cylindric, white, covered with a mottled film or epidermis . . . The anterior end for an inch or more is of a purplish-brown, and furnished with eight large and two very small contiguous. . . tentacula . . . When the animal was alive it was observable that one of the least arms, or tentacula, was always covering the mouth, and for that purpose were alternately in motion . . . the lips or margin of the aperture white; the posterior



end is furnished with a small pentangular opening of a red colour."

Fleming, 1828.—*Holothuria Montagu*. "Tentacula eight, with two small contiguous subsidiary ones. Mouth simple."

(Here reference to Montagu.)

"The body is cylindric, white, covered with a mottled cuticle; towards the head the whole becomes purplish-brown; margin of the mouth white; while alive the two small subsidiary tentacula are alternately in motion, covering the mouth; vent pentangular, red. The divisions of the tentacula are not so numerous as in the preceding species."

Thus the whole of the description of the species is actually a quotation from Montagu down to the word "red," and then, as though Fleming intended to signify this fact, the first full stop occurs after "red"; and a capital letter commences the sentence "The divisions of the tentacula are not so numerous as in the preceding species." He gives a locality "Firth of Forth, Mr. Neil"; but it may be questioned whether Fleming ever himself saw a specimen which he would refer to Montagu's *Holothurian*, for the sentence respecting the tentacula might well be written from a comparison of Montagu's figure with the tentacles of the species which he (Fleming) called *Holothuria pentactes*. Mr. Pace writes of "Montagu's excellent description"; but "the description of *C. Montagu* is based upon specimens of another species collected in the Firth of Forth." It is unnecessary to write more.—*Cucumaria Montagu* (Fleming) *stet.* *Cucumaria Nermani*, Pace, *dele.*

In my former paper I carefully described the spicula of *Cucumaria Montagu*. That description need not be repeated; but I have here given illustrations of the spicula, both lower and upper, of the dermis together with those of the feet and of the tentacles. Fig. 1 *a, b, and c* (Pl. XI.) are normal and characteristic examples of the spicula of the lower layer.

#### *Specimens B and C.*

What are the specimens which in my paper I called B and C? Are they the young of *C. Montagu*, or are they a distinct species as Mr. Pace considers them to be? Pl. XI. fig. 5 represents a specimen, slightly enlarged, which was sent to me from Plymouth by Mr. Pace himself. Fig. 6 represents the body-spicula and fig. 7 the spicula of the feet. Of these figures, fig. 6 *a, b, c* represent the spicula with six openings which distinguish this condition, and are not found, so far as I have observed, in full-grown *C. Montagu*. *y, h, i, k* are



irregular forms; *c*, *d*, *e* spicula with openings as in *C. Montagu*, *c* and *d* showing also the characteristic nodulation.

Mr. Pace suggests that the nodulous spicules had got into my preparation by accident. This might have been, but was not the case, as is proved by the fact that whereas the spicule fig. 6 *d* is one from my original slide of spicula of specimen B, fig. 6 *e* is drawn from a mounting of the spicula of the specimen fig. 5 which was sent to me by Mr. Pace himself; but only very few of these spicula are present in either specimen.

But while Mr. Pace would reject these nodulous spicula with four perforations he substitutes for them another; and says that in specimens similar to my B and C he has found "quite typical 'tables,' which being few in number are easily overlooked." They have been overlooked by myself though diligently sought for, since, if found, they would form an entirely new feature in the spiculation of Cucumarians, for there would exist *two distinct types of primary body-spicules in a species, a feature hitherto unknown*. May I suggest to him a source of possible error? When I was at Plymouth in Sept. 1903, two species were brought to me as the two Cucumarians which besides *C. lactea* were known at the Station. On examining one of these and boiling down the spicule I found the species was no Cucumarian, but *Phyllophorus Drummondi*, W. Thompson, with its characteristic "tables." Perhaps spicules of this species have by some accident got into Mr. Pace's mounting; and it is even possible that he may have employed the very test-tube in which I had boiled the *Phyllophorus* and which may not have been cleaned with sufficient care\*.

The question remains, Are the specimens which I described as B and C a mature form, and, if so, are they referable to *Cucumaria saxicola* of Brady and Robertson? Let us take the last part of this question first. I did not neglect to take *C. saxicola* into consideration when engaged on my former paper; and I wrote to Professor Brady to enquire if he would allow me to see the type or a mounting of its spicula, but he no longer had either in his possession. Examining his description and figures, I came to the conclusion that it was not the same as my B and C: 1st, because of the presence of the stellate-formed upper spicules; and 2nd, because I saw no reason to regard it as the same species as my specimens,

\* I left a mounting of the spicules of *Phyllophorus Drummondi* at the Station together with the specimen itself, but I see that the species is not inserted in the list of Plymouth Echinoderms published at the end of last year (Journ. Marine Biol. Assoc. vol. vii. p. 206).

any more than to refer it to the young of *C. Planci*, Marenzeller, to which latter species it appeared to me more likely to be referable\*.

As I told Mr. Pace *in litt.*, when young specimens of *C. Montagu*, say 14 mm. long, should be found having spicules agreeing with those of the adult, my view that B and C are young forms of that species would require to be reconsidered.

The colours of the two forms are stated by Mr. Pace to somewhat differ, but not materially. The podia are, he says, more numerous and in two parallel rows in *Montagu*, but in B and C so few as to appear in a single series; this is a strong point in favour of the latter being immature †. Again, he writes: "In *sp. 1*" (= *Montagu*) "the test, being densely crowded with spicules, is very tough and coriaceous, and its surface is much wrinkled; while in *sp. 2*" (= my B and C) "the surface of the body is extremely smooth and delicate, marked only with transverse striæ due to the encircling fibres of the superficial layer." Here, again, is a difference such as is usual and might be expected between mature and immature examples.

But the main question still remains to be answered: On what grounds do I presume to suggest that B and C, the majority of the spicules in which have six perforations, are the young of a species in which the number of perforations is almost invariably four, and never six?

1st. In *Montagu* the plate-spicula form a dense regular layer, over which are developed the campanulate spicules, but in B and C the spicules are not disposed in a layer. They are comparatively very few in number, and are developed at different depths in the

\* The spicules of *C. Planci* are figured by Jeffrey Bell, Cat. Brit. Echin. B. M. pl. ii. fig. 2; but it is, I think, obvious that there is an error in the connecting-lines to figures on the plate, and that the three bottom figures lettered *a* and also the feet-spicules lettered *b* on the middle of the plate, which are joined by connecting-lines with the spicules of *C. Planci*, belong to *C. Hyndmanni* figured on the same plate, the feet-spicules of which species are peculiarly characteristic. Specimens in my collection have been examined from Trieste (cotype from Von Marenzeller), Naples (specimens received many years ago, when the Holothurians were not well known there, from the Zool. Stat., under the names *C. communis* and *C. doliolum*), Gairloch, Firth of Clyde (*Dr. D. Robertson*).

† It will be seen by my figure 5 (which, slightly magnified, was sent to me by Mr. Pace, and is the largest specimen known to me having the spicula of B) that the podia are in double rows, thus showing signs of more mature growth.

- dermis. This is a difference known to me from the study of the old and young in other species.
- 2nd. It is a known fact that spicula found in the young of certain species (e. g. *C. frondosa*) entirely disappear in the adult, or a spicule of another form takes its place.
- 3rd. Spicules which are entirely free from nodulation in some young Cucumarians become highly nodulous or greatly incrassated in old examples. I will take as an instance a species I have already referred to, *C. Hyndmanni*. The plate-spicules as figured by Bell, pl. ii. fig. 1 *a*, and also *a* at bottom of the plate, show from two to sixteen perforations and are scarcely thickened. I should not have been able to say positively that these spicula belonged to *C. Hyndmanni* had it not been for the peculiarly characteristic foot-spicules; for the plates of the old specimens are often all extraordinarily massive, their thickness being subequal to the breadth; yet other specimens I have, especially a young one, which have spiculation corresponding with Bell's figures.
- 4th. The ventral ambulacra in both A and B bear closely-set double rows of feet; dorsal ambulacra with few irregularly arranged papillæ or feet. Thus some authors would place the species in the subgenus *Colochirus*.

To sum up my views as regards B and C: I am of opinion that the figures I give, fig. 6 *a, b, f, g, h, i, k*, represent the primary spicules of the young scattered at depths in the dermis, which will at a later stage be absorbed; while *c, d*, and *e* represent some of the earliest spicules developed of those which will at a later stage constitute the dermal layer.

I may add that I have studied the spiculation of the Holothuroidea for at least forty years; that I have mountings of spicula (often many mountings) of almost all European shallow-water species and some abyssal forms; and that while recognizing spiculation as the truest guide to the determination of species, I know full well that allowance should be made for variations in respect of individuals and also in regard to age; and that on these points there remains a valuable field for study.

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After the foregoing was actually printed I happened to turn to E. von Marenzeller, 'Résultats Camp. scient. Prince

de Monaco, Contrib. à l'Étude des Holothuries de l'Atlantique Nord,' 1893, p. 15, and there, under *Cucumaria Montagu*, found a reference to a paper of Prof. Jeffrey Bell which had escaped my memory and to which no reference is made in that author's more recent publication 'Cat. Brit. Echin. in B.M.' On turning to this paper by Bell, "On the Spicules of *Cucumaria Hyndmanni* and *calcigera* and two allied Forms," Journ. R. Micros. Soc. ser. 2, vol. iii. 1883, I learnt that types of Montagu's Cucumarian were in existence in the British Museum.

I at once went up to the Museum, and with the kind assistance of Professor Bell examined these interesting specimens, with the following most satisfactory results. The names and other remarks which I enclose in inverted commas are in the handwriting of Leach, while the name annexed has been written on a more recent label.

Bottle 1. "*Holothuria Montagu*, S. Devon, G. Montagu, Esq., Mus. Leach." *C. Planci*.

This is a large specimen, about six inches, but I did not measure it. It is my A, with extremely numerous four-holed spicules in the lower layer, and with plenty of the characteristic campanulates in the upper.

Bottle 2. "*Holothuria decollata*, South Devon, G. Montagu, Esq., Mus. Leach." *Pentacta Montagu*, Gray.

This is a much smaller specimen, agreeing with my B in spiculation, but smooth four-holed and dumbbell forms most frequent, only a few with six perforations.

Bottle 3. "*Cucumaria communis*, South Coast of Devon, Mus. Leach." *C. Planci*.

The spiculation of these three or four small specimens is in entire agreement with my form B.

Thus striking facts confirmatory of my views come out:—

1st. That at each of three places where adult *C. Montagu* have been found—South Devon (*Montagu*), Polperro (*Norman*), Plymouth (*Pace*)—there also small specimens have been found with the spiculation of my B and C.

2nd. That in the British Islands Cucumarians with the spiculation of B and C have only been found at these three places.

3rd. That no small examples are known to occur having the same spiculation as the adult *C. Montagu*.

I give in the list below some synonymy, but do not refer to continental authors, leaving them to reconcile differences now that they will have full illustrations of the spicula of *C. Montagu*. In 1886 I sent specimens agreeing with B and

C to the Vienna Museum as *C. Montagu*, for I had only one adult example in my collection, and therefore Marenzeller's writings refer to these younger stages, and not to the adult.

Koehler states that he had received a specimen from Plymouth under the name "*C. pentactes*"; this he rightly referred to *C. Montagu*, but he would have been more correct had he written the YOUNG of *C. Montagu*.

*Cucumaria Montagu*, Fleming.

1808. *Holothuria pentactes*, var., Montagu, Linn. Trans. vol. ix. p. 112, pl. vii. fig. 4.  
 1828. *Holothuria Montagu*, Fleming, Hist. Brit. Anim. p. 483.  
 1848. *Pentacta Montagu*, J. E. Gray, List Brit. Animals in B.M. pt. i. Centroniæ, or Radiated Animals, p. 11.  
 1893. *Cucumaria Montagu*, Norman, Ann. & Mag. Nat. Hist. ser. 6, vol. xii. p. 469.  
 1904. *Cucumaria Normani*, Pace, Journ. Marine Biol. Assoc. vol. vii. p. 305.

*The Young.*

1848. *Holothuria decollata*, Leach, MS. name only, J. E. Gray, under *Pentacta Montagu* as above referred to.  
 1883. *Holothuria decollata*=*C. Montagu*, Bell, Journ. R. Micr. Soc. ser. 2, vol. iii. p. 3 (separate copy), pl. viii. figs. 4, 4 a.  
 1893. *Cucumaria Montagu*, specimens B and C, Norman, l. c.  
 1893. *Cucumaria Montagu*, Marenzeller, Résultats Camp. scient. Prince de Monaco, Contrib. à l'Étude des Holothuries de l'Atlantique Nord, p. 15, and Ann. & Mag. Nat. Hist. ser. 6, vol. xii. p. 335.  
 1904. *Cucumaria saxicola*, Pace (nec Brady and Robertson), l. c.

Of synonyms which I gave in my former paper, *Semperia Drummondii*, Hérouard (nec Thompson), has spicules exactly like those of adult *C. Montagu*; but *C. Lefevrei*, Bonnier, is stated by Koehler not to have the feet arranged as in *Colochirus*, and therefore to be different from *C. Montagu*, and Marenzeller has made it a synonym of *C. Koellikeri*. I may add that Marenzeller refers *Colochirus Lacazei*, Hérouard, as a synonym to *C. Montagu*; but I do not think that this can possibly be the case if fig. 8 of Hérouard correctly represents one of the upper layer of spicules, and, moreover, there seems to be considerable difference in other spicules also.

EXPLANATION OF PLATE XI.

- Fig. 1. *Cucumaria Montagu* (Fleming). Spicules of the lower layer of the adult, a, b, c being the normal forms.  
 Fig. 2. Ditto. Spicules of sides of feet.  
 Fig. 3. Ditto. Spicules of tentacula.  
 Fig. 4. Ditto. Campanuliform spicules of upper layer of dermis.  
 Fig. 5. Ditto. Immature "B and C," slightly enlarged.  
 Fig. 6. Ditto. Dermal spicules: a, b, f, g, h, i, k, primary spicules characteristic of the young; c, d, e, secondary spicules characteristic of the adult layer.  
 Fig. 7. Ditto. Spicules of the feet.

XL.—*Ophiopsila annulosa* (M. Sars), a British Ophiurid.  
By Canon A. M. NORMAN.

*Ophiopsila annulosa* (M. Sars).

1857. *Ophionoplus annulosus*, M. Sars, Middelhavets Littoral-Fauna, p. 79, pl. i. figs. 2-7.  
1859. *Ophiopsila annulosa*, Lütken, Addit. ad hist. Ophiuridarum, pt. ii. p. 133.  
1869. *Ophionoplus annulosus*, Brady and Robertson, "Week's Dredging in the West of Ireland," Ann. & Mag. Nat. Hist. ser. 4, vol. iii. p. 356, pl. xxii. figs. 1-6.  
1904. *Ophiopsila aranea*, Allen and Pace (*vis* Forbes), Journ. Marine Biol. Assoc. vol. vii. pp. 169, 171, and 209.

Although it is thirty-six years ago since *Ophiopsila annulosa* was added to our fauna, it remains the most recent addition to the Ophiuroidea to be met with in our inshore waters. A few words on its distribution as now known may not be out of place, as I am able to give two additional habitats.

1. In 1868, Professor G. S. Brady and the late Dr. D. Robertson, when dredging in Birterbuy Bay, Ireland, procured a single arm of an Ophiurid unknown to them, and they sent it to me for determination. This arm (*l. c.* pl. xxii. fig. 1) was figured by them, together with reproductions of five figures from the plate of M. Sars, and thus the species was fully illustrated, and a translation of Sars's description given in full.

In 1874, accompanied by my friend Dr. D. Robertson, I went on a dredging-excursion to the west of Ireland. Roundstone was one of our quarters; my chief object in going there was to rediscover the gigantic form of *Acera* (*Acera bullata*, var. *Farrani*, Norman, Ann. & Mag. Nat. Hist. ser. 6, vol. vi. p. 63) which Dr. Farran, many years before, had taken there, and, secondly, to procure *Ophiopsila annulosa*. We were not rewarded with the *Acera*, but procured the *Ophiopsila*. Dr. Robertson remembered the place where the arm had been dredged. It was just at the entrance of Birterbuy Bay on the west side, and very near the rocks. A considerable time on two occasions was spent on this spot: again and again the dredge would catch in the rocks; then, when we imagined we had passed over a small scrap of sand, arms and parts of arms would now and then reward us, and at last a single disk with broken arms came up.

2. Mr. A. G. More was also at Roundstone at the time, and on seeing the *Ophiopsila* he said that he had dredged a

similar arm in a bay much nearer to Galway. That arm he subsequently kindly sent me.

3. When at the Biological Station at Plymouth in the autumn of 1903 I saw a number of fine and perfect specimens which had been procured and some of these I purchased. The species had been found to be not uncommon in crevices of the red sandstone, "especially in old *Pholadidia* crypts" in 15-25 fathoms on Mewstone Ledge and Stoke Point Grounds. It would thus appear to be a lover of hard ground and a clinger to rocks, which is what we might have been led to expect from its sturdy build and short and strong arm-spines—remininding us of species of similar habit, such as the genera *Ophiopholis* and *Ophiactis*. If, therefore, the specimens dredged by us at Birterbuy were, as we imagined, on sand, they had probably crept out temporarily from the rocks close by.

4. I found the *Ophiopsila* in a fourth locality in the spring of last year, having dredged a portion of an arm outside Dartmouth Harbour.

I regard *Ophiopsila aranea*, Forbes, as a distinct species. It is of smaller size, and, besides other differences, the arm-spines are both fewer in number and more slender. The species inhabits the Ægean and Mediterranean Seas.

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XLI.—*A Collection of Fishes made by Dr. H. Gadow in Southern Mexico.* By C. TATE REGAN, B.A.

THE collection of fishes made by Dr. H. Gadow, F.R.S., in Southern Mexico in the summer of 1903 was brought to the British Museum by him and worked out by me in the autumn of that year. Publication of the results obtained was held back in the expectation that another collection would be received from Dr. Gadow as the result of his visit to Mexico in 1904. Unfortunately, however, the season proved to be unfavourable for fish collecting during this second visit.

The Cichlids collected by Dr. Gadow have already been dealt with in my revision of the genus *Cichlosoma*. They include examples of a new species, *C. Gadovii*, and of two others, *C. Eigenmanni*, Meek, and *C. heterodontus*, Pellegr., new to the British Museum. Also new to the British Museum are specimens of *Platypæcilus Nelsoni*, *Gambusia fasciata*, *Heterandria Lutzi*, and *Pomadasys Templei*, species described by Dr. Meek in his recent work on the fishes of Mexico.



Below I describe a new *Cotylopus* and make some remarks about *Pseudoxiphophorus bimaculatus* and *P. pauciradiatus*.

*Cotylopus punctatus*, sp. n.

Depth of body  $6\frac{2}{3}$  in the length, length of head  $5\frac{1}{4}$ . Snout  $1\frac{4}{5}$  as long as eye, the diameter of which is  $5\frac{1}{3}$  in the length of head and  $1\frac{1}{4}$  in the width of the osseous interorbital space. Lower jaw shorter than the upper; maxillary extending to below posterior border of eye. Dorsal VI, I 10; all the rays of the spinous dorsal, except the first, produced as filaments, the fourth the longest, when laid back extending beyond the middle of the second dorsal; rays of the second dorsal increasing in length posteriorly, the last, when laid back, reaching the caudal. Anal I 11, opposite to the second dorsal; last anal ray, when laid back, extending  $\frac{2}{3}$  of the distance from its base to the caudal. Pectoral a little longer than the head; ventral  $\frac{2}{3}$  the length of head. Caudal rounded. 95 scales in a longitudinal series, 25 between second dorsal and anal fins; abdomen with a median naked area extending forward from the vent. Caudal peduncle  $1\frac{3}{4}$  as long as deep. Head covered with small dark spots; each scale on the body bearing a similar spot; very small dark spots on the dorsal fins and on the base of the pectoral.

A single specimen, 132 mm. in total length, from Tequesixtlan.

The outer series of teeth of the lower jaw are completely concealed in a fleshy pad; but examination of other species of *Cotylopus* and *Sicydium* shows that the extent to which these teeth are exposed varies considerably and that this feature must not be regarded as characteristic of the species.

*Pseudoxiphophorus pauciradiatus*, Regan.

Dr. Meek regards this species as a synonym of *Pseudoxiphophorus bimaculatus*, Heck., but it seems probable that he has seen specimens of the latter species only.

I have examined a large number of specimens of *Pseudoxiphophorus bimaculatus* from Southern Mexico, Guatemala, and British Honduras. The number of rays in the dorsal fin is usually 15, but varies from 14 to 17, whilst the head, snout, and caudal fin appear to be slightly, but constantly, longer and the anal fin considerably deeper than in *P. pauciradiatus*. Of this latter species I have seen the eight typical examples from Orizaba and six others collected by Dr. Gadow\*,

\* Of six specimens of *P. pauciradiatus* from Orizaba, collected by Dr. Gadow, one has 13, three have 12, and two have 11 dorsal rays. Of



also from Orizaba, which are exactly similar to the types. The number of rays in the dorsal fin is usually 12, but varies from 11 to 13. Each scale on the body has a rather broad blackish marginal or intramarginal crescent.

In the following table, based only on female specimens, are given in the first column (A) the number of dorsal rays and in the others the following measurements in millimetres:— (B) total length, (C) length to base of caudal, (D) length of head, (E) distance from tip of snout to origin of dorsal, (F) longest anal ray.

	A.	B.	C.	D.	E.	F.
<i>P. pauciradiatus</i> , two of the types, from Orizaba.	13	75	63	15	36.5	9
	12	42	35	9.5	20	5.5
<i>P. pauciradiatus</i> , two of the specimens from Orizaba, collected by Dr. Gadow.	11	72	60	14	36.5	9
	12	67	57	13.5	33	9
<i>P. bimaculatus</i> , four of the specimens from the Rio Tonto, collected by Dr. Gadow.	16	79	65	17	34	14
	14	77	64	16.5	33	13
	15	72	58	15	30	12
	14	62	50	13	27	11
<i>P. bimaculatus</i> , two specimens from San Domingo de Guzman, collected by Dr. A. C. Buller.	17	74	61	16	31	12
	15	72	59	16	30	12

In the typical form of *P. bimaculatus* the scales of the body have narrow dark edges, forming a network which usually fades out below. In five specimens from San Domingo de Guzman, collected by Dr. A. C. Buller, the scales of the middle series have very broad dark edges, giving the appearance of a blackish longitudinal band from operculum to base of caudal. This well-marked variety may be called *Pseudoxiphophorus bimaculatus*, var. *teniaius*.

XLIII.—*Descriptions of Three new Fishes from Japan, collected by Mr. R. Gordon Smith.* By C. TATE REGAN, B.A.

SINCE the publication of my report on the fishes collected by Mr. R. Gordon Smith in the Inland Sea of Japan\* the British Museum has received a further series from him, which contains examples of three species which appear to be new to science.

fifteen specimens of *P. bimaculatus* from the Rio Tonto, also collected by Dr. Gadow, three have 16, seven have 15, and five have 14 dorsal rays.

\* Ann. & Mag. Nat. Hist. (7) xv. 1905, p. 17.

*Diagramma aporognathus.*

Depth of body  $3\frac{1}{5}$ – $3\frac{1}{2}$  in the length, length of head  $3\frac{3}{5}$ – $3\frac{4}{5}$ . Snout as long as or slightly longer than eye, the diameter of which is  $3\frac{3}{4}$  in the length of head, interorbital width  $3\frac{1}{4}$ – $3\frac{1}{2}$ . Jaws equal, or the lower very slightly projecting; lower jaw without pores; maxillary extending to below the anterior margin of eye. 24 gill-rakers on the lower part of the anterior arch. Scales 110–116  $\frac{11-12}{22-24}$ . Dorsal XIV 17, the fourth to the seventh spines the longest,  $\frac{1}{3}$ – $\frac{2}{5}$  the length of head; rays of the soft fin subequal in length,  $\frac{1}{4}$  the length of head. Anal III 8. Pectoral nearly as long as the head. Caudal apparently emarginate (broken in each specimen). Caudal peduncle  $2\frac{1}{2}$  as long as deep. Greyish, with dark oblique undulating stripes along the series of scales.

Two specimens, 260 and 270 mm. in total length, from the Inland Sea.

*Gobius (Ctenogobius) atriceps.*

Depth of body  $4\frac{1}{2}$  in the length, length of head  $3\frac{1}{4}$ . Snout longer than eye, the diameter of which is  $5\frac{1}{2}$  in the length of head and a little less than the interorbital width. Jaws equal anteriorly; maxillary not extending to below the middle of eye. Head naked; nape covered with small scales. Scales in a longitudinal series 38, in a transverse series between second dorsal and anal 13. Dorsal VI 12; rays of the spinous dorsal produced into filaments; rays of the second dorsal slightly increasing in length to the last, which is  $\frac{1}{2}$  the length of head and, when laid back, reaches the caudal. Anal 11. Pectoral  $\frac{4}{5}$  the length of head; ventral  $\frac{3}{5}$  the length of head, extending a little more than  $\frac{1}{2}$  of the distance from its base to the origin of anal. Caudal rounded. Caudal peduncle longer than deep. Olivaceous; head blackish; fins dusky, the dorsal and anal light at the base, the pectoral with a pale transverse bar on its basal part.

A single specimen, 80 mm. in total length, from the Inland Sea.

*Achilognathus longipinnis.*

Pharyngeal teeth 5—5, sickle-shaped, the sides with transverse striæ, the edges entire. Depth of body 2– $2\frac{1}{4}$  in the length, length of head 4– $4\frac{1}{3}$ . Snout  $\frac{1}{2}$  the diameter of eye, which is  $2\frac{1}{2}$ – $2\frac{3}{4}$  in the length of head and equal to the interorbital width. Lower jaw a little shorter than the upper; maxillary hardly reaching the vertical from the anterior

margin of eye; no barbels. Scales 35-38  $\frac{5\frac{1}{2}-6}{8-9}$ , 5 $\frac{1}{2}$  or 6 between lateral line and root of ventral. Dorsal II 14-15, originating at a point equidistant from tip of snout and base of caudal; anterior branched rays as long as the head. Anal II 14-15. Pectoral nearly as long as the head, extending to the root of the ventral. Ventral 8-rayed, a little shorter than the pectoral, extending a little beyond the origin of anal. Caudal deeply forked. Caudal peduncle longer than deep. Olivaceous above, silvery below; lower parts of abdomen blackish; vertical fins dusky, the dorsal and caudal with some dark spots on the rays, the anal with a blackish edge; ventral blackish, with the outermost ray white.

Four specimens, 62 to 78 mm. in total length, from the Yamasabu River, Lake Biwa.

#### BIBLIOGRAPHICAL NOTICE.

*Memoirs of the Geological Survey of India.—Palæontologia Indica.* Series XV. *Himalayan Fossils.* Vol. IV. *The Fauna of the Spiti Shales.* By Dr. VICTOR UHLIG, Professor of Geology in the University of Vienna. 132 pages, 18 plates, and 10 text-cuts. Folio. 1904. Geol. Surv. Office, Calcutta; Kegan Paul & Co., London; and Friedländer, Berlin.

THE important fossiliferous strata which constitute the basis of this elaborate and well-illustrated Monograph by Dr. Victor Uhlig, of Vienna, are met with in limited areas among the much denuded rocks of the Central Himalaya, especially in the Spiti Valley, latitude N. 32° 5', longitude E. 78° 15', and lat. N. 28° 51', long. E. 77° 36'. The beds consist of dark grey and black shales, 300 feet thick, lying over a limestone and under a sandstone. The former (part of the Lower Gondwána system) is referred to the Jurassic epoch, and the latter or Giusmal Sandstone (600 feet thick) belongs to the Upper Gondwána and is referred to the Neocomian. The relative age of the "Spiti Fossils" has been the subject of much controversy, and several eminent palæontologists have assisted the Geological Survey of India in this investigation with both head and hand.

In the Introduction Dr. Uhlig makes careful mention of the many geologists who have advanced our knowledge, special and general, of the Spiti Fauna through the clouds of doubt and difficulties encountered in former days; and he gratefully thanks his fellow-workers and friends in India, Europe, and Britain, by whose help this comprehensive and really valuable memoir has been perfected and published. The talented artists and the friendly translator of his MS. are especially thanked. Indeed everybody who has been engaged in this good work has to be congratulated on the complete success of their labours.

The description of the species occupies pages 4 to 132, and in the Introduction (p. 3) this is apparently referred to as Part I. of the work, the notes on the natural history of the fossils, their relationships, stratigraphical position, and discovery being intended for Part II., but these particulars appear to have been incorporated with the description of each species.

In his systematic treatment of the species of Ammonites from the Spiti strata, Dr. Uhlig introduces the *Ammonidea* (p. 4) by carefully explaining that, not binding himself to the modern definition of the genera, he draws up the description of each of the forms with extreme minuteness, and indicates its "apparent position in the most generally accepted system." Thus he prefixes his view of the generic characters at the commencement of the account given of each group of species.

The classification of the species can be casually seen in the several tabular lists at pages 77, 82, 83, 89, 93, 95, 96, 98, 99, 101, 102, 106, 107, 110, 112, 114, 115, 117, 119, 121, 122, 124, 126, 127, 129, 130. The reference-numbers here annexed to the species, which are arranged according to their natural affinities, will be of some use to student and reader, especially as there is no Index issued with this edition of the Memoir.

The following and some other Ammonites (see pages 107-111, 112-118, 119-125, 126-130, 130-132; and the table, *infra*, page 368) from the Spiti beds are described, besides those mentioned at pages 4 to 74:—

AMMONIDEA.  
 PHYLLOCERAS, *Suess*, p. 4.  
   *plicatum*, sp. nov., p. 4.  
   *strigile*, *Blanford*, sp., p. 6.  
 LYTOCERAS, *Suess*, p. 8.  
   *exoticum*, *Oppel*, sp., p. 14.

HOPLOCERAS, *Zittel*, p. 18.  
   *Dieneri*, sp. nov., p. 19.  
   *indicum*, sp. nov., p. 21.  
 HECTICOCERAS, *Bonarelli*, p. 23.  
   *Kobelli*, *Oppel*, sp., p. 25.  
   *latistrigatum*, sp. nov., p. 27.  
   sp. nov. indet., p. 29.  
 OPPELIA, *Waagner*, p. 30.

The *Oppelia* of the Spiti fauna are classified in four groups according to their lobal structure, as below. It is noted by the author that "the name *Oppelia* (sensu stricto) should be reserved for the group of *subradiata*, as Waagner, in establishing the genus, had that group of forms above all in his mind." The generic aspect is that of a smooth or feebly costate discoidal Ammonite.

I. Group of *Oppelia Adolphi*, *Oppel*, p. 31 (*Ammonites pictus*, *Quenstedt*; Group of the *Tenuilobata*, *Oppel*; *Streblites*, *Hyatt*), represented by the under-mentioned forms:—

	Page
<i>Oppelia</i> ( <i>Streblites</i> ) <i>Adolphi</i> , <i>Opp.</i> .....	42
"  " <i>Krafti</i> , sp. nov. ....	44
"  " <i>Griesbachi</i> , sp. nov. ....	47
"  " <i>planopicta</i> , sp. nov. ....	47
"  "  sp. nov. indet. ....	50
"  " <i>indopicta</i> , sp. nov. ....	52
"  " <i>himalayana</i> , sp. nov. ....	51
"  " <i>substriata</i> , <i>Oppel</i> , sp. ....	54
"  " <i>Lymani</i> , <i>Oppel</i> , sp. ....	56

	Page
Oppelia (Streblites) n. sp. indet. aff. <i>Lymani</i> , <i>Oppel</i> ...	56
"    " <i>punctatopicta</i> , sp. nov. ....	59
"    " <i>sphenodoma</i> , sp. nov. ....	58
"    " <i>platydoma</i> , sp. nov. ....	60
"    " <i>leptodoma</i> , sp. nov. ....	58
"    " <i>domocrenata</i> , sp. nov. ....	64
"    " <i>pygmaea</i> , sp. nov. ....	65
"    " <i>adunata</i> , sp. nov. ....	63
"    "    sp. nov. indet. ....	67

The *Adolphi* group are closely connected with the European *Tenuilobata* by their concordance of the lobal structure, ornamentation, external shape of the test, development of the carina, and the form of the body-chamber.

- II. Group of *Oppelia acucineta* (*Oppelia*, sensu stricto), represented by only one species: *Oppelia acucineta*, Strachey, sp. (p. 40).
- III. Group of *Oppelia nivalis* (*Neumayria*, Bayle), represented by only one species: *Oppelia (Neumayria) nivalis*, Stoliczka, sp. (p. 41).
- IV. Group of *Oppelia (Ecotraustes) adela*, represented by only one species: *Oppelia (Ecotraustes) adela*, sp. nov. (p. 41).

In comparing the Spiti *Tenuilobata* with the European, Dr. Uhlig finds (pp. 37-38) that the former group had multifarious ramifications very partially known to us, while in Europe the group is also manifold, but more closely knit, and there are some analogies and some divergent characters; these two geographically distinct series do not appear to have followed a similar and quite parallel course of evolution, but were affected "by partial and provincial tendencies to mutation, and admitted, even along the same lines of mutation, of the development of vicarial forms (as, for example, *Opp. indopicta* and *Erotho*)." It is not necessary to ask for a land-barrier to account for this isolation, for a wide range of ocean may well be occupied by various and different creatures. It is thought possible, however, that one at least of the Cutch (Katrol) Ammonites (*Opp. plicodiscus*, Waagner) might serve as an intermediate.

Following the genus *Oppelia* comes the genus *Aspidoceras*, Zittel (pp. 74, 75), represented by *Aspidoceras avellanoides*, sp. nov., founded on a specimen regarded by Stoliczka, in 1865, as *Ammonites liparus*, Oppel, and proved on re-examination to be *Aspidoceras* of the *Inflati* group *Physolerocheras*, Hyatt).

The genus *Holostephanus*, Neumayr, is recorded next to *Aspidoceras* in order (page 77). In external form it has a thick and costate shell, tuberculate along the umbilical border. It is divisible into several groups, one of which has a single representative in the Spiti Shales (*H. Schenki*), while the other groups "exhibit an unexampled variety of forms." The alliances of some of these have been very differently regarded by different writers. Taking *Holostephanus spitiensis* (Blanford) as the type of a new subgenus (*Spiticeras*, pp. 77 & 82), Dr. Uhlig describes it carefully, and defines its species in the following order:—

## I. Forms with a broad saddle and slightly pendent, feebly developed, auxiliary lobes.

		(a) Forms of larger growth.		
No.		Page	Page	Page
12.	Spiticeras Stanleyi ( <i>Oppel</i> ).....	77	82	107
13.	„ Mojsvari, sp. nov. ....	77	82	110
		(b) Forms of medium and smaller growth.		
1.	Spiticeras spitiense ( <i>Blanf.</i> ) .....	77	82	89
3.	„ subspitiense, sp. nov.....	77	82	93
2.	„ Grotei ( <i>Oppel</i> ) .....	77	82	92
4.	„ bilobatum, sp. nov. ....	77	82	96
5.	„ subbilobatum, sp. nov. ....	77	82	98
8.	„ binodigrum, sp. nov. ....	77	82	101
7.	„ planum, sp. nov. ....	77	82	99
9.	„ conservans, sp. nov. ....	77	82	102
10.	„ Cantleyi ( <i>Oppel</i> ) .....	77	82	104
11.	„ subcantleyi, sp. nov. ....	77	82	106
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15.	„ bulliforme, sp. nov. ....	77	82	114

## II. Forms with narrow slashed saddles and deeply pendent, strongly developed, auxiliary lobes.

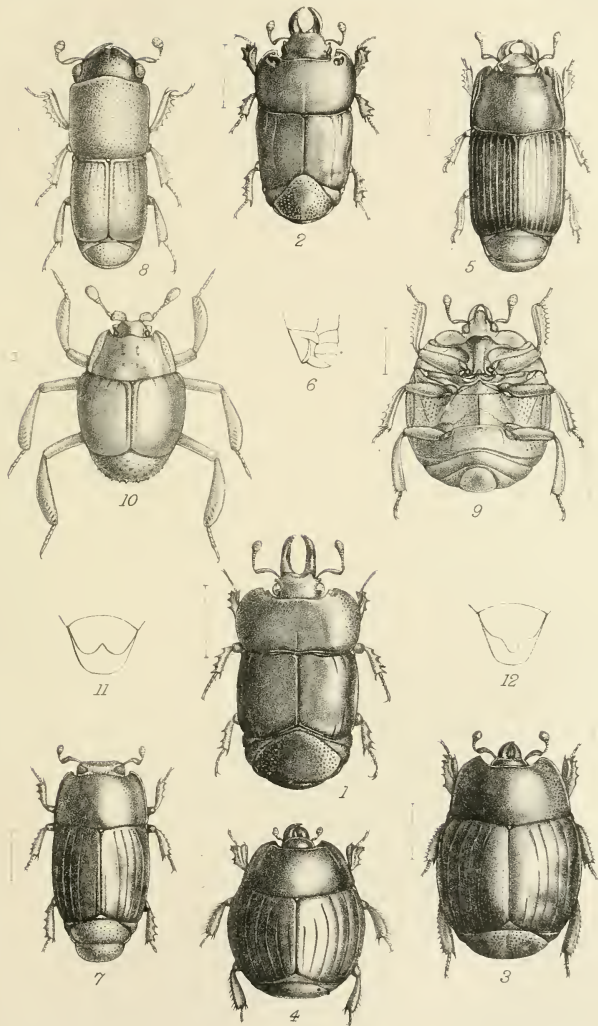
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## III. Isolated and extreme forms.

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24.	„ nov. indet. ....	77	83	129

The "important and oft-quoted" *Holostephanus (Astieria) Schenki*, *Oppel*, sp., is refigured and described anew from *Oppel's* restoration of the *Tobeta* specimen, and another fragment is mentioned (pages 130-132). Some observations are made on the standing of the species among its allies, also on the relationship of some South-African Ammonites to one of the groups of *Holostephanus*.

Besides the shape and ornamentation of the shell and the peculiarities of the septa, the naturalist has to note their successional features (due to phases of growth), in establishing specific and other divisions in Ammonites. In estimating the relative value of their many features and characters, *Dr. Uhlig* finds breaks and puzzling contrasts, and it will be quite possible that other Cephalopodists, following their own views of the relative value of the evidence, may be unable to accept the classification proposed in this *Monograph*, but at all events they will highly appreciate the value of its great store of illustrated information, so carefully collected and systematically arranged.



H. Knight ad nat lith

West, Newma. imp.

Histeridæ.









# THE ANNALS

AND

## MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 94. OCTOBER 1905.

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XLIII.—*Descriptions of new Species of Noctuidæ in the British Museum.* By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c.

### *EUTELIANÆ.*

#### *Ingura glauca*, sp. n.

Head, thorax, and abdomen grey, tinged with pale olive-yellow and irrorated with black, the last with subdorsal and subventral series of small black spots. Fore wing grey, largely suffused with pale olive-yellow and slightly irrorated with black, more thickly on medial area; a black spot at base of cell with striga from costa above it; an antemedial black line angled outwards below costa, then slightly waved and with traces of an olive line before it; orbicular and reniform small with olive centres and grey annuli, the former round or elongate elliptical, sometimes confluent with the latter, which has its lower extremity produced to a point; a diffused waved black medial line; postmedial line double, bent outwards below costa, then the inner line excurved in interspaces and angled inwards on the veins, very oblique below vein 4, the outer line reduced to black points and a prominent lunule above inner margin, followed by an oblique olive band from costa to vein 4, then incurved and reduced to spots; some black points on costa towards apex; an oblique olive band across apical area from costa to vein 6; a grey and black apical patch with a pale curved line on its inner edge and a waved black line on termen; a series of black points

just before termen and more prominent spot at submedian fold; cilia intersected with black near apex. Hind wing pale suffused with fuscous on the veins and terminal area and with olive on inner area, more uniformly fuscous in female. Underside of fore wing with the costal and terminal areas whitish; hind wing whitish, with traces of medial line, post-medial series of black points, diffused waved subterminal line, and waved terminal line.

*Hab.* VENEZUELA, Aroa, 1 ♂ type; BR. GUIANA, Potaro R. (Kaye), 1 ♀. *Exp.* 28 mm.

*Ingura griseifusa*, sp. n.

Antennæ of male bipectinate, the apical part simple.

♂. Head and thorax grey, tinged with rufous and irrorated with a few black scales; abdomen grey irrorated with black. Fore wing grey-white irrorated with fuscous and slightly tinged with brown; a waved black antemedial line; orbicular and reniform moderate, rounded, defined by black; an indistinct waved medial line; postmedial line double, bent outwards below costa and incurved below vein 4, with another indistinct line beyond it; short black streaks above middle of veins 5, 6; a dark patch from costa before apex; a crenulate line just before termen. Hind wing fuscous brown, the interspaces of basal and inner areas paler; a slight pale mark above tornus and some black striæ on inner margin near tornus; the underside paler except terminal area, traces of waved medial, postmedial, and subterminal lines.

♀. Fore wing with the outer edge of reniform indented; the line before termen reduced to a series of points.

*Hab.* BRAZIL, Rio Janeiro, 1 ♂ type, Organ Mts., Tijuca (Wagner), 1 ♂, 1 ♀; PARAGUAY, Sapucay (Foster), 1 ♀. *Exp.* 32 mm.

*Ingura nyctichroma*, sp. n.

Antennæ of male bipectinate, the apical part simple.

♂. Head and thorax dark red-brown irrorated with black; tegulæ with diffused black medial line; patagia with short black streaks; prothorax with pair of white points; pectus with some white hair; tarsi ringed with white; abdomen red-brown with dorsal and subdorsal series of black points, the second and third segments with lateral white lines. Fore wing red-brown suffused with fuscous; a double minutely waved antemedial black line; orbicular absent; reniform a greyish bar with red-brown line in centre; a waved line from lower angle of cell to inner margin; postmedial line black,

slightly bent outwards below costa, angled outwards above vein 6 and incurved below vein 4, with traces of a wavy line before it; a slight black streak above middle of vein 5; traces of a pale subterminal line defined on each side by brown, slightly angled outwards at vein 7 and below vein 3 forming two whitish indentations; a whitish patch at apex with short black streak below it; a series of oblique black striæ just before termen; a fine dark terminal line. Hind wing dark reddish brown, the interspaces of inner area pale towards base; some black striæ on inner margin towards tornus; a fine pale line at base of cilia; the underside grey irrorated and suffused with brown, a medial line strongly excurved at middle, traces of a double wavy postmedial line with series of points on the veins and a diffused subterminal line.

*Hab.* PANAMA, La Chorrera (*Dolby-Tyler*), 1 ♂ type. *Exp.* 30 mm.

*Ingura leucotrigona*, sp. n.

♀. Head and tegulæ ochreous tinged with rufous; thorax rufous mixed with grey; pectus and legs ochreous tinged with rufous; abdomen brown suffused with grey, the anal tuft and ventral surface whitish tinged with rufous. Fore wing ochreous tinged with rufous; the base rufous suffused with grey; a triangular white subbasal patch between cell and vein 1 before a diffused rufous band from cell to inner margin with incurved red-brown line on its inner edge; a red-brown line from below costa beyond middle oblique to near termen below vein 7, below vein 5 strongly incurved, then obliquely sinuous to inner margin, the area beyond it dark brown suffused with grey; a series of black striæ before termen. Hind wing whitish tinged with brown, the terminal half suffused with dark brown; a diffused grey subterminal line excurved below costa; a series of dark points just before termen and striæ on termen; the underside yellowish, irrorated with red-brown; a brown discoidal lunule, an ill-defined medial line, an indistinct wavy postmedial line with brown suffusion between it and the diffused grey subterminal line.

*Hab.* BORNEO, Kuching (*Shelford*), 1 ♀ type. *Exp.* 38 mm.

*Ingura poliotis*, sp. n.

Antennæ of male bipectinate, the apical part simple.

♂. Head and thorax rufous mixed with grey and fuscous; abdomen rufous tinged with grey and irrorated with black, slight dorsal black marks on the two medial segments. Fore

wing with the basal and costal areas ochreous suffused with rufous and irrorated with fuscous, the rest of wing grey, suffused in parts with rufous; a fine strongly incurved antemedial line from submedian fold to inner margin, with some diffused brown beyond it; postmedial line indistinct and very oblique from costa to below vein 7, then prominent, blackish, strongly incurved below vein 5 and oblique to inner margin, with traces of a dentate line beyond it; a grey patch on apical part of terminal area; a series of black striæ before termen; some white points on costa towards apex. Hind wing fuscous brown, the basal and inner areas rather paler; a diffused pale subterminal mark towards tornus; the underside grey irrorated with black and suffused with red towards apex, a discoidal bar, slight sinuous postmedial line, and diffused subterminal band.

♀. Fore wing with the incurved postmedial line less distinct, the dentate line more prominent; an indistinct waved subterminal line angled inwards in submedian fold.

*Hab.* SINGAPORE (Ridley), 1 ♂, 3 ♀ type. *Exp.* 28 mm.

*Eutelia chrysotermina*, sp. n.

♂. Head and thorax deep red-brown mixed with a little grey, the head and a patch on metathorax redder; palpi pale in front; hind tarsi with black spot at base; abdomen pale red, the basal half darker with a red patch at base, the crests and subdorsal series of small spots blackish. Fore wing deep red-brown suffused with grey on basal half of costal area, the terminal area below vein 6 broadly golden yellow suffused with some red, on inner margin extending to before middle; a subbasal grey striga from costa; an indistinct highly curved dark antemedial line, below the cell bounding the dark area; reniform defined by white at sides, very narrow and constricted at middle; postmedial line almost obsolete towards costa, below the cell fine double defined by red-brown on inner side, very oblique and minutely waved, another line beyond it very oblique from costa to vein 6 near termen, then inwardly oblique and rather diffused; a prominent white subterminal bar from costa to vein 6, the area beyond it deep chocolate with two black lunules defined by white on termen, the subterminal line then indistinct, yellow and slightly sinuous; a fine slightly sinuous brown subterminal line. Hind wing pure white; the costal area dark brown; the terminal area below vein 5 fiery red with sinuous yellow subterminal line; a black spot on inner margin beyond middle; the underside with the costal and

terminal areas suffused with fiery red, some black suffusion in base of cell, an oblique elliptical black discoidal spot defined by white and with black bar from costa just beyond it; an indistinct dark postmedial line with blackish spot below vein 6, an indistinct sinuous yellow subterminal line, some black points on termen towards apex.

*Hab.* FR. GUIANA, St. Jean Maroni (*Schaus*), 1 ♂ type, St. Laurent Maroni. *Exp.* 32-34 mm.

*Eutelia caustiplaga*, sp. n.

♂. Head and thorax bright chocolate-red mixed with a little grey; palpi with the second joint in front and tuft on basal joint of antennæ white; pectus, base of legs, and tarsi white, the tibiæ with white bases, the tarsi with black spot on first joint; abdomen red with deep chocolate-red subdorsal patches at base, with a little grey before each, the ventral surface pale grey-brown. Fore wing red with some grey suffusion in places; the median nervure and veins rising from it white; subbasal line represented by a grey striga from costa; antemedial line fine, grey, very oblique from costa to median nervure, then inwardly oblique, a diffused oblique grey-white fascia beyond it from costa to lower angle of cell and a chocolate-red patch on inner area followed by a triangular white patch with some yellow and a dark striga on it; reniform narrow, constricted at middle, chocolate-red with white annulus, a white striga above it from costa, and a large chocolate-red patch beyond it with a little yellowish in centre; postmedial line unusually near termen, white, obliquely curved to vein 6, then inwardly oblique, below vein 3 indistinct, dark, slightly waved, with a white point on its outer edge at vein 5 and some whitish suffusion below vein 3; some white points on costa towards apex, which is grey with a white line across apical area to termen at vein 5; a grey subterminal line from the white point on postmedial line angled inwards below vein 4 and below vein 3 incurved, prominent and white, the area beyond it deep chocolate-red; some triangular black points on apical half of termen; a fine white line at base of cilia. Hind wing pure white, the terminal area brown suffused with fiery red; a white subterminal line from vein 3, angled outwards to near termen at submedian fold; a fine white line at base of cilia; the underside with the costal and terminal areas grey; a black discoidal spot, a small spot at middle of submedian fold; traces of two waved postmedial lines with some red on them at discal and submedian folds, some black points on termen.

*Hab.* CUBA, Santiago (*Schaus*), 1 ♂ type, Matanzas.  
*Exp.* 36 mm.

*Eutelia pyrastis*, sp. n.

Antennæ of male bipectinate, the apical part simple.

♂. Head rufous; palpi and basal joint of antennæ in front white; tegulæ and prothorax grey, the rest of thorax suffused with rufous; abdomen grey slightly tinged with rufous, rufous dorsal patches on second and third segments and a point on fifth segment. Fore wing grey suffused in part with rufous; the basal area rufous except costal area; subbasal line represented by a whitish striga from costa; antemedial line oblique from costa to median nervure, then obliquely curved, a yellow patch beyond it on inner area; the veins of terminal half slightly streaked with white; an oblique dark striga from middle of costa; reniform a narrow lunule constricted at middle, with dark centre and whitish annulus; postmedial line with small white and brown mark on costa, then indistinct, strongly bent outwards below costa, excurved and slightly waved to vein 4, then strongly incurved and almost obsolete; a rufous triangle defined by white from costa before apex to vein 6, with three small white-defined blackish marks below it followed by a white line to tornus; the apical half of termen grey, the inner half rufous; some black points on termen. Hind wing with the basal half whitish, the veins and terminal half brown; some black striæ on inner margin towards tornus; a white bar above tornus; the termen tinged with red, with some white and three black points at middle; the underside white slightly irrorated with fuscous, a small discoidal lunule, indistinct waved medial and post-medial lines and terminal series of points.

♀ rather more rufous.

*Hab.* U.S.A., Florida, Miami (*Schaus*), 1 ♂; BAHAMAS, Nassau (*Sir G. Carter*), 1 ♂, 1 ♀ type. *Exp.*, ♂ 32, ♀ 36 mm.

*Eutelia leucographa*, sp. n.

Antennæ of male bipectinate, the apical part simple.

Palpi white, the first two joints and the third joint near tip brown at sides; frons white with the frontal tuft tipped with brown; vertex of head and antennæ black; thorax black with a few white scales and white spot on metathorax; pectus white behind; legs black banded with white; abdomen black-brown slightly variegated with white, the ventral



surface mostly white. Fore wing red-brown variegated with white especially on antemedial area and on postmedial area from vein 3 to inner margin, the white areas with dark striæ; subbasal line represented by a white striga from costa; antemedial line unusually near base, strong, black, slightly angled in cell, then oblique and not quite reaching inner margin; orbicular an ill-defined white spot with dark points on it; reniform an elliptical white patch with black spots in its upper and lower parts; medial line indistinct except at costa and inner margin, oblique from costa to cell, then inwardly oblique and obscurely double; postmedial line strong, black except between veins 3 and 1, oblique from costa to vein 6, incurved between veins 3 and 1, defined on outer side by a fine white line from costa to vein 3; subterminal line white from costa to vein 3, with a black band on its inner side expanding towards costa and vein 3, oblique to vein 6, then outwardly oblique and irregular, below vein 3 represented by a black spot above tornus; cilia chequered brown and whitish. Hind wing white, the terminal area fuscous, extending to middle at costa and narrowing to tornus, a slightly waved white subterminal band from vein 6 to tornus, the area beyond it browner, two black striæ above tornus; a fine crenulate black line; cilia white at base, blackish at tips; the underside white irrorated with black, the apical area suffused with brown, two black discoidal bars, a waved medial line excurved at middle, double minutely waved postmedial line and traces of a subterminal line.

♀. Fore wing less variegated with white.

*Hab.* BR. E. AFRICA, El Quaso, Masai (*Betton*), 3 ♂, 1 ♀ type; CAPE COLONY, Steynsberg, 2 ♂. *Exp.* 36–40 mm.

### *Eutelia diplographa*, sp. n.

Antennæ of male bipectinate, the apical part simple.

♂. Head and thorax grey mixed with brown and fuscous; palpi with the second joint blackish at sides; tegulæ black at base, with brown medial line and dark tips; abdomen grey suffused with fuscous, the ventral surface paler. Fore wing grey-white suffused with brown especially on basal and costal areas; subbasal line represented by two striæ from costa; antemedial line double, oblique, the inner line brown, diffused, the outer strong, black; orbicular a slight brown annulus; reniform defined by fuscous and with some brown in centre; medial line strongly excurved round the reniform; postmedial line double, the inner line black, the outer brown,

excurved from costa to vein 4, then incurved; subterminal line represented by blackish patches, forming bars from costa to vein 7 and vein 3 to inner margin, excurved between those points; a fine waved terminal line; cilia chequered white and brown. Hind wing white, the terminal area suffused with brown; the underside white, the costal and terminal areas irrorated with brown, a discoidal annulus, crenulate postmedial line with slight streaks on the veins, traces of subterminal line, and terminal series of points.

♀ whiter.

*Hab.* SIKHIM (*Pilcher*), 1 ♂; PERAK, Larut Hills (*S. S. Flower*), 1 ♀ type. *Exp.* 40 mm.

*Eutelia mesogona*, sp. n.

♀. Head and thorax ochreous mixed with reddish brown; palpi with the second joint brown at sides, the third ochreous, long and dilated at extremity; tegulæ with dark upper edge; patagia black at extremity; pectus whitish; legs whitish, brown and black; abdomen whitish tinged with brown and with small brown subdorsal spots. Fore wing reddish brown tinged with greenish fuscous; subbasal line represented by a slight striga from costa; antemedial line indistinctly double, slightly waved, oblique from costa to median nervure, then incurved and with the inner line strong, black; a medial ochreous band, its outer edge defined by the double postmedial line, oblique from costa to vein 6, where it is acutely angled, inwardly oblique below the cell; orbicular represented by a small ochreous spot on the dark area, the reniform slightly defined by brown and rather triangular, on the ochreous area; traces of a waved medial line; a somewhat trilobate whitish mark between veins 4 and 2, with some ochreous below it, before the subterminal line, which is whitish and very oblique from costa to vein 6, then ochreous, waved, excurved to vein 3; some white points on costa towards apex and a whitish apical patch; a terminal series of small black lunules with ochreous striæ beyond them. Hind wing brown, the basal and inner areas paler; some black and whitish striæ in submedian fold and on inner margin towards tornus; a whitish waved line from vein 3 to termen near tornus; small black lunules defined by whitish on termen from apex to submedian fold; the underside with the costal half reddish brown, the inner half whitish, a small black discoidal spot, curved medial line, and three slight minutely waved lines on terminal area.

*Hab.* MADAGASCAR, Betsileo (*Cowan*), 1 ♀ type. *Exp.* 36 mm.

*Eutelia geræa*, sp. n.

Antennæ of male strongly serrate and fasciculate, the apical part simple.

♂. Head, thorax, and abdomen reddish brown suffused with grey, the last with the dorsal crests small, dark. Fore wing brownish grey with some dark irroration; a dark point at base of cell; antemedial line oblique to subcostal nervure, hardly traceable except at costa; orbicular represented by a small spot; reniform well developed, rounded, rufous defined by blackish; medial line oblique from costa to lower angle of cell, then incurved; postmedial line indistinctly double, minutely waved, excurved from below costa to vein 4, then incurved; a triangular chocolate patch defined by grey on costa before apex, the subterminal line arising from it and represented by small rufous dentate marks, excurved at middle; a terminal series of small chocolate lunules. Hind wing rufous, the basal and costal areas paler; the underside rufous, the inner area whitish, a black discoidal lunule, curved postmedial and subterminal lines showing through to upperside.

♀. Head, thorax, and fore wing grey-white, the last with the markings much more distinct, some rufous suffusion between medial and postmedial lines.

*Hab.* MAURITIUS, Curepipe (*Tullock*), 1 ♂, 1 ♀ type.  
*Exp.* 26 mm.

*Eutelia flaviluna*, sp. n.

Antennæ of male serrate and fasciculate.

♂. Head, thorax, and abdomen grey tinged with brown and irrorated with black; pectus and legs blackish, the tarsi ringed with white. Fore wing reddish brown suffused with grey and irrorated with black; antemedial line double, the outer line strong, black, oblique from costa to subcostal nervure where it is angled, then slightly incurved; orbicular represented by a slight black streak, the reniform a prominent ochreous lunule defined by black; medial line rather indistinct, oblique from costa to median nervure, then incurved; postmedial line double, sinuous, oblique from costa to vein 6, then inwardly oblique; subterminal line indistinct, ochreous defined by somewhat dentate blackish marks on inner side, waved, angled inwards to discal fold and outwards on vein 3; a fine waved black terminal line. Hind wing fuscous, the inner area slightly paler; an ill-defined ochreous line from vein 5 to tornus; the underside whitish suffused with brown and irrorated with fuscous, a

small black discoidal spot defined by whitish, a curved medial line and diffused subterminal band outwardly defined by whitish on inner half.

*Hab.* SINGAPORE (Ridley), 1 ♂ type. *Exp.* 30 mm.

*Eutelia furcicauda*, sp. n.

Antennæ of male serrate and fasciculate.

♂. Head, thorax, and abdomen brick-red tinged with grey; palpi in front to near end of second joint, pectus, the greater part of legs, and ventral surface of abdomen white; the lateral anal tufts long. Fore wing brick-red suffused with grey; conjoined yellowish-white spots defined by red and with red centres above and below vein 1 at middle of inner margin; a fuscous medial line angled outwards below costa and ending at the spots on inner margin; minute points at angles of cell; a faint postmedial line, excurved from costa to vein 4, then incurved to near the medial spots; costa red towards apex with some yellow points on it; a slight red streak above vein 7 with two outwardly oblique yellow striæ defined by red from its inner side to vein 5; subterminal line indistinct red, sinuous, with two obliquely placed yellow points on it below costa and ending above tornus; termen strongly angled at vein 3, then oblique, waved. Hind wing yellowish white, the terminal area brick-red, brownish at tornus; a yellow point at extremity of vein 2; termen slightly crenulate, angled at vein 2, then excised; cilia yellowish and red. Underside of fore wing with the basal areas of costa and inner margin yellowish, the disk fuscous irrorated with grey, the terminal area blue-grey, costa red from middle to near apex, some reddish beyond cell and a deeper red spot beyond postmedial line; hind wing white with some black irroration at base of costa and lower angle of cell, a small red discoidal spot, postmedial line defined by small red spots before and beyond it, terminal area suffused with red, some black points on termen.

*Hab.* SINGAPORE (Ridley), 3 ♂ type. *Exp.* 30 mm.

*Eutelia cautabasis*, sp. n.

Antennæ of male minutely serrate and fasciculate.

♂. Head and thorax ferruginous red; patagia with deeper red patches at shoulders; palpi blackish at base; tarsi fuscous ringed with white; abdomen pale rufous with some deeper red on dorsum and some greyish hair at base, the ventral surface deep rufous. Fore wing with the basal area

yellowish with small deep rufous patch below base of costa and large patch from subcostal nervure to inner margin, bounded by a red-brown band expanding into a triangular patch on costa; the rest of wing greenish grey with a slight rufous tinge; an indistinct wavy rufous medial line excurved from costa to vein 2; postmedial line faint with dark points on the veins, bent outwards below costa, then slightly curved; a small triangular red-brown patch on costa before apex; some brown suffusion before termen between veins 4, 3; a terminal series of points; termen angled at vein 3, then oblique, wavy. Hind wing reddish brown, the basal and inner areas yellowish white; an obliquely curved whitish medial line; some slight dark marks on extremity of vein 2 and at tornus; a fine wavy terminal line; cilia rufous; the underside rufous slightly irrorated with brown, the inner area whitish, a small discoidal lunule and faint minutely wavy medial and postmedial lines.

*Hab.* OLD CALABAR (*Crompton*), 1 ♂ type. *Exp.* 38 mm.

*Eutelia holocausta*, sp. n.

♀. Head, thorax, and base of abdomen fiery rufous; tegulæ with blackish patches at base; palpi long; abdomen rufous tinged with grey, with small lateral chocolate-red spots on third and fourth segments. Fore wing fiery rufous slightly tinged with grey and irrorated with fuscous; traces of an antemedial red line, oblique below the cell; a fiery-red spot in middle of cell; a faint pale discoidal lunule; traces of a double postmedial line oblique from costa to vein 6 and below vein 4; a chocolate-red patch on costa before apex outwardly defined by an oblique white line with some fuscous beyond it; traces of a subterminal line excurved at middle, then strongly incurved, with minute dentate chocolate marks before it above and below vein 5, and slight rufous marks above and below vein 2; termen angled at vein 4, then oblique. Hind wing fiery rufous, with small chocolate-red spots on inner margin towards tornus; the underside with chocolate discoidal spot and minutely wavy medial, post-medial, and subterminal lines, obsolescent on costal half.

*Hab.* NIGERIA, Sapele (*Sampson*), 1 ♀ type. *Exp.* 32 mm.

*Eutelia metasarca*, sp. n.

Antennæ of male serrate and fasciculate, the apical part ciliated.

Head, thorax, and abdomen pale red-brown tinged with

grey; palpi black at base; abdomen with sublateral and two ventral series of black points on medial segments. Fore wing grey tinged with pale rufous; a black point in base of cell; antemedial line indistinct, double, slightly angled outwards below costa, then oblique; a minute annulus in middle of cell; reniform D-shaped with brownish centre and white annulus defined by black; traces of a medial line; postmedial line double, oblique from costa to vein 6, then inwardly oblique, waved; traces of a pale waved subterminal line, whiter and with brown shade before it at costa; a terminal series of small black lunules; the termen slightly angled at vein 4. Hind wing flesh-red, the basal and inner areas slightly paler; a terminal series of dark lunules; the underside whitish irrorated with rufous, a black discoidal spot on a slightly waved medial line and maculate postmedial line.

*Hab.* NIGERIA, Sapele (*Sampson*), 1 ♂, 2 ♀ type. *Exp.* 20 mm.

*Eutelia melanopis*, sp. n.

Antennæ of male serrate and fasciculate, the apical part simple.

♂. Head, thorax, and abdomen brown suffused with grey; palpi black at base; tarsi black with whitish rings; abdomen with the small dorsal crests black, and paired ventral black points on basal and three medial segments. Fore wing grey tinged and irrorated with brown; antemedial line indistinct, oblique from costa to submedian fold and with small black spot on costa beyond it; a minute annulus in middle of cell; reniform narrow, black with white annulus and with oblique black striga above it from costa; a medial line from cell to inner margin; postmedial line indistinct, double filled in with whitish, with black mark on its outer side at costa, oblique to vein 6 where it is angled, angled at vein 4, then incurved to below end of cell; a conical deep chocolate patch with white points on costa before apex, the subterminal line arising from its outer side, very indistinct, pale slightly defined on each side by brown, white at costa, irregularly waved; a terminal series of black points; the termen slightly angled at vein 4. Hind wing grey-brown; a fine waved terminal line from apex to submedian fold; some dark points on inner margin near tornus and on extremity of vein 2; the underside grey tinged with rufous and irrorated with fuscous, a black discoidal spot, minutely waved double postmedial line, and traces of subterminal line with small black spot at tornus.

*Hab.* SIERRA LEONE (*Cator*), 1 ♂ type. *Exp.* 24 mm.

*Eutelia chlorobasis*, sp. n.

♀. Head and thorax whitish, mixed with brown; palpi black at base; abdomen grey, with slight subdorsal series of fuscous points, small lateral black spots on fourth segment, and some sublateral spots, the ventral surface suffused with red and with series of white points. Fore wing pale reddish brown, slightly irrorated with fuscous; the basal area suffused with greenish grey; an oblique blackish antemedial line, defined by white on inner side except towards costa; a slight medial line from cell to inner margin; orbicular and reniform greenish white defined by fuscous, the former a minute spot, the latter elliptical, with grey centre; post-medial line double filled in with grey, oblique from costa to vein 6, where it is angled, then minutely waved, incurved below vein 4, some greenish-grey suffusion beyond it on costa; a black patch defined on outer side by a white striga on costa before apex, the slight grey subterminal line arising from its outer edge, excurved at middle and incurved below vein 3, traversing a patch of fuscous suffusion on terminal area from vein 5 to inner margin; a fine waved black terminal line. Hind wing brown, suffused with fuscous, with fine waved dark terminal line. Underside of fore wing with the terminal area brick-red, with oblique white subapical striga; hind wing suffused with rufous, a black discoidal point, fine waved medial and postmedial lines, and terminal series of lunules.

*Hab.* NIGERIA, Sapele (*Sampson*), 1 ♀ type. *Exp.* 22 mm.

*Eutelia nigridentula*, sp. n.

♀. Head, thorax, and abdomen red-brown; palpi whitish, black at base and on outer side of third joint; tarsi fuscous, ringed with white; abdomen with dorsal and subdorsal series of slight points, the ventral surface whitish, with paired series of black points. Fore wing pale or dark reddish brown, slightly irrorated with fuscous; a whitish striga in cell before the double antemedial line, filled in with rufous and defined by whitish on inner side, angled outwards below costa, then oblique; orbicular a small black spot; a slight medial line, excurved below costa and oblique below the cell; reniform elliptical, chocolate with ochreous annulus defined by black; postmedial line double filled in with ochreous, oblique from costa to vein 6, where it is angled, angled inwards in discal fold and outwards at vein 4, then oblique waved; a chocolate patch on costa before apex, defined on outer side by a whitish lunule, below which is a black dentate



mark, followed by traces of a series of points ; the terminal area rather darker, with a series of small black lunules on termen. Hind wing fuscous brown, with fine waved terminal dark line ; the underside greyish, suffused with rufous and irrorated with fuscous ; a small black discoidal lunule, indistinct minutely waved medial and double postmedial lines.

*Hab.* SIERRA LEONE (*Clements*), 1 ♀ type ; NIGERIA, Old Calabar (*Crompton*), 1 ♀, Sapele (*Sampson*), 2 ♀. *Exp.* 22 mm.

*Eutelia albiluna*, sp. n.

♀. Head and thorax white, slightly mixed with brown ; abdomen white, tinged with fuscous except at base, where there are some black scales, the ventral surface white, with sublateral and two ventral series of black points. Fore wing whitish, irrorated with fuscous and suffused with fuscous brown on medial area and beyond the cell ; some brownish suffusion at base of costa ; antemedial line indistinctly double, angled outwards below costa, then oblique ; orbicular a minute white spot defined by black ; an oblique medial line from cell to inner margin ; reniform a prominent white lunule ; postmedial line indistinct, double, oblique from costa to vein 6, then inwardly oblique, dentate below vein 4 ; a black-brown patch below costa towards apex, its outer edge rather dentate and defined by the whitish subterminal line, which is defined by fuscous on inner side, angled inwards in discal fold, below vein 4 obliquely incurved, strongly defined by black on inner side and with the area beyond it darker ; a terminal series of small black lunules. Hind wing fuscous brown, with some black and white striæ on inner margin near tornus, a black and white subterminal mark on vein 2, and a fine waved terminal line ; the underside whitish, tinged with brown and irrorated with fuscous, a discoidal point, slight waved medial and postmedial lines, and traces of subterminal line.

*Hab.* NIGERIA, Sapele (*Sampson*), 2 ♀ type. *Exp.* 22 mm.

*Eutelia leucodelta*, sp. n.

♀. Head, thorax, and abdomen grey-white ; tegulæ with slight brown medial line and brownish tips ; tibiæ with slight black marks ; abdomen with the basal crest tipped with rufous, the slight dorsal crests rufous, the ventral surface white, with sublateral and two ventral series of black points. Fore wing grey-white, the basal and costal areas suffused with pale olive-brown, slightly irrorated with



fuscous; antemedial line prominently defined by white on inner side except towards costa, incurved to costa, then oblique, with a slightly rufous-tinged band beyond it and black point at inner margin; reniform a **C**-shaped white mark incompletely defined by black and with olive centre; some rufous suffusion beyond the cell; postmedial line double, indistinct, oblique from costa to vein 6, then inwardly oblique, dentate below vein 4; an olive patch on costa before the indistinct, wavy, white subterminal line, which has some slight black marks on it between veins 4 and 2, the area beyond it greyer; a terminal series of small black lunules. Hind wing brick-red, the base and termen whitish; some slight black marks on inner margin towards tornus; a wavy black terminal line. Underside whitish, irrorated with rufous; fore wing with the disk suffused with rufous, the white discoidal lunule with black centre, a wavy black postmedial line excurved from costa to vein 4, then oblique; hind wing with black discoidal spot, slight wavy medial and double postmedial lines.

*Hab.* NIGERIA, Sapele (*Sampson*), 1 ♀ type. *Exp.* 30 mm.

*Eutelia ochricostata*, sp. n.

♀. Head and fore half of thorax rufous, tips of patagia and hinder part of thorax ochreous white, metathoracic crest rufous; palpi blackish at base; abdomen brown, tinged with grey and rufous, the dorsal crests dark, subdorsal series of slight dark segmental striæ. Fore wing red-brown, the basal and costal areas to near apex ochreous tinged with rufous; two oblique black antemedial lines from middle of cell to inner margin, towards which they separate more widely; a slight oblique medial line from cell to inner margin; reniform a **V**-shaped ochreous-white mark filled in with rufous; postmedial line indistinct, double, minutely wavy, almost obsolete on costal area, bent outwards below costa, excurved to vein 4, then incurved; subterminal line ochreous, distinct from costa to vein 6, where it is joined by an oblique ochreous streak from beyond postmedial line, then represented by slight ochreous and rufous striæ incurved below vein 3; apical area fuscous grey, with black streaks above veins 6, 7; a terminal series of small dark lunules; cilia with some ochreous above and below vein 5. Hind wing brown, with some pale and dark striæ on vein 2 and inner margin towards tornus; a pale subterminal line towards tornus; a terminal series of dark lunules; the underside suffused with rufous

and irrorated with brown, a dark discoidal lunule, minutely waved medial and double postmedial line.

*Hab.* NIGERIA, Old Calabar (*Crompton*), 1 ♀ type. *Exp.* 24 mm.

*Eutelia ferridorsata*, sp. n.

♀. Head blackish, slightly mixed with grey; thorax ferruginous, the tegulæ tinged with fuscous; pectus and legs fuscous and greyish; abdomen pale ferruginous, the dorsal crests and slight subdorsal segmental striæ dark, the ventral surface suffused with black. Fore wing greenish grey, suffused with black and rufous and with numerous dark striæ; a double waved antemedial line; reniform grey, defined by black, and with some fuscous in centre, narrow, irregularly elliptical; postmedial line indistinct, defined by rufous on outer side, minutely waved, excurved from costa to vein 4, then incurved; a slight, minutely waved, black subterminal line, incurved below vein 4, and with the area beyond it greyish towards tornus; a terminal series of small black lunules; cilia rufous and black. Hind wing rufous, suffused with fuscous, the inner area rather paler; some dark striæ on vein 2 and on inner margin towards tornus; a pale mark on termen near tornus; cilia rufous; the underside rufous irrorated with brown, the inner area whitish, a discoidal point, medial line excurved below costa, double minutely waved postmedial line, the inner line indistinct, traces of a subterminal line, and a terminal series of black lunules on whitish marks.

*Hab.* NIGERIA, Old Calabar (*Sampson*), 1 ♀ type. *Exp.* 26 mm.

*Eutelia cyanolopha*, sp. n.

Antennæ of male ciliated.

♂. Head and thorax rufous, mixed with some whitish; tegulæ with blackish medial line and dark tips; metathorax with a pair of blue-black spots; abdomen whitish, dorsally suffused with rufous, the first segment with a pair of blue-black spots, the fourth with dorsal white spot. Fore wing rufous, suffused with greyish; the cell from near base, the area beyond it, and the submedian interspace with rubbed appearance; subbasal line represented by slight double striæ from costa filled in with grey; antemedial line with two oblique striæ from costa and oblique dark bar to the lobe on inner margin, with white bar beyond it; reniform an ill-defined lunule with rufous tuft of scales at upper angle of

cell; postmedial line faint, oblique, waved, from costa to vein 6, defined by grey on inner side; the terminal half of inner area with some grey and blackish striæ; some obscure dark points just before termen and a fine terminal line. Hind wing semihyaline whitish, the veins and terminal area suffused with brown; some dark striæ on inner margin towards tornus, and a rufous mark at extremity of vein 2; cilia whitish; the underside with two black discoidal points, traces of a curved medial line, and a diffused subterminal band.

♀. Fore wing with the rubbed appearance confined to the extremity of cell.

*Hab.* GOLD COAST, Aburi (*Johnson*), 1 ♂, 1 ♀; BR. E. AFRICA, Athi-ya-Mawe (*Betton*), 1 ♂ type; MASHONALAND, Umtali (*Marshall*), 2 ♂, 4 ♀. *Exp.* 30-34 mm.

*Eutelia albidisca*, sp. n.

Antennæ of male ciliated.

♂. Head, thorax, and abdomen fuscous, irrorated with white and a few black scales; metathoracic crest white and rufous; tarsi ringed with white; abdomen with subdorsal tufts of white hair at base and white patch on terminal segment, the crests dark, the ventral surface whitish. Fore wing greyish fuscous, irrorated with white, the cell and discal area pure white; a curved black antemedial line bent outwards to inner margin; a curved black medial line interrupted in cell; a discoidal lunule and striga beyond upper angle of cell; postmedial line represented by a black point on costa, a black striga from below costa to vein 5, and an indistinctly double sinuous line from cell to inner margin; subterminal line slight, white, irregularly dentate, excurved from below costa to vein 6; a terminal series of small black lunules. Hind wing white, the terminal area fuscous, broadly so at costa, narrowing to tornus; the underside with the costal and terminal areas suffused with grey and irrorated with brown, a black discoidal lunule, and ill-defined slightly waved medial and postmedial lines, interrupted at middle and on inner area.

*Hab.* CAPE COLONY, Brak Kloof (*Mrs. White*), 1 ♂ type. *Exp.* 26 mm.

*Eutelia rufula*, sp. n.

Antennæ of male ciliated.

Head and thorax deep rufous; terminal half of patagia and mesothorax greyish ochreous; pectus ochreous; legs

brown and ochreous, the tarsi blackish with pale rings; abdomen ochreous, dorsally suffused with rufous and grey except at base, the slight dorsal crests dark. Fore wing with the basal half ochreous, suffused with violaceous white; an obliquely curved antemedial rufous band; a dark spot in middle of cell; an interrupted curved medial line forming the inner edge of the rufous terminal half; an obscure discoidal spot defined by blackish points and some rufous; some violaceous suffusion before and beyond the postmedial line, which is double, oblique from costa to vein 6, then inwardly oblique and sinuous; subterminal line violaceous grey, defined by obscure dark marks before and beyond it, slightly angled outwards at vein 7 and excurved at middle; a fine black terminal line and whitish line at base of cilia, which are fuscous. Hind wing fuscous brown, the interspaces of basal half somewhat paler; a fine dark terminal line and pale line at base of cilia; the underside pale, a discoidal point, curved medial and double postmedial lines.

*Hab.* PERAK (*Künstler*), 1 ♀; SINGAPORE (*Ridley*), 4 ♂, 1 ♀ type. *Exp.* 22 mm.

*Entelia siccata*, sp. n.

♀. Head and thorax brown mixed with fuscous; tegulæ with black spots; abdomen grey-brown, irrorated with fuscous, the slight dorsal crests black, small black subdorsal spots on first three segments, and some lateral spots. Fore wing reddish brown, tinged with fuscous, the interspaces rather paler, giving a streaky appearance; a diffused blackish subbasal mark on inner area; the antemedial area rather pale; an obscure dark discoidal mark; the lines obsolete, except double oblique striæ at middle of inner margin, representing the postmedial line; a small white spot on inner margin towards tornus; traces of a subterminal series of small dark spots; a terminal series of small black lunules. Hind wing fuscous brown, the basal area paler; a slight pale mark on termen near tornus; the underside with traces of curved medial and double postmedial lines, the latter with slight black streaks on median nervures; a terminal series of small black lunules, the one near tornus with white mark before it.

*Hab.* SIERRA LEONE (*Carter*), 1 ♀ type. *Exp.* 28 mm.

[To be continued.]

XLIV.—*Some Observations on the Development of an Asterid with Large Yolk Eggs from the Franklin Islands.*  
By E. H. HENDERSON, M.Sc., M.D., McGill University,  
Montreal\*.

[Plates XII. & XIII.]

THE material consisted of a brood of young starfish collected off the Franklin Islands and belonging to the British Museum, and the work was carried on in the Zoological Laboratories of McGill University during the summer vacations of the years 1902-03-04.

*External Appearance.*—On examination the specimens showed evidence of being in the fixing stage, being agglutinated together into masses resembling miniature bunches of grapes. The five-rayed shape was in all cases evident and at first sight seemed to be due in part to the pressure of neighbouring embryos on each other, but on closer examination was seen to be really due to the assumption of that typical form of the adult starfish.

When one of these masses was separated with a needle into its constituent members and examined under a hand-lens, it became evident that the individual members were connected together in the region of the preoral lobe (this arrangement giving them that peculiar bunched appearance), the preoral lobes being central, while the dorsal portions of the embryos were outermost.

The individuals themselves were of large size, measuring almost 2 mm. in diameter; they were hemispherical in shape, the ventral surface being flat and showing the radial symmetry, the dorsal surface dome-shaped. There were only two or three members of the collection which did not show radial symmetry, and these proved to be only masses of yolk surrounded by a membrane, very likely unfertilized eggs (Pl. XII. fig. B).

Pl. XII. fig. A shows a group of three, from which others have been detached, so as to reveal the characteristic union of the preoral lobes.

Pl. XII. figs. C and D are drawings to represent what were the earliest stages in the collection. The preoral lobe is still prominent, showing little or no constriction, while the hydrocœle is just appearing as two longitudinal ridges in each radius. The five-rayed appearance is seen only from the

\* Abstract of a thesis presented for the M.Sc. degree.

ventral surface, as the arms have not yet grown out and differentiated themselves from the body, so that the embryo from above appears spherical. In some instances (fig. D) there could be seen distinct bosses, or projections, in each radius along the line of, and just dorsal to, the tube-feet. These are the arms of the future starfish.

Pl. XII. fig. E (ventral surface) shows the latest stage that was found, and it existed in the material in great numbers. The pentamerous arrangement is distinctly seen both from above and below. The ridges shown in figs. C and D have developed well-marked tube-feet in fig. E. These can be counted by a hand-lens and appear as small round white papillæ, ten or twelve in each arm. At this stage the preoral lobe is to a considerable extent atrophied, and is about to separate off from the young starfish.

I might here state that the adherence of the preoral lobes to each other is due rather to some agglutinative material, which forms a coagulum between them, than to any cupping or suction action, and that they cling to one another thus till the stalk is excessively atrophied and ready to separate from the body.

Having described the external appearance, I may now briefly indicate the results of the study of sections.

*Methods adopted.*—The great difficulty was to get these large yolky larvæ penetrated to the centre with celloidin or paraffin, so that proper sections might be made. Both the chloroform-paraffin and the benzol-paraffin methods were tried, but in each case it was found to be impossible, even with the greatest care, to get the paraffin to penetrate the mass of yolk; when the larvæ were sectioned the centre would drop out, leaving the outside tissue in the form of a ring, and so the celloidin method had to be adopted. Thin, medium, and thick solutions were used, since the more gradual the change of density in successive solutions the better is the degree of penetration. It is well to leave them in each solution at least twenty-four hours, and a longer time gives better results. Some of my best sections were made last summer from material that had been lying in a thin solution of celloidin for over a year.

The sections from a celloidin-paraffin block have a tendency to curl, a trouble which is remedied in a large measure by having an exceedingly sharp razor and a Bunsen flame near by or else bright sunshine playing over the surface of the microtome.

The sections were cut in varying thickness from  $5\ \mu$  to  $10\ \mu$ .

In thick sections the yolk is not nearly so apt to be broken nor is there such a liability in folding, but there is a greater liability to curl. The sections were then mounted on the slide in hot water to flatten them. They were stained in hæmatoxylin, then washed in running tap-water till the excess of stain was removed and until they took on a deep blue colour. They were then doubly stained in eosin (watery solution).

By such procedure very successful results in staining were attained and the differentiation between yolk and tissue shown up clearly and distinctly.

*Internal Anatomy.*—The type of development conforms exactly to that shown in *Asterina gibbosa* as described by MacBride\*. The chief difference is that the embryos under discussion are much larger in size and have all the interstices of the body gorged with yolk. The cœlomic cavities, hydrocœles (both right and left), perihæmal spaces, the stone-canal, and pore-canal all have developed in a similar manner to that which has been described in the case of *Asterina*. Pl. XII. fig. F shows the relations of the cœlomic spaces. The right posterior cœlom (*r.p.c.*) is placed dorsally; the left posterior cœlom (*l.p.c.*) with its right ventral horn (*l.p.c.'*) extends over to the right on the ventral surface. Between these two portions of the left cœlom is seen the remains of the old anterior cœlom, now the axial sinus (*ax.*), with the stone-canal (*st.c.*) on its posterior wall. The development of all these structures is the same as in the case of *Asterina* and by their further growth and changes leads to similar alterations in the structure of the organism.

The perihæmal spaces are derived from evaginations of the cœlom, four arising from the left posterior and one from the anterior cœlom. Pl. XII. fig. F shows one (*ph.* 1-5) developed from the left cœlom and also one (*ph.* 1-2) developed from the anterior cœlom (*ax.*). These tongue-like projections of cœlom insinuate themselves between the lobes of the hydrocœle and the ectoderm from either side and finally meeting beneath the floor of the hydrocœle form a septum. Pl. XIII. fig. G serves to illustrate another point, viz. the relation of the preoral cavity to the axial sinus. The constriction of the preoral lobe or stalk from the body is effected by opposite sides of the stalk becoming approximated to each other and folded, so that portions are invaginated into the interior and destroyed by histolysis. This process causes the anterior cœlom to become divided into two portions—

\* E. W. MacBride, "The Development of *Asterina gibbosa*," Q. J. M. S. 1896.



a stalk-cœlom, which is cast off, and a portion remaining with the body called the axial sinus (*ax.*).

The alimentary tract is hard to define in many sections. No trace of either mouth or anus is found to exist. All that can be seen of an alimentary system is an extensively folded and coiled gut-wall lying in the interior yolk. In Pl. XIII. fig. H I have endeavoured to show its appearance. One is able to follow its general outline fairly well in some sections, but the interior within the outer line of the gut-wall reveals only a disturbed mass of broken-down yolk, portions of gut-wall, and amœbocytes. The gut-cells are oblong or oval in shape with irregular ends towards the lumen, and seem to be engulfing yolk, as particles of yolk can be seen not only among them but also in their substance. In places where the lumen can be seen it often appears full of yolk which is granular, showing that it is being broken up by a process, perhaps, of digestion and absorption.

The yolk forms by far the largest part of the whole starfish, at least nine-tenths of the whole bulk is yolk. Stained with eosin this becomes easily differentiated from the other tissues. It is composed chiefly of large globular or irregularly shaped masses (Pl. XIII. fig. J), which are closely apposed to one another, leaving few chinks intervening. This yolk not only fills up the centre but penetrates everywhere; in fact, the whole of the tissues would seem to have been built up around it, as, indeed, they really are. It is found among the ectoderm cells, between the ectodermic wall and the peritoneal wall of the cœlomic spaces, and among the cells of the gut-wall, while with the gut it composes the main mass of the interior. Here it so presses on the cœlomic sacs as to almost obliterate them—the two peritoneal walls being brought into close apposition, so that the cœlom is not seen at all as an open space, but only as a layer of peritoneal tissue in the midst of yolk.

*Histology.*—The structure of the body-wall differs on the oral and aboral surfaces. On the dorsum the ectoderm consists of a single layer of flattened cells, which, as the ventral surface is approached, gradually merge into long and narrow cells (Pl. XIII. fig. H). On the dorsal surface the ectoderm lies in close relation to the peritoneum, while on the ventral surface it is separated by a mass of yolk, among which are found amœbocytes and tissues of the mesenchyme. On the ventral surface beneath the hydrocœle the ectoderm cells increase in number, and become long and filamentous, and closely compacted, so that if the section be thick there is nothing to be seen but a mass of nuclei.



Immediately beneath the bases of the ectoderm cells, where these abut on the perihæmal spaces, it is possible to trace evidence of what I conclude to be the nervous system. This appears as a layer of exceedingly fine fibrils, which could only be made out by a high power, and which apparently replaces the mesenchyme intervening between the ectoderm and the walls of the perihæmal spaces (Pl. XIII. fig. I).

The cells of the peritoneum vary in shape from flattened to cubical, and occasionally one sees evidence of fine myo-epithelial cells, the beginning of muscle-formation. The ectoderm, too, is often bent into folds, while the peritoneum remains straight, a fact which may be regarded as evidence of the contractile power of the latter. This is especially true of the preoral lobe, the ectoderm of which becomes folded into pockets, while the peritoneum of the cœlom assumes a contracted appearance. These folds are closed off from the exterior and are then destroyed by amœbocytes.

The cells of the hydrocœle vary in appearance from columnar to flattened or cubical. In the radial water vascular canal they are flat or cubical, while in the tube-feet and terminal tentacles they are columnar and increased in number, so that the nuclei appear several layers deep (Pl. XIII. fig. I). Fig. I also shows muscular elements developing on the aboral side of the walls of the perihæmal spaces (*musc.*). These muscles would serve, when in action, to draw together the ambulacral ossicles of opposite sides and so close the ambulacral groove in the adult.

Pl. XIII. fig. J shows a curious group of cells projecting into the axial sinus from its posterior wall. This is the ovoid gland, and is composed of a mass of primitive germ-cells. These are large and cylindrical in shape, held together by fibres derived from the mesenchyme. In places the surface of this group of cells is irregular and folded, and covered with smaller cells, which are doubtless derived from the peritoneum of the axial sinus, which has been pushed in before it in its growth forward. Further, it is developed from the wall of the left posterior cœlom, which becomes thickened and invaginated.

The foregoing are the chief points which could be made out from the material. I have endeavoured to show, in my thesis, of which this is an abstract, the close parallelism in development between this organism and *Asterina*; while here I have mentioned them but briefly, and rather dwelt on the more important differences, and some points of technique, which I have learned while doing the laboratory work.

## EXPLANATION OF THE PLATES.

*List of Abbreviations employed.*

*ant.cœ.*, anterior cœlom; *ax.*, axial sinus; *ect.*, ectoderm; *hist.*, a spot on the preoral lobe undergoing histolysis; *hyd.*, left hydrocœle; I.-V., its five primary lobes; *l.p.c.*, left posterior cœlom; *l.'p.'c.'*, its right ventral extension; *mes.*, mesenchyme; *musc.*, muscular tissue developing from the wall of the perihæmal canal; *nerv.*, nervous fibrils; *per.*, peritoneum; *ph.*, rudiments of the perihæmal spaces; *ph.* 1-5, that between lobes I. and V. of the hydrocœle; *ph.* 1-2, that between lobes I. and II. of the hydrocœle; *pr.germ.*, primitive germ-cells; *r.p.c.*, right posterior cœlom; *st.c.*, stone-canal.

## PLATE XII.

*Fig. A.* Three embryos adhering by their preoral lobes.

*Fig. B.* An unfertilized egg.

*Fig. C.* The youngest embryo in the collection, showing primary lobes of the hydrocœle.

*Fig. D.* A slightly older embryo. The rudiments of the arms appear as bosses above the lobes of the hydrocœle.

*Fig. E.* The oldest embryo in the collection. The pentagonal form is clear, and the rudiments of the tube-feet have appeared.

*Fig. F.* Transverse section of a comparatively young embryo, showing relations of cœlomic cavities, the stone-canal as open groove, and the perihæmal cavities arising as evaginations of the cœlom.

## PLATE XIII.

*Fig. G.* Portion of another transverse section of an embryo about the same age as that represented in Pl. XII. *fig. F.*, showing the formation of the axial sinus by constriction from the anterior cœlom.

*Fig. H.* Another transverse section, showing gut-wall and its relation to the yolk.

*Fig. I.* Section, more highly magnified, of a small portion of the ventral body-wall, showing the relations of a lobe of the hydrocœle to the perihæmal space and the ectoderm. The beginnings of nervous and muscular tissue are seen.

*Fig. J.* Section, highly magnified, of a small portion of the dorsal body-wall, showing yolk-globules in the dermis and the first rudiment (*pr.germ.*) of the genital stolon or "ovoid gland."

Zoological Laboratory, McGill University.

June 1905.

*XLV.—Descriptions and Records of Bees.—IV.*  
By T. D. A. COCKERELL, University of Colorado.

*Bombus sumatrensis*, sp. n.

♀.—Length about 18 mm.

Head elongate, narrow, the greater part of the clypeus, which is smooth and shining, below the level of the eyes;

malar space long, smooth and shining; a round red tubercle at extreme base of mandibles; labrum bituberculate, with a median depression, its lower part with reddish and black hair; hair of face and cheeks long and black, that of upper part of head mixed black and white, the white hairs being long and mainly on occiput; antennæ entirely black, scape long, strongly curved; first joint of flagellum as long as third or slightly longer, the second much shorter than either; hair of thorax long, dense, yellowish white, with no sign of any median band or patch. Legs very dark reddish, the hind tibiæ and tarsi quite bright ferruginous; hair of legs black and orange, the latter mainly on the distal parts; hind metatarsi very broad. Wings strongly suffused with orange-brown, nervures ferruginous. Hair of abdomen long, black on first two segments, with yellowish white toward the sides, especially on the second; black on third segment, yellowish white on fourth and fifth, the colours largely mixed owing to the overlapping of the long hairs and the presence of more or less pale hair even amongst the black; hair of venter black, except at apex (principally fringe of penultimate segment), where it is yellowish.

*Hab.* Sumatra; marked "at flower, 2381. X<sup>2</sup>, 2. 5. 81." In collection of British Museum, received in 1892.

This is the first *Bombus* known from Sumatra, the *B. bellicosus*, Sm., supposed to be from "Sumatra or India," being really American according to Bingham. It is closely allied to *B. Mearnsi*, Ashmead, from the Philippine Islands. Unfortunately *B. Mearnsi* is known only from a worker which has been in alcohol; but it seems to be different from the Sumatra species, and Dr. Ashmead, to whom I showed the insect now described, expressed the opinion that it was not the same as his. *B. rufipes*, Lep., from Java, is also allied, but is readily distinguished by the black pubescence. Among the Indian species *B. sumatrensis* appears to be nearest to *B. funerarius*, Sm.

### *Cladocerapis bipectinatus* (Smith).

*Lamprocolletes bipectinatus*, Smith, Trans. Ent. Soc. Lond. 1856, Proc. p. 31.

Smith described this remarkable bee as above, and then in 1862, forgetting all about the first description, redescribed it as *L. cladocerus*. The species, under the latter name, became in 1904 the type of my genus *Cladocerapis*.

## ANTHOPHORA, Latr.

The Australian species before me may be separated as follows :—

- Abdomen not, or not obviously, banded; covered with appressed fulvous hair . . . . . 1.  
 Abdomen conspicuously banded . . . . . 2.
1. Tegument of abdomen black, except broad hind margins of segments; clypeus yellow, with two large brown patches . . . . . *scymna*, Gribodo, ♀.  
 Tegument of abdomen red; clypeus with a large reversed **T** in yellow . . . . . *rhodoseymna*, Ckll., ♂.
2. Clypeus light, with a black stripe on each side of the upper part; males . . . . . 3.  
 Clypeus with at least large black marks . . . . . 6.
3. Larger, about 13 mm. long; hair of thorax above bright orange-fulvous, with black intermixed; abdominal bands bright blue. *emendata* Gilberti, Ckll.  
 Smaller; abdominal bands greenish or ochreous or pallid . . . . . 4.
4. Hair of thorax above bright orange-fulvous, with black intermixed; abdominal bands emerald-green shading to blue . . . . . *emendata*, Smith.  
 Hair of thorax above ochreous or light fulvous, with black intermixed . . . . . 5.
5. Abdominal bands very light bluish . . . . . *zonata subcærulea* (Lep.).  
 Abdominal bands very light greenish . . . . . *zonata subcærulea* (Lep.).
6. Sides of clypeus broadly black, leaving a light pyramid, which is notched on each side; abdominal bands dull white; size rather small; male . . . . . *Salteri*, Ckll.  
 Clypeus with a large reversed **T** in yellow, its stem broadly truncate on upper margin; size rather small; males . . . . . 7.  
 Clypeus with a light reversed **T**, its stem tapering above, pointed; size larger; females . . . . . 8.
7. Hair of mesothorax light blue mixed with black . . . . . *Walkeri*, Ckll.  
 Hair of mesothorax yellow mixed with black . . . . . *adelaidæ*, Ckll.
8. Hair of mesothorax light greenish mixed with black; light hair on outer side of middle legs strongly suffused with blue; abdominal bands light blue . . . . . *cingulata* (Fabr.).  
 Hair of mesothorax light blue mixed with black; abdominal bands very bright greenish blue . . . . . *Walkeri*, Ckll.  
 Hair of mesothorax very bright orange-fulvous mixed with black; light hair on outer side of hind legs orange-fulvous; larger than the next species . . . . . *emendata* Gilberti, Ckll.  
 Hair of mesothorax paler fulvous, inclining to greenish and mixed with black; light hair on outer side of hind legs white . . . . . *zonata* (L.).

*Anthophora scymna*, Gribodo.

Described from a single ♀ from Queensland. A ♀ before me is from West Australia, "68. 6."

*Anthophora rhodosecymna*, sp. n.

♂.—Length about 12½–13 mm.

Similar to *A. scymna*, but differing thus: tegument of abdomen entirely bright red, with appressed orange hair, that on first segment more erect and with some black intermixed; that on hind margins of segments pale golden, producing faint bands; apex without dark hair; clypeus with a light orange reversed T, the upwardly-directed stem tapering to a point; hair of cheeks abundant and snow-white; of vertex and occiput pale yellowish and mixed with black; of thorax above light yellowish, copiously mixed with black; of pleura pale yellowish; tegulæ apricot-colour; wings stained with brown along the veins; the red legs have orange pubescence, but the thick fringe on each side of hind metatarsus and the long inner anterior fringe of hind tibia are black; the hind femora have short black hair beneath. The fourth ventral segment of abdomen has a conspicuous median tubercle, beset with short ferruginous hair; the fifth segment is deeply emarginate and the apical one ends in two rather short widely separated spines, with a low elevation, pyramidal in outline, between.

*Hab.* Queensland (*Gilbert Turner*); marked "300 Hy." Three males.

It is not impossible that this is the undescribed male of *A. scymna*, but with the evidence at present available it must be considered distinct.

The species of the group of *A. zonata* are very difficult to classify. Dours, in 1869, recognized only *A. cinctofemorata*, Sichel, with a very strongly punctured abdomen, and *A. zonata* (L.), from Australia, the latter being credited with a number of named varieties. According to the characters given in descriptions, the various named Australian forms may be separated thus:—

- |   |    |                                 |
|---|----|---------------------------------|
| Size small, usually less than 13 mm.....                                  | 1. |                                 |
| Size larger.....  | 3. |                                 |
| 1. Hair of thorax silvery; abdominal bands blue,<br>with some green ..... |    | <i>cinctofemorata</i> , Sichel. |
| Hair of thorax reddish or rufo-fulvous.....                               | 2. |                                 |
| 2. Bands of abdomen metallic blue; light hair of<br>legs white .....      |    | <i>zonata</i> (L.).             |

- Bands bluish white; hair of thorax ruf-fulvous ..... *pulchra*, Sm.  
 3. Bands blue or silvery blue; hair of legs on outside ferruginous ..... *emendata*, Sm.  
 Bands bluish green or pale blue, not very metallic; hair of legs on outside bluish.... *cingulata* (Fabr.).

*A. cinctofemorata* is clearly distinct from anything I have seen. The species before me I classify as follows, recognizing that some revision will probably be necessary in the light of fuller information:—

*Anthophora zonata* (L.).

Three females from Queensland (*Gilbert Turner*, 298) and "Australia, 95.64," agree excellently with *zonata*. Curiously, however, the two males accompanying them, collected in Queensland by Gilbert Turner (297 Hy. and 298), are both of the variety *subcaerulea* (Lep.), not hitherto reported from Australia. The one labelled 298 has pale blue bands, the other a sort of greenish white.

*Anthophora emendata*, Smith.

Queensland (*Gilbert Turner*, 299); 1 ♀, 2 ♂.

The two males differ greatly in size, but they appear to belong to the same species, and the collector has given them the same number. The fifth ventral segment in the male is more strongly emarginate than in *zonata*, so I do not think *emendata* can be a mere colour-variety. Smith describes the female as 6 lines long, and gives good reasons for supposing that Dours's measurement of 18 mm. (under the erroneous name "*cincta*, Fabr.") is a mistake. My female and one of the males are larger than Smith indicates, being about 13 mm. long, but the small male agrees with Smith's measurement. Smith says the female has the clypeus reddish yellow, while Dours says it is marked as in *zonata*; my ♀ agrees with the latter statement. Smith says that the ventral surface of the abdomen has fulvous hair in the middle, white at the sides; Dours says reddish black in the middle, white at sides; my insect has it black in the middle, white at the sides. In view of these discrepancies I will designate my insect var. *Gilberti*, taking the female and large male as typical of the variety.

*Anthophora Walkeri*, sp. n.

♀.—Length just over 12 mm.

Face-markings &c. agreeing with *zonata*; flagellum, except

at base, ferruginous beneath; hair of vertex and thorax above bluish white very strongly mixed with black, of pleura bluish white, of cheeks and sides of metathorax white, of legs as in *zonata*; abdominal bands strongly metallic, the first emerald-green, the other three paler, with mother-of-pearl tints; tegulae dark rufous.

♂.—Length about 10 mm.

Face-marks chrome-yellow; clypeus with a large black mark on each side, shaped like a human foot; hair of hind tarsi entirely black; abdominal bands emerald-green, the last two and the third at the sides largely overlaid with white.

*Hab.* Baudin Island, Long Reef, Western Australia, 2 ♀, 1 ♂, collected by Commander J. J. Walker on the 'Penguin' Expedition.

This exquisite species is appropriately named after its discoverer, whose collections have made such important additions to our knowledge of the Australian insect-fauna. It is nearest to *A. cingulata*, but distinguished by its smaller size and strongly metallic bands, and in the male by the markings of the clypeus. The structure of the male abdomen beneath is nearly as in *zonata*. It is to be remarked that the Australian *A. cingulata*, as described by Dours, does not agree with the Indian *cingulata*, described by Bingham. As the species was originally described from Australia, I take it that the Doursian description pertains to the true *cingulata*, though the length he gives (18 mm.) must be a misprint for 13. Dours says the wings are 10 mm. long, and I find them so in a specimen 13 mm. long.

#### *Anthophora cingulata* (Fabr.).

Clare, South Australia (*W. Wesche*); two females taken, Nov. 20, 1904.

The hair on the outside of the front and middle legs is largely bluish green. Froggatt states that this bee is widely distributed over the southern part of Australia (*Tr. Roy. Soc. Austr.*, June 1893).

#### *Anthophora adelaidæ*, sp. n.

♂.—Length about 11 mm.

Looks like a variety of *A. zonata* or *pulchra*, but is distinguished as follows: face-marks chrome-yellow; clypeus at upper sides with large foot-like black patches, with the heel very long and the toe very short; hair of head and thorax above as in *zonata*, light fulvous strongly mixed with black;

abdominal bands light yellowish with a sort of greenish tint; fifth ventral segment feebly emarginate, as in *zonata*, but with a large, median, subapical, dull black patch where the sculpture runs in semicircular lines; flagellum ferruginous beneath; legs as in *zonata*.

*Hab.* Adelaide River (*J. J. Walker*, 890).

*Anthophora Salteri*, sp. n.

♂.—Length about 11 mm.

Looks just like *A. adelaidæ*, except that the abdominal bands are dull white, the foot-like marks on the clypeus have a short heel and a long thick toe, and the flagellum is only dull dark brownish beneath. I should hardly venture to separate it but for the entirely different structure of the fifth ventral segment of the abdomen, which has a very broad, deep, rounded emargination, its sides forming nearly a right angle with the margin on each side, which is furnished with two or three short but strong spines.

*Hab.* Paramatta, N.S.W. (*W. R. Salter*).

PROSOPIS, Fabr.

All the species in the following table have the abdomen blue or green:—

First recurrent nervure meeting first transverso-cubital or entering extreme apex of first submarginal cell; abdomen dark blue ..	1.	
Both recurrent nervures received by second submarginal cell .....	3.	
1. Large, about 11 mm. long; face with three yellow stripes .....		<i>alcyonea</i> , Erichs., ♀.
Small, less than 7 mm. long .....	2.	
2. Face all creamy white below level of antennæ. Lateral margins of clypeus dark; no light supraclypeal mark .....		<i>albonitens</i> , Ckll.
3. Scutellum and postscutellum yellow .....		<i>disjuncta</i> , Ckll.
Scutellum and postscutellum not yellow ....	4.	<i>parallela</i> , Ckll.
4. Tubercles conspicuously marked with yellow or white .....	5.	
Tubercles not so marked, wholly metallic, or rarely with a median non-metallic greyish band .....	6.	
5. Large; mesothorax black; face-marks and tubercles very bright yellow .....		<i>alcyonea</i> , Erichs., ♂.
Smaller; mesothorax green; face-marks and mark on tubercles cream-colour .....		<i>varicolor</i> , Smith.
6. Head, thorax, and abdomen bright green ....		<i>perviridis</i> , Ckll.
Abdomen deep blue .....	7.	
7. Larger; face with three narrow cream-coloured stripes .....		<i>reginarum</i> , Ckll.
Smaller; face in male all white below antennæ, in female without light markings....		<i>Turneriana</i> , Ckll.



*Prosopis alcyonea*, Erichs.

Albany, W. Australia (*J. J. Walker*, 4296), 1 ♂ ; Franklin, Tasmania (*J. J. Walker*, 3469), 1 ♀ .

The difference in venation indicated by the above table is not specific, I believe, the insects being so similar in all other respects. The male has the first r. n. nearer the base of the second s.m. on one side than on the other. Erichson described only the female; the male has most of the face bright chrome-yellow, but there is a black band down each side of the clypeus. The lateral face-marks narrow abruptly just above the antennæ and are then continued very narrowly nearly to the top of the eyes. There is a yellow mark in front of the anterior ocellus. The curious shining tubercle at the base of the metathorax is as in the female. Evidently *P. vidua*, Smith, is the male of *alcyonea*, as Smith himself surmised; Smith's type had the venation as in my female.

*Prosopis varicolor*, Smith.

Townsville, Queensland, 5. 3. 02 (*F. P. Dodd*); also 13. 12. 01 (same collector). Both sexes.

This is evidently Smith's species, but the face-markings are cream-colour rather than white and the punctures of the abdomen are quite strong. The male, not hitherto described, is like the female, but the face-marks are ivory-white, the lateral marks larger and longer, and the much narrower and more elongate clypeus has a large white triangle, occupying the greater part of its disk. The blue and green shades of the abdomen are very brilliant.

*Prosopis albonitens*, sp. n.

♂.—Length a little over 5 mm.

Very closely and minutely punctured; dark deep blue; light markings ivory-white, with a canary-yellow suffusion on anterior and middle tibiæ. Face below antennæ all shining ivory-white, the white ending between the antennæ in a rounded prominence, but along the orbital margins extending upwards, gradually narrowing to a point, the distance from which to the top of the eye is about as great as the distance of the latter from a lateral ocellus; mandibles and scape in front ivory-white; flagellum brown, pale and yellowish beneath; mesothorax convex, very closely and minutely punctured; hind border of prothorax continued to cover tubercles, but interrupted in middle, white; base of metathorax with a very large area, semilunar in form, with the

ends (sides) shortened, bounded by a sharp ridge, except in the middle line posteriorly; this area is shining and is divided into three subequal parts by two longitudinal carinae, the lateral spaces being rather obscurely obliquely ridged. Legs piceous brown and yellowish white; femora dark except the anterior knees; tibiae light, the anterior ones wholly so, the middle ones with a dark spot behind, the hind ones with a very broad, dark, subapical ring; tarsi yellowish white, with the last two joints of the middle and the last three of the hind tarsi pale brown; tegulae with a white spot in front; abdomen rather narrow, the hardly noticeable fine pilosity white as far as the third segment, after that black.

*Hab.* Queensland (*Gilbert Turner*, 713, *Ridg.* 11.91).

*Prosopis disjuncta*, sp. n.

♂.—Length about  $6\frac{1}{2}$  mm.

Strongly punctured, but not so closely as in *P. albonitens*, the punctures of the mesothorax in particular being much larger, more irregular, and less dense; dark blue, the head and thorax inclining to steel-blue, the abdomen to deep rich purple; light markings cream-colour or a very pale primrose; wings hyaline, nervures dark. Clypeus light, with a dark margin, this margin varying in breadth, so that the light triangle may be very large or rather small; lateral face-marks broad, bow-shaped, notched above by the antennal sockets; mandibles and scape wholly dark; flagellum brown, yellowish ferruginous beneath; middle of front elevated and rugose, the elevation bounded on each side by a sharp ridge; at each side of this elevation is a smooth shining area; hind border of prothorax and large spot on tubercles light, but the two light areas are not nearly continuous; basal area of metathorax somewhat dumbbell-shaped, broader at the sides than in the middle; tegulae with a small light spot. Legs dark, slightly metallic; the anterior tibia and metatarsus in front, a small spot at base of middle and hind tibiae, a very small spot at apex of middle tibia, and short line on its tarsus, yellow; abdomen with the almost imperceptible pilosity white as far as the fourth segment, after that black.

*Hab.* Queensland (*Gilbert Turner*, 717, *Ridg.* 11.91).  
Two.

*Prosopis parallela*, sp. n.

♀.—Length nearly  $8\frac{1}{2}$  mm.

Strongly punctured, the punctures very large and dense

on mesothorax ; bright Prussian green, the abdomen a bluer green except near the sutures, the first two segments strongly suffused with purple above ; light markings bright chrome-yellow, except those of the head, which are pellucid grey, but one has the upper end of the median facial stripe yellow, and probably the markings should all be of that colour when fully mature ; wings hyaline, nervures dark. Head elongated, the facial quadrangle nearly twice as long as broad ; inner orbital margin above gently concave ; mandibles wholly dark, strongly ridged ; light markings of head consisting of a stripe behind the eyes and three nearly parallel stripes on the face, the middle one going up to the middle ocellus, the lateral ones failing a short distance before top of eye ; scape long and wholly dark ; flagellum ferruginous beneath ; hind border of prothorax (continuous in middle, but not reaching tubercles), tubercles, spot on tegulæ, triangular spot just below wings, scutellum and post-scutellum (except lateral corners) all yellow ; basal area of metathorax triangular, not bounded by a ridge, but abruptly defined by the absence of punctures, finely shagreened, shining green, appearing purplish in some lights ; legs brown-black, a light yellow spot at base of anterior and middle tibiæ ; apex of abdomen with black hairs. The base of the metathorax is radically different from that of *P. disjuncta* and *P. albonitens*, but is of quite the same type as that of *P. varicolor*, which is closely allied.

*Hab.* Queensland (*Gilbert Turner*, 852, Ridg. 11.93, and 272 Hy.). Two.

*Prosopis perviridis*, sp. n.

♀.—Length about 8 mm.

Strongly punctured, the punctures of the mesothorax well separated on a shining ground ; brilliant green, even including the legs, except the tarsi, the metallic colour of which is purplish ; wings hyaline, with dark nervures. Head broad and not especially long ; mandibles and scape dark, flagellum ferruginous beneath ; median and lateral stripes on face and stripe behind eyes light chrome-yellow ; the median stripe is expanded on clypeal margin to look like the head of a nail in profile ; in the supraclypeal area it is represented by a round mark, and above that it is shaped like a spear-head, not reaching the ocellus ; the lateral stripes have a linear extension to the top of the eyes ; hind border of prothorax with two yellow stripes, but tubercles wholly green ; a small light yellow spot just beneath the wings and a streak on axillæ ; tegulæ green in front, with no light

spot; scutellum and postscutellum broad and flattened, the former shining, with widely separated punctures; basal area of metathorax triangular, large, smooth and shining, bounded by a groove; anterior and middle tibiæ marked with yellow at base; abdomen rather broad, the apical segments strongly retractile; the abdomen recalls that of a *Ceratina*.

*Hab.* Adelaide River (*J. J. Walker*, 5759). Collected on the 'Penguin' Expedition.

*Prosopis reginarum*, sp. n.

♀.—Length nearly 10 mm.

Strongly punctured, the punctures on the mesothorax close; deep blue, with purple tints, the mesothorax greenish blue; light markings cream-colour; wings rather dusky, nervures dark. This has in general the structure and markings of *P. perviridis*, but it not only differs in its deep blue colour, darker wings, and more closely punctured mesothorax, but also as follows: flagellum wholly dark; no light stripe on axillæ; median facial stripe not reaching far above antennæ, the spear-head mark divided by a dark line. The apical part of the abdomen has long coarse black hair. The tubercles are fringed with white pubescence, and have a minute, hardly visible, light spot.

*Hab.* Queensland (*Gilbert Turner*, 270 Hy.).

*Prosopis Turneriana*, sp. n.

♂.—Length 8–9 mm.

Strongly punctured, the punctures very dense on the mesothorax; head and thorax bluish green, with purple tints; abdomen deep shining blue, with purple tints; anterior coxæ purple, but their femora olive-green; metallic tints of middle and hind legs purplish blue; wings dusky at apex, nervures dark. Head ordinary; face below antennæ white, the white ascending only a short distance above in the middle line, giving way to a groove which ascends to the middle ocellus; lateral marks ending very broadly and bluntly about halfway between the antennæ and the top of the eyes; labrum with a light spot; mandibles with a small light stripe; scape creamy white in front, flagellum dull ferruginous beneath; enclosure of metathorax triangular, shining, of the type of *P. varicolor*; no yellow or white marks on thorax; tubercles shining reddish purple; tegulæ with a light spot in front; anterior and middle tibiæ light yellow in front; apex of abdomen with two short widely separated teeth; last three ventral segments strongly tufted

with black. The hind tibiæ may have a cream-coloured stripe on basal half. The face-markings in the specimens described are more or less discoloured.

♀.—Similar, but the face is without light markings and the area in front of the ocelli is brassy.

*Hab.* Queensland (*Gilbert Turner*, 383 Hy., males, and 269 Hy., females). Two of each sex.

The mouth-parts of this species seem not to be those of true *Prosopis*; it is probable that the Australian species assigned to this genus should form the basis of one or two new genera, but I do not feel able to offer a plan of segregation just at present.

*Prosopis Lubbocki*, n. n.

*Prosopis metallica*, Smith, Trans. Ent. Soc. Lond. 1862, p. 59 (Australia, in coll. of J. Lubbock), ♂, not ♀.

It seems very unlikely that the insects described as the sexes of *P. metallica* are conspecific, and it will probably cause less confusion if the male is separated under the above name.

*Prosopis Frederici*, n. n.

*Prosopis similis*, Smith, Cat. Hym. Brit. Mus. 1853, p. 26 (Australia). Not of Fabricius, 1793.

*Prosopis Cameroni*, n. n.

*Prosopis sulcifrons*, Cameron, Mem. Manchester Soc. 1897, p. 51 (New Zealand). Not of Smith, 1853.

University of Colorado,  
Boulder, Colorado, U.S.A.,  
June 27, 1905.

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XLVI.—*Some Results of the North-Atlantic Fin-Whale Fishery.* By THOMAS SOUTHWELL, F.Z.S.

OUR knowledge of the specific distinctions, habits, and distribution of the members of the family of Cetacea known as the Balænopteridæ, or Fin-Whales, has until quite recently been lamentably deficient, and even now it cannot be said to be very complete. This has undoubtedly been owing to the wide dispersal of these animals over the oceans of the world, their gigantic size, and to the circumstances under which

they until of late occurred having rendered their study a matter of extreme difficulty ; for although members of the family have long been more or less familiar objects in all quarters of the globe, the only opportunities for their scientific study have been the accidental stranding of individual examples on the shores of civilized countries ; and these events have too often occurred in desolate regions, far from the reach of a competent authority, or even of individuals capable of recording the features essential to the due recognition of their species. It thus happened that, mainly owing to hasty deductions from insufficient materials, species were unduly multiplied and an almost inextricable state of confusion arose ; this, happily, through the recent labours of British and Continental cetologists, has at last been reduced to comparative order.

One great aid to the study of these animals has been the perfecting by a Norwegian seaman, Captain Svend Foyn, of Tønsberg, of an apparatus by which these giant whales, hitherto regarded as too dangerous to be attacked by the methods employed in the capture of the Polar whale, could be successfully overcome, and this (although it cannot, in one respect, be regarded otherwise than with extreme regret, seeing that it risks the eventual extermination of these interesting animals) has been the means of providing abundant materials for a critical study of the various species—facilities which have been duly utilized by the naturalists of Europe and America. The whales when captured are towed to the various shore-stations, where their carcasses are converted into oil and manure.

I may here remark that one of the results of the prosecution of this industry is the revelation of the astonishing numbers in which these animals occur in summer in the North Atlantic—a result altogether unlooked for, except perhaps by the far-seeing Capt. Foyn ; and especially has this been the case with two species, Rudolphi's Rorqual and the Blue Whale (*B. Sibbaldii*), which had been regarded as extreme rarities.

I need not dwell further on this portion of the subject than briefly to chronicle the development of the fin-whale fishery ; the success of Herr Foyn soon led to his example being extensively followed, and on the expiration of his patent in 1882 many other companies were formed to hunt from the Finmarken and Murmansk coast, till the Norwegian government enacted restrictions which, added to the growing scarcity of the whales, caused the opening of fresh stations in Iceland, where the whalers had greater freedom of action,

and subsequently of other centres in the Faroe and Shetland Islands.

On the western side of the Atlantic also, in the year 1898, a company, under the name of the "Cabot Steam Whaling Company," commenced operations, thus becoming the pioneer of quite a fleet of vessels now engaged in this fishery from Newfoundland.

It is to a comparison of the results obtained in these three centres, remote from each other, that I wish now to call attention. It may here be remarked that just as happened when the fishery for *Balena biscayensis* in the temperate water of the North Atlantic was abandoned in favour of that of *B. mysticetus* in the Polar seas, the skill and seamanship of the old Basque whalers were still requisitioned, so now in the extension of this new industry in Europe and America it is the Norwegian originators who fill the positions requiring expertness and experience.

In the following notes I purpose to examine, taking each species in succession, the results of the operations in the three great centres of the industry, with a view to ascertaining if possible whether any racial variation is to be observed in the members of the same species frequenting the several localities, as indicated by appreciable differences in their habits, frequency, or external characters. I shall therefore, avoiding as much as possible the commercial aspect of the question, confine my remarks mainly to the comparative abundance of each species with any departures from the normal type, the season of their occurrence, proportionate numbers of the sexes, period of gestation, number of young produced, and such minor considerations as may help to throw light upon the identity or otherwise of the races frequenting the localities under consideration.

As the pioneers of this industry the Norwegians claim our first attention, and it is desirable to use the statistics of a somewhat early period in order that they may be as distinct as possible from those of the more southern areas, which were invaded later on. I am therefore especially fortunate in being allowed, through the kindness of Mr. Alfred Heneage Cocks, to use the statistics collected by that gentleman during his visits to the Finmarken whaling-stations in the years 1883 to 1889\*, on which what follows is mainly based.

The field of operation in the first instance was contiguous to the coast, the whales, especially the large blue whale (*B. Sibbaldii*), penetrating far into the fjords in search of

\* 'Zoologist,' 1884-1890.



food; but as the result of persecution they soon discarded the shore, and the final area in which their pursuit took place was off the coast of Lapland to the north of  $70^{\circ}$  N. lat., especially between Sö:öen on the west and Varanger Fjord on the east, but extending below  $70^{\circ}$  N. off the Murmansk coast (Russia) to Swjatoi Nos in about longitude  $40^{\circ}$  E.

The fin-whales killed, in the order of their frequency, are as follows:—

### BALÆNOPTERA MUSCULUS, Linn.

#### Norwegian Area.

The common rorqual (finhval, sildehval, or rörhval of the Norwegians). This, the most numerous species, occurs from March to the early part of September: 473 were killed in the season of 1885, 646 in 1886, 463 in 1887, and from that year the numbers began to decline; this decline in the number of whales, added to the legal restrictions already referred to, led to the removal of some of the factories to Iceland, the result of which, so far as known, will be included in the Shetland fishery.

The common rorqual is so well known a species that no description of the normal form is needed, but it is subject to considerable variation both in form and coloration; the most important of these is frequently referred to by Mr. Cocks as well known to the Norwegian whalers under the name of "bastarder" or bastard whales, and commonly believed to be the joint offspring of the common rorqual and the blue whale (*B. Sibbaldii*). It appears to attain larger dimensions than the type of the species, and is described as grey rather than white on the under surface; the anterior baleen-plates are white, and the remaining portions darker than normal; the average length of eight females was 68 feet and of five males 70 feet, but 80 feet appears to be no uncommon length. The "bastards" killed in 1887 averaged nearly 5 feet longer than those of the normal type.

Another well-recognized variety is known as the "Ioddehval," *i. e.* capelan whale. This is the common fin-whale of the north; it is white under the belly, and disappears at the end of April. The fin-whale which then comes, Capt. Ellevsen informed Mr. Cocks, "has more or less grey colour among the white, especially on one side [an asymmetrical disposal of colour common to all the rorquals], its snout is generally more pointed, and the whale is more slender and



longer"; he adds that the whales which eat the capelan or "lodde" are only in Finmarken waters in the spring, and "those that eat the 'kril' (*Calanus finmarchicus*), *i. e.* the southern form, come later." This variety is also known as the "langrör" (literally long-reed, as rorqual (rörkval) is the Finmarken dialect for rörhval or reed-whale: *Cocks*), and Capt. Horn, of Yeretiki, informed Mr. Cocks that of sixteen rorquals captured by him off the Murmansk coast in 1889 all were of this variety, and not one normal fin-whale. The variation in colour taken by itself would not amount to much, but in conjunction with several other minor differences in form, food, and the season of their appearance would seem to suggest subspecific value.

It is the opinion of experienced Norwegian whalers that this species pairs in December or January, and that, as a rule, the fœtuses found in April are from 6 to 12 inches long, whereas in August they are from 6 to 10 feet in length and at birth 16 to 20 feet; but that there are many exceptions to this generalization the following examples of actual dates and measurements of fœtuses will show:—

*March*.—4 ft.

*April*.—1 ft.  $4\frac{1}{2}$  in.—5 ft.

*May*.—2nd, female in milk; 7th, 4 ft.; 19th, 4 ft. 2 in.; 20th, 4 ft. 2 in.; 21st, 5 ft. 2 in.; 23rd, 19 $\frac{7}{10}$  in.

*June*.—2nd, 4 ft. 5 in.—3 ft. 8 in.; 10th, 8 ft.; 18th, 2 ft. 1 in.; 20th, 3 ft.; 25th, 4 ft. 6 in.

*July*.—1 ft.  $10\frac{7}{8}$  in.; 5th, 4 ft. 2 in. and 6 ft.; 7th, 6 ft. 6 in. and 8 ft. 1 in.; 8th, 6 ft.; 9th, 6 ft. 6 in.; 12th, 1 ft. 5 in.; 16th, 8 ft. 5 in.; 20th, 3 ft. 1 in.; 24th, 7 ft.; 28th, 4 ft. 8 in.

*August*.—4th, 5 ft. 7 in.; 8th, 10 ft. 5 in.

A whale of this species which came on shore at North Woolwich in November 1899 was delivered after death of twins; and Mr. Haldane tells me that two fœtuses were taken out of a cow at Faroe last year (1904), also that Capt. Castberg, of Ronas Voe, met with a similar case two years ago. These are the only instances of twins which have come to my knowledge.

The deductions to be drawn from the above appear to be that this species in the North-east Atlantic produces a single young one (on very rare occasions two) at rather irregular dates in the autumn months, and that the period of gestation is probably ten months. The destruction of so many gravid females is a matter of great regret, but seems inevitable

under the circumstances. The quantity of oil yielded by one of these animals varies from 800 to 1400 gallons, but averages somewhat over 1000 gallons. 65·64 per cent. of the whales killed in Finmarken, according to Mr. Cocks's statistics, were of this species. The average length of a large number of males was 62 ft. 5 in., and of females 66 ft. 1 in., the proportions of the sexes being about equal. The food consists of herrings, capelan (*Mallotus arcticus*), and various crustaceans (copepods), according to season.

### The Shetland Area.

The gradual decrease in the number of the whales and certain restrictions imposed by the Norwegian government led Capt. Foyn to establish a station in Iceland about the year 1883; but here, again, he met with difficulties from the Danish government, and the enterprise was abandoned before operations had commenced, but eventually they were successfully renewed and spread to the Faroes as well. In 1893 there were said to be thirty steamers fishing from Iceland and seven from the Faroes, and in 1902 nearly 2500 whales were killed by them. In 1903 two stations were opened at Ronas Voe, a third at Colla Firth in 1904, and subsequently a fourth at Olna Firth, all on the mainland of Shetland. In the Hebrides a station was also established at Bunaveneader in North Harris. It is to the results of the operations in this more southerly group of stations that we will now refer.

Mr. R. C. Haldane, of Lochend, Ollaberry, Shetland, has most kindly allowed me to avail myself of his valuable notes on the fishery from Shetland, which has been carried on in his immediate neighbourhood, and as the result of his enquiries informs me that the Iceland fishery was at first pursued on the west coast in Ise Fjord, Brede Fjord, &c., and gradually spread further west, most whales being taken along the Greenland ice in July and August; latterly the east coast has been resorted to. The present areas of the fishery are, I am informed, as follows:—

Iceland . . .	63°-67° N. lat.,	10°-30° W. long.
Faroe . . .	61°-64°	5°-9°
Shetland . .	60°-62°	0°-5°

Before entering upon the comparison of the statistics from this area of the species under consideration (i. e. *B. musculus*), it may be well to mention that a very unlooked-for feature in the fishery has been the occurrence of a number of sperm-

whales. In 1903 a sperm-whale 68 feet long was killed by a Shetland whaler out of a school of five, four of which escaped, and five or six others were killed by the Iceland vessels. A considerable school of these valuable animals, estimated by some at thirty individuals, visited the seas to the eastward of Iceland, and apparently wintered there, for five others were killed by the Bunaveneader vessels in the past season of 1904. But by far the most interesting capture was a whale killed on 3rd July, 1903, in 61° N. lat. and 4° W. long., with whalebone 7 feet long, evidently an Atlantic right whale (*Balena biscayensis*).

Of the first year's operations at Ronas Voe there are no statistics further than that 126 whales were killed; these Mr. Haldane states, with the exception of the sperm-whale already mentioned, "one with barnacles" (probably a humpback), and a bottlenose, were all the common finner (*B. musculus*).

In 1904, 400 finners were killed from Shetland and 37 from Bunaveneader. Of the Shetland finners 236, or 59 per cent., were males and 164, or 41 per cent., females, showing a very large majority of males. Of the total catch of 506 of various species from these islands, 86 (36 per cent.) were finners. Mr. Haldane gives the average length of 135 males as 62 ft. 9 in., and of 91 females 66 ft., an excess of 3 ft. 3 in. over the males. The five longest males were 78, 77, 77, 75, and 75 feet respectively, and the five longest females 78 (an exceptionally large animal), 76, 75, 75, and 73 feet; but the 'Norrøna' has since killed a male, confidently asserted to be of this species, 82 feet long.

The average length of the adult female is believed to be 65 or 66 feet, but a foetus 2 feet long was taken from an example only 50 feet long. In a foetus 16 feet long the baleen had not begun to show, but in one 22 feet long it was well developed and the colour of the young one the same as its mother; at birth the baleen should be quite 2 inches long. The growth of the calf is very rapid, and suckers 40 feet long have been seen; the general opinion among the Norwegian whalers is that a calf of this size is not more than a year old and that the suckers remain with the mother twelve months. In support of the early sexual maturity of the female Mr. Haldane mentions the example just referred to, which, although only 50 feet long, contained a foetus. The whalers, who have had great experience, believe the period of gestation in this species to be eleven months; and a table\* of measurements of eighteen foetuses given by Mr. Haldane,

\* Annals of Scot. Nat. Hist., April 1905, p. 70.

varying from 6 inches to 16 feet, all obtained in one season between the months of April and September, indicates that the dates of birth must be very irregular. In three instances, mentioned above, twins have been observed in this species.

Two fresh slips of whalebone of *B. musculus* kindly sent me by Mr. Haldane were coloured blue-black on the outer margin, toning down to blue-grey for the first third of their width, and merging into clear cream-yellow with a few longitudinal stripes of blue-black in the second third, thence to the inner margin wholly cream-yellow, the hairy fringe the same colour as the portion from which it took origin. The slips of bone measured 25 inches from the gum, to which the bristles added 8 inches, and at the gum they were  $12\frac{1}{2}$  inches wide. A small anterior slip was 11 inches long and  $\frac{1}{2}$  inches wide, bristles  $3\frac{1}{2}$  inches long; wholly a clear pale cream-colour and very transparent.

For about a month from 12th June in 1903 there was an absence of "kril" in the water, and the whales fed largely on herrings, but in 1904 "kril" (*Thysanopoda inermis*) was abundant and they consumed very few herrings; it was quite evident that the kril was their favourite food, and the whales which fed on it were in better condition than when of necessity they were feeding on herrings.

Mr. Haldane informs me that, in addition to the double row of hairs found under the chin in a finner, he has found "another double row on the upper jaw, beginning 3 feet from the snout and running up to just beyond the blow-hole."

#### North-west Atlantic.

Passing to the western side of the Atlantic, we have now to consider the results of the fin-whale fishery from the shores of Newfoundland.

In the year 1896 the steamship 'Cabot,' of 160 tons, was fitted out by a company at St. Johns for the purpose of hunting fin-whales after the manner of the Norwegians. At first the operations took place in Notre Dame Bay, and subsequently in Hermitage Bay, but the number of factories was gradually increased till, according to the Annual Report of the Newfoundland Department of Fisheries for 1904, there were fourteen of these establishments in operation, extending around the island and as far north as Cape Charles on the Labrador coast; and five others were expected to commence operations in the spring of 1905. In the year 1903 there were killed 858 whales, 345 of which were *B. musculus*, and

in 1904 the number was 1275, of which 690 were the species under consideration.

I am not able to give the proportion of males to females of these 1035 "finners," but of the total catch of various species for the two years, numbering 2133 (the sex of one was not recorded), 1192, or 55.91 per cent., were males, and 940, or 44.09 per cent., were females. It may be well to give here the numbers of each species (although they will be repeated as they come separately to be considered). They were as follows:—

Finners . . . .	1035	Rudolphi . . . .	39
Sulphur-bottoms . .	489	Sperm . . . . .	1
Humpbacks . . . .	568	Unknown . . . . .	1

The preponderance of finners will be noticed here also. After the middle of July the finners are found in Notre Dame Bay, where they are most numerous in August; in October they become scarce and in poor condition, and finally leave the coast.

In the year 1899 Dr. F. W. True, of the U.S. National Museum, Washington, paid a first visit to the whaling-station at Snook's Arm, Notre Dame Bay, and as the result of this and subsequent visits there appeared in 1904 a most exhaustive treatise on the 'Whalebone Whales of the Western North Atlantic,' wherein, with all the thoroughness which characterizes the work of that gentleman, he enters minutely into the history of the species of the whales frequenting those regions, and compares them with those inhabiting the European waters. I am thus enabled to avail myself of Dr. True's carefully compiled statistics in what follows.

In 39 examples where the sex was noted 24 were males and 15 females; the males averaged 58 ft. 7 in. and the females 62 ft. 3 in. Ten of the females killed in the month of August contained foetuses or were accompanied by young: of seven foetuses measured by Dr. True, one on the 5th August measured 6 ft. 5 in., another on 15th August 15 ft. 2 in., and a third on the 27th August 6 ft. 10½ in.; it is evident therefore that, as in the European waters, the date of pairing must vary considerably. No instance of twin foetuses is mentioned.

The average length of the longest slip of baleen in six individuals over 55 feet in length, measured from the gum and exclusive of the bristles, is given as 21½ inches.

The following table shows the average measurements of a

large number of Norwegian and Shetland finners, which, although in excess of like averages of the Newfoundland whales given by Dr. True, is still less than the average of the Norwegian whales given for comparison in his table; this is probably owing to my having rejected the so-called "bastard" whales, the inclusion of which would have considerably increased the average.

The figures given below for the Newfoundland whales are from Dr. True's table and the Report of the Newfoundland Department of Fisheries, and those for Norway from Mr. Cocks's reports.

*Balaenoptera musculus.*

Region.	Number and proportion of sexes.			Length.				Length of baleen.
				Males.		Females.		
	Total.	Males.	Females.	Max.	Med.	Max.	Med.	
Norway .....	240	118	122	ft. 75	ft. in. 62 5	ft. in. 77 1	ft. in. 66 1	36×12 in.
Shetland .....	400	236	164	78	62 9	78 0	66 0	25×12½ in.
Newfoundland.	39	24	15	65	57 1	70 8	62 3	21½ in.

The "bastard" whales are not included in the above: of these, 16 males averaged 66 ft. 2 in., and 16 females 68 ft. 5 in.; of these several were evidently immature, thus reducing the average. The longest male measured 72 ft. and the longest female 80 ft. 6 in.; omitting all those under 65 ft. as immature, 7 males averaged 69 ft. 5 in., and 13 females 70 ft. 2 in.

Mr. Haldane found a foetus in a finner 50 ft. long, but the ordinary length of a sexually mature female would probably be over 60 ft.

Of 2893 fin-whales killed in Norway, 1869, or 65·64 per cent., were of this species, and of 2131 killed in Newfoundland the percentage was 48·56.

The Norwegian foot has been taken as 12½ English inches in the above calculations.

It remains to consider what, if any, is the taxonomic value

of the variations observed in these animals, and it is convenient to do so with regard to the present species, which is far the best known and with regard to which there is so much more material on which to base conclusions. Dr. True minutely examined ten freshly killed specimens in Newfoundland and compared them with Sars's careful description of a Norwegian individual, the whole showing conspicuously the great individual variations to which the species is subject so far as the intensity and distribution of the body-colours are concerned, the constant features being a dark left lower lip, white right lower lip, white anterior right whalebone, and the marked asymmetry of coloration. Where individuals differ so materially it would be unsafe to generalize on the mere shade or disposal of colour; Dr. True, however, instituted a very careful comparison of the measurements of the East and West Atlantic fin-whales, and found that the former were larger in all their proportions than the latter, which is confirmed by the foregoing table so far as length is concerned. He does not from this fact conclude that there exists even sub-specific differences between those inhabiting the two sides of the Atlantic; but I think it clearly demonstrates that the herds frequenting the two distant areas do not intermingle, their normal line of migration being south to north in summer, rarely, if ever, under normal conditions latitudinal, and that they may be considered *racially* distinct. Perhaps we may go even farther than that, and regard the gigantic "bastard" whale of Mr. Cocks, which has been known to reach the enormous length of 80 ft. 6 in., as at least a distinct race; and probably the same may be said of the southern form of *B. musculus*, the "sildehval" of the Norwegians, which goes north in summer to occupy the area in the ocean already vacated by the "loddehval," which has then departed to a more northerly latitude. That the *species* may be cosmopolitan cannot at present be conclusively disproved, but, as Dr. True very pertinently remarks, "even should it be demonstrated that the species of large whalebone whales are cosmopolitan, it does not follow that the individuals constituting these several species range throughout the globe, the probabilities are much against such world-wide movements." So long ago as the year 1898\* I endeavoured to show with regard to the Polar right whale that the areas frequented by separate races or herds of those animals were vastly more restricted than was generally supposed; and I think expe-

\* "On the Migration of the Right Whale," *Natural Science*, June 1898, pp. 397-414.



rience will show the same to be the case with the fin-whales inhabiting the North Atlantic Ocean.

With regard to the recorded measurements of these animals, in some instances they are taken in a straight line, in others along the curves, and till a system is adopted ensuring uniformity, although useful in their way, they cannot be regarded as scientifically accurate, and are therefore only approximately useful for comparison.

### BALÆNOPTERA SIBBALDII.

#### Norway.

Sibbald's rorqual, the blaa-hval or blue whale of the Norwegians and sulphur-bottom of the American whalers, is the chief prize of the whalers; it yields an average of 2800 gallons of oil, occasionally even as much as 10,000 gallons. Mr. Cocks states that twenty-five years ago Varanger Fjord was a favourite resort of this huge animal in summer, and that it penetrated far into the fjord in search of the "kril" (*Thysanopoda inermis*), on which it delighted to feed; all this is now a thing of the past, constant harrying has taught the survivors to keep out to sea, and, in addition, no whales are allowed by law to be captured at a less distance than 7 kilometres \* from the shore.

The time for the appearance of this whale upon the Finmarken coast is, as a rule, about the middle of June, exceptional instances have been known in May, and they have departed by the middle of September—the date of departure probably being dependent on the falling-off of the food-supply, and not due, as was formerly supposed, to the decreasing temperature of the sea. Mr. Robert Gray, when in the 'Eclipse' whaler on April 27th, met with blue whales in lat. 70° 14' N., and speaks of the partiality of this species for water of very low temperature; its departure, therefore, from the Finmarken coast cannot be directly attributed to declining temperature.

Dr. Guldberg describes this species as blue-grey or blue-black above, and sometimes copper-brown when rolling about in the sea; it has always a more or less pronounced blue-grey colour on the back—hence its trivial name. The underparts are minutely flecked with white and grey, but it varies considerably in coloration. The baleen-plates are black, with black hairs, about 36 inches long by 24 inches broad at the gum. Mr. Cocks remarks that "the sex of a blue whale (and in a less marked degree it is, I believe, true of other species

\* This for ten years.



of *Balænoptera* and possibly of other whalebone whales) may be distinguished by the shape of the baleen-plates, which in a male are long (up to 4 feet including gum) and narrow, but thick; while in a female they are short and broad, but thinner." The baleen is much infested with a species of copepod (*Balænophilus unisetus*).

The greatest length given by Mr. Cocks is that of a female 88 ft. 7 in. long, and the sexes occur in about equal numbers. There is no certain information as to the season of pairing, but two males are said to have been "making overtures" to a female on August 5th. Capt. Sørensen believes they have no fixed time for pairing, and fœtuses have been found in August measuring 13 ft., 18 ft. 9 in., 9 or 10 ft., and 15 ft. 6 in.; Mr. Cocks, however, does not vouch for the exactness of these measurements. Calves have been seen following the mother estimated at 40, 50, or even 60 feet long. The probable length of the sexually mature female is about 70 feet. Dr. Guldberg is of opinion that the blue whale goes with young eighteen or twenty months, and that, judging mainly from the large size of the young ones which have been seen following the mother, she produces only every third year; but perhaps he does not fully allow for the rapid growth of the young one. Two fœtuses, both males 6 and 4 feet long respectively, were found in a female only 60 feet in length which was brought into Eide Fjord, Faroe, in June 1894, as recorded by Mr. Harvie-Brown in the Ann. of Scottish Nat. Hist. for April 1905.

No blue whales were taken from Shetland, but, in addition to that already mentioned as killed from the Faroes in 1894, forty-two of these whales and five sperm-whales were killed last season (1904) from the station at Bunaveneader, Harris, which would seem to indicate that this species follows a more westerly course on its northward passage than the other fin-whales.

#### Newfoundland.

Turning to the consideration of the blue or sulphur-bottom whale, as it is known by the American whalers, in the Western Atlantic, we find, according to Dr. True's careful statistics, that, like the common fin-whale, the dimensions of the Newfoundland examples are on the average considerably less than those found in the European waters, although agreeing fairly with the latter in other respects. In colour there is a close resemblance, subject to the same considerable individual variations, but all exhibiting more or less of the characteristic irregular "milk-white spots" below the pectorals on the fluted sides of the breast described by Sars.

The only important difference which Dr. True points out is in the coloration of the dorsal fin, which in the Newfoundland specimens "is usually more or less white or whitish, except on the margins, with darker curved lines extending up vertically from its base"; but he remarks that this fin is not fully described in a fresh condition by any European authority. There seems to be no appreciable difference in the colour of the baleen. Dr. True arrives at the conclusion that, notwithstanding its superior dimensions, there is no sufficient reason for separating the European blue whale from the American sulphur-bottom.

*Balenoptera Sibbaldii.*

Region.	Number and proportion of sexes.			Length.				Length of baleen.
				Males.		Females.		
	Total.	Males.	Females.	Max.	Av.	Max.	Av.	
Norway .....	104	47	57	ft. in. 85 5	ft. in. 75 4	ft. in. 88 7	ft. in. 77 0	36×24 in.
Newfoundland.	25*	10	15	72 7	68 3	72 2	68 9	23-32 in.

Taking the average length of sexually mature females at 72 feet, Dr. True arrives at an average of 74 ft. 8½ in. for that sex in Newfoundland; subject to the same test the Norwegian females average 79 ft. 3 in.

Of 2893 fin-whales killed in Norway, 338, or 11·68 per cent., were of this species; in Newfoundland of 2132, 489, or 22·94 per cent., were *B. Sibbaldii*.

None of these whales have hitherto been killed in Shetland.

MEGAPTERA LONGIMANA (Rudolphi).

Norway.

The third large species of fin-whale is known to the British whalers as the humpback (from its low dorsal fin),

\* In another table Dr. True gives the average of a larger number of these whales from other sources—57 males equalling 70 ft. 8 in. and 35 females 70 ft.; but the above are measurements carefully taken by himself.

to the Norwegians as the knölhval, pukkelhval, or troldhval. Although it was not fully recognized as a European species till the year 1829, when Rudolphi described and figured a specimen cast ashore at the mouth of the Elbe, it has been found fairly plentiful on both sides of the North Atlantic; owing, however, to the fact of its sinking when killed and to its small yield of oil it is not considered a very desirable capture. It is of moderate length, but bulky in proportion, and yields from 600 to 800 gallons of oil: Mr. Haldane, however, heard of a Finmarken specimen, 50 feet long and 16 feet in diameter, which yielded 125 barrels of oil; as the petroleum barrels used by the Norwegians are of the capacity of about 40 gallons, this would represent some 5000 gallons!

A marked characteristic of this species is the great length of its pectoral fins: in a specimen 40 ft. long the pectoral fin measured 12 ft. in length and 2 ft.  $8\frac{1}{2}$  in. in its greatest breadth; in a 44 ft. example measured by Mr. Cocks the flipper was 13 ft. 9 in. to the skin of the axilla and 3 ft. 7 in. in width; the height of the dorsal fin was 9 in. The pectorals also vary exceedingly in colour, being sometimes black on the upper surface and white below, or in some instances entirely white on both surfaces. The body-colours are equally variable; the throat and nearly all the underside may be white or entirely black. These variations do not seem to bear any relation to sex or age. Another peculiarity is the extent to which they are generally infested by external parasites—*Cyamus* in abundance and a cirriped (*Diadema coronula*), the latter in turn bearing the curious *Conchoderma auritum*. Mr. Cocks also mentions the loud screaming of the humpback when harpooned, which he compares to the gruesome sound uttered by a pig when being killed. The food of this species appears to be rather mixed, consisting of small fish as well as kril; possibly, as with the common finner, this may be the result of circumstances. The baleen is black, with yellowish-brown hairs, and the longest plates measure about 2 feet.

The humpback comes on the Finmarken coast very early in the year, having been killed on the 24th of February, and departs in the middle of September. The date of pairing is uncertain, as is also the period of gestation; but fetuses have been found in June (no day mentioned) 12 in. long, again on June 21st 13 in., July 1st and 15th each 13 in., and on the 28th  $17\frac{1}{2}$  in. (Norwegian), on August 21st  $34\frac{3}{4}$  in.—thus showing a more regular approach to maturity than in most species.

Capt. Wiborg informed Mr. Cocks that in 1886 he saw a

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humpback followed by two calves each 10 Norwegian feet long, but he does not give the date, and Scammon gives a beautiful plate of a humpback suckling two calves; the birth of twins, therefore, in this species seems to be of occasional occurrence. Far more males than females of this species are killed; of 37 taken in 1886 28 were males. The average length of 27 males was 38 ft. 5 in., and of 13 females 42 ft. 3 in. The largest specimen Mr. Cocks records was a male 53 Norwegian feet (55 ft. 3 in., English) long; he mentions the girth of a female 52 English feet long as 40 feet, but this measurement in a dead whale is absolutely valueless, as distension commences immediately after death. The total number killed in six years was 317, and the largest number in a single year 96.

#### Shetland.

Of the results of the Shetland fishery I have very little information, and no particulars as to species or measurements before 1904; in that season eight humpbacks were taken by the Shetland boats and five from Harris in the Hebrides. The Shetland vessels, Mr. Haldane informs me, fish in about  $60^{\circ}$  to  $62^{\circ}$  N. lat. and  $0^{\circ}$  to  $5^{\circ}$  W. long.; the Faroe boats work to the southward and the Shetland vessels as far as 120 miles north of those islands. Of the Shetland humpbacks four females measured 30, 39, 40, and 46 feet respectively, three males 47, 49, and 46 feet; the last male had pectoral fins 13 ft. 10 in. long. The colours varied as already described. The food of those which Mr. Haldane examined consisted of kril and a few shrimps; herring also form part of their diet. The average yield of oil was 1200 to 1600 gallons.

#### Newfoundland.

In the Newfoundland fishery this species figures largely: in the season of 1893 287 were killed, and 281 in 1904; unfortunately no statistics as to sex or dimensions have been collected at these stations—desiderata which, I hope, will, at least to some extent, be supplied in the present season,—and therefore nothing can be added to the investigations made by Dr. True. That gentleman only had the opportunity of personally examining three specimens at Snook's Arm in August 1899, but of these he gives minute descriptions: he also gives the dimensions supplied to him of 18 others killed in the two following years between April 26th and July 6th,

the bulk (12) being killed in May, 21 in all; of these 10 were males, 4 females, and 7 sex not recorded. By the table it will be seen that the maximum of the Norwegian specimens of both sexes considerably exceeded that of those taken in Newfoundland, but in other respects (colour, dermal tubercles, dorsal and pectoral fins, and flukes) they present no material difference. Dr. True is of opinion that the various nominal species into which the humpbacks of the North Atlantic have been divided are all referable to one species, and in this he agrees with European cetologists; but considering the extensive range thus assigned to this whale it seems probable that the individuals inhabiting, say, the West Indies or the Californian coast are racially distinct from those frequenting the Greenland seas.

*Megaptera longimana.*

Region.	Number and proportion of sexes.			Length.				Length of baleen.
				Males.		Females.		
	Total.	Males.	Females.	Max.	Av.	Max.	Av.	
Norway .....	40	27	13	ft. in. 55 3	ft. in. 38 5	ft. in. 52 0	ft. in. 42 3	24 in.
Shetland .....	7	3	4	49 0	47 4	46 0	38 9	
Newfoundland.	14	10	4	46 11	37 6	46 6	41 6	22 in.

Of 2893 fin-whales killed in Norway, 236, or 8·16 per cent., were humpbacks.

BALENOPTERA BOREALIS (Lesson).

Norway.

This species, known to the Norwegian whalers as the sejhval (coal-fish whale), until the establishment of the Finnmarken fishery believed to be of excessive rarity, is found in varying numbers, singly or in schools of perhaps fifty individuals, every summer in the months of May and June off the coast west of the North Cape. Up to the year 1885 it could only be regarded as a straggler eastward of that cape. In the year mentioned, however, Mr. Cocks was assured that

they were common along the whole coast hunted by the Norwegian and Russian whalers during nearly the whole season, and an immense number remained off Sylte Fjord (East Finmarken) for about three weeks in May and June. They appear, however, to have reached the Russian coast somewhat later, the first killed by one of the Yeretiki steamers being on July 10th; the large number of 771 were killed during that season, these being fairly distributed among all the vessels of the fleet. In 1886 only 62 were killed (40 of which fell to one vessel), the whales having again resorted to their habitat westward of Söröen. In 1887 they were again abundant, and 245 were killed, 110 of these by Capt. Bull, chiefly between Loppen Island and Reisen, the first on May 21st and the last on the 12th of August. The next year the number fell to 92, but in 1889 it again increased to about 113—thus showing this species to be a constant visitor in considerable, but fluctuating, numbers off the Finmarken coast.

It is not much sought after by the whalers, and owing to its small size and proportionately small yield of oil is neglected when other species are to be obtained.

As is the case with all the members of this family, the date of pairing, period of gestation, and season of calving are not known with certainty, but the following measurements of fœtuses, with the dates of their occurrence, afford some indication:—

	Date.	Length of fœtus.			
		ft.	in.		
	June 21	. . . . .	4	10	
	July 3	. . . . .	2	1	
	18	. . . . .	6	0	♂ } ♀ } Two fœtuses.
		. . . . .	4	0	
	26	. . . . .	8	5	
	28	. . . . .	5	6	
Aug.	6	. . . . .	3	7	
	10	. . . . .	6	0	
	10	. . . . .	5	0	
	15	. . . . .	9	0	

A female, 46 ft. 10 in. long, brought into the factory at Tufjord on the 18th July, 1885, contained twin fœtuses of opposite sexes. Prof. Collett (*P. Z. S.* 1886, p. 261) mentions a similar instance of twins in a whale of this species 43 ft. long captured at the entrance to the Varanger Fjord, which contained two young ones each 6 ft. 7 in. long. So far as I am

aware, these are the only instances of twins in this species on record.

In 34 instances where the sex is given, 17 were males and 17 females: the former averaged 45 ft. 4 in. and the latter 46 ft. 7 in. in length; the longest male was 51 ft. 1 in., and the longest female 52 ft. 1 in. The measurements are variously given in Norwegian and English feet; I have reduced the former to English measurement on the scale of  $12\frac{1}{2}$  inches to the Norwegian foot.

The yield of oil averages about 200 gallons, rarely as much as 280 gallons. The food of this species is believed to consist very largely of "kril" (*Thysanopoda inermis*), a small crustacean, and *Calanus finmarchicus* (a copepod).

Professor Collett visited the factory at Vardö in 1885, and contributed an excellent paper on the "external characters" of this species, of which he stated that even then our knowledge was very deficient, to the P. Z. S. 1886, pp. 243-265, with illustrations.

The baleen is black, with white bristles, and the longest plate measures 31 inches.

Of 2266 fin-whales killed in Norway in the years 1886, 1887, and 1889 (omitting the abnormal kill of 771 in 1885), 420, or 18.5 per cent., were Rudolphi's rorquals.

#### Shetland.

Of 507 fin-whales killed from Shetland and the Hebrides in 1904 only 9 were of this species, and I have no particulars as to sex or measurements further than that two were bulls 37 and 41 feet long respectively.

#### Newfoundland.

None of these whales came under the notice of Dr. True when he visited the Bakena Station at Hermitage Bay, nor do any appear to have been killed till 1904, when 5 were obtained from Bakena, 30 from Bay Chaleur, and 3 from Rose au Rue; there therefore exists no material for comparison of specimens from the three fishing-centres.

The lesser rorqual (*B. rostrata*) does not figure in the returns from any of the above "fisheries."

XLVII.—*On some Australasian Mammals.*

By OLDFIELD THOMAS.

*The Nomenclature of the Two Bats of New Zealand.*

IN 1889 \*, taking Dobson's synonymies and identifications of the two bats found in New Zealand as correct, I amended, on a purely nomenclatural point, the names he gave to them in his Catalogue, showing that on his data *tuberculatus* was to be used for the *Mystacops* and *morio* for the *Chalinolobus*.

But it has been pointed out to me by my American friends Messrs. Palmer and Miller that there is an earlier work, most pertinent to the subject, not quoted by Dobson at all, and therefore ignored by me, and this upsets the conclusions I came to. Moreover, Dobson's identification of the New Zealand *Chalinolobus* with one from Australia proves to be quite incorrect, the former being perfectly distinct from any occurring on the mainland. This frees the New Zealand bat from the competition of the earliest name of all, *morio*, Gray, 1841 (type locality Tasmania †).

The relations to *C. morio* of the respective owners of the names *microdon*, Tomes, 1859 (South Australia), and *signifer*, Dobson (Queensland), may be left for further material to elucidate, but all three are different from the New Zealand *Chalinolobus*, whose skull has a much longer and heavier muzzle than any of them.

\* Ann. & Mag. Nat. Hist. (6) iv. p. 462.

† In Grey's 'Journals of Expeditions,' Appendix, ii. p. 405. The confusion in Gray's account of his three species of "*Scotophilus*" (*S. morio*, *Gouldi*, and *australis*) is very great and almost defies elucidation, though the fault may have been as much the printer's as the author's. Among other things the measurements given as those of *S. morio* are evidently those properly belonging to *S. Gouldi*. As a preliminary step towards clearing the matter up, I have gone carefully over the specimens which were before Gray at the time, over his notes in the registers and in his MS. list of bats, the basis of the published list of 1843. In this way I have identified no. 37. 4. 8. 118 ("90. a") (Dobson's *Chalinolobus tuberculatus*, *e*, not *f* as he stated), from Tasmania, coll. Sir W. J. Hooker, as the type of *S. morio*, while no. 41. 1516 ("118. a") *e* of Dobson's *C. Gouldi* should be taken as the type of the latter species. It was from Launceston, Tasmania, Gould collection, not, as Dobson says, from Lieut. A. Smith, whose specimens came in twenty years later.

Dobson's "R. Maitland, Esq.," the donor of specimen *h*, also proves to be the River Maitland, New South Wales, its locality.

I can identify no individual type of *S. australis*, which is, however, evidently a synonym of *morio*.



The point about the double usage of the name *tuberculatus* has hitherto been that, as Forster's description of the *Chalinolobus* was not published till 1844, Gray's description of the *Mystacops* in 1843 (Voy. 'Sulphur,' Mamm. p. 23) had absolute priority, whether he thought it was Forster's *tuberculatus* or not.

But in the work to which my attention has been drawn, Dieffenbach's 'New Zealand,' 1843, Gray, by publishing in the Appendix (ii. p. 181) five words of description of Forster's plate, then unpublished, not only cut him out with regard to the *Chalinolobus*, but invalidated his own *tuberculatus* for the *Mystacops*, which he first used on p. 296 of the same work, distinctly stating his opinion that it was the same bat. As a result, *tuberculatus* being invalidated for the *Mystacops*, Hutton's *velutinus* will come into force, and the names and chief synonymy of the two species will be as follows:—

*Chalinolobus tuberculatus*, Gray.

Short-eared Bat.

*Vespertilio tuberculatus*, Gray (ex Forst.), Dieffenb. N. Zealand, ii. p. 181 (1843); Forst. Descr. Anim. (ed. Licht.) p. 62 (1844).

*Scotophilus tuberculatus*, Tomes, P. Z. S. 1857, p. 135; Hutton, Trans. N. Z. Inst. iv. p. 185 (1871).

*Chalinolobus tuberculatus*, Peters, MB. Ak. Berl. 1866, p. 680, and 1867, p. 480; Dobson, Cat. Chir. B. M. p. 248 (1878) (the New Zealand specimens only).

*Chalinolobus morio*, Thos. Ann. & Mag. Nat. Hist. (6) iv. p. 462 (1839) (in part.).

*Mystacops velutinus*, Hutton.

Long-eared Bat.

*Mystacina tuberculata*, Gray, Dieffenb. N. Zealand, ii. p. 296 (1843), nec *Vespertilio tuberculatus*, id. tom. cit. p. 181; Dobs. Cat. Chir. B. M. p. 442 (1878).

*Mystacina velutina*, Hutton, Tr. N. Z. Inst. iv. p. 185 (1871).

*Mystacops tuberculatus*, Lydekker, in Flow. & Lyd. Mamm. p. 671 (1891).

*Dobsonia magna*, sp. n.

Similar in all essential respects to *D. paliata*, Geoff.\*, but very much larger, the skull especially being conspicuously larger in all dimensions.

\* *Cephalotes Peronii*, Dobs. et auct. al.

Colour about as in *D. paliata*, the head similarly dark bistre-brown and the nape drab-brown; under surface dull isabella-brown. Back more entirely naked than usual, absolutely hairless everywhere except just over the base of the tail.

Skull very similar in its proportions to that of *D. paliata*, but very much larger, the difference corresponding with that found in *Nyctymene aello* as compared with *N. major*, while Dobson's *Dobsonia minor* may similarly rank with the smallest species, *Nyctymene cephalotes*, of the allied genus. These differences may best be seen by the dimensions given below. Teeth on the whole broader in proportion to their length than in *D. paliata*, but there is a good deal of variation in this respect in the latter species.

Measurements of the type (those marked with an asterisk taken by the collector in the flesh):—

Forearm 145 mm.

Head and body 200 \*; tail 26 \*; ear 27 \*. Third finger: metacarpus 93, first phalanx 68, second phalanx 103; fifth finger 188. Lower leg and foot (c. u.) 107.

Skull (measures in brackets those of an adult male skull from Sumba): greatest length 62 (51); basal length 55.5 (46); muzzle, from tip of nasals to hinder side of postorbital processes 28.5 (22.5); interorbital breadth 10.7 (9.8); intertemporal breadth 9 (8.3); palate length in middle line 29 (23); front of canine to back of  $m^2$  26.5 (21.5); length of canine on hinder edge from cingulum 8.8 (5.2). Lower jaw, condyle to front of canines 50 (40); front of canines to back of  $m_3$  28 (22.5).

*Hab.* Tamata, Northern British New Guinea, near German frontier. Alt. 100 feet.

*Type.* Male. Original number 65. Collected 9th September, 1904, by W. Stalker.

Dr. Matschie considers the members of this genus so variable in size that he unites them all in one species, even including the little *D. minor*, Dobs. But none of the dimensions he gives at all approach those of this Papuan example, and a comparison of the skulls shows such an immense disproportion between it and those representing true *D. paliata*, that it seems necessary to separate it.

No other species has been described from this part of the Papuan region.

*Petrogale lateralis Hacketti*, subsp. n.

Closely similar to true *P. lateralis* in external and cranial characters, including both colour and pattern of markings, but larger and with larger teeth, especially with larger anterior premolar or "secator" \* ( $p^4$  of the Catalogue of Marsupials).

Dimensions of the type (measured in skin):—

Head and body 660 mm.; tail 540; hind foot (s. u.) 139; ear 55.

Skull: greatest length 107; basal length 93; greatest breadth 50; front of orbit to back of skull 62; nasals, length 47, greatest breadth 14.3; interorbital breadth 18.3; diastema 20; palatal foramen 8; large secant premolar 8.3 × 4.1; combined length of three anterior molariform teeth 18.5.

*Hab.* Mondrain Island, off the coast of S.E. Western Australia.

*Type.* Adult male. B.M. no. 5. 4. 1. 5. Original number 7161. Collected 1st November, 1904, by J. T. Tunney. Presented by the Western Australian Museum, Perth. Fourteen specimens examined.

While in colour and other external characters I can find no difference between the Mondrain-Island rock-wallabies and the typical specimens of *P. lateralis* described and figured by Gould, there is so marked a distinction in the size of the skulls and teeth, especially of the large secant premolar, that it is clear that the former cannot be referred to Gould's animal.

Among five skulls of *P. lateralis* none exceed 95 mm. in total length, the front of the orbit about 53 mm. from the back of the skull, and the upper secator 6.8 mm. in length by 3.1 mm. in breadth, the tooth markedly narrowing forwards, while in *Hacketti* it is a long and comparatively broad oval, nearly as broad in front as behind. Below, the

\* This tooth, the most important for systematic work in the Marsupials, might conveniently be called the "secator," thus avoiding altogether the confusing question of its serial homology. It is the " $P^4$ " of the Catalogue of Marsupials, but is now more usually believed to be homologous with  $p^3$ , or, more probably,  $mp^3$ , of Placental mammals. This change of opinion, even if it were accepted universally—and the question is still under discussion,—renders the use of a numerical symbol exceedingly inconvenient for ordinary systematic descriptions; and it is hoped that a special name for the tooth will be of as much value to workers on marsupials as "carnassial" has proved to writers on Carnivora.

corresponding tooth is also conspicuously broader and heavier in *Hacketti* than in true *lateralis*.

I think it probable that *P. l. Hacketti* is not a true insular form, but that it will be found to occur in suitable localities on the mainland of S.E. West Australia, diminishing in size and strength of dentition northwards.

In accordance with a suggestion of Mr. B. H. Woodward's, I have named this handsome rock-wallaby in honour of Dr. Hackett, Chairman of the Western Australian Museum Committee.

*Thalacomys* \* *sagitta*, sp. n.

In the Catalogue of Marsupials all the specimens of *Thalacomys*—there called *Peragale*—were referred to a single species, *Th. lagotis*, without distinction between the West-Australian and South-Australian examples. But the recent presentation of a fine specimen from South Australia by Mr. Hillier has drawn my attention to the fact that the form found in that district is so considerably smaller than the West-Australian one that the two ought certainly to be separated. The difference is mainly in the skulls, and may be readily appreciated by comparing the measurements given below of the South-Australian animal with those of the typical West-Australian form published in the Catalogue.

Externally, apart from the corresponding difference in size, there is little to distinguish the two forms. On the whole *Th. sagitta* is a little paler in tone, the black band on the tail is slightly shorter, being shorter instead of longer than the white end, and the feet are paler below, the black only extending about a third of their length underneath the heel.

Dimensions in the flesh (measured by Mr. Hillier):—

Head and body 316 mm.; tail 215; hind foot 91; ear 79.

Skull: greatest length 85; basal length 76·5; greatest breadth 38; nasals, length 40, greatest breadth 7·5; inter-temporal breadth 13; palate length 50; basicranial axis 22·5; basifacial axis 54; front of canine to back of last molar 36; combined length of three anterior molariform teeth 12·5.

*Hab.* South Australia. Type from Killalpanima, east of Lake Eyre.

*Type.* Adult male. B.M. no. 3. 5. 21. 2. Collected 6th April, 1903, and presented by H. J. Hillier, Esq.

\* Cf. Ann. & Mag. Nat. Hist. (7) v. p. 223 (1900).

Five skulls of this species are in the Museum collection all of practically the same dimensions, while two from West Australia are both of the larger size indicated by the Catalogue measurements.

*Th. sagitta* is clearly the "common species or 'Urgarta,' *Peragale lagotis*," of Prof. Baldwin Spencer's description \* of a new species of this genus from Central Australia, *Th. minor*, which he distinguishes, no doubt rightly, by its still smaller dimensions and its different habits.

Mr. Hillier gives the local name for this animal, as used by the Diari natives, as "Kapita."

*Phascogale Hillieri*, sp. n.

Near *Ph. cristicauda*, but conspicuously paler in colour throughout.

Size about as in *Ph. cristicauda*. Fur soft and fine; hairs of back about 9 mm. in length. General colour above a beautiful soft drab-colour, similar to but decidedly paler than Ridgway's "ecru-drab"; a few fine longer hairs black, contrasting curiously with the general pale colour. Sides more whitish drab, passing without sharp line of demarcation into the pure white under surface, on which region, from chin to anus, the hairs are pure white to their bases. Top of head like back, but rather more fawn. Cheeks and lips pure white. Ears thinly clothed with whitish hairs, an inconspicuous whitish patch behind their posterior bases. Upper surface of hands and feet snowy white; structure of feet apparently as in *Ph. cristicauda*. Tail slightly incrassated basally; crested above for its terminal two inches, the hairs attaining a length of 16 mm.; nothing that can be called a crest below, though some of the hairs towards the end are slightly longer than on the proximal part. In colour the main part of the tail is rather more rufous than the general body-colour, though nothing like the corresponding part in *Ph. cristicauda*; under surface indistinctly darker, not black; crest glossy black.

Skull unfortunately lost.

Dimensions of the type (measured in the flesh):—

Head and body 150 mm.; tail 100; hind foot 30; ear 27.

*Hab.* Killalpanima, Lake Eyre East, South Australia.

*Type.* Male. B.M. no. 5. 3. 28. 1. Collected 13th February, 1905, and presented by H. J. Hillier, Esq.

\* P. Roy. Soc. Victoria, ix. p. 6, pl. ii. (1897).

This beautiful *Phascogale* differs so conspicuously from the *Ph. cristicaula*, Kufft, as identified by Baldwin Spencer after comparison with the type, that I have no alternative but to describe it as distinct, though I have little doubt that its skull will show it to be closely allied to that animal. I have much pleasure in naming it after its donor, to whom the National Museum owes a number of interesting specimens from the same locality.

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XLVIII.—*Notes on the Distribution of some Species of Terrestrial Isopoda introduced into Australasia.* By CHARLES CHILTON, M.A., D.Sc., F.L.S., Professor of Biology, Canterbury College, New Zealand.

IN this short paper I give a few notes on the distribution, so far as it is at present known, of some species of terrestrial Isopoda that appear to have been introduced into Australasia, most probably by the unconscious action of man. I have already pointed out elsewhere\* that the terrestrial Isopoda are well worthy of study from the point of view of the geographical distribution of animals, and it is therefore desirable to place on record any facts illustrating the spread of different species at the present time. Two or three of the species introduced into Australasia have been described as new local species, and until these are reduced to the rank of synonyms lists of the species inhabiting any part of Australasia are apt to be misleading.

Only references necessary for workers in Australasia have been given; full references and synonyms can be found in the works by Dr. Budde-Lund and Professor G. O. Sars.

My collections from Australia are as yet rather meagre, but Messrs. Helms and Sayce have sent me specimens from various localities in New South Wales and Victoria, and Messrs. W. and R. M. Laing from Norfolk Island. To these gentlemen my thanks are due, and also to Monsieur V. Bouge, who has taken considerable trouble to send me specimens from New Caledonia.

\* See Trans. Linn. Soc. ser. 2, Zool. viii. p. 100; and 'New Zealand Journal of Science,' ii. (1884) p. 155.

*Porcellio scaber*, Latr.

*Porcellio scaber*, Budde-Lund, Isopoda Terrestria, p. 129.

*Porcellio scaber*, G. O. Sars, Crustacea of Norway, ii. p. 176.

*Porcellio graniger*, Miers, Cat. New Zealand Crust. p. 99.

*Porcellio scaber*, Chilton, Trans. Linn. Soc. ser. 2, Zool. viii. p. 139.

It will be seen from a reference to the works of Budde-Lund or Sars quoted above that this species is very widely distributed and has been described under many names. It is found everywhere in Northern, Western, and Central Europe, extending far north into Greenland and Iceland; less frequently in Southern Europe; also in North America, Mexico, &c.; in the islands of St. Paul, St. Croix, in Cape of Good Hope, and in Kamtschatka. Monsieur Dollfus\* does not give it in his list of terrestrial Isopoda from the mainland of the North of Africa, but it is known from the Canary and the Azores Islands. It appears probable, therefore, that it belongs originally to the more northern portions of the continents of Europe, Asia, and perhaps America, and that it has been unintentionally introduced into the various islands and other localities in the Southern Hemisphere, where it is now found.

In Australia it has been recorded by Miers from Melbourne and Tasmania, and I have had specimens from Sydney in my collection for many years past, and more recently Mr. Sayce has sent me a few specimens from "Forest Country, Healsville, Victoria"; but it does not appear to be at all abundant in Australia, for these are the only localities from which it has been obtained, and it is not represented from the other places in New South Wales and Victoria from which I have specimens sent me by Mr. R. Helms and Mr. Sayce, and it does not appear to occur in Norfolk Island.

In New Zealand, on the other hand, where it has been long known under the name of *Porcellio graniger*, Miers, it is the commonest terrestrial Isopod, and is very abundant everywhere, more particularly in the neighbourhood of inhabited places, but also extending sometimes a considerable distance into the bush; and it is interesting to note that specimens from New Zealand were already in the collections of the British Museum in 1847 when White's 'List of the Crustacea in the British Museum' was published †. It has not

\* Proc. Fourth International Congress of Zoology, p. 250.

† This statement appears to be in error. The specimens recorded by White in 1847 were from "Van Diemen's Land." That from New Zealand described by Miers was received by the Museum in 1854. [Note by Dr. W. T. Calman, British Museum (Nat. Hist.).]

yet been recorded from the Chathams or any of the outlying islands of New Zealand.

From the notes given above it appears that *Porcellio scaber* thrives best in the colder temperate regions of both North and South Hemispheres, and becomes less abundant as the warmer climates are reached.

Dollfus, in his "Isopodes terrestres du 'Challenger'"\*, when recording this species from the islands of Juan Fernandez and Tristan d'Acunha, has already drawn attention to the fact that it is found in several widely remote localities in the cold temperate regions of the south as well as the north, although not found in the intermediate warmer regions, and considers that its abundance excludes the idea of artificial transport. I think, however, that the additional localities now given are sufficient to show that it has reached these places in the south by accidental introduction, as already explained.

#### *Porcellio lævis*, Latr.

*Porcellio lævis*, Budde-Lund, Isopoda Terrestria, p. 138.

*Porcellio lævis*, G. O. Sars, Crustacea of Norway, ii. p. 181.

*Porcellio obtusifrons*, Haswell, Cat. Australian Crust. p. 280.

Budde-Lund says of this species that it is without doubt the most widely spread of all the Oniscidæ, so that it seems to be almost cosmopolitan. He does not record it, however, from Australia, although it had been recorded from Sydney under the name of *Porcellio obtusifrons* (a species that Budde-Lund appears to have overlooked) by Haswell in 1882. I have had specimens from Sydney for many years completely agreeing with Haswell's description, and have no doubt that they should be referred to *P. lævis*. Besides these I have specimens sent me by Mr. Sayce labelled "From Garden," presumably from Melbourne, and in 1891 Mr. George Gordon sent me numerous specimens from Geraldton, in Western Australia, most of them being slightly larger than those from other localities. It is also to be found in Norfolk Island and in New Caledonia, where, judging by the number of specimens sent me by Monsieur V. Bouge, it appears particularly abundant. Among these were several albino or partially albino forms similar to those of which Budde-Lund speaks as being found in Southern Europe.

It is interesting to note that the species does not appear to have yet reached New Zealand; there is no record of its ever

\* Extr. Bulletin Société d'Études scient. de Paris, xii<sup>e</sup> Année, 1890.



having been found in this Colony, and as I have collected terrestrial Isopoda for many years, both directly and with the help of numerous friends, it is hardly likely that it would have escaped observation if it occurred in any numbers.

*Metoponorthus pruinosus* (Brandt).

*Metoponorthus pruinosus*, Budde-Lund, Isopoda Terrestria, p. 169.

*Metoponorthus pruinosus*, G. O. Sars, Crustacea of Norway, ii. p. 184.

*Porcellio zealandicus*, Miers, Cat. New Zealand Crustacea, p. 100.

*Porcellio zealandicus*, Chilton, Trans. Linn. Soc. ser. 2, Zool. viii. p. 141.

This is another species which Budde-Lund says has been carried by navigation to all parts of the world. It has, however, not yet been recorded from Australia, and no specimens have so far reached me from the mainland of that continent. On the other hand, it appears to be common on Norfolk Island, whence specimens have been sent to me both by Mr. W. Laing and Mr. R. M. Laing, and, according to Monsieur Adrien Dollfus, it also occurs in New Caledonia and in the Marianna Islands.

A specimen of this species appears to have been collected in New Zealand before 1847, and was given the name *Porcellio zealandicus* in the list published in that year. In 1885 Budde-Lund gave *P. zealandicus* as a doubtful synonym of *Metoponorthus pruinosus*; but as the specimen in the British Museum was not sufficiently well preserved to render identification certain, and as other species formerly recorded had not been met with again in New Zealand, the question remained doubtful till March 1905, when I received from Mr. Hutchinson numerous specimens of *Metoponorthus pruinosus* from the shores of a tidal lagoon in Hawke's Bay, in the North Island of New Zealand. There is therefore no reason for doubting that *Porcellio zealandicus*, Miers, is the same as *Metoponorthus pruinosus* and that the species had reached New Zealand before 1847. It is rather interesting to note that the species has not spread more widely, for as yet it has not been met with in any other locality in New Zealand\*.

*Armadillidium vulgare* (Latr.).

*Armadillidium vulgare*, Budde-Lund, Isopoda Terrestria, p. 66.

*Armadillidium vulgare*, G. O. Sars, Crustacea of Norway, ii. p. 189.

*Armadillidium vulgare*, Chilton, Trans. Linn. Soc. ser. 2, Zool. viii. p. 142.

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\* A short paper on the occurrence in New Zealand of this species has been sent to the Transactions N.Z. Institute, vol. xxxviii.

This is another widely distributed species. Budde-Lund says that it inhabits the whole of Europe and also the neighbouring regions of Asia and Africa, and that it has been carried to many other places probably by navigation.

Budde-Lund records it also from Melbourne, but so far it has not been met with from any other part of Australia, and it is not represented in any of my collections from that country.

In New Zealand it appears to be abundant in the town of Nelson; specimens were sent me from there many years ago by the late Mr. J. C. Gully, and I have recently received many specimens from Mr. F. G. Gibbs, who tells me that it appears to be as common in Nelson as *Porcellio scaber*. I have also a specimen taken near Mount Egmont and forwarded to me by the late Mr. S. H. Drew, but up to the present it has not been met with in any other localities, in this respect forming a marked contrast to *Porcellio scaber*, which has overrun the whole colony.

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XLIX.—*An undescribed Guereza.*

By R. LYDEKKER.

MAJOR POWELL-COTTON has sent from Qugo, Central Equatorial Africa, the skull and skin of an adult *Guereza* monkey belonging to the black-and-white group, which appears to indicate an undescribed form. The specimen closely resembles *Colobus palliatus* of British East Africa (which may be only a local form of the western *C. angolensis*), but is distinguished by the absence of a white superciliary ridge connecting the two face-tufts and of a white perineal patch, as well as by the terminal half of the tail being grey, with a white tip, instead of the whole terminal third being white and the middle third grey. The new form may be best regarded as a subspecies of *C. palliatus* under the name of *Colobus palliatus Cottoni*, and characterized as above. It adds one more link connecting the wholly black and smooth-tailed forms of *Guereza* with the white-tailed *C. caudatus*, which has an enormous white mantle and face-tufts and a white "flag" to the tail like that of a setter; and is therefore of more interest than the ordinary "subspecies."

L.—*A Revision of the Fishes of the American Cichlid Genus Cichlosoma and of the Allied Genera.* By C. TATE REGAN, B.A.

[Concluded from p. 340.]

PETENIA.

*Petenia*, Günth. Cat. Fish. iv. p. 391 (1862).

*Petenia* (part.), Eigenm. & Bray, Ann. Ac. N. York, vii. 1894, p. 614; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 243 (1904).

Body moderately clougate, compressed; scales rather large, ctenoid. Two lateral lines. Jaws with bands of small conical teeth, the outer series enlarged; canines moderate. Mouth large; præmaxillaries very protractile, their processes as long as the head; maxillary considerably exposed; lower jaw strongly projecting. Upper surface of the head to the level of the orbits, cheeks, and opercular bones scaly; præoperculum narrow, entire, without distinct lower limb. Gill-rakers rather short and few. A single dorsal, with XV–XVI 12–13 rays; anal with V 8–10 rays. Pectoral asymmetrical, with 1½ rays; ventrals below the base of the pectoral. Caudal rounded.

A single species from Lake Peten, Guatemala, to be regarded as a specialized form derived from a type similar to *Cichlosoma Dovii*.

*Petenia splendida*.

*Petenia splendida*, Günth. Cat. Fish. iv. p. 301 (1862), and Trans. Zool. Soc. vi. 1869, p. 469, pl. lxxix. fig. 2; Steind. Denkschr. Ak. Wien, xxiii. 1864, p. 73, pl. iv. figs. 3 & 4; Eigenm. & Bray, Ann. Ac. N. York, vii. 1894, p. 615; Jord. & Everm. Bull. U.S. Nat. Mus. xvii. 1898, p. 1513; Everm. & Goldsb. Bull. U.S. Fish. Comm. xxi. 1902, p. 155, fig.; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 243 (1904).

Depth of body about 3 in the length, length of head  $2\frac{3}{5}$ – $2\frac{3}{4}$ . Snout a little shorter than postorbital part of head. Diameter of eye 5–6 in the length of head and  $1$ – $1\frac{1}{3}$  in the interorbital width; depth of præorbital  $\frac{1}{2}$ – $\frac{3}{4}$  the diameter of eye. Lower jaw strongly projecting; maxillary extending to below middle of eye or beyond; præmaxillary processes extending nearly to origin of dorsal. Check with 7–10 series of scales; 10 or 11 gill-rakers on the lower part of anterior arch. Scales of the lateral line a little larger than the others; scales above the lateral line a little smaller than those below it, about 45 in a longitudinal series above,

40 below the lateral line. Scales in a transverse series  $\frac{6-7}{16-17}$ . Dorsal XV (XVI) 12-13, the last spine about  $\frac{2}{7}$  the length of head, the soft fin not scaly. Anal V (8) 9-10. Pectoral nearly  $\frac{2}{3}$  the length of head. Caudal rounded. Caudal peduncle longer than deep. Head, body, and vertical fins with dark spots; a series of dark blotches along the middle of the side.

Lake Peten, Guatemala.

1-4. (260-415 mm.) types of Lake Peten. O. Salvin, Esq.  
the species.

### HERICHTHYS.

*Herichthys*, Baird & Girard, Proc. Ac. Philad. 1854, p. 25.

*Heros* (part.), Günth. Cat. Fish. iv. p. 290; Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1898, p. 1537; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 226 (1904).

*Neetroplus* (part.), Jord. & Snyder, Bull. U.S. Fish. Comm. xix. 1899, p. 146; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 245 (1904); Meek, Zool. Pub. Columbian Mus. v. 1904, p. 221.

*Cichlasoma* (part.), Meek, t. c. p. 205.

Closely allied to *Cichlosoma* and perhaps most nearly to *C. heterodontus*, differing only in that the anterior teeth of the outer series in each jaw are compressed, pointed in the young, truncate in the adult.

Three species from Mexico and Central America.

### Key to the Species.

- I. Anal with 5 (exceptionally 6) spines.  
D. XV-XVII 10-12. A. V (VI 7) 8-9. Sc.  
27-30  $\frac{4\frac{1}{2}}{12-13}$  ..... 1. *cyanoguttatus*.  
D. XVI 13. A. V 10. Sc. 31  $\frac{6}{12}$  ..... 2. *Bocourti*.  
II. Anal with 6 or 7 spines.  
D. XVI-XVIII 11-12. A. VI-VII 9-10. Sc.  
30  $\frac{5}{13-14}$  ..... 3. *Geddesi*.

#### 1. *Herichthys cyanoguttatus*.

*Herichthys cyanoguttatus*, Baird & Girard, Proc. Ac. Philad. 1854, p. 25, and Rep. U.S. Mex. Bound. Surv., Zool. p. 30, pl. iv. figs. 9-12 (1859).

*Heros cyanoguttatus*, Günth. Cat. Fish. iv. p. 290 (1862); Jord. & Gilb. Bull. U.S. Nat. Mus. xvi. 1882, p. 608; Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1898, p. 1537; Everm. & Goldsborough, Bull. U.S. Fish. Comm. xxi. 1902, p. 157; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 231 (1904).

*Neetroplus carpintis*, Jord. & Snyder, Bull. U.S. Fish. Comm. xix. 1899, p. 146, fig. 22; Jord. & Everm. t. c. p. 3175; Pellegr. t. c. p. 246; Meek, Zool. Pub. Columbian Mus. v. 1904, p. 221.

*Cichlasoma cyanoguttatum*, Meek, t. c. p. 215.

Depth of body 2 in the length, length of head  $2\frac{1}{2}$ -3. Snout shorter than postorbital part of head. Diameter of eye  $3-4\frac{1}{3}$  in the length of head, interorbital width  $3-3\frac{1}{2}$ . Depth of præorbital  $\frac{1}{2}-1\frac{1}{6}$  the diameter of eye. Maxillary slightly exposed, not extending to below the eye; præmaxillary processes extending to above anterior  $\frac{1}{4}$  of eye or slightly beyond; jaws equal anteriorly, or the lower slightly projecting; both jaws with the teeth of the outer series regularly increasing in size anteriorly; fold of the lower lip usually more or less distinctly interrupted; cheek with 4 or 5 series of scales; 7 or 8 gill-rakers on the lower part of anterior arch. Scales  $27-30$   $\frac{4\frac{1}{2}}{12-13}$ , 2 between lateral line and base of anterior rays of soft dorsal. Dorsal XV-XVII 10-12, commencing above the extremity of operculum, the spines subequal or slightly decreasing from the sixth to the thirteenth, thence increasing to the last, which is  $\frac{1}{2}$  the length of head; the soft fin scaly at the base. Anal V (VI 7) 8-9. Pectoral  $\frac{4}{5}$  the length of head, extending to above origin of anal; ventral extending nearly to origin of anal. Caudal subtruncate or rounded. Caudal peduncle  $\frac{3}{5}$  as long as deep. Light blue spots on head, body, and vertical fins; young with 7 dark cross-bars, the third bearing a blackish blotch below the lateral line, and with a dark spot on the base of caudal.

North-Eastern Mexico and Texas.

1-2. (65 and 118 mm.)	Matamoros.	Smithsonian Institution.
3-6. (39-62 mm.) co-types of <i>N. carpintis</i> .	Tampico.	Dr. D. S. Jordan.

*Heros teporatus*, Fowler (Proc. Ac. Philad. 1903, p. 321) is based on a single specimen of 38 mm. from Tamaulipas. It appears to differ from *H. cyanoguttatus* only in the more slender body (depth  $2\frac{1}{2}$  in the length).

## 2. *Herichthys Bocourti*.

*Neetroplus Bocourti*, Vaill. & Pellegr. Bull. Mus. Paris, 1902, p. 85; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 246 (1904).

Depth of body 2 in the length, length of head  $3\frac{1}{5}$ . Diameter of eye  $3\frac{3}{4}$  in the length of head. Maxillary not extending to below the eye; fold of the lower lip slightly interrupted; cheek with 6 series of scales; 9 gill-rakers on the lower part of anterior arch. Scales  $31$   $\frac{6}{12}$ . Dorsal XVI 13, the spines only slightly increasing in length after the fifth, the last more than  $\frac{1}{2}$  the length of head; soft fin scaly at the base. Anal V 10. Pectoral a little shorter

than the head. Caudal slightly rounded. Caudal peduncle nearly as long as deep. Olivaceous, with obscure darker cross-bars.

Lake Isabel, Guatemala.

The single known example measures 182 mm. in total length.

This species is said to be closely allied to the preceding, differing especially in the larger eye.

### 3. *Herichthys Geddesi*, sp. n.

Depth of body  $2\frac{1}{5}$ – $2\frac{1}{2}$  in the length, length of head  $2\frac{2}{3}$ – $2\frac{4}{5}$ . Snout as long, or nearly as long, as postorbital part of head. Diameter of eye  $2\frac{3}{4}$ – $3\frac{1}{4}$  in the length of head, interorbital width  $3\frac{1}{3}$ – $3\frac{2}{3}$ . Maxillary not extending to below the eye; premaxillary processes extending to above anterior  $\frac{1}{4}$  of eye; jaws equal anteriorly; both jaws with the teeth of the outer series regularly increasing in size anteriorly; fold of the lower lip not continuous; cheek with 5 or 6 series of scales; 7 or 8 gill-rakers on the lower part of anterior arch. Scales  $30\frac{5}{13-14}$ , 2 between lateral line and base of anterior rays of soft dorsal. Dorsal XVI–XVIII 11–12, commencing above the opercular cleft, the spines subequal or slightly decreasing from the fifth or sixth to the fourteenth or fifteenth, the last  $\frac{2}{5}$  the length of head; the soft fin scaly at the base. Anal VI–VII 9–10. Pectoral  $\frac{3}{4}$ – $\frac{7}{8}$  the length of head, extending to above origin of anal; ventral extending to anterior anal spines. (? Caudal subtruncate.) Caudal peduncle  $\frac{1}{2}$ – $\frac{2}{3}$  as long as deep. Brownish, with 7 or 8 cross-bars bearing a series of blackish blotches below the lateral line; vertical fins spotted.

Southern Mexico.

1–6. (47–65 mm.) types of Southern Mexico. P. Geddes, Esq.  
the species.

### PARANEETROPLUS, gen. nov.

Differs from *Cichlosoma* only in the dentition, all the teeth being broad, compressed, and pointed or rounded. The single species, from Mexico, is intermediate between *Cichlosoma nebuliferum* and *Neetroplus nematopus*.

### *Paraneetroplus Bulleri*, sp. n.

Depth of body 3 in the length, length of head nearly 4. Snout a little shorter than postorbital part of head. Diameter of eye  $4\frac{2}{3}$  in the length of head, interorbital width  $2\frac{2}{3}$ . Depth

of præorbital  $1\frac{3}{5}$  the diameter of eye. Maxillary scarcely exposed, not nearly extending to below the eye; præ-maxillary processes not extending to above the eye; mouth small, almost transverse, the lower jaw shorter than the upper; upper jaw with about 20 teeth in the outer series, the lateral teeth decreasing in size posteriorly; lower jaw with a transverse series of about 10 teeth, not continued as a lateral series; fold of the lower lip not continuous; cheek with 5 series of scales; 7 gill-rakers on the lower part of anterior arch. Scales  $34\frac{5\frac{1}{2}}{14}$ , 3 between lateral line and base of anterior rays of soft dorsal, those of the thoracic region very small. Dorsal XVIII 12, commencing a little in advance of the axil of pectoral, the spines subequal from the fifth to the fifteenth, thence increasing to the last, which is  $\frac{1}{2}$  the length of head; soft fin, when laid back, extending to base of caudal; posterior part of spinous dorsal and anterior part of soft fin scaly at the base. Anal VI 9. Pectoral a little shorter than the head, not nearly extending to above the anal; ventral extending nearly to origin of anal. Caudal truncate. Caudal peduncle a little longer than deep. Olivaceous, with a series of 5 dark blotches on the side of the body, the last 2 extending upwards as vertical bars on to the base of the soft dorsal; a dark spot at the base of caudal; vertical fins slightly dusky.

Rio de Sarabia, Mexico.

1. (218 mm.) type of the Rio de Sarabia. Dr. A. C. Buller.  
species.

#### NEETROPLUS.

*Neetroplus*, Günth. Trans. Zool. Soc. vi. 1839, p. 469; Eigenm. & Bray, Ann. Ac. N. York, vii. 1894, p. 613; Jord. & Everm. Bull. U.S. Nat. Mus. xvii. 1898, p. 1541.

*Neetroplus* (part.), Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 245 (1904).

Differs from *Paraneetroplus* in that the teeth are not pointed or rounded, but truncate, incisor-like.

A single species from Nicaragua.

#### *Neetroplus nematopus*.

*Neetroplus nematopus*, Günth. Trans. Zool. Soc. vi. 1869, p. 470, pl. lxxiv. fig. 4; Jord. & Everm. Bull. U.S. Nat. Mus. xvii. 1898, p. 1541; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 245 (1904).

*Neetroplus nicaraguensis*, Gill & Bransford, Proc. Ac. Philad. 1877, p. 186.

Depth of body  $2\frac{1}{2}$  in the length, length of head  $3\frac{1}{3}$ . Snout as long as postorbital part of head. Diameter of eye  $3\frac{1}{4}$  in



the length of head, interorbital width  $2\frac{4}{5}$ . Depth of præ-orbital a little greater than diameter of eye. Maxillary extending a little beyond the nostril; præmaxillary processes not extending to above the eye; jaws nearly equal anteriorly; upper jaw with about 14 teeth in the outer series, the lateral teeth decreasing in size posteriorly; lower jaw with a transverse series of 9 teeth; fold of the lower lip not continuous; cheek with 5 series of scales; 6 gill-rakers on the lower part of anterior arch. Scales  $33\frac{6}{13}$ ,  $2\frac{1}{2}$  between lateral line and base of anterior rays of soft dorsal, those of the thoracic region very small. Dorsal XIX 10, the spines subequal from the fifth to the sixteenth, the last  $\frac{3}{5}$  the length of head; soft fin, when laid back, extending to middle of caudal; dorsal scaly at the base posteriorly. Anal VIII 7. Pectoral nearly as long as the head, not extending to above the anal; ventral with the outer ray elongate. Caudal truncate or even slightly emarginate. Caudal peduncle as long as deep. Olivaceous, obscurely spotted or marbled with darker.

Nicaragua.

1. (107 mm.) type of the species. Lake Managua. Capt. J. M. Dow.

#### HEROTILAPIA.

*Herotilapia*, Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 247 (1904).

Differs from *Cichlosoma* only in the dentition; both jaws with several series of compressed, incisor-like, tricuspid teeth; the outer series enlarged and with the median teeth simple, truncate.

The single species is evidently closely related to *C. nigrofasciatus* and its allies.

#### *Herotilapia multispinosa*.

*Heros multispinosus*, Günth. Trans. Zool. Soc. vi. 1869, p. 453, pl. lxxiv. fig. 2.

*Cichlasoma multispinosum*, Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1898, p. 1525.

*Herotilapia multispinosa*, Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 247 (1904).

Depth of body  $2\frac{1}{8}$  in the length, length of head nearly 3. Snout a little shorter than eye, the diameter of which is  $3\frac{1}{5}$  in the length of head, interorbital width  $2\frac{1}{4}$ . Depth of præ-orbital nearly  $\frac{2}{3}$  the diameter of eye. Maxillary not extending to below the eye; præmaxillary processes extending nearly to above anterior margin of eye; jaws equal



anteriorly; cheek with 3 series of scales; 8 gill-rakers on the lower part of anterior arch. Scales  $28 \frac{4\frac{1}{2}}{12}$ . Dorsal XVIII 9, commencing above the opercular cleft, the spines subequal from the fifth, the last a little more than  $\frac{1}{2}$  the length of head; soft fin scaly at the base, when laid back extending nearly to middle of caudal. Anal XI 8. Pectoral as long as the head, extending to above middle anal spines; ventral extending to sixth anal spine. Caudal rounded. Caudal peduncle  $\frac{2}{5}$  as long as deep. Olivaceous, with darker cross-bars; a dark spot on the middle of the side; a longitudinal band from eye to lateral spot.

Lake Managua.

1. (87 mm.) type of the species. Lake Managua. Capt. J. M. Dow.

### UARU.

*Uaru*, Heck. Ann. Mus. Wien, ii. 1840, p. 330; Günth. Cat. Fish. iv. p. 302 (1862); Eigenm. & Bray, Ann. Ac. N. York, vii. 1894, p. 612; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 248 (1904).  
*Acara* (part.), Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 63.

Closely allied to *Cichlosoma*, and especially to *C. psittacum*, differing in the dentition, the rather slender teeth being compressed, pointed in the young and with rounded apices in the adult. Scales rather small, those of the lateral line larger than the rest.

A single species from the Amazon.

### *Uaru amphiacanthoides*.

*Uaru amphiacanthoides*, Heck. Ann. Mus. Wien, ii. 1840, p. 331; Günth. Cat. Fish. iv. p. 302 (1862); Eigenm. & Bray, Ann. Ac. N. York, vii. 1894, p. 612; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 248 (1904).

*Uaru obscurum*, Günth. l. c.

*Acara (Heros) amphiacanthoides*, Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 94.

*Acara (Heros) imperialis*, Steind. Sitzb. Ak. Wien, lxxx. 1879, p. 161.

*Uaru imperialis*, Pellegr. t. c. p. 249.

Depth of body  $1\frac{1}{2}$ – $1\frac{3}{4}$  in the length, length of head 3– $3\frac{1}{5}$ . Diameter of eye  $3\frac{1}{2}$ – $3\frac{4}{5}$  in the length of head, interorbital width 2– $2\frac{1}{2}$ . Depth of præorbital  $1\frac{1}{4}$ – $1\frac{2}{5}$  the diameter of eye. Jaws equal anteriorly; maxillary not extending to below the eye; fold of the lower lip not continuous; cheek with 9–12 series of scales; 7 or 8 gill-rakers on the lower part of anterior arch. Scales in a longitudinal series, 55–60 above the lateral line, 46–52 below it; scales in a transverse series  $\frac{11-13}{24-28}$ . Lateral line 18–21 + 10–13. Dorsal XV–XVI (13–14)

15-16, the spines subequal from the fifth or sixth, the last  $\frac{1}{2}$ - $\frac{2}{5}$  the length of head, the soft fin scaly at the base. Anal VIII-IX (X 12-13) 14 (15-16). Pectoral a little longer than the head. Caudal rounded. Caudal peduncle  $\frac{1}{4}$ - $\frac{1}{3}$  as long as deep. Brownish, with a broad blackish lateral band, a blackish spot behind the eye and another on the upper part of the base of caudal.

R. Amazon.

- |   |            |                   |
|---|------------|-------------------|
| 1. (145 mm.) type of <i>U. obscurum</i> . | R. Cupai.  |                   |
| 2. (215 mm.)                              | L. Saraca. | Prof. A. Agassiz. |
| 3. (198 mm.)                              | Teffé,     | Paris Museum.     |

#### SYMPHYSODON.

*Symphysodon*, Heck. Ann. Mus. Wien, ii. 1840, p. 332; Günth. Cat. Fish. iv. p. 316 (1862); Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 106; Eigenm. & Bray, Ann. Ac. N. York, vii. 1894, p. 623; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 249 (1904).

Closely allied to *Cichlosoma*, especially to *C. severum*, differing in having the teeth confined to the anterior part of each jaw and in the structure of the fins, the dorsal having VIII-IX 28-31 rays and the anal VII-IX 26-31. The body is nearly circular in form, compressed; the scales are rather small, those of the lateral line being larger than the rest.

A single species from the Amazon.

#### *Symphysodon discus*.

*Symphysodon discus*, Heck. Ann. Mus. Wien, ii. 1840, p. 333; Günth. Cat. Fish. iv. p. 316 (1862); Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 106; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 250 (1904).

Depth of body  $1-1\frac{1}{5}$  in the length, length of head  $3\frac{2}{5}-3\frac{3}{5}$ . Snout as long as postorbital part of head. Diameter of eye  $3-3\frac{1}{2}$  in the length of head, interorbital width  $2-2\frac{2}{5}$ . Depth of præorbital  $1-1\frac{1}{4}$  the diameter of eye. Mouth small, oblique; maxillary extending to below the nostril; fold of the lower lip continuous, slightly produced. Cheek with 7 or 8 series of scales; 4 or 5 very short gill-rakers on the lower part of anterior arch. Scales 65-70  $\frac{17-18}{33-35}$ , 50-55 in a longitudinal series below the lateral line, 6 between upper and lower lateral lines. Dorsal VIII-IX 30-31 (VII-IX 26-31). Anal VIII 27-30 (VII-IX 26-31). Dorsal and anal spines graduated, the fins covered with scales in their basal halves. Pectoral a little longer than the head. Caudal rounded. Caudal peduncle very short. Body with dark

undulating longitudinal stripes and with 9 dark cross-bars, of which the first, through the eye, the fifth, in the middle of the length of the body, and the ninth, on the base of the caudal, are more strongly marked than the others; soft vertical fins with alternate light and dark spots.

R. Amazon.

- |              |           |                   |
|--------------|-----------|-------------------|
| 1. (110 mm.) | R. Cupai. |                   |
| 2. (135 mm.) | R. Negro. | Mr. J. C. Antony. |
| 3. (170 mm.) | Teffé.    | Dr. J. Bach.      |
| 4. (130 mm.) | Manaos.   | Paris Mus.        |

Pellegrin gives the name *aquifusciata* to a variety without longitudinal stripes and with all the cross-bars equally distinct.

#### PTEROPHYLLUM.

*Pterophyllum*, Heck. Ann. Mus. Wien, ii. 1840, p. 334; Günth. Cat. Fish. iv. p. 316 (1862); Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 136; Eigenm. & Bray, Ann. Ac. N. York, vii. 1894, p. 624; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 251 (1904).

*Plataxoides*, Casteln. Anim. Am. Sud, Poiss. p. 21, pl. xi. fig. 3 (1855).

Very closely allied to *Symphysodon*, which it resembles in the deep nearly circular body and the small scales, but differing in the dentition, the teeth extending on to the sides of the jaws. Dorsal with XI-XIII 24-30 rays, anal with V-VII 24-32.

R. Amazon; R. Orinoco.

Two species.

#### 1. *Pterophyllum scalare*.

*Platax scalaris*, Cuv. & Val. Hist. Nat. Poiss. vii. p. 237 (1831).

*Pterophyllum scalare*, Heck. Ann. Mus. Wien, ii. 1840, p. 335; Günth. Cat. Fish. iv. p. 316 (1862); Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 136; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 251 (1904).

*Plataxoides Dumerili*, Casteln. Anim. Am. Sud, Poiss. p. 21, pl. xi. fig. 3 (1855).

Depth of body a little less than the length, which is  $2\frac{2}{3}$ -3 the length of head. Snout not longer than eye, the diameter of which is  $2\frac{2}{3}$ -3 in the length of head and equal to the interorbital width. Depth of præorbital  $\frac{1}{2}$  the diameter of eye or less. Mouth small, oblique; maxillary extending to below the nostril; fold of the lower lip continuous; cheek with 4 or 5 series of scales; 12-14 gill-rakers on the lower part of anterior arch. Scales 40-47  $\frac{8-10}{22-26}$ , 33-38 in a longitudinal series below the lateral line. Lateral line 17-19 + 9-11. Dorsal XI-XIII 23-27, the spines graduated,

the last about as long as the head; anterior soft rays considerably produced; middle part of the fin scaly at the base. Anal VI 26-29 (V-VII 24-29). Pectoral as long as the head; ventral produced into a long filament. Caudal truncate, the outer rays sometimes produced. Caudal peduncle  $\frac{1}{4}$ - $\frac{1}{3}$  as long as deep. Silvery with 4 well-marked blackish cross-bars, the first through the eye, the second from spinous dorsal to origin of anal, the third from soft dorsal to anal, the fourth on the base of caudal; between these narrower and less distinct intermediate bars; soft vertical fins sometimes with alternate light and dark stripes.

R. Amazon.

1. (102 mm.)	R. Cupai.	
2. (81 mm.)	Tabatinga.	Mus. Comp. Zool.
3. (99 mm.)	Manaos.	Mr. J. C. Antony.
4. (61 mm.)	Tonantins.	Paris Mus.
5-7. (31-60 mm.)	Marajo Id.	Dr. E. A. Göldi.

## 2. *Pterophyllum altum*.

*Pterophyllum altum*, Pellegr. Bull. Mus. Paris, 1903, p. 125; Mém. Soc. Zool. France, xvi. 1903, p. 252, pl. iv. fig. 4 (1904).

Depth of body equal to its length. Cheek with 6-7 series of scales; 11 gill-rakers on the lower part of anterior arch. Scales about 55  $\frac{14-16}{31-36}$ , 41-47 in a longitudinal series below the lateral line. Dorsal XII-XIII 27-30. Anal (V) VI 28-32. Caudal peduncle  $\frac{2}{3}$  as long as deep. In other characters similar to the preceding species.

R. Orinoco.

1-2. (83 and 85 mm.) co-types of the species.	R. Orinoco.	Paris Museum.
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## APPENDIX.

The British Museum has just received a series of the Mexican Cichlids collected and described by Dr. S. E. Meek. After examination of these it seems useful to make a few additions and corrections.

### *Cichlosoma fenestratum* (suprà, p. 227).

To the synonymy add:—

*Cichlasoma melanurum* (part.), Meek, Zool. Pub. Columbian Mus. v. 1904, p. 219.

After the description of *C. melanurum* (p. 231) should be inserted:—

*Cichlosoma labridens*.

*Heros (Cichlasoma) labridens*, Pellegr. Bull. Mus. Paris, 1903, p. 122.

*Cichlasoma labridens*, Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 207, pl. vi. fig. 1 (1904).

*Cichlasoma Bartoni* (non Bean), Meek, Zool. Pub. Columbian Mus. v. 1904, p. 211.

*Cichlosoma Bartoni* (part.), Regan, *suprà*, p. 327.

Depth of body  $2\frac{1}{5}$ – $2\frac{2}{5}$  in the length, length of head  $2\frac{1}{5}$ – $3\frac{1}{5}$ . Snout a little shorter than postorbital part of head. Diameter of eye  $4$ – $5\frac{1}{2}$  in the length of head, interorbital width 3. Depth of præorbital  $1$ – $1\frac{3}{5}$  the diameter of eye. Maxillary not extending to below the eye; jaws equal anteriorly; fold of the lower lip subcontinuous or not continuous; cheek with 4–6 series of scales; 6–8 gill-rakers on the lower part of the anterior arch. Scales  $30$ – $32$   $\frac{5-6}{12-14}$ ,  $2\frac{1}{2}$  or 3 between lateral line and base of anterior part of soft dorsal. Dorsal XV–XVI 10–12, commencing above or in advance of the axil of pectoral, the spines subequal from the fifth or sixth to the thirteenth or fourteenth, thence increasing to the last, which is  $\frac{2}{5}$  the length of head. Anal V (VI) 8–9. Pectoral nearly  $\frac{3}{4}$  the length of head, extending about to above the vent; ventral extending nearly to origin of anal. Caudal rounded or subtruncate. Caudal peduncle from  $\frac{3}{4}$  to as long as deep. Olivaceous, sometimes with 4 or 5 dark cross-bars on the posterior part of the body; sometimes the lower part of the head and abdomen blackish and a large dark blotch on the caudal peduncle; upper surface and sides of head often covered with small dark spots; fins greyish or dusky.

Rio Panuco and its tributaries, Mexico.

The above description is based on six specimens, 80–175 mm. in length, from the Rio Verde.

This species is very closely allied to *C. melanurum*.

*Cichlosoma Gadovii* (p. 232).

The synonymy of this species should read:—

*Cichlasoma melanurum* (part.), Meek, Zool. Pub. Columbian Mus. v. 1904, p. 219.

*Cichlosoma aureum* (p. 320).

Specimens have been received under the names of *Thorichthys Helleri* and *T. Elliotti*. The former have the

spots on the cheeks blue, often surrounded by a dark ring ; in the latter the corresponding spots are blackish, many of them with a blue centre. In all other respects these two supposed species are absolutely identical.

*Cichlosoma istlanum* (p. 326).

Several young specimens differ in coloration from examples of *C. Steindachneri* of the same size. They have 7 or 8 dark cross-bars, a dark spot below the origin of the lateral line, another on the middle of the side, and a third at the base of the caudal.

After the description of *C. istlanum* should be inserted:—

*Cichlosoma Steindachneri.*

*Cichlasoma Steindachneri*, Jord. & Snyder, Bull. U.S. Fish. Comm. xix. 1899, p. 143, fig. 20; Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1900, p. 3173; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 206 (1904); Meek, Zool. Pub. Columbian Mus. v. 1904, p. 211, fig. 67. *Cichlosoma istlanum* (part.), Regan, *suprà*, p. 326.

Depth of body  $2\frac{1}{3}$  in the length, length of head  $2\frac{4}{5}$ . Snout as long as postorbital part of head. Diameter of eye 4 in the length of head and equal to the interorbital width. Depth of præorbital equal to diameter of eye. Maxillary slightly exposed, extending to between nostril and eye; præmaxillary processes extending to above anterior margin of eye or slightly beyond; jaws equal anteriorly; fold of the lower lip subcontinuous; upper jaw with the two anterior teeth of the outer series the largest, forming canines; lower jaw with 3 pairs of canines, the anterior pair the smallest; cheek with 6 series of scales; 8 gill-rakers on the lower part of the anterior arch. Scales  $31\frac{5\frac{1}{2}}{13}$ ,  $2\frac{1}{2}$  between lateral line and base of anterior rays of soft dorsal. Dorsal XVI 10, the spines subequal from the sixth to the fourteenth, thence increasing to the last, which is a little more than  $\frac{1}{3}$  the length of head; soft fin, when laid back, extending to anterior  $\frac{1}{3}$  of caudal. Anal V 8. Pectoral  $\frac{3}{4}$  the length of head, extending to above the vent; ventral extending to the vent. Caudal subtruncate. Caudal peduncle nearly as long as deep. Olivaceous; sides with about 10 narrow vertical dark bars; a series of dark blotches forming an interrupted longitudinal band from operculum to base of caudal; sides of head and lower part of body with small dark spots;

spinous dorsal blackish; soft dorsal, anal, and caudal dusky, obscurely spotted at the base.

The above description is based on a single specimen, 104 mm. in total length, from the Rio Verde. Smaller examples (40–55 mm.) have a more slender body (depth  $2\frac{2}{3}$ –3 in the length).

*Cichlosoma Bartoni* (p. 327).

The synonymy of this species should read:—

*Acara Bartoni*, Bean, Proc. U.S. Nat. Mus. 1892, p. 286, pl. xlv. fig. 3.  
*Cichlasoma Bartoni*, Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1893,  
p. 1515, fig. 587; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 206  
(1904); Meek, Zool. Pub. Columbian Mus. v. 1904, fig. 68.  
*Cichlosoma Bartoni* (part.), Regan, *suprà*, p. 327.

Three young examples of this species, 53–72 mm. in total length, from the Rio Verde, received as *C. Steindachneri*, differ from that species, which they resemble in coloration, in the larger head ( $2\frac{1}{2}$  in the length), more produced snout, and larger and more oblique mouth. Scales  $32\frac{5-6}{12-14}$ ,  $2\frac{1}{2}$  between lateral line and base of anterior part of soft dorsal. Dorsal XVI 10–11, the last spine  $\frac{1}{3}$  the length of head. Anal V 8. The coloration is similar to that of the adult example figured by Bean, but the body is not so deep.

*Cichlosoma octofasciatum* (p. 331).

A series of specimens received as *C. Hedricki* includes a small example in every way similar to the type of the species.

*Herichthys cyanoguttatus* (p. 434).

Entirely similar examples have been received under the names *Cichlasoma cyanoguttatum* and *Neetroplus carpintis*. My opinion as to the identity of these species is thus confirmed.

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LI.—*A New Explanation of the Red Colour in the Hind Wing of Catocala*, Schr. By CH. SCHAPOSCHNIKOW\*.

THE question as to how the development of the red colour in the hind wing of *Catocala* is to be explained has not yet, in the literature with which I am acquainted, been dealt with

\* Translated by E. E. Austen from the 'Biologisches Centralblatt,' xxiv. Bd. (1904) pp. 514–520.



and answered in the way that I attempt to set forth in its main outlines in the following pages. My more especial aim in publishing this little paper, however, is that other observers may be thereby induced to give utterance to further remarks and views as to the question under discussion.

All attempts at explaining the significance of the red coloration in the hind wing of *Catocala*, as recorded in literature, amount to two modes of regarding it, since the red is put down either as a "warning" or as what may be termed an "attractive" colour. The latter designation implies that, as interpreted by the authors who hold this view, the significance of the red colour consists in attracting the bird which is pursuing the moth. According to this theory the bird seizes only the *wing*, and not the *body*, of the fugitive insect; the portion seized tears away, and thus the victim escapes. Explanations such as this have been given by Wallace, Darwin, Poulton, von Bock, Bedar, and others.

The first-mentioned attempt at explaining the red coloration in *Catocala* as a "warning" colour is, however, opposed by important facts, the first of which is that *Catocala*, on the approach of an enemy, suddenly departs from its resting-place when that enemy is still at a considerable distance. Secondly, it is only during its most rapid flight that the insect displays the bright colour. These facts can scarcely be used in support of such an interpretation of the colour as that it serves to frighten away the enemy, or else to indicate to it at once that the insect is unfit to eat. Experiments, moreover, lead to the conviction that the pursuing bird seizes the *Catocala* in its flight by the brightly coloured wing.

The second attempt at explanation, according to which the red in *Catocala* is to be regarded as an "attractive" colour, is chiefly based upon observations upon species of *Agrotis* with yellow hind wings, whence it has been transferred to the species of *Catocala* with yellow and also to those with red hind wings. With reference to the observations upon *Agrotis* it must not, however, be overlooked that they were only made in the artificial conditions of an aviary. Moreover, the external resemblance between *Agrotis* and *Catocala* in no way justifies us in attributing to their *similar coloration* the same *biological significance* in the struggle for existence, and still less are we entitled to do so seeing that there is to start with a very considerable difference in the mode of life of the two genera. Besides this, it is still doubtful whether the principle in question can even be applied to all species of *Agrotis* with yellow hind wings; there is a series of transitional forms, ranging from the large



*Agrotis pronuba*, Linn., to the small *Agrotis anachoreta*, H.-Sch., and *luperinoides*, Gn. The hind wings of these small species of *Agrotis* are not less brightly and conspicuously coloured; and even granting that this feature in the case of the first-mentioned species (the Large Yellow Underwing) is able to divert the attention of a bird so as to cause it to attempt to seize the insect by its hind wings, this would still be far too difficult in the case of the two latter species when on the wing, owing to their very smallness. It would undoubtedly be easier for the pursuing bird to strike at the *body*. But even if we admit the justice of this explanation in the case of *Agrotis pronuba*, Linn., it is still impossible to fix a limit up to which the yellow coloration of the hind wing may be injurious to the possessor or to decide when its attractive property may begin to be useful to the insect, for species of *Agrotis* occur in all sizes in an ascending series from the smallest forms. It must also not be overlooked that, in opposition to the large species which, apart from accidental contingencies, flies exclusively by night, we find the above-mentioned small species of *Agrotis* on the wing by day, and therefore at the only time when they are in a position to turn the yellow coloration to account.

If we are unwilling to admit the force of all these statements, there still remains the question as to how we are to reconcile with the principle of attractive wing-coloration the bright colour of the *body* of various species of *Catocala* (*pacta*, Linn., *neogama*, Sm. Abb., *magdalena*, Streck., *Frederici*, Grote, *neonympha*, Hbnr., and *amica*, Hbnr.), of *Agrotis* (*imbria*, Linn., &c.; for since the wings, which during flight are in a state of rapid movement, appear less brilliant than the similarly coloured body, which is more at rest, we are led, on the basis of the above-mentioned principle, to the conclusion that this brighter body is calculated to entice birds to pursuit. Furthermore, how can the black marking of the hind wing be consistent with the recognition of this principle? Since, by virtue of well-known physiological laws, the parts of the wing that lie nearer to the base and move with less great rapidity appear brighter to us than the marginal portions of the wing, it follows that the former, which are adjacent to the body, must, being the brighter, concentrate the attention of the pursuer upon themselves. This concentration of the attention is further accentuated and the capture of the fugitive moth thereby facilitated if the margins of the wings are darkened, so that the lightness of the central area is heightened by contrast; and it is actually a fact that, in the case of the species of *Agrotis* with yellow

hind wings, we almost always find a more or less broad black margin. The pursuing bird will accordingly always endeavour to seize the portion of the wing that lies nearer to the body, *i. e.* the basal half; but if it does so it is doubtful whether the victim can tear itself free.

Let us now refer to a hypothesis—purely an abstract one, indeed—which is indispensable if we would explain the bright coloration as attractive. We actually find in nature a series of examples showing that in self-defence an animal sacrifices the portion of its body by which its enemy seizes it; thus, for instance, the lizard abandons its tail and certain spiders sacrifice their long legs. In all such cases the part of the body that is shed is regenerated. In the case of moths an analogous reproduction naturally cannot take place, and with them therefore a safeguard of this kind must continue to be accidental and only possible on one single occasion.

If, however, in spite of all these considerations, we would still apply the above-mentioned principle to *Catocala* also, we shall have to meet the question as to how it is affected by natural selection.

When motionless, and so long as it remains upon a particular spot, the moth is unable to make use of the “attractive” coloration; for this purpose it must be in *motion* and on the wing. If, however, during its flight it abandons a portion of its wings to the pursuing bird, it will scarcely satisfy the latter by so doing, and can consequently not free itself from further pursuit. The sacrifice of a part of its wings at most enables the moth to gain a little time, while, on the contrary, the lizard, for instance, which sacrifices part of its tail, utilizes the few moments so gained to disappear into a hole or cleft in a rock. The moth with “attractive” coloration would be compelled to fly on and to make use of a suitable moment in order to conceal itself. It follows that in its case there would have to be developed, firstly, a quick and adroit flight, and, secondly, the capacity of concealing itself unnoticed. The struggle for existence was bound first of all to evolve so much the more strength and adroitness of flight, since with the loss of or injury to the hind wing exhibiting the attractive coloration its attractive *rôle* as such disappears. It follows that only those individuals would survive that by dint of concealing themselves unnoticed were able to turn their flight to the best account and escape the sacrifice of a portion of their wings, *i. e.* those that made least use of the “attractive” coloration in order to “attract.” The ultimate object of the flight would be to settle unobserved by the enemy and to obtain concealment by means of the mimetic coloration of the

upper side of the fore wings; this object is, moreover, alluded to by von Bock in the passage in which, referring to *Catocala*, he states that the moths on being frightened up by him suddenly disappeared before his eyes, without his having been able to observe where they had settled. Herein there lies an inconsistency, however: if the destined function of the bright colour in the case of *Catocala* were to turn the attention of the pursuer to itself, and if the bird then made use of the chance of seizing its victim by the wing, it would be impossible for so large a moth as *Catocala* to conceal itself unnoticed at so short a distance from its enemy. But what do we see in reality? The structure of the wings of the red *Catocala*, as also the relative size and the shape of its body, render the insect capable of strong and rapid flight. The coloration of the species in question differs from that of the other species owing to the hind wings being red on the upper side and provided with two black transverse bands, while the grey dark-striped fore wings appear perfectly adapted to the tree-bark on which the moth usually settles; the under side is characterized by a light ground-colour, bordered by two black bands. By day we generally find our *Catocala* at rest on a tree-trunk; it is excessively shy and flies up if approached ever so gently. Its flight is not regular, but, on the contrary, interrupted; it darts from one side to the other, settles suddenly on a tree, flits up again, and frequently makes one or two more short flights of this kind before finally settling down. At times it flies no farther, but merely makes, as it were, a jump to one side, and settles again upon the same tree, but on the opposite side and higher up. These irregular interrupted movements render the insect uncommonly difficult to capture. On settling it makes a dart with lightning-like rapidity in the direction of its chosen resting-place, and then drops down there, having thus again made it extremely difficult to fix the spot with the eye. The fact that on the approach of an enemy our moth does not remain quietly sitting still as other mimetic species are wont to do, but endeavours to save itself by flying away, certainly points to the conclusion that in this case flight is of greater importance for the self-preservation of the insect than the mimetic coloration of the fore wings—that is to say, flight attains the object of leading the pursuer astray, and then, with the assistance afforded by the coloration, rendering it possible for the moth to settle unperceived.

The characteristic flight of our *Catocala* compels the enemy to make a special effort with its visual apparatus, in order to keep its prey within view; in the pursuit the bird fixes its

eyes upon the bright object, as the flying *Catocala* appears to it to be. The brighter the effect of its colour, the more difficult will it be, owing to the contrast of hue, to recognize the grey patch into which, especially upon grey bark, the moth converts itself at the moment of settling. Were its colours wholly grey, the pursuer, fixing its gaze upon this grey object, would pay most attention to its outlines and not to its colour; and consequently the object would always remain visible to the enemy, to whom the spot upon which it had settled would likewise be apparent. Assuming that its contrast in colour is absolutely necessary to the moth, it is evident (1) that moths that have recourse to the above-described mode of flight, which I would term "distracting" flight, must possess the brightest coloration, and (2) that those that exhibit brightly coloured hind wings must also have a bright-coloured underside to all the wings, in order to be able to give greater effect to the influence of this coloration in flight. Since, moreover, the larger the moth the less is the advantage that it is able to gain from its mimetic coloration, while, on the other hand, it is all the more capable of saving itself by means of its powers of flight, it follows from these two hypotheses that the largest species of *Catocala* must also show the brightest colours. The red *Catocala* chiefly inhabits woods composed of the various deciduous trees. In perspective a wood appears generally as a green background (foliage and grass) with some light and dark streaks (tree-trunks and their shadows); consequently as a *contrast of colours* we have the red, which serves a complement of the green. And, again, it is especially in the most robust representatives of their genus that this red coloration must display itself. As a *colour-contrast to the light and dark stripes in the wood there appear in addition the black- and white-banded undersides* of the fore and hind wings of our moth, which cause the latter to be easily visible in the light as well as in the dark interspaces among the trees.

With this appearance of species of *Catocala* with red hind wings is also connected their geographical distribution. Their predominance in the northern half of Europe is especially characteristic, for among all the species of *Catocala* in this region we find only two which show no red. The conditions presented to them in the area in question are the following:—the forests are not so dense as in warmer lands, so that usually sufficient space remains to allow the moth to make use of its powers of flight; moreover, a perspective is produced which, in accordance with the hypothesis expressed above, enables the moth to bring its corresponding coloration

and marking into play. In these woods the enemies of the moth, which rests during the day upon the trunks of trees, are the birds\*, both the scansorial species (*Picus*, *Sitta*, and their allies), as also those that pick insects off twigs, or in other cases search for them upon the ground (*Turdus* and others of the same group). At night, when the moth is on the wing, it is waylaid by bats. From thrush-like birds the red *Catocala* is sufficiently protected by the height of its resting-place; it scarcely ever settles so near the ground as to attract the attention of birds of this kind, and, again, never at such a height as to fall a victim to birds perching upon twigs. A safe elevation would be at from  $1\frac{1}{2}$  to  $2\frac{1}{2}$  metres from the ground, and it is at about this height that, as a rule, our red *Catocala* is actually to be seen. More dangerous to it are the birds that climb and closely search the tree-trunks (*Picus*, *Sitta*); it is not easy for so large a moth to escape their notice, but all these birds invariably make a noise in climbing, and in our *Catocala* the sense of hearing appears to be particularly well developed, so that on the approach of woodpeckers and other climbing birds it is always possible for it to flit off from the trunk at the right time. By day it avails itself both of the strength and adroitness of its flight, as also of the corresponding wing-coloration, in order by these means to be more or less effectually protected from a bird that may be seeking for it. Though I am acquainted with a considerable number of cases which point to bats as being solely responsible for the destruction of the moth, I am unable to prove a single instance in which a *Catocala* has been killed by a bird during the day. Nor is it difficult to understand why *Catocala* is chiefly caught by bats, for bats hunt in the dark and by ear, and against them *Catocala* can only make a partial use of its distracting flight, while its colour is of no use to it at all.

What has been stated above as to the enemies of *Catocala* explains at once the precise kind of region in which existence is possible for a group of moths of fairly considerable size and powerful musculature, the members of which sit upon tree-trunks when at rest and possess mimetic fore wings and brightly coloured hind wings, the coloration of which plays a distracting part in connexion with a distracting flight. For the evolution of a group of moths with the above-mentioned

\* Lizards and snakes would also come within the category of insect-enemies which climb without noise; but the tree-lizards that inhabit the region in question are too small and not sufficiently numerous, while the tree-climbing snakes are incapable of ascending trunks as thick as those usually chosen by the red *Catocala* for its resting-place.

characteristics—that is to say, the development of the red species of *Catocala*—would be simply impossible, firstly in a region in which a series of foes exists capable of noiselessly approaching the moth as it rests upon the tree-trunk, and secondly where, on being pursued, owing to limited space and in consequence of the absence of a definite perspective, the insect cannot terminate its distracting flight and turn its distracting colour to account. To these circumstances is to be ascribed the fact that the red *Catocala* is widely distributed in the Nearctic and Palæarctic Regions, but does not occur in the Tropics. And it appears to be further deserving of note that in the Neotropical and Australian Regions, which have an older character, nothing is known of any representatives of the genus *Catocala* at all.

A glance at the recent species of *Catocala* will serve to confirm the interpretation here given; almost all the red species of *Catocala* are moths of a size which the yellow species of *Catocala* in most cases fall far short of. The marking of the red species of *Catocala*, consisting of two black transverse bands, is, almost without exception, absolutely regular in its occurrence, while the yellow species show manifold modifications. Another interesting fact is that the orange-coloured species of *Catocala* are also of large size, while their marking, which consists of two black transverse bands, remains more or less constant; in the case of the yellow species, on the other hand, it is generally only among the larger representatives that we find the marking in question regular in its development. At the same time, however, it is self-evident that local and historical conditions must have produced a series of modifications both in size as also in coloration in the case of the red species of *Catocala* as well; in them nevertheless these modifications are, as has already been mentioned, much less considerable. As a characteristic representative of the coloration that we have been investigating, *Catocala elocata*, Esp., may be taken. This species is one of the largest of the genus *Catocala*, and at the same time one of the commonest of European moths.

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LII.—On the *Mus orthodon* of Hensel.

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

GENTLEMEN,—In 1900, while preparing a paper for the P. Z. S. (pp. 387–428) on *Mus sylvaticus* and its allies, I had occasion to examine and discuss the *Mus orthodon* of



Hensel. Misled by an authority, who shall be nameless, and by the fact that an important paper by my friend Dr. Forsyth Major was published in a foreign tongue with which I was at that time unacquainted, I erroneously concluded that Dr. Forsyth Major considered *Mus orthodon* to be a very near ally of *Mus sylvaticus*. His real opinion, published in the Proc. Verb. Soc. Tosc. Sci. Nat. 1884, was very different, as he now informs me, and I believe I am right in saying that it coincides with that at which I myself independently arrived in my paper of 1900.

Although, then, no difference of opinion exists between us on any question of fact, I fear that those who read my paper might easily conclude otherwise, and they would certainly gain a false impression—due to my having followed too blindly the above-mentioned “authority”—of the value of Dr. Forsyth Major’s work. To remove any such misunderstandings is the object of this letter, an explanation being clearly due to Dr. Forsyth Major, against whom I can formulate no complaint more serious than that so many of his most luminous papers on Palearctic mammalogy should have been published in foreign journals often not readily accessible.

I am, yours truly,  
G. E. H. BARRETT-HAMILTON.

#### BIBLIOGRAPHICAL NOTICES.

*Economic Resources of the Northern Black Hills.* By J. D. IRVING. With Contributions by S. F. EMMONS and T. A. JAGGAR, JR. Pages 222. 4to. Government Printing Office, Washington, 1904.

THIS volume, published as “No. 26” of the “Professional Papers: Series A. Economic Geology, 34; B. Descriptive Geology, 38,” consists of Part I. General Geology, by T. A. Jaggar, pages 17–41; and Part II. Mining Geology, by J. D. Irving and S. F. Emmons; 214 pages, 19 plates, and 15 text-figures. Lastly, the Index, 8 pages.

This is one of the very useful contributions by the U.S. Geological Survey to the inhabitants of a definite area of the recognizable features and structure of the land, systematically considered, as well as of its products and capabilities.

All notices of the Geology of the district already published are duly mentioned at page 13.

The Black Hills in South Dakota have a dome-like structure of

strata in successional order from the Alongkian schistose formation at the base, up to the Benton (Cretaceous) beds at top. Thus including: (1) the Cambrian (after the Alongkian); (2) the Silurian or Ordovician; (3) the Carboniferous; (4) the Permian and doubtful Triassic; (5) the Jurassic; and (6) the Cretaceous. There are some Tertiary and Quaternary deposits, of limited extent, here and there on the surface.

The succession, chief characters, physical features, and relative thicknesses of the several formations are given in the diagram at page 18, and the table, pages 20 & 21; giving for these superincumbent formations an aggregate thickness of more than 2000 feet.

These are more or less completely traversed by intrusive igneous rocks, chiefly porphyritic, in dikes and sills, with laccolites. The intrusions were probably made in the Eocene period. But the general uprise of the area was not caused by the forcible addition of the porphyries and their associated intrusive rocks, but by other earlier and different crush-movements, intimately connected with the great movements that elevated the Bighorn Range and the Rocky Mountains. Many sections well show the extent of erosion, exposing both the sedimentary and the igneous rocks, and their local features; also the particular crush-breccias of certain old limestones. Careful calculations are made as to the formerly superincumbent formations; also as to the probable order of events, and the local results of movements in the various schists and limestones.

The descriptive Geology of the mining districts (p. 33) treats concisely of certain sections:—(I.) in the Alongkian Schists near Homestake and Clover-leaf mines; (II.) in the Lower Palæozoic Rocks, (1st) on the railroad near Terry Peak, (2nd) near Englewood in the Eo-Cambrian limestone, and (3rd) on the Bear-Butte Creek near the town of Galena; (III.) The Tertiary and Quaternary deposits are not metalliferous, but some of the "ancient stream-gravels may contain placer gold, but they have not been worked to any extent, as compared with the gravels of the present gulches" (p. 41).

Part II. Mining Geology begins with the gold-ore of the Alongkian rocks in the Homestake and Clover-leaf mines (pages 55-94), treating in full of their history, development, geological features, and the method of working; also of the character and constitution of the ores and their associated rocks and minerals, and of the probable order of deposition and metamorphism. Traces of copper are noticed in the schists at City Creek and Deadwood Hill.

The ore-deposits in the Cambrian rocks of the North Black Hills (page 98, &c.) are considered both generally and in detail. Of late years they have given an aggregate output nearly equal to that of the Homestake Mine. They are the Gold and Silver ores of the Cambrian basal conglomerates (pages 104, &c.), the "Refractory Siliceous Rocks" (page 101, &c.), the Tungsten ores (page 162, &c.), and the Lead and Silver ores (page 169, &c.). The very interesting account



of the position, characters, and origin of the "Refractory Siliceous Ores" is full of information as to discovery, exploitation, extent, characters, and the value of the several bodies of ore in the Bald Mountain area (with its subordinate districts), also in the Garden, Lead, Yellow Creek, and Squaw Creek areas.

The component minerals of these bodies of ore are quartz, chalcedonic silica, pyrite, arsenopyrite, barite, fluorite, gypsum, stibnite, and uranium-mica; but they exhibit considerable variations, due to local alterations and rearrangements of constituents. The methods of mining and treatment of the ores are referred to at page 160.

The production of these Cambrian Siliceous ores in the North Black Hills, in 1897, has been reported as amounting to \$2,164,287.58 (page 117). The ore-bodies (or "shoots") occur as more or less banded masses, with a "channel-like" form, nearly parallel to the bedding-planes of the strata in which they are found, and are thick in the centre with vertical extensions, and thin at the periphery. Their origin is probably due to the passage of mineral waters along the planes of bedding, and in very numerous cross-fractures, giving rise also to extensive mineralization of the neighbouring ("country") rocks. The text-figures at pages 126, 132, and 157, as well as plates xi. to xvii., are especially illustrative of these "Refractory Siliceous ores." The reason for the name here given to them is explained at page 111.

*Iowa Geological Survey.*—Vol. XIV. *Annual Report, 1903, with Accompanying Papers.* SAMUEL CALVIN, A.M., Ph.D., State Geologist. T. SAVAGE, Assistant State Geologist. With 664 pages, 38 plates, and 132 text-figures. Des Moines, Iowa Geological Survey, 1904.

The mineral products of Iowa are generalized at pages 9–26, with their localities according to Counties, and with the relative value of the coal, clay, stone, gypsum, lead, zinc, and limestone. Of these the clays are the most important; and a full account of the clay industries in the State constitutes the main subject of this useful volume.

Pages 29–348 treat of the "Technology of Clay." This abundant hydrous silicate of alumina originates in the decomposition of the felspar in granite and other rocks; and, being distributed by rain, river, and sea, is ultimately collected by nature in various modes and conditions, known to geologists generally, and practically to agriculturalists, civil engineers, and makers of pottery and other ceramic ware. For them this chapter proceeds to treat in detail of the origin and natural history of clay, how it is got, how prepared, and of its economic uses. The physical properties and consequent characters of clay are described; and chemical analyses, both of the raw and the burnt material, are given. Thus the relative fineness of grain in the fresh clay (p. 116) is very important in judging the probable results in proposed manufacture of any kind of brick, tile,

or pottery, since the various physical conditions directly influence its fusibility.

Chapter IV. describes processes in the manufacture of clay-wares. Firstly, the method of getting and preparing the raw material (pp. 148-184); with illustrations of machinery and apparatus. The making of bricks, tiles, pipes, and pottery follows; with remarks on glazings (pp. 185-234). The methods of drying, heating, and burning are described, with notes on fuel and the types of kilns. Chapter V., "The Chemistry of Clays" (pp. 322-345), gives the methods, results, and value of different analytical processes; the quantitative analyses of samples from seventy-two places in the State are tabulated, pp. 344 & 345. Chapter VI. (pp. 347-376) is concerned with the "Selection, Installation, and Care of Plant Power," giving clear and useful reports on the engines, boilers, and associated machinery used in the clay-works—how they should be chosen, fixed, and utilized to the best advantage. With several illustrative plates and diagrams.

Chapter VII. (pp. 379-534), "The Geology of Clay," deals with the topographical and geological distribution of clays and shales in Iowa. Plate I. defines the 101 Counties of the State. Plate II. shows the outcrop of nine regular geological formations, with a N.W.-S.E. strike and a general N.E. dip. Plate III. indicates the distribution of seven superficial Drift-deposits and 220 localities of special clay-pits.

The Map, Pl. II., recognizes the Cretaceous (see also p. 409), the Carboniferous (Missourian, Des-Moines, Mississippian), Devonian (p. 325), Silurian, Ordovician, Cambrian, and Algonkian Formations. At pages 403 &c., after a notice of the Devonian Shales, the Lower Carboniferous series, including the Kinderhook shales, are described as being of some value. In the Upper Carboniferous (pp. 410-549), including the Coal-measures, argillaceous beds, especially the fire-clays, are very valuable and extensive. These fire-clays or under-clays (pages 411 &c., also p. 325), because of their having lost (by leaching chiefly) most of their original alkaline constituents, do not readily fuse, and, being resistant to fire, are well-known as "fire-clays." The characters and uses of these and other clays are carefully noticed according to localities and Counties. The seventy illustrations (in plates and text-figures) given for the geological sections, the local works, machinery, and apparatus, are of first-rate quality, and fit well into their right places, both for artistic and economic effect. This may also be said of the numerous other illustrations in the volume, enhancing its value to all engaged in scientific studies or business pursuits concerned with the handling of clays or with the trading of its products.

The larger portion of the north-western third of the State of Iowa consists geologically of Cretaceous deposits (p. 509). In the upper series argillaceous beds predominate, and near the top the marls and limestones of the Niobrara Chalk appear. In the 'Iowa Geological Survey,' vol. iii. 1895, this formation and its fossils were reported on; and its Foraminifera were especially noticed in the 'Geological Magazine,' 1895, pp. 425-428.

Pleistocene deposits, of glacial origin (Drift, &c.), cover almost all the surface of the State, with varying depth to as much as 300 feet, forming most of the landscape features, except where older rocks give rise to larger hills and valleys. The Drift is a heterogeneous series of boulder-beds, gravel-trains, and "more or less sorted over-wash." Nearly structureless deposits of Loess (sands, silts, and clays) occur in the Eastern Counties, and supply abundant material ready for the clay-works. In most of the Drifts, however, the stones, boulders, and pebbles give trouble, and, like the many calcareous concretions, have to be eliminated in preparation for manufacture. Seven areas of Drift on the map (Pl. III.) are referred to five out-spread sheets. Reckoning from above downwards, they are the Wisconsin and its Moraine, the Iowan, the Loess, the Illinoian and its Moraine, and the Kansan. At pages 525-534, however, they are described according to the Counties, and from below upwards, as follows: the Pre-Kansan or Albertan of Canada, the Kansan, Illinoian, Iowan, the Loess, and the Red Clay or Gambo.

Chapter VIII.—"Test of Clay-Products" is the subject of pages 538-620: different kinds of test, and different kinds of bricks, common, hollow, and paving, tested by crushing, breaking, by absorption, freezing and thawing; followed by a comparison and summary of tests, with many tables and good diagrams. A Directory of 294 Iowa clay-workers, arranged in Counties alphabetically (pp. 623-642), generally indicates the firm, the locality of the works, the material used, its geological age, where obtained, the plan of drying, kind of kilns, and the products. An Index of eight pages, but not very perfect, completes the volume.

*Maryland Geological Survey. Miocene.* [Part I.] Text: pages clv and 543, with Plates i.-ix. [Part II.] Plates x.-cxxxv. 8vo. Baltimore. The Johns-Hopkins Report, 1904.

THE State of Maryland, occupying a district between the Alleghanies and the Atlantic, and intersected by two great and broad-mouthed rivers, the Potomac and Chesapeake, has a general slope from west to east. Its surface is regarded by naturalists as divisible at the Apalachian region, the Piedmont plateau, and the Coastal plain, each of them continuing through the adjacent States of Delaware and Virginia, and thus constituting the "Middle Atlantic Slope," which comprises in its geology and mineral resources much that is typical of the entire Atlantic border region (page *xxiv*). A portion only of the coastal plain in Eastern Maryland is here described with the Mid-Tertiary or Miocene strata, of which the surface is mainly composed. These strata and their fossils have largely attracted the attention of American geologists and others for two centuries and more according to the Bibliography at pages *xl-lxiv*, including the earlier sporadic notices and the more recent systematic and well-nigh exhaustive treatises.

The relation of the Tertiary deposits of the Coastal Plains to the belt of crystalline rocks in the Piedmont plateau and to the intervening limited series of Secondary strata is referred to (page *xxvi*).

Of the latter the Potomac group is the chief mass, consisting of six or seven formations. Its lower portion is decidedly of marine origin and of Cretaceous age, extending northward to New Jersey.

Overlying these are some Eocene formations (Nanjemoy and Aquia). They are succeeded on the south-east by the Miocene deposits, formerly known as the Chesapeake group, but now divided by the State Geological Survey into three well-defined formations—"the Calvert, Chaptank, and St. Mary's."

The Chesapeake group consists of variously coloured clays and sands, sometimes fully charged with shells; especially when comminuted; these form limestone ledges. The lower part of the Calvert series is rich in Diatomaceous beds, in places 20-40 feet thick.

Gravel, sand, and clay, probably of Pliocene age, are noticed in Maryland. Later deposits of the mid-Atlantic slope, known as the Columbia group, of Pleistocene age, have been divided by the Geological Survey into three divisions; the oldest of these, namely the Sunderland, consists of gravel, clay, and loam, with ice-borne boulders on the highest lands on the west shore of Chesapeake Bay. The Wicomico in formation is similar to the Sunderland and skirts the high-land capped by the former. The Talbot, somewhat similar in formation, occupies the low level of the Coastal plain, seldom rising above 40 feet. It has much peat and boulders and larger areal extent than other Pleistocenes.

The continuous examination of the fine series of fossiliferous strata has been well carried out, and its various characters have been studied both individually and in relation with similar geological formations in other parts of the world.

The different areas of local seas during the great period defined as the Miocene or Mid-Tertiary, their shifting coasts, varied sea-bottoms and faunal characters, and their successive climatic changes can be fairly well indicated by geologists careful in work and in arriving at philosophical conclusions. This aspect of the subject is elaborated by W. H. Dall and others at pages *cxvix-clv*, on the basis of the comprehensive tabular lists of the Maryland species, according to local distribution, at pages *xciv-cxvi*, and of the Mollusca alone in their general geographical and geological distribution (pages *cxvix-cxxvii*).

The systematic palæontology of the Miocene formation of Maryland is very fully described and illustrated in Part II., pages 1-508, with 132 plates and some figures in the text. Scrupulous exactitude appears to have been the rule in both descriptions and drawings, and so abundant and so excellent are the figures that they may serve the student with materials sufficient (with some groups of fossils) to make him well acquainted with the facies of generic and even specific groups. For fossil Vertebrata (Mammalia, Aves, Reptilia, and Pisces) see plates 10-32; Cirripedia, pls. 33, 34; Ostracoda, pls. 35-38; one Cephalopod and many Gasteropods, pls. 39-63; Amphineura and Scaphopoda, 1 plate; Pelecypoda, pls. 65-108; one Brachiopod and many Bryozoa and one Spirorbis,

pls. 109-118; Echinodermata, pls. 119, 120; Hydrozoa, pl. 121; Anthozoa, pls. 122-129; Radiolaria, pl. 130; Foraminifera, pls. 131-133; and Diatomaceæ, pls. 134, 135.

The conclusion drawn by W. H. Dall, Part I. page *cl*, is that the Miocene of South Europe has a rather more tropical character than that of Maryland. It is known that a northern fauna invaded the Miocene area in Europe; but in the Atlantic region the Chesapeake formations show that, after an elevation of land and a somewhat warmer climate, the tropical current was modified and more temperate conditions prevailed at the end of the Miocene period.

The geological map of the Miocene formations in Maryland and eight plates (in Part I.) of good photographic views of local Miocene sections, are useful adjuncts to this interesting work; and the same may be said of the full Index, divided into "general" and "palæontological," at pages 509-543 of the same Part I.

J. H. FABRE. *Souvenirs Entomologiques. Études sur l'Instinct et les Noces des Insectes.* (Neuvième Série.) 8vo. Paris [1905]. Pp. 374.

HERE we have another volume of interesting natural history romance ("Wahrheit und Dichtung") from an elegant French writer, who reminds us somewhat of Alphonse Karr, but is at the same time a trained and excellent naturalist, whose observations are always of great interest and value. There is nothing dry or technical in the writings of Fabre, and they might be read and appreciated for their delightful style by anyone who can read French.

The present volume, however, contains less matter than usual relating to insects in the strict sense; only the last two of the twenty-five chapters are devoted to the pretty Coccid, *Dortheia characias*, Latr., which is found on *Euphorbia* (other species of the genus are found in Britain on nettle), and to the kermes of the *Ilex*. The rest of the volume, exclusive of chapters 13 and 14, "Souvenirs mathématiques," which contain general dissertations, with which Fabre likes to vary his scientific writings, are devoted almost entirely to Arachnida: spiders and scorpions, especially the *Lycosa* of Narbonne, *Epeira fasciata*, *Clotho Darandi*, and the scorpion of Languedoc (*Scorpio occitanus*). There are a few illustrations in the text—"La promenade à deux," on p. 305, representing a pair of scorpions walking hand-in-hand, being perhaps the most noteworthy. The first volume only of this series has yet been translated into English; but Fabre is an author whose works lose so much in translation that it is far better, for those who are able, to read them in the original, for they are as good literature as good science.

## PROCEEDINGS OF LEARNED SOCIETIES.

## GEOLOGICAL SOCIETY.

February 1st, 1905.—J. E. Marr, Sc.D., F.R.S.,  
President, in the Chair.

The following communication was read:—

‘On the Sporangium-like Organs of *Glossopteris Browniana*,  
Brongn.’ By E. A. Newell Arber, M.A., F.L.S., F.G.S.

It has been discovered that some specimens from New South Wales, on which numerous and well-preserved scale-fronds of *Glossopteris* occur, also exhibit impressions of groups of minute bodies, not unlike the sporangia of certain recent and extinct Ferns and Cycads. The new organs are elliptical in shape, and measure from 1·2 to 1·5 millimetres along the major axis. They are hollow, sac-like structures, which open or dehisce longitudinally. Unfortunately, no trustworthy evidence can be obtained as to their contents. The fact that they have never been found, except in the closest association with the scale-leaves of *Glossopteris*, is regarded as an indication that they may be attributed to that genus; and this conclusion is supported by the direct evidence of some of the scale-fronds, which show scars of attachment and fragments of the sac-like bodies still apparently in continuity. While, in the absence of recognition of spores, it is impossible to be quite certain that these sac-like bodies are really sporangia, there is much to be said in favour of this conclusion. The fact that they were probably borne on the scale-fronds in sorus-like groups, and that in size, shape, and mode of dehiscence they are not unlike the sporangia of certain recent and fossil plants, supports this view. The closest analogy may probably be found in the microsporangia of Cycads, which are also exannulate.

An historical sketch is given of the present evidence on the subject of the fructification of *Glossopteris*: and it is shown that no sporangia have so far been found, and that such evidence as has been put forward as to the occurrence of sori on the larger fronds is not altogether satisfactory. It is pointed out that, if the present conclusion be correct (that the sporangia were borne on the smaller scale-fronds), *Glossopteris* cannot be included in any recent family of the true Ferns. Although the affinities of this genus are still doubtful, the creation of a new family may not be inadvisable.

March 8th, 1905.—J. E. Marr, Sc.D., F.R.S.,  
President, in the Chair.

The following communications were read:—

1. 'Observations on some of the Loxonematidæ, with Descriptions of two New Species.' By Miss Jane Donald.

Shells having more convex whorls, or less sigmoidal lines of growth than *L. sinuosum*, cannot be left within the genus *Loxonema*. The two new species described resemble the type in form and in the sinuosity of the lines of growth; but the whorls are ornamented with spiral striæ, two of which frequently stand out and give the shell a banded appearance. Both species are of Silurian age: one was obtained from the Aymestry Limestone near Ledbury, and from beds of about the same age at Llangadock; and the other from the Wenlock Limestone, Dudley.

2. 'On some Gasteropoda from the Silurian Rocks of Llangadock (Caermarthenshire).' By Miss Jane Donald.

These fossils occur almost entirely in the state of casts and moulds. Eleven distinct forms have been made out, referable to seven genera; but only seven are sufficiently well-preserved for specific determination. Five of these are new, including one described in the previous communication; a new genus is described, for the reception of *Euomphalus funatus*. The first species described comes nearest to examples placed in the genus *Plethospira*, as represented by *Pl. Semle*, with which it might be placed in a new subgenus. Three other species, including two new ones, resemble shells referred to *Bemboscia*. The three species are turriculated, and the band is situated on the angle of the whorls, a little distance above the suture. The specimens described come from the horizons of the Upper Llandovery, the Wenlock, the Lower Ludlow (including the Aymestry Limestone), and the Upper Ludlow.

## MISCELLANEOUS.

*The Generic Names given by Frisch in 1775.*

By OLDFIELD THOMAS and GERRIT S. MILLER, JUN.

THE excessively rare 'Natur-System der vierfüssigen Thiere'\*, published by Frisch in 1775, appears to have remained quite

\* 'Das Natur-System der vierfüssigen Thiere, in Tabellen, darinnen alle Ordnungen, Geschlechter und Arten, nicht nur mit bestimmenden Benennungen, sondern beygesetzten unterscheidenden Kennzeichen angezeigt werden, zum Nutzen der erwachsenen Schuljugend,' von J. L. Frisch. Glogau, 1775.



unnoticed, so far as nomenclature is concerned, until 1902, when Sherborn, in the 'Index Animalium,' declared it to be a non-binomial work. Two years later Palmer, apparently overlooking Sherborn's statement, included about a dozen Frisch names in the 'Index Generum Mammalium,' whence a few have recently been introduced into the nomenclature of mammals. But that this course is quite unjustifiable seems to us evident after carefully examining a copy of Frisch's book which Mr. Sherborn has kindly placed at our disposal. The work appears to have been intended primarily as a text-book for pupils in natural history. It deals with mammals and reptiles only, twenty-three pages being devoted to the former, seven to the latter. These animals are arranged according to a classification based on that of Klein, but containing so many new features that its author did not feel at liberty to connect with it the name of "the great Pliny of Danzig." Three categories are recognized—"Societas," "Genus," and "Species,"—and under each category the names, German and Latin, are arranged column-wise, three columns to a page. The following are a few examples:—

Societas.	Genus.	Species.
<i>Bovina.</i> Ochsenartige.	1. <i>Bos</i> , der Ochs.	1. <i>Bos vulgaris</i> , gemeiner Ochs.
<i>Ovina.</i> Schafartige.	1. <i>Ovis communis</i> , gemein Schaf.	1. <i>Ovis vulgaris</i> , gemein Wollenschaf.
<i>Tragelaphina.</i> Gazellenartige.	5. <i>Bubalis</i> , der Stierhirsch. 8. <i>Tragulus</i> , das Rehzieglein. 9. <i>Tragus moschifer</i> , Muskusbock.	1. <i>Buselaphus</i> , der Bubalis, der Alten. 1. <i>Guevi</i> , Rehzieglein von Akra. 2. <i>Guevi Kaqor</i> , von Sennegall. <i>Tragus moschifer</i> , Muskusthier.
<i>Rhinocerotina.</i> Nashornartige.	1. <i>Rhinoceros</i> , <i>Monoceros</i> , et <i>Bicornis</i> , Nashorn mit einem oder 2 Hörnern.	1. <i>Rhinoceros unicornis</i> , Nashorn mit einem Horn.
<i>Felina.</i> Katzenartige.	5. <i>Leo</i> , der Löwe; <i>Leona</i> , die Löwinn.	Es sind zwey Rassen vom Löwen.

In an unpagged table at the end the whole of the system is repeated, this time classified into Ordines, Gentes, Societates, and Genera, the species not being mentioned. The generic names used in this table are quite commonly different from those in the main part of the work, and many of them are again double (e. g. *Tatu Armadillus*, *Araneus mus*) or otherwise technically impossible.

At first sight the majority of the names in the second and third columns of the pagged part and in the table at the end have an attractively Linnæan appearance, but on reading the work consecutively it becomes evident that those in the third column have no invariable relation to those in the second, while among the latter we find such irregularities that all illusion of binomialism quickly disappears. As names for genera we find such compound



terms as "*Ovis communis*," "*Ovis auribus pendentibus*," "*Tragus moschifer*," "*Mus araneus*," and "*Phoca ursus*": while for others there are alternative names, as "*Papio*, *Pavianus*, der Pavian"; "*Cercopithecus* oder *Cercopithecus*, auch *Cebus*"; "*Phoca minor*, *Canis marinus*, Seehund"; "*Phoca major*, *Leo marinus*, Seelöwe"; "*Bos marinus*, *Vacca marina*, der See Ochs oder die See Kuh"; "*Catus*, *Felis*, der Kater, die Katze"; "*Leo*, der Löwe, *Leena*, die Löwinn." It seems unnecessary to cite further instances to show that this system of naming is hopelessly non-Linnæan. What Frisch apparently intended to do was merely to supply his pupils with Latin equivalents for German vernacular terms; but of the essential principles of binomial nomenclature he had not the least idea\*.

While we therefore unhesitatingly reject as untenable all of the names applied to genera † in this work, the circumstances are such that it seems desirable to publish a complete list of them.

*List of Names applied to Genera by Frisch.*

MAMMALIA.

- P. 1. Equus. Asinus. Bos. Urus. Bubalus. Ovis communis. Ovis auribus pendentibus. Ovis montana. Ovis strepsiceros. Caper. Ibex.
2. Gacella. Adaces. Antilopes. Rupicapra. Bubalis. Cudus. Grimus. Tragulus. Tragus moschifer. Camelopardalis.
3. Cervus. Dama. Alec. Rangifer. Capreolus. Poreus. Macrocephalus. Tagassu. Babirussa.
4. Elephas. Equus Niloticus. Tapirussa. Rhinoceros, Monoceros, & Bicornis. Camelus. Lama.
5. Tamandua. Quaggelo. Tatu. Erinaceus.
6. Talpa. Mus araneus. Marsupiale. Volucra.
7. Vespertilio. Mus. Rattus.
8. Glis. Sciurus.
9. Cavia. Lepus. Marmota.
10. Castor. Hystrix.
11. Mustela. Putorius. Ichnemom. Martes.
12. Catus, Felis. Linx. Panthera.
13. Tigris. Leo.
14. Canis. Lupus.
15. Hyæna. Vulpes.
16. Coati. Meles. Cibeticum.
17. Lutra. Gulo.
18. Ursus.
19. Tardigradus, Tardipes. Papio, Pavianus.
20. Cercopithecus oder Cercopithecus.
21. Simia.

---

\* Or, if he had any clear notion of it, he deliberately rejected the system. "Des grossen schwedischen Naturforschers Ritter v. Linné seine weitläufige und prächtige Systemen, welche er so oft verändert, waren, nach meiner Einsicht, zu meiner Arbeit unbequem," he remarks in his preface (p. ii), and the observation is amply justified.

† No one has suggested that the specific names are valid, and, in fact, their status is too evident to require any discussion.

22. *Phoca minor*, *Canis marinus*. *Phoca major*, *Leo marinus*. *Phoca ursus*,  
*ursus marinus*.  
 23. *Rosmarus*. *Bos marinus*, *Vacca marina*.

## REPTILIA.

24. *Testudo digitata*. *Testudo alata digitis alatis*. *Crocodylus*.  
 25. *Caimanus*.  
 26. *Lacerta*, *Lacertus*.  
 27. *Guaña*, *Iguan*. *Salamandrina*. *Salamandra*. *Stellio*, *Jekko*.  
 28. *Cordylus*, *Uroastix*. *Scincus*. *Chalcis*, *Seps*, auch *Putria*. *Chamaeleo*.  
 29. *Rana*.  
 30. *Bufo*.

*The Secondary Appendage of the Upper Antennæ as a Character  
 in the Amphipoda.* By ALFRED O. WALKER.

From the time of Leach (1815) the presence or absence of an appendage to the upper antennæ in the Amphipoda has been used as a character to separate not only species but genera and families. As long as the antennæ were not examined too closely, and no notice was taken of the appendage in a rudimentary condition, the practice worked fairly well, though open to the objection that the antennæ are more often missing in an Amphipod in spirit than any other part. But when, in consequence of the discovery by Stebbing of the appendage in certain species of *Metopa* in the 'Challenger' Collection (all from one locality), Della Valle, regardless of the fact that in most species of this genus no appendage has been found, places two genera so nearly allied as *Stenothoë* and *Metopa* in different families, it is time to enter a protest. Even as a specific character the appendage is unsatisfactory. Young specimens often have fewer joints in it than adults, and in *Elasmopus sokotrar*, Walker, all the males examined had the appendage, while the females were without it.

The question has been forced on my notice by the examination of a species of *Iphimedia* in the 'Discovery' Collection. A young specimen, 15 mm. long, has a secondary appendage which is rather conspicuous, being half as long as the second joint of the flagellum; while in another specimen from the same tube, but double the size, the appendage is reduced to the most rudimentary condition. The species is in every other respect a typical *Iphimedia*; yet, according to G. O. Sars's definition of the family Iphimedidæ, the immature form does not belong to it!

In conclusion, while we can hardly afford to dispense altogether with the appendage in our diagnoses of species, yet I submit it should be used with caution and only when it is conspicuous; a difference in the number of joints should not be considered sufficient to constitute a distinct species.

Ulcombe Place, Maidstone.  
 July 15, 1905.



A



D



B



E

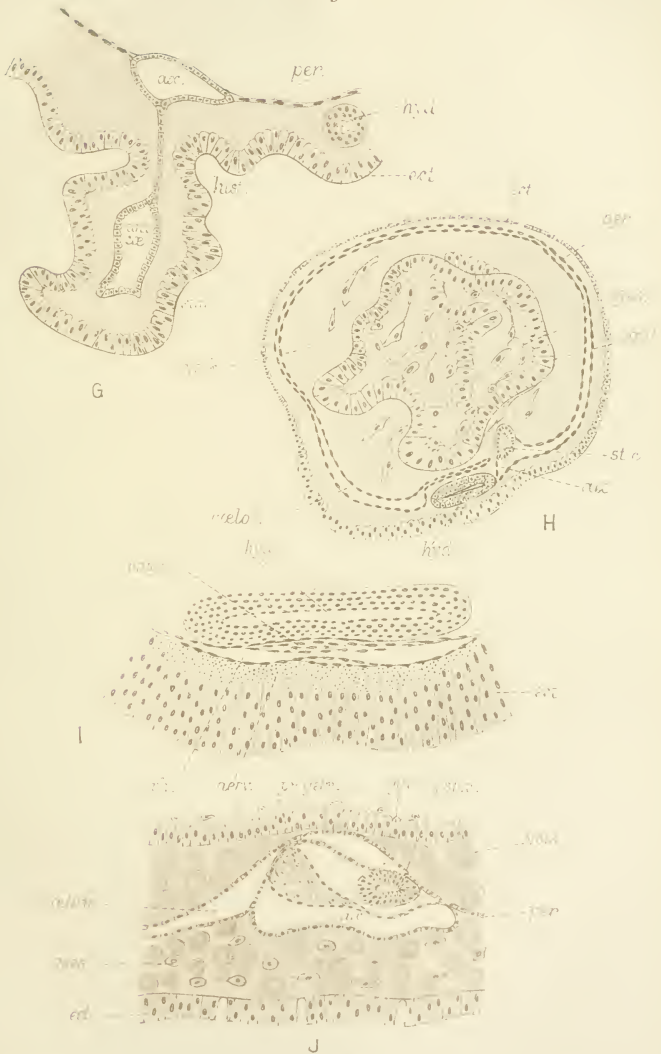


C



F







# THE ANNALS

AND

## MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 95. NOVEMBER 1905.

LIII.—*Descriptions and Records of Bees.*—V.  
By T. D. A. COCKERELL, University of Colorado.

### EXONEURA, Smith.

- Abdomen black ; face with a large cream-coloured  
mark ..... *botanica*, Ckll.  
Abdomen red ..... 1.  
1. Face entirely dark ; size small, length 4 mm. . . *Froggattii*, Friese.  
Face with at least a light streak ; size larger . . 2.  
2. Second abdominal segment with a black patch ;  
face with an anchor-shaped cream-coloured  
mark ..... *hamulata*, Ckll.  
Second abdominal segment without a black patch ;  
face with only a yellow streak..... *bicolor*, Smith.  
Allied to *E. hamulata*, but smaller, and with  
yellow tubercles..... *tau*, Ckll.

### *Exoneura bicolor*, Smith.

Franklin and Hobart, Tasmania (*J. J. Walker*, 3481, 3246,  
3248).

### *Exoneura Froggattii*, Friese.

Moss Bay, 13. 12. 1893 (*Froggatt*). Two specimens.

### *Exoneura botanica*, sp. n.

♀.—Length about  $4\frac{1}{3}$  mm.

Black, including abdomen ; hind margins of abdominal  
segments reddish, especially the third and following ones ;

tarsi dull red, as also are the anterior tibiæ, and an apical patch on the middle and hind ones; face narrow, the orbits converging below; an elongated depression at each side of the antennæ; clypeus with a very broad cream-coloured band, broadest above, with a sudden enlargement something like the head of a nail; mesothorax smooth and shining; tegulæ margined with reddish. Wings dull hyaline, iridescent; stigma and nervures very dark brown. The tubercles are cream-coloured.

*Hab.* Botany, New South Wales, 12. 10. 1893 (*W. W. Froggatt*, 192).

*E. coneura hamulata*, sp. n.

♀.—Length about  $6\frac{2}{3}$  mm.

Head and thorax shining black; abdomen chestnut-red (a rather darker shade than that of *bicolor*), the first two segments each with a large black discal patch; legs red, the coxæ, trochanters, and greater part of the femora black; hind tibiæ and tarsi with coarse abundant reddish bristles, rufous on the outer side. Head large, face broad, clypeal cream-coloured band suddenly broadened above, with a sharp hook on each side. Wings yellowish; stigma and nervures dark ferruginous, the stigma varying to lighter. The apical part of the abdomen is roughened, as usual in the genus.

*Hab.* Moss Bay, Australia, 13. 12. 1893 (*W. W. Froggatt*). Two specimens.

*E. coneura tau*, sp. n.

Similar to *E. hamulata*, but smaller (length of anterior wing 4 mm.); second submarginal cell much smaller; clypeal stripe narrow, with a short cross-bar at the top, which is not at all hooked; tubercles yellow. By the light tubercles it resembles only *E. botanica*, but that has a black abdomen, dark stigma, and the clypeal stripe very much broader. *E. Froggattii* has the comparatively small second submarginal cell, but that is a much smaller insect.

*Hab.* Moss Bay, Australia, 13. 12. 1893 (*W. W. Froggatt*). It bears the collector's number 177.

Unfortunately the single example had the abdomen broken off in transit, and the two basal segments are missing.

*Apis mellifera*, L.

Perth, W. Australia (*H. W. J. Turner*); Hobart, Tasmania (*J. J. Walker*, 3216).



## PROSOPIS.

The species discussed below may be separated as follows :—

- |   |                               |
|---|-------------------------------|
| Abdomen wholly or largely red . . . . .   | 1.                            |
| Abdomen black (in one species reddish black) ..   | 5.                            |
| Abdomen blue; size very small . . . . .   | 8.                            |
| 1. Legs, except coxæ, entirely bright yellow; scutellum and postscutellum yellow . . . . .        | <i>sydneyana</i> , Ckll.      |
| Legs not so; scutellum and postscutellum not yellow . . . . .                                     | 2.                            |
| 2. Mesothorax and scutellum red . . . . .   | <i>lateralis</i> , Smith.     |
| Mesothorax and scutellum black . . . . .  | 3.                            |
| 3. Apical half of abdomen dark fuscous . . . . .  | <i>constricta</i> , Ckll.     |
| Apical half of abdomen red like the basal half ..   | 4                             |
| 4. Supraclypeal mark present . . . . .  | <i>coronata</i> , Ckll.       |
| Supraclypeal mark absent . . . . .  | <i>subplebeia</i> , Ckll.     |
| 5. Large and robust, about 12 mm. long; scutellum with a light patch . . . . .                    | <i>percrassa</i> , Ckll.      |
| Much smaller; scutellum wholly black . . . . .  | 6.                            |
| 6. Yellow of prothorax confined to tubercles, face yellow nearly up to level of antennæ . . . . . | <i>hobartiana</i> , Ckll.     |
| Yellow of prothorax not confined to tubercles ..  | 7.                            |
| 7. Larger; clypeus black . . . . .  | <i>amicula</i> , Smith, ♀.    |
| Smaller; face all yellow below antennæ; abdomen reddish black . . . . .                           | <i>primulipicta</i> , Ckll.   |
| 8. Face blue or greenish blue, without light markings . . . . .                                   | <i>baudinensis</i> , Ckll.    |
| Face with cream-coloured lateral marks . . . . .  | <i>albonitens</i> , Ckll., ♀. |

*Prosopis albonitens*, Ckll.

The female is like the male, except for the usual sexual differences. The clypeus is green, and the scape is slender and dark.

Queensland (*Gilbert Turner*, Ridg. 11. 93, 712).

*Prosopis amicula*, Smith.

Queensland (*Gilbert Turner*, Ridg. 620). One ♀, about 6 mm. long.

The basal area of metathorax is irregularly ridged and bounded by a rim.

*Prosopis lateralis*, Smith.

Queensland (*Gilbert Turner*, Ridg. 11. 93, 858).

♀.—The hind tibia has a creamy-white subbasal annulus. Base of metathorax dull and granular.

*Prosopis sydneyana*, sp. n.

♂.—Length about 6 mm.

Head and thorax black, with yellow markings; abdomen

with the first two segments red, the others reddish black, the third red basally at the sides; legs bright yellow. Face produced, the clypeus prolonged and the malar space quite large; face below antennæ, labrum, and mandibles bright chrome-yellow; the yellow extends upwards in the middle line, gradually narrowing, to the middle ocellus; laterally, along the orbital margins, it extends about as far, but ends more bluntly; cheeks entirely black; scape yellow, swollen; flagellum light ferruginous beneath, darker above; mesothorax minutely but distinctly and rather closely punctured; scutellum, postscutellum, collar, tubercles, tegulæ, and a band on each lateral margin of mesothorax bright yellow; area of metathorax with regular longitudinal basal ridges, terminated by a transverse ridge, while at the sides a curved ridge bounds a larger area. Wings clear hyaline, iridescent; stigma honey-colour with a narrow fuscous margin; nervures fuscous; second s.m. very much broader than high; first r. n. joining apex of first s.m.; abdomen punctate.

*Hab.* Sydney, New South Wales, 1891 (*W. W. Froggatt*, 28).

*Prosopis constricta*, sp. n.

♂.—Length about 5 mm.

Head and thorax black, dull, the vertex and mesothorax with close minute punctures; abdomen with the first two segments red, the rest dark fuscous, the fuscous extending on to the apical part of the second segment. Clypeus, labrum, and mandibles dull white, the white of the clypeus notched or constricted just above the middle by a black spot on each side; no supra-clypeal mark; lateral marks grey, extending very narrowly some distance above the antennæ; scape rather broad, whitish in front; flagellum thick, light ferruginous beneath, greyish fuscous above, the last joint pointed; sides of collar and tubercles brownish white; tegulæ light brown with a white spot; area of metathorax semicircular, bounded by a rim, but not definitely ridged except in the middle, where there is a strong longitudinal ridge, with a weak one on each side of it. Wings hyaline and iridescent, nervures and stigma fuscous; second s.m. comparatively short (narrow), receiving the first r. n. a short distance from its base, and the second at its extreme apex. Femora dark brown, the anterior knees pallid; anterior tibiæ light amber-colour, with a fuscous spot behind; middle tibiæ light in front and dark behind, except at extreme apex and base; hind tibiæ

dark brown with the base broadly white; tarsi yellowish white, the hind tarsi fuscous beyond the first joint; abdomen narrow, the punctures so fine as to be hardly visible with a lens.

*Hab.* Queensland (*Gilbert Turner*, Ridg. 10. 91, 708).

*Prosopis coronata*, sp. n.

♂.—Similar to *P. constricta*, but differing thus: clypeus and lateral face-marks white, suffused with light red; clypeus hardly constricted by the black spots, which are minute; supraclypeal mark present, large, nearly all light red, tridentate above, having the appearance of a crown; antennæ entirely clear red, the flagellum scarcely darkened above, the last joint not so pointed; collar and tubercles entirely black; tegulæ fuscous, without a white spot; area of metathorax without a median keel, but with strong, oblique, lateral keels; middle tibiæ not light in front, except at apex; hind tibiæ without any distinct white base; abdomen broader, entirely clear bright red.

*Hab.* Queensland (*Gilbert Turner*, Ridg. 11. 91, 707).

*Prosopis subplebeia*, sp. n.

♂.—Similar to *P. coronata*, but differing thus: no supraclypeal mark; clypeus without red, except a little well-defined patch on each side; lateral marks grey; scape with a cream-coloured patch in front; collar with a yellowish streak on each side, and a small light mark on tubercles; tegulæ with a whitish spot; area of metathorax more regularly sculptured, the fine lateral keels numerous and regular, and the median area well ridged; apex of abdomen somewhat infuscated.

This species is curiously intermediate between *coronata* and *constricta*, but nearest to the former, and apparently distinct.

*Hab.* Queensland (*Gilbert Turner*, Ridg. 11. 91, 707).

The collector apparently regarded this and the last as one species, as he gave them the same number; but the absence of a supraclypeal mark and decidedly different sculpture of the metathorax seem to indicate a different species.

*Prosopis percrassa*, sp. n.

♀.—Length about 12 mm.

Robust, black, strongly punctured; clypeus striato-punctate, with a short groove on each side; no light face marks, except a dark red spot between the antennæ;

mesothorax shining between the punctures; disk of scutellum shining, with the punctures sparse though large; area of metathorax triangular, with a densely punctate median area, but otherwise smooth and shining, posteriorly produced and obtusely angulate; the area is not bounded by any rim, but sharply by the cessation of the dense punctures which cover the rest of the metathorax; a stripe on each side of collar, large spot on tubercles, triangular spot on the piceous or black tegulæ, spot on axillæ, large triangular mark on middle of scutellum, and wedge-shaped mark on middle of postscutellum, all cream-colour, some of them brighter than others; lateral margins of metathorax strongly tufted with greyish-white hair. Wings hyaline, the apex faintly dusky, nervures dark fuscous, stigma dark ferruginous; second submarginal cell very broad (long), about three-quarters length of first, receiving the first r. n. a long distance from its base, and the second r. n. much nearer its apex. Legs black, with white pubescence. Abdomen broad, the apical part thinly but conspicuously hairy; lateral hind margins of first segment with dense hair-bands; punctures of first segment small, and very close posteriorly, strongly contrasting with the very large, well-separated punctures on base of second.

*Hab.* Queensland (*Gilbert Turner, Hy., 273*). Presented to the Museum by Mr. E. Saunders.

Somewhat allied to *P. alcyonea*.

*Prosopis hobartiana*, sp. n.

♂.—Length about 6 mm.

Black, head and thorax dull, the punctures of the vertex and mesothorax so fine and dense as to produce a minutely granular effect; head large, broader than thorax; face comparatively broad, chrome-yellow nearly up to the antennæ, including a supraclypeal mark, the top of which presents a little angular elevation; laterally the yellow gradually rises, to end in a fine point on the orbital margin about the level of the antennæ; labrum and mandibles with much yellow; scape with a yellow stripe beneath; flagellum all dark; collar dark, but tubercles yellow with a black dot; area of metathorax formed much as in *percrasse*, but the basal part finely granular; scutellum sculptured like mesothorax; tegulæ piceous. Wings strongly infuscated, stigma and nervures piceous; second s.m. much shorter than first; the two recurrent nervures meeting the transverso-cubitals. Femora black, the anterior knees pale reddish; anterior tibiæ pale reddish with a dusky stripe

behind; middle tibiæ black, with the extreme base yellowish, and a pale reddish subapical stripe in front; hind tibiæ black, with about the basal two fifths light yellow; tarsi with the first joint yellowish or reddish, the others infuscated; abdomen black, rather narrow, moderately shiny.

*Hab.* Hobart, Tasmania (*J. J. Walker*, 3249).

*Prosopis primulipicta*, sp. n.

♂.—Length about  $4\frac{1}{2}$  mm.

Slender, black, head and thorax dull, the abdomen slightly reddish and with a silky lustre; markings bright primrose-yellow, including labrum, mandibles, face up to level of antennæ, and sending a pointed projection on each side a little way up orbital margin, collar, and tubercles; scape with a yellow stripe beneath; flagellum long, light yellowish fulvous beneath (contrasting with the shining dark funicle), above dark fuscous; tegulæ dark. Wings hyaline and strongly iridescent, the apical field somewhat dusky, and the upper half of the marginal cell more strongly so; nervures and stigma piceous; second s.m. very short, much less than half length of first, receiving second r. n. at its extreme apex, but the first r. n. enters the apical part of the first s.m.; area of the metathorax finely granular, minutely somewhat plicate basally, defined only by an impressed line; femora black, the anterior ones yellow at apex; anterior tibiæ yellow, with a large reddish-fuscous spot behind; middle tibiæ black in the middle and yellow at each end, the yellow connected by a narrow band in front; hind tibiæ black with nearly the basal half yellow; tarsi yellow, the hind tarsi fuscous with only the basal half of the first joint yellow.

*Hab.* Queensland (*Gilbert Turner*, Ridg. 11. 91, 714).

*Prosopis baudinensis*, sp. n.

♀.—Length about  $4\frac{2}{3}$  mm.

Head, thorax, and abdomen deep blue; sometimes some green tints on face, which is without light markings; antennæ dark, the flagellum sometimes more or less ferruginous; mesothorax shining and strongly punctured; collar dark, but tubercles mainly white, with a black dot; base of metathorax shining, no well-defined enclosure; tegulæ piceous. Wings hyaline and iridescent, nervures and stigma piceous; second s.m. not far from square, receiving the recurrent nervures at the extreme base and apex. Legs black; middle tibiæ with a white spot at base; hind tibiæ with the

base broadly white; small joints of anterior tarsi pale reddish.

*Hab.* Baudin I., N.W. Australia (*J. J. Walker*, 673, 674).  
Three specimens.

#### EURYGLOSSA.

The following species, referred to *Euryglossa*, are probably not all truly congeneric; but Smith's species of this genus also seem to represent more than one generic type, and it will be best to defer the proposal of segregated genera until more material is available.

Clypeus with a prominent longitudinal keel; mesothorax very shiny; abdomen dark red . . . . .	<i>Froggattiana</i> , Ckll.
Clypeus without a keel; size smaller . . . . .	1.
1. Second and third abdominal segments almost entirely orange . . . . .	<i>cygnella</i> , Ckll.
Second and third abdominal segments dark . . . . .	2.
2. Head and thorax very dark green . . . . .	<i>Walkeriana</i> , Ckll.
Head and thorax black . . . . .	3.
3. Extremely small, about $3\frac{1}{3}$ mm. long. . . . .	<i>pernana</i> , Ckll.
Much larger; hind tarsi (at least) red . . . . .	4.
4. Mesothorax with sparse feeble punctures . . . . .	<i>neglectula</i> , Ckll.
Mesothorax densely punctured. . . . .	5.
5. Hind tibiæ strongly infuscated; wings not yellowish. . . . .	<i>reginæ</i> , Ckll.
Hind tibiæ not infuscated; wings yellowish . . . . .	<i>adelaidæ</i> , Ckll.

#### *Euryglossa Froggattiana*, sp. n.

♀.—Length nearly 9 mm.

Head and thorax shining black; abdomen broad and flattened, dark red, clouded with fuscous, especially at the sides; head large and broad; clypeus with the form of a very large equilateral triangle, with a strong and sharp reddish keel running down its middle, which is elevated; the keel continues weakly upwards about halfway to the middle ocellus, after which it is replaced by a groove; sides of clypeus and adjacent sides of face with very sparse weak punctures; front shining, with numerous exceedingly minute punctures; narrow black facial foveæ are closely adjacent to the upper orbital margins, their upper part curving away from the eye; scape dark reddish, with scattered hairs; flagellum with the apical half thickened, the base reddish, the rest dark, with the underside dark red; malar space wanting; mandibles slender, reddish in the middle; maxillary palpi 6-jointed, ordinary; labial palpi 4-jointed, first joint darkened, curved, considerably longer than the second, and a little

longer than 3 and 4 united; mesothorax convex, smooth, with very few minute punctures; scutellum broad and flattened; area of metathorax cup-shaped, smooth and shining, scarcely defined; margin of tubercles tomentose; sides of metathorax with a hairy fringe; tegulæ small, light apricot-colour. Wings dusky hyaline; stigma dark reddish brown, nervures lighter; second s.m. hardly half as long as first, receiving the recurrent nervures not far from its base and apex; basal nervure falling far short of transverse-medial. Legs light red, with thin white hair, the femora darkened, except at base and apex; hind tibiæ tuberculate on the basal half of the outer edge; pygidial plate extremely narrow.

*Hab.* Shoalhaven, New South Wales, 4. 10. 1894 (*W. W. Froggatt*, 175).

*Euryglossa cygnella*, sp. n.

♂.—Length 5 mm.

Slender, black, with the second and third abdominal segments above orange, except the broad hind margins and the sides more or less; on the ventral side segments 2 to 4 are pale orange; head and thorax with scanty, but rather long, dull white hair; head transversely oval, eyes converging below; antennæ long, the flagellum stout, and pale yellowish ferruginous beneath; mesothorax dull and very densely punctured; area of metathorax large, triangular, with a very narrow basal band enclosed by a raised line, and marked by numerous little transverse (antero-posterior) ridges: behind the basal band the area is covered for a space with very fine raised lines, and its lateral margins are more or less marked by little raised lines; tegulæ very pale testaceous. Wings hyaline, stigma large and piceous, nervures very dark brown; second submarginal cell about or almost as long as first, receiving the first r. n. a considerable distance from its base, and the second very close to its apex. Femora black, with a little reddish on the knees; anterior and middle tibiæ and tarsi clear ferruginous; hind tibiæ ferruginous, with a dark cloud anteriorly, and conspicuous bristles in little groups of two or more on the hind edge; hind tarsi fuscous; abdomen narrow and flattish, the first segment narrow and long, the black parts with a dull satiny lustre.

*Hab.* Swan River, Australia, "69. 50."

*Euryglossa Walkeriana*, sp. n.

♀.—Length about  $5\frac{2}{3}$  mm.

Head and thorax very dark bluish green; abdomen broad,



convex, smooth, and shining black; head wider than thorax, facial quadrangle nearly square, but perhaps a little broader than long; mandibles ferruginous in the middle; clypeus sparsely punctured; antennæ dark, the flagellum red beneath at apex only; facial foveæ distinct, narrowing above, reaching top of eye; occiput and cheeks with white hair; tubercles fringed with white hair; mesothorax convex (almost gibbous), little hairy, rather shining, finely granular; area of metathorax not marked by peculiar sculpture; tegulæ dark basally, with broadly hyaline margins. Wings clear hyaline; stigma large, very dark brown; nervures pale brown; second s.m. less than half length of first, receiving the recurrent nervures very near its base and apex. Femora black, with the knees more or less red; anterior tibiæ and tarsi clear ferruginous; middle and hind tibiæ greatly infuscated; hind tarsi dark red.

*Hab.* Launceston, Tasmania (*J. J. Walker*, 3855).

*Euryglossa pernana*, sp. n.

♀.—Length about  $3\frac{1}{3}$  mm.

Black, the oval abdomen becoming a sort of dull pale sepia basally, or rather more reddish on middle of first segment; head ordinary, face flattened or even depressed, the areas on each side of the clypeus shining silvery with minute appressed hair; apical half of mandibles bright ferruginous; long hairs spring from beneath anterior margin of clypeus; facial quadrangle longer than broad; antennæ dark, the flagellum beneath a sort of dull yellowish brown; head and thorax dull, the punctures too minute to distinguish with a lens; mesothorax with a complete median groove and short parapsidal ones; metathorax truncate, the area merely granular; tegulæ brown. Wings dusky hyaline, nervures and stigma piceous, the stigma rather small; second submarginal cell higher than broad, the first r. n. meeting first t.-c. Legs dark, the hind legs with slight reddish and brownish tints.

*Hab.* Fremantle, W. Australia (*J. J. Walker*, 1953).

*Euryglossa neglectula*, sp. n.

♀.—Length about  $5\frac{1}{2}$  mm.

Shining black, with sparse whitish hair; abdomen convex and very broad; mandibles with a dark red subapical spot; flagellum faintly reddish beneath; facial quadrangle a little broader than long; front shining; clypeus with large scattered punctures; facial foveæ present but shallow; mesothorax moderately shining, with fine scattered punctures,



the parapsidal grooves distinct; area of metathorax triangular, hardly distinguished, except by its duller surface; tubercles fringed with white tomentum; tegulæ extremely dark brown. Wings clear hyaline, iridescent; nervures and stigma reddish brown, stigma large; second s.m. broader than high, a little more than half length of first, receiving the first r. n. a short distance from its base, and the second almost at its apex; basal nervure strongly bent, only falling a short distance short of transverse-medial. Legs piceous, the tarsi ferruginous; abdomen with a very obscure purplish lustre, sides of its apical part with long hairs.

*Hab.* Australia (no other particulars known); from the F. Smith collection, accession number 79. 22.

*Euryglossa reginæ*, sp. n.

♂.—Length about  $6\frac{1}{3}$  mm.

Black, head and thorax very densely and minutely punctured; abdomen granular, with a subsericeous gloss, the hind margins of the segments narrowly brownish; mandibles reddish in middle; flagellum dull ferruginous beneath; tarsi ferruginous, as also are the knees, the anterior tibiæ except a dark cloud behind, and both ends of the other tibiæ; head broad, but facial quadrangle longer than broad; face with a good deal of whitish hair; facial foveæ linear; area of metathorax triangular, without any marked peculiarity of sculpture; tegulæ very dark brown. Wings dusky hyaline, nervures and stigma sepia; second s.m. much broader than high, receiving the first r. n. some distance from its base; second r. n. meeting second t.-c.; dorsal abdominal segments overlapping ventral, the overlapping margins broadly whitish hyaline.

*Hab.* Queensland (*Gilbert Turner*, Ridg. 11. 91, 703).

*Euryglossa adelaidæ*, sp. n.

♀.—Length slightly over 6 mm.

Very close to *E. reginæ*, but differing thus:—Wings yellowish; scape, funicle, and flagellum light yellowish ferruginous beneath, and not more than dark brown above; tibiæ, tarsi, and apices of femora yellowish ferruginous, the anterior and hind tibiæ with small and faint dusky clouds; tegulæ yellowish hyaline.

*Hab.* Adelaide, S. Australia; accession number 59. 52.

It is possible that this is the female of *E. reginæ*, but in view of the differences noted, and the widely different localities, this seems improbable.

*Euryglossa rejecta*, sp. n.

♂.—Length about  $6\frac{1}{2}$  mm.

Head and thorax black, with long loose pubescence, more or less fuscous on head and thorax above, otherwise dull white; head very broad; eyes converging below; clypeus with very close, large punctures, the surface between them shining; maxillary palpi long and slender; blade of maxilla more than twice as long as broad, rounded at end; mandibles bidentate, entirely black; antennæ black, scape with much long hair; flagellum rather stout, pruinose, the last joint with a shining area at the side of the apex; mesothorax shining, but well punctured; tegulæ very dark brown. Wings greyish hyaline, iridescent, stigma and nervures piceous; second s.m. nearly as long as first, and receiving the recurrent nervures a moderate distance from its base and apex. Legs shining black, with thin white hair, spurs creamy white. Abdomen black, with the hind margins of the segments broadly ferruginous; the segments are elevated or gibbous about the middle, the ferruginous margins thus appearing to be abruptly depressed; the apex terminates in a projection, which might be called spoon-shaped but for its being truncate; on each side of this is an elongate ferruginous lamina, and above it a pair of delicate lamellæ placed edgeways; venter with the basal segment black or almost, the second and third entirely light yellowish ferruginous, the others strongly clouded with brown.

*Hab.* Perth, W. Australia (*H. W. J. Turner*).

When working on *Euryglossa*, I put this aside as not belonging to the genus. I have concluded to leave it there for the present, however, to be separated when more is known about the group.

*Stilpnosoma semisericea*, sp. n.

♀.—Length 10 mm.

Head black, large and quadrate; clypeus very shiny, with a few scattered punctures; labrum with a very prominent shining tubercle; mandibles strongly bidentate, slightly reddish about the middle; mouth-parts practically as in *Euryglossa*; blade of maxilla subcircular, broadly truncate, fringed with rather long hairs; first joint of labial palpi stout and dark; supra-clypeal arca with very distinct, but small and rather sparse, punctures; antennæ entirely clear ferruginous, scape long; vertex with a dull silky surface and very minute punctures; cheeks strongly and closely punctured; thorax black, the anterior part of prothorax, tubercles,

scutellum, postscutellum, and basal area of metathorax ferruginous; mesothorax dullish, silky, with minute punctures, like the vertex; median and parapsidal incised lines distinct; legs red; hind spur of hind tibia strongly serrate (it is serrate also in *S. levigatum*); tegulæ shining yellowish ferruginous. Wings yellowish, stigma and nervures ferruginous; venation nearly as in *S. levigatum*, except that the first r. n. meets the first t.-c., and the upper outer angle of the second s.m. is an acute angle (an obtuse one in *levigatum*); the second r. n. bends inwards, and, as in *levigatum*, joins the second s.m. some distance from its end. Abdomen dull, with a sort of silky surface; first segment light ferruginous; second to fourth very dark brown, nearly black, with the hind margin broadly ferruginous, the junction of the two colours on the second and third wavy, with a double curve; fifth segment ferruginous, black at extreme base; apical segment ferruginous, pointed, with a very narrow pygidial plate; venter ferruginous, varied with dark brown.

*Hab.* Queensland (*Gilbert Turner*, Ridg. 11. 93, 683), and another marked "Australia" (F. Smith's collection, 79. 22).

This insect is so unlike *S. levigatum* in colour and sculpture, that I thought at first it must represent a distinct genus; but the other characters are all essentially those of *Stilpnosoma*.

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ERRATUM (Ann. & Mag. Nat. Hist., June 1905, p. 528).—For *Melissodes parosete* read *Melissodes paroselce*.

University of Colorado,  
Boulder, Colorado, U.S.A.,  
July 9, 1905.

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LIV.—*Descriptions and Records of Bees.*—VI.  
By T. D. A. COCKERELL, University of Colorado.

*Paracolletes moretonianus*, sp. n.

♂.—Length about 11 mm.

Black, with red legs and pale yellow and golden pubescence. The general appearance of the insect closely simulates *Nomia semiaurea*, Ckll., but it is easily known from that species by the dull, very minutely and densely punctured first abdominal segment, the second and following segments

granular instead of strongly punctate, the triangular second submarginal cell, &c.

Head large, nearly circular seen from in front; inner orbits parallel; facial quadrangle somewhat longer than broad; mandibles pale yellowish ferruginous with the apex black; face densely covered with yellow hair; scape red; flagellum black, its last joint strongly curved inwards, forming a sort of stout hook; hair of thorax ochreous, somewhat darker and redder above, that on postscutellum long; mesothorax and scutellum excessively closely punctured; area of metathorax triangular, smoothish and shining, its margin minutely beaded, or that effect is produced by little cross-lines; tegulæ ordinary, light ferruginous. Wings dusky; nervures and stigma ferruginous, rather dark; stigma very small; apex of marginal cell away from costa; b. n. meeting t. m. on the distad (apical) side; second s.m. triangular, narrowed nearly to a point above, receiving the first r. n. just before its middle; third s.m. very oblique, receiving the second r. n. at a moderate (variable) distance from its end. Legs clear red, with abundant, but mostly short, very pale yellowish hair; coxæ black, and hind femora blackened behind; hind femora somewhat incrassate, with a posterior keel; hind tibiæ incrassate; basal joint of hind tarsi bent. Abdomen black, with the hind margins of the segments broadly ferruginous; the whole dorsal surface, but especially the hind margins (not, however, forming bands), with a thin beautifully golden tomentum; apical plate broad and dark, truncate with rounded edges; penultimate ventral segment with a median longitudinal tomentose elevation.

*Hab.* Moreton Bay, Australia (F. Smith collection, 79. 22). Another is labelled Queensland (F. Smith collection, 79. 22).

*Paracolletes moretonianus* is so like a *Nomia* that I at first took it for one. In reality, it appears to be closely allied to *P. venustus* (Smith), from which it differs by its larger size, red femora, &c. It should probably be separated generically from *Paracolletes*.

*Paracolletes bimaculatus* (Smith).

♂.—Perth, W. Australia; 93–198, collected by H. W. J. Turner.

The specimen has the tibiæ largely suffused with black. The male genitalia of this species are rather striking, the stipites and sagittæ being very large. The former have the basal half broad, the apical half narrow, like a finger, and not hairy. The latter, taken together, present a sort of

broadly-pyriform outline, the inner apical corner of each being provided with a short spine, as it appears from above, or lamella, as seen from the side. There is nothing which can be said to differ essentially from the type of genitalia found in *Colletes*. The third submarginal cell is remarkably large, and the wings are very hairy.

*Paracolletes flavomaculatus*, sp. n.

♂.—Length about 9 mm.

Slender, shining black; eyes converging below; facial quadrangle much longer than broad; face covered with very light yellowish hair, dense and with a silky lustre at sides; mandibles dark; clypeus with large punctures; antennæ ordinary, black, the flagellum faintly brown beneath; cheeks bearded with white hair; vertex and occiput, and also the shining sparsely punctured mesothorax, with black hair; scutellum (except anterior middle) and middle of post-scutellum covered densely with long, erect, bright, light orange-fulvous hair, and tubercles covered with hair of the same colour; metathorax and pleura with sparse dull white hair, but there is a patch of black just under the wings; area of metathorax with a slight transverse ridge; tegulæ shining piceous. Wings dusky hyaline; stigma fairly large, dark reddish; nervures dark brown; b. n. falling a little short of t. m.; first r. n. joining second s.m. very near its base; second r. n. joining third s.m. a short distance from its apex; third s.m. having at least twice the area of second. Legs slender, piceous, with rather long thin pale hair. Abdomen narrow, shining black, punctate, the apical part with black hair, but no hair-bands; apical plate strongly fringed with hair; at the base of the penultimate ventral segment is a thick suberect fringe of hair, shortest in the middle.

*Hab.* Australia (no other particulars known); from the F. Smith collection; 79. 22.

By the venation and the black hair on thorax, this is nearest to *P. argentifrons* (Smith); but it is easily distinguished by the patch of fulvous-yellow hair on the scutellum.

*Paracolletes cupreus semipurpureus*, subsp. n.

♀.—Length about  $9\frac{1}{2}$  mm.

Similar to *P. cupreus* (Sm.), but the caudal fimbria is brown-black (not pale fulvous), the hair of the abdomen beneath is white, and the stigma and nervures are amber-

colour. Other characters are: abdomen brilliant crimson-purple, with some golden tints; clypeus with large well-separated punctures on a shining ground; mesothorax olive-green, strongly punctured; second s.m. broad, receiving the first r. n. about its middle; third s.m. not very much larger than second, receiving the second r. n. very near its end; sides of metathoracic enclosure with numerous raised lines; hind spur of hind tibia pectinate with five long spines; all the tarsi, hind tibiæ, parts of the other tibiæ, and the knees red.

*Hab.* Queensland (*Gilbert Turner*, Ridg. 11. 93, 863).

The typical *P. cupreus* came from Adelaide; it is very likely that the Queensland insect should be regarded as a distinct species, but it has all the principal characters of *cupreus*, and for the present I treat it as a subspecies. Its colours remind one of some of the Neotropical species of *Augochlora*.

*Paracolletes plumosellus*, sp. n.

♂.—Length  $7\frac{1}{2}$  mm.

Expanse of wings about 16 mm.; head and thorax bluish green, the mesothorax with large punctures, the surface between the punctures minutely sculptured but shining; abdomen with a strong purple lustre, the hind margins of the segments dark reddish; apical plate broadly rounded, deep red with a hyaline margin; hair of head and thorax abundant, strongly plumose, dull white with little yellowish tint, that on the scutellum greyish; antennæ rather long, entirely dark, the third joint with a little protuberance beneath; tegulæ shining rufous. Wings hyaline, stigma and nervures ferruginous; b. n. meeting t. m.; second s.m. little narrowed above, receiving the first r. n. well before its middle; third s.m. receiving second r. n. very near its end; stigma rather large. Legs slender, very dark reddish, with pale hair.

*Hab.* "New Holland, 44. 4."

In all respects this is very similar to *P. plumosus* (Sm.), described from a female. Were it not that the venation differs somewhat, I should think *plumosellus* to be the male of *plumosus*; and as it is, I am not wholly without doubt. Australian students must settle the matter by collecting the sexes together.

*Paracolletes cæruleotinctus*, sp. n.

♂.—Length about 9 mm.

Slender, the abdomen narrow; head and thorax green,

with tints of blue, with abundant long pale yellowish hair (yellowest on face), but the scutellum and hind part of mesothorax (except its hind border) with black hair; facial quadrangle much longer than broad; mandibles dark, rufescent apically; antennæ long, dark, the third and last three joints more or less reddish beneath; vertex and front strongly punctured, with blue tints, a small shining smooth space on each side of the ocelli; mesothorax shining olive-green, with very strong punctures; area of metathorax triangular, shining, without any transverse ridge or keel; pleura yellowish green, very closely and strongly punctured; tegulæ shining piceous. Wings clear, iridescent; nervures and stigma very dark red-brown; stigma rather large; marginal cell long, narrowly obliquely truncate at apex; b. n. falling short of t. m.; second s.m. broad, especially below, receiving the first r. n. well before its middle; third s.m. receiving the second r. n. a short distance before its end. Legs metallic yellowish green; the anterior tibiæ yellowish ferruginous in front; all the claw-joints largely red; spurs dark. Abdomen shining and strongly punctured, blue-green, with splendid purple tints on the first two segments; hair of abdomen pale to a little beyond middle of third segment, beyond that black or almost, the black hair at apex quite abundant; apex ending in a broad fan-shaped plate; last ventral segment shining, raised in the middle, and having on each side a conspicuous tuft of hair.

*Hab.* Queensland (*Gilbert Turner*, "Seaf. 1, 91; 433"). Two specimens.

A very distinct species, not closely allied to any yet described; best known by the narrow, brilliantly coloured and strongly punctured abdomen.

*Paracolletes amabilis* (Smith).

Described from "Australia," no particular region being mentioned. A female before me is labelled Queensland, 72, 18. The venation differs a little from the type; the b. n. falling a little short of the t. m., and the second r. n. entering the third s.m. a short distance before its end. The abdomen is olive-green. The insect agrees so well with *amabilis* in all its more obvious characters, that I presume it is not to be separated, notwithstanding the difference in venation.

*Paracolletes carinatus*, sp. n.

♂.—Length about 8 mm.

Rather slender; head, thorax, and abdomen olive-green;



anterior and middle femora black, with the extreme apex red; hind femora, and all the tibiæ and tarsi, rather dark chestnut-red; antennæ dark, long, but the flagellum has a hoary pruinosity, and is reddish beneath at apex; clypeus olive-green, shining, with sparse punctures; mandibles bidentate, slightly reddish towards the apex; mesothorax shining and sparsely punctured on middle, but anteriorly duller with large, closer punctures. Wings hyaline, faintly dusky at apex; stigma yellowish ferruginous, nervures dark fuscous; second s.m. considerably narrowed above, receiving the first r. n. just before its middle; second r. n. meeting third t.-c.; b. n. falling a little short of t. m.; tegulæ shining dark ferruginous; pubescence pale, with dark hairs on vertex and scutellum (not very well seen, as the insect has been in some liquid); area of metathorax with a strong, sharp, transverse keel; ventral surface of abdomen normal.

*Hab.* Queensland (*Gilbert Turner*, *Ridg.* 11. 91, 704).

This is so much like *P. amabilis* that it might be taken for its male, but for the sharp keel of the enclosure of metathorax. This character allies it to *P. carinatus* (Sm.), but the general coloration suffices to distinguish it from that species.

*Paracolletes viridicinctus*, sp. n.

♀.—Length a little over 8 mm.

Head and thorax black; abdomen black with the depressed hind margins of the segments broadly brassy green; hair of thorax light grey, but that on the scutellums, mesothorax (except in front), and vertex (but not occiput) mainly black; hair at apex of abdomen thick and black; venter with three long greyish-white fringes margining the segments, and a fourth yellowish. Legs black, the hind tarsi very dark reddish, with the first joint broadened and flattened; hair of legs mainly pale, the hind femora above with a large crest of curled white strongly plumose hair, but the knee capped with black hair; hind tibiæ with light hair except on the upper surface, where is much black; hind spur pectinate with many (7 or 8) slender spines; clypeus smooth and bare, shining, with sparse distinct punctures; antennæ black; front dull; mesothorax shining, but dull in front, scarcely punctured; area of metathorax rather shining but granular, with a median longitudinal groove, but no transverse keel; tegulæ shining black. Wings yellowish, stigma and nervures red-brown; b. n. meeting t. m.; second s.m. broad,



receiving the first r. n. at or a little beyond its middle; third s.m. receiving second r. n. a short distance from its end.

*Hab.* Tasmania; 51. 153.

In some ways like *P. versicolor* (Sm.), but the colour of the abdomen is different, and there are other differences. It is also allied to *P. chalybeatus* (Erichson), and I have wondered whether it could be a colour-variety of that species; but at present there is no reason for assuming this.

*Paracolletes spatulatus*, sp. n.

♂.—Length slightly over 8 mm.

Broad, with rather the shape of a female; head and thorax black; abdomen dark bluish green, or rather yellowish green toward the apex, the hind margins of the segments not reddened. Legs black, the tibiæ stained with red beneath, and the hind tarsi reddened at extreme base; hair of legs pale, but on inner side of the tarsi orange-fulvous. Mandibles strongly bidentate, reddened only at apex; clypeus shining, with well-separated punctures; antennæ dark, but flagellum greyish pruinose; hair of head and thorax light grey, but on vertex, middle of mesothorax, and scutellums there is a good deal of black; mesothorax and scutellum shining; area of metathorax dull, without any distinct transverse keel; tegulæ shining black. Wings clear, nervures and stigma dark red-brown; b. n. meeting t. m.; second s.m. broad, receiving first r. n. about its middle; third s.m. receiving second r. n. near its end; end of abdomen with some sooty hair, and terminating with a rounded ferruginous spatulate plate, near the base of which, on each side, is a little tooth-like projection.

*Hab.* Blackheath, New South Wales, 1895 (*W. W. Froggatt*, 183).

Allied to *P. chalybeatus* (Erichson).

*Paracolletes providellus*, sp. n.

♂.—Length about  $7\frac{1}{2}$  mm.

Abdomen not narrow; head and thorax shining black; abdomen shining dark bluish green, with the hind margins of the segments broadly reddish; hair of head and thorax greyish white, a little black or blackish on vertex and scutellums; clypeus shining, with well-separated punctures; antennæ dark; middle of mesothorax scarcely punctured, very shiny; area of metathorax dull and granular, with no sharp transverse keel. Legs black, with light hair, that on inner side of tarsi yellowish; tegulæ dark rufous. Wings

hyaline, slightly stained with reddish; stigma dark reddish, nervures fuscous; b. n. not quite meeting t. m.; second s.m. strongly narrowed above, and receiving the first r. n. about its middle; third s.m. receiving the second r. n. a short distance before its end. Hair at apex of abdomen all pale; venter normal.

*Hab.* "Australia" (no more precise locality known), 56. 94.

A second specimen ("Australia," 66. 64) is a little smaller, with much lighter (reddish amber) stigma and nervures, and no dark hair on vertex or scutellums; it is perhaps a distinct species. By the reddened hind margins of the abdominal segments, this resembles *P. providus* (Sm.) and *P. frontalis* (Sm.). The dark mandibles &c. readily separate it from *frontalis*; from *providus* it appears to be distinguished by several details, but as that species is known only in the female, it is perhaps not quite certain that *providellus* may not be its male.

*Paracolletes obscuripennis*, sp. n.

♂.—Length about 9 mm.

Black, the abdomen very faintly ochreous, somewhat as in *P. chalybeatus*; pubescence (somewhat spoiled from immersion in a liquid) pale, dense and yellowish (perhaps partly stained) on face, but black on vertex and upper part of front, and largely so on mesothorax and scutellum. Legs black with pale hair, the tarsi slightly rufescent; tegulae dark reddish, clouded with fuscous. Wings rather light fuliginous throughout, the stigma and nervures dark; stigma large; b. n. not quite meeting t. m., or rather meeting it a little on one side; second s.m. broad (narrower, but not narrow, above), receiving first r. n. about its middle; third s.m. receiving second r. n. near its end. Mandibles dark, bidentate; antennae dark, faintly reddened at apex; maxillary palpi with the first four joints subequal, and the fifth shortest, the last three more slender than the first three; mesothorax shining, sparsely punctured; area of metathorax large, dullish, humped in the middle, but with no transverse keel; abdomen without hair-bands; the hair near the apex is black; venter normal.

*Hab.* Tasmania; no other particulars known.

This has the form and appearance of *P. viridicinctus*, but it is known from that and from *P. chalybeatus* by its dark wings. In *P. viridicinctus* the metathoracic area is short, and the posterior lateral margin is a simple grooved line,

almost straight, but slightly curved inwards; in *P. obscuripennis* the area is large, and the posterior lateral margin has a conspicuously beaded appearance and is quite strongly curved outwards.

*Paracolletes colletellus*, sp. n.

♂.—Length 8 mm.

Black, very pubescent, the face densely covered with light yellow hair; vertex and occiput with yellow hair like the face, but cheeks with abundant white hair, long below, forming a large beard; mandibles black basally, rufous apically, the apical tooth long and sharp, the inner very small; flagellum clear red beneath, including the last joint; head broad, orbits converging below; vertex rather dull; hair of thorax ochreous above, lighter, but not a pure white, below; mesothorax shining, but rather closely punctured; area of metathorax somewhat shining, ridged transversely; tegulæ shining fulvous. Wings hyaline and iridescent, stigma and nervures ferruginous; b. n. falling a little short of t. m.; second s.m. large and square, except for the fact that the second t.-c. is bent inwards for its upper half; first r. n. joining second s.m. at its extreme base; second r. n. joining third s.m. at its apex. Legs with pale yellowish hair; femora dark, reddened at the knees; tibiæ and tarsi clear ferruginous, but all the tibiæ with a large black median patch. Abdomen with the basal half or more of the segments grey-tomentose, and the apical margins broadly yellowish hyaline, the junction of the hyaline with the black reddened; ventral segments 2 to 5 with the hind margins apparently deeply excavated or concave in the middle, but the excavations are filled in by hyaline membrane, so that the actual hind margins of the segments are straight.

*Hab.* Adelaide River, Australia (*J. J. Walker*, 5518, 5520); two, collected on the 'Penguin' Expedition.

There is some resemblance to *P. punctatus* (Sm.), known only in the female, but it does not seem likely that this is its male. *P. colletellus* has all the appearance of a small *Colletes*, such as *C. fodiens*, Kirby.

*Paracolletes semilautus*, sp. n.

♂.—Length about 8 mm.

Black, hairy, the hair in general cinereous or whitish, but the long hair of the face (abundant but not dense enough to hide the surface) is mixed with black on the clypeus and black at the sides, and there is black also on the front and

vertex and on the scutellum; head large, subquadrate, with broad cheeks, which are obtusely angled behind; facial quadrangle much broader than long, the eyes nearly parallel; mandibles dark, the extreme apex reddened; clypeus with many but not very strong punctures; flagellum dark reddish beneath; mesothorax hairy, but shining; scutellum very shiny, sparsely punctate, not obscured by hair; area of metathorax dullish, not transversely carinate, posterior lateral margins curved outwards. Legs dark dull red, with light hair; tegulæ shining dark reddish. Wings clear, faintly dusky at apex, nervures and stigma amber-colour; b. n. meeting t. m., but not quite squarely; t. m. bent at its lower end; second s.m. about twice as broad below as above, and receiving the first r. n. about its middle; third s.m. receiving second r. n. a short distance from its end. Abdomen hairy, shining, the hind margins of the segments rufescent; the hair at apex more or less fuscous, but not black.

*Hab.* "Australia," 58. 168.

Easily known by the very broad face, with black hair at the sides.

LV.—*Notes on the Forficularia.*—IX. *On new Species, with Synonymic Notes.* By MALCOLM BURR, B.A., F.L.S., F.E.S.

I AM at present engaged upon a general revision of the Dermaptera (earwigs) of the world, and, through the generosity of my friends and correspondents, am able to examine a very large amount of material, including a high proportion of the types of the described species. Lack of time, however, will very greatly delay the completion of the work, and therefore, in order to prevent the confusion likely to occur through having a large number of novelties named and described in manuscript, I shall publish the descriptions of such new species as pass through my hands during the period of preparation.

Our knowledge of this group of insects has made such progress in recent years, and so many new forms have been discovered and described, and many of the old genera contained such heterogeneous groups, that a number of new genera will be required; it is not, however, advisable to erect new genera except in comprehensive works, and so many of

the new species described in these papers will be provisionally placed in the existing genera to which they have the strongest affinities.

*Gonolabis Verhoeffi*, sp. n.

Fusco-castaneus, nitidus: antennæ . . . . . (13 segmenta restant); segmento 3 longo, clavato; 4 quam 3 dimidio breviori, valido, ovato; 5 quam 3 breviori, ovato; 6 tertium æquanti, ovato-clavato; ceteris longioribus, ovato-conicis: caput læve, tumidum, margine postico recto: pronotum subquadratum, marginibus omnibus rectis, postice leviter dilatatum, lateribus reflexis; planum: abdomen glabrum, læve, postice valde dilatatum; segmentum ultimum dorsale quam metanotum duplo latius, magnum, læve, latius quam longius, margine postico recto, integro, medio sutura distincta instructum; lateribus carina instructis; segmentum penultimum dorsale lateribus carinatis, rugulosis, postice reflexis, in modum generis *Ancistrogastri*; segmentum ultimum dorsale lateribus oblique truncatis, margine postico recto, truncato: pygidium minimum, vix perspicuum, transversum: forcipis brachia basi valida, triquetra, prope basin margine superiori dente forti apice obtuso armata; dehiuc attenuata, valde incurva, brachio dextro supra sinistrum fortius incurva, apice decussata. ♂. ♀ ignota.

	♂.
Long. corporis . . . . .	10 mm.
„ forcipis . . . . .	2 „

*Patria.* South Australia (type in Mus. Hope, ♂).

There is a second specimen, agreeing entirely in structure, but with a thick pale pubescence which is wanting in the larger specimen, doubtless through being rubbed off; the length of the body of the smaller one is 7 mm.

This species almost exactly resembles *G. Kirbyi*, Burr, but differs in the strong tubercular tooth above the base of the forceps (unarmed in *G. Kirbyi*) and the presence on the sides of the antepenultimate dorsal segment of the keel which is present on the last segment of both species; the sides of the last two or three segments in this species are more strongly hooked than in *G. Kirbyi*.

I am pleased to dedicate it to Dr. Karl Verhoeff, in recognition of his work upon the earwigs; for though it is not always possible to agree with his conclusions, the value of his articles cannot be denied.

*Labia tenuipes*, sp. n.

Fusco-castanea, valde pubescens: antennæ 15-segmentatæ, nigrae; segmento 3 elongato, cylindrico, apice vix incrassato; 4 cylindrico,

incrassato, quam 3 dimidio breviori; 5 quam 4 sublongiori, apice incrassato; ceteris elongato-conicis, apicalibus tenuioribus: caput fusco-castaneum, globosum, suturis haud perspicuis, margine postico recto; totum pilis longis pallidis spissis valde pubescens: pronotum caput latitudine æquans, longius quam latius, rectangulare, margine antico recto, postico rotundato; lateribus rectis, sat late reflexis; nigrum: prozona tumida, sutura mediana distincta, usque ad marginem posticum producta; hae parte tumida tantum a l marginem posticum evanescenti: elytra carinula humerali subobsoleta usque ad marginem posticum elytri percurrenti, punctis rugulosis parvis seriatim dispositis signata; rugulosa, apice truncata, lateribus pilis longis pallidis obsita: alae longæ, nigrae, rugulosæ: pedes graciles, longi; valde pubescentes, pilis longis, pallidis; femora longa, incrassata; tibiæ tenues, femora æquantes, valde pubescentes, superne deplanatæ, sed haud sulcatæ; tarsi gracillimi, uniti tibiis longitudine æquantes vel sublongiores; segmento primo valde elongato, subtus dense piloso; segmento secundo minimo, simplici; segmento tertio elongato, quam primum subbreviori, subtus vix pilosum: abdomen convexum, sat latum, apicem versus paulo dilatatum, nigrum, minute granulolum, lateribus pilis longis obsitum; plicis lateralibus parvis sed distinctis; segmentum ultimum dorsale magnum, rufescens, latius quam longius, margine postico subarcuato, medio impresso, margine ipso reflexo, utrinque tuberculo magno ruguloso instructum: segmentum penultimum ventrale amplum, rotundatum, margine postico medio paulo excavatum: pygidium brevissimum, haud prominens, crassum, superne incrassatum, margine inferiori incrassato, subtuberculato: forcipis brachia basi remota, elongata, subrecta, basi incrassata et triquetra, pilis brevibus instructa, basi ipso leviter divergentia, deinde subrecta, elongata, gracilia, attenuata, medio margine interno dento forti armata.  
♂. ♀ ignota.

	♂.
Long. corporis . . . . .	8.5 mm.
„ forcipis . . . . .	3.5 „

*Patria.* Peru: Chanchamarjo, La Merced, at 3000 metres (type, one ♂, in my collection, taken by W. F. H. Rosenberg).

This is a very distinct species, resembling no form known to me: it is characterized by the thick and elongate fourth and fifth segments of the antennæ; by the very hairy body; by the granulose elytra and wings; by the humeral keel of the elytra, almost obsolete, its position marked by a row of small tubercles running the entire length of the elytra's edge; by the rounded penultimate ventral segment, a little emarginate posteriorly; by the form of the pygidium and the long and slender, slightly curved, almost straight forceps; especially by the long and slender feet and the extremely long and very slender tarsi.

It will require a new genus for its reception, but its affinities are with the genus *Labia*, though it does not resemble any species known to me.

The unique specimen has the left branch of the forceps missing, and the right branch appears to have been broken off at the apex. Otherwise it is in good condition.

*Chatospania confusa*, sp. n.

Antennæ (?) 13-segmentatæ, fusco-testaceæ; caput, pronotum, elytra, alæ atra; ore pallido; pedes testacei, fusco-annulati; abdomen rufum; forceps rufo-fuscus. Pronotum margine antico recto, postico rotundato, metazona angusta: abdomeu plicis later-alibus parvis; segmentum ultimum dorsale fusco-rufum, magnum, quadratum, margine postico medio sulculatum, supra insertionem forcipis tuberculo obtuso utrinque instructo: forcipis brachia ♂ basi triquetra, typica, subrecta, medio margine interno dentato; pygidium breve, latum, margine postico sinuato, angulis posticis in lobos parvos acutos obliquos productis. ♂.

	♂.
Long. corporis . . . . .	9 mm.
„ forcipis . . . . .	3 „

*Patia*. Mentawai, Sipora, Sereinu, v.-vi. 1894: taken by Modigliani, one male (type in coll. mea).

The type of this species has long been in my collection, labelled "*Ch. Fœa*, Borm.?" from de Bormans's own collection. It is distinct, however, from *Ch. Fœa*, on account of the short and broad pygidium of the male, which has the angles produced into small, sharp tubercles or lobes; otherwise it resembles *Ch. Fœa* closely, in form and colour. The female is not yet known.

*Mecomera Kervillei*, sp. n.

Statura majore; colore fusco-rufo: antennæ 17-segmentatæ; segmento primo valde incrassato; 3 modice elongato, apice incrassato; 4 quam 3 dimidio breviori, incrassato, ovato; 5 quam 3 subbreviori, valido, ovato; 6 tertium æquanti, incrassato, subcylindrico; ceteris elongatis, cylindricis; brunneæ: caput læve, deplanatum, rufo-testaceum, margine postico leviter emarginato: pronotum caput latitudine æquans, deplanatum, testaceum, fusco-variegatum; margine antico convexo, in collem producto; margine postico subrotundato; lateribus rectis; longius quam latius, postice leviter dilatatum: elytra ampla, deplanata, lævia, apice emarginata, fusca: alæ longæ, læves, fuscæ: pedes testacei, breves, compressi: tarsorum segmento primo quam tertium distincte breviori, secundo parvo, haud lobato; tarsi dilatati, breves:



abdomen valde depressum, latum, rufum, lateribus infuscatis, læve, plicis lateralibus distinctis; segmentum ultimum dorsale ♂ magnum, subquadratum, læve, latius quam longius, margine postico medio impresso, utrinque tuberculato; angulis in tuberculum parvum productis; ♀ margine postico angustius, tuberculis obsoletis: pygidium ♂ breve, transversum, margine postico exciso, angulis in puncta acuta productis; ♀ brevissimum, subglobosum, margine postico leviter emarginato: forcipis brachia ♂ valida, deplanata, lata, rufa, margine interno dente forti bifido armata, dehinc crenulata, sensim attenuata, apice incurva; ♀ subcontigua, deplanata, subrecta, margine interno crenulata, sensim incurva, apice decussata. ♂ ♀.

	♂.	♀.
Long. corporis . . . . .	14.5 mm.	13.5 mm.
„ forcipis . . . . .	2.5 „	3 „

*Patria.* Java (1 ♂, 1 ♀, ex coll. Gadeau de Kerville).

Approaches *M. Weissi*, Burr, from Tonkin, but larger and stouter; the coloration is different, and the forceps are shorter and stouter and more strongly toothed.

I have much pleasure in dedicating this species to my friend M. Gadeau de Kerville, who, with great generosity, has placed his entire collection at my disposal.

*Ancistrogaster Kervillei*, sp. n.

Niger, nitidus, glaber: antennæ nigræ, 11-segmentatæ; segmentis elongatis, cylindricis; segmentis 3 et 4 subæquantibus, 5 sublongiori: caput tumidum, nigrum, margine postico recto: pronotum nigrum, lateribus anguste testaceum, caput latitudine æquanti, latius quam longius, margine antico truncato, postico subconvexo; lateribus rectis; vix tumidum, deplanatum, sutura mediana subobsoleta: elytra brevia, latiora quam longiora; carina humerali distincta, in medio elytri evanescenti; trapezoidalia, margine interno quam externo breviori; margine postico oblique truncato: alæ nullæ: pedes typicæ, longi; tibiæ superne integres; tarsorum segmentum primum cetera unita longitudine æquans: abdomen basi angustum, medio valde dilatatum, apice angustatum, depressum, nigrum; segmentis 2 et 3 plicis distinctis; ♂ medio valde dilatatum, segmentis 2-6 lateribus in tuberculum reflexum acuminatum recurvis; segmentis 2 penultimis angustioribus, inermibus; segmentum ultimum dorsale ♂ læve, transversum, medio puncto impresso, margine postico incrassato, tuberculis 2 obtusis paullo elevatis instructum; angulis exterioribus posticis acutis: abdomen ♀ minus dilatatum, segmentis lateribus haud reflexis; segmentum ultimum dorsale ♀ valde angustatum, subinermis: pygidium ♂ brevissimum, conicum; ♀ brevissimum, conicum: segmentum penultimum ventrale ♂ ♀ rotundatum; segmentum ultimum ventrale ♂ margine postico medio



emarginatum, bilobum, lobis rotundatis, fere totum obtectum, angulis carinulatis; ♀ obtectum: forcipis brachia ♂ depressa, basi sat incrassata, margine interno prope basin dente parvo armata; in dimidio primo valde divergentia; in dimidio apicali repente, fere angulatum incurva, apice ipso sinuata et mucronata; ad tertiam partem apicalem margine interno dento obtuso armata; ♀ simplicia, recta, subcontigua, gracilia. ♂ ♀.

	♂.	♀.
Long. corporis . . . . .	9·5–11·5 mm.	10–11 mm.
„ forcipis . . . . .	3–3·5 „	3·5 „
Lat. max. abdominis . . . . .	4·75–5 „	3·75 „
„ „ forcipis . . . . .	3–3·5	

*Patria.* Venezuela: region of Merida (in coll. Gadeau de Kerville et mea; typus in coll. mea).

This species I formerly confused with *Ancistrogaster impennis*, Borm., but on a comparison with the original type of the latter I find it differs in several respects: the forceps are strongly bowed outwards and then inwards and have but a small tooth at the base on the inner margin, in *A. impennis* there is a powerful tooth at that place and the branches are gently incurved; in the new species the extreme tips of the forceps are strongly sinuate, as the antepical tooth is obsolete, but in *A. impennis* the two hooks are both strongly developed; in *A. impennis* the elytra have the exterior keel continued throughout their length, in *A. Kervillei* it dies out halfway down the elytra; in *A. impennis* the pronotum is almost square, in *A. Kervillei* it is transverse: in the final revision both these forms will probably require new genera.

I dedicate it to my friend M. Gadeau de Kerville, as a slight token for his generosity in providing me with a large amount of most interesting material, including three pairs in good condition, of this new species.

#### *Opisthocosmia Poultoni*, sp. n.

Gracilis: antennæ ?-segmentatæ, sat crassæ; segmento 3 brevi, conico; 4 sublongiori, conico; 5 conico, etiam longiori; nigræ (13 segmenta restant): caput læve, rufum, margine postico recto; oculis parvis, nigris: pronotum planum, capite sublatius, margine antico truncato, postico late rotundato, lateribus rectis; planum, pallido-flavum, sublatius quam longius, lateribus vix reflexis: elytra longa, angusta, humeris vix dilatatis, apice truncata, fusco-castanea: alæ longæ, pallido-flavæ: pedes breves, testacci: abdomen cylindricum, rufum, læve, plicis lateralibus distinctis; segmentum ultimum dorsale ♂ quadratum, fuscum, læve, apice subangustatum, declive, margine postico subsinuato, angulis oblique truncatis: pygidium brevissimum, transversum, integrum:

forcipis brachia basi remota, gracilia, valde elongata, rotundata; margine interno prope basin leviter excavata; ad quartam partem longitudinis dente parvo armata, dehinc teretia, rectissima, gracilia, inermia, apice incurva. ♂. ♀ ignota.

	♂.
Long. corporis . . . . .	12 mm.
„ forcipis . . . . .	8 „

*Patria.* Batchian (taken by Wallace; type, 1 ♂, in Mus. Hope, Oxford, “Stevens, 1860”).

In spite of the age of the type, it is in very good condition, except that the antennæ are somewhat broken.

In form it resembles *O. formosa*, but differs in colour; the broad, flat pronotum is characteristic.

I am very pleased to dedicate it to Professor Poulton, who has always placed the Hope Collection at my disposal with the greatest courtesy.

*Opisthocosmia formosa*, sp. n.

Gracilis, elongata: antennæ fusæ; segmento primo valde elongato, apice incrassato; 3 valde elongato, pallido, cylindrico; 4 cylindrico, quam 3 vix breviori; 5 tertium æquanti, cylindrico; (segmenta 6 restant): caput nigrum, tumidum, margine postico submarginato: pronotum capite angustius, longius quam latius, subovatum, margine antico recto, postico late rotundato, lateribus subrotundatis; nigrum: prozona tumida; lateribus reflexis: elytra angusta, carina humerali obsoleta, costa autem elytri distincte plicata; fusco-castanea, macula humerali magna rufa ornata: alæ longæ, nigræ, basi macula magna flava ornata: pedes longi, graciles, testacei, genubus infuscatis: abdomen gracile, fusco-rufum, læve; segmentum ultimum dorsale attenuatum, longius quam latius, læve, margine postico subrotundato, subreflexo et subincrassato: pygidium minimum, globosum: forcipis brachia basi remota, gracilia, rotundata, valde elongata, subrecta, margine interno in dimidio basali crenulata; ad mediam longitudinem dente parvo subobsoleto armata, dehinc inermia, teretia; usque ad dentem medium subsinuatâ, ovalem valde elongatam includentia; dehinc subrecta, apice incurva. ♂. ♀ ignota.

	♂.
Long. corporis . . . . .	9 mm.
„ forcipis . . . . .	7·5 „

*Patria.* Cameroons (type, one ♂, ex coll. Gadeau de Kerville).

This graceful species is the first of the genus recorded from Africa, if we except the wingless *O. Micheli*, Burr, from Abyssinia and *O. hova*, Borm., from Madagascar, both of

which are very different in colour and of much stouter build. It may be also known by the colour of the elytra and wings, and the long, slender, almost unarmed forceps.

*Anechura sokotrana*, sp. n.

Corpus pilis longis pallidis obsitum, fusco-castaneum; antennæ testaceæ, segmentis gracilioribus; caput ferrugineum, suturis transversalibus sat distinctis: pronotum quadratum, nigrum, marginibus rectis, postico rotundato, totum subtumidum, marginibus reflexis, pallido-testaceis; elytra brevia, nigra, medio macula magna pallida ornata, margine interno quam externo multo brevius, margine postico sinuato, angulo interno apicali rotundato: alæ abortivæ: pedes longi, sat graciles, testacei, femoribus prope apicem infuscatis: abdomen magnum, rufonigrum, punctulatum, plicis lateralibus sat distinctis; segmentum ultimum ♂ subquadratum, latius quam longius, margine postico superne tuberculis duobus, spiniformibus, supra forceps spectantibus, armatum; ♀ angustum, declive, inermis: pygidium ♂ quadratum, globosum, lateribus convexis, margine postico truncato, angulis spinulis armatis; ♀ haud perspicuum. Forcepis brachia ♂ sat valida, basi ipso paullo dilatata sed haud deplanata, margine interno basi ipso dente forti armata, dehinc extus ac intus incurva, aream ellipticam elongatam includentia, inermia; ♀ recta, inermia, contigua; forceps rufescens, apice infuscatus.

	♂.	♀.
Long. corporis . . . . .	16 mm.	10 mm.
„ forcepis . . . . .	6 „	3 „

*Patria.* Sokotra (♂ ♀ in B.M.).

*Anechura Fedtchenkoi*, Burr, in Forbes's Nat. Hist. Sokotra, p. 414 (1903).

The two specimens brought from Sokotra by the Forbes-Grant Expedition were formerly identified by me as *A. Fedtchenkoi* (*l. c.*), but, now that I have been able to examine a good series of that species, a further examination shows that they are entirely distinct. The forceps are more strongly bowed, forming an elongated ellipse; the pygidium is different; the last segment of the abdomen has two tubercles in the middle, pointing directly backwards and parallel, whereas in *A. Fedtchenkoi* the tubercles are stronger, situated at the corners, and point outwards.

*Forficula canariensis*, sp. n.

*F. Lesnei* proxime affinis: differt statura majore, robustiori, elytris brevioribus, apico oblique truncatis, angulis rotundatis, margine interno quam externo multo brevioribus, corpore minus pubescenti. Ceteris cum *F. Lesnei* omnino congruet. ♀ ignota.

		♂.
Long. corporis	.....	11.5 mm.
„ forcipis	.....	3 „

*Patria.* Teneriffe (♂ in B.M.).

Very closely allied to *F. Lesnei*, agreeing exactly in the form of the forceps, but somewhat larger and stouter, and the elytra are trapezoidal instead of square, and almost show a minute scutellum.

*Forficula redempta*, sp. n.

Statura mediocri: antennæ segmento primo testacco: caput rufonigrum, postice subtumidum, suturis obsoletis: pronotum fuscum, lateribus testaceis, margine antico truncato, postico lateribusque late rotundatis, sat supra elytra productum; prozona tumida, a metazona plana distincte sejuncta: elytra nigra, macula parva humerali flava ornata, longa, apice truncata: alæ longæ, pallidoflavæ, sutura infuscata: pedes testacei: abdomen nigrum, vix punctulatum, plicis lateralibus distinctis; segmentum ultimum dorsale ♂ magnum, subquadratum, paullo latius quam longius, margine postico medio trituberculato, utrinque ad latera tuberculo parvo instructum: pygidium haud perspicuum: forcipis brachia ♂ fusco-rufa, parte dilatata brevi, quartam partem forcipis attingenti, margine interno crenulato, hac parte deplanata dente parvo superiori sursum spectanti terminata; dehinc attenuata, gracilia, inermia, arcuatim incurva. ♂. ♀ ignota.

		♂.
Long. corporis	.....	10 mm.
„ forcipis	.....	3 „

*Forficula smyrnensis*, Burr, in Forbes's Nat. Hist. Sokotra, p. 413, pl. xxv. fig. 5 (♂) (1903).

*Patria.* Sokotra: Dahamieh, 3500 feet (♂, unique, in B.M.).

Resembles *F. smyrnensis*, with which it was formerly confused by both M. de Bormans and myself, but smaller, slighter, darker: the flattened part of the forceps has a smooth tooth pointing upwards, and the pronotum is almost circular, instead of transverse oblong.

*Forficula vidua*, sp. n.

Haud nitida. Statura majore; colore nigro: antennæ (?) 10-segmentatæ; segmentis tenuibus, 4 sat elongato, quam 3 vix breviori; rufo-nigræ: caput nigrum, globosum, suturis vix perspicuis: pronotum sublatius quam longius, lateribus parallelis margine postico rotundato; prozona vix tumida, medio sulculo impresso: elytra lata, brevia, apice truncata, fusco-castanea, haud nitida: alæ breves, parum prominentes, fusco-castaneæ: pedes testacei: abdomen atrum, vix punctulatum, plicis distinctis; segmentum ultimum

dorsale medio impressum et subtuberculatum: pygidium breve, conicum, apice fissum: forcipis brachia sat valida; margine interno prope basin dilatata et deplanata, hac parte brevi vix contigua, dente obtuso obsoleto terminata; dehinc sensim incurva, in tertia parte basali denticulo minuto: forceps ipse haud deplanatus, margine solo interno laminato. ♂.

		♂.
Long. corporis	.....	12 mm.
„ forcipis	.....	4.5 „

*Patria.* Guatemala: Mt. Oltrain (in B.M.).

#### SYNONYMIC NOTES.

The following descriptions and names appear to me to be applied to the same species; I have not been able to verify all the types, but the quoted localities and the descriptions leave very little doubt that the names are synonymous.

*Anechura eoa*, Semenov, Rev. russe d'Ent. ii. p. 100, fig. 2 (1902) = *Forficula japonica*, Borm. An. Soc. Esp. H. N. ix. p. 512 (1880). As the name *japonica* in *Forficula* is pre-occupied by Haan, Rehn (Proc. U.S. Nat. Mus. xxvii. p. 540, 1904) suggests the new specific name *athymia*. As it falls into my genus *Odontopsalis* (Trans. Ent. Soc. London, 1904, p. 316), which will coincide with true *Anechura*, Scudder, the correct name for this insect is *Anechura athymia* (Rehn).

*Nesogaster Fruhstorferi*, Verhoeff, Zool. Anzeig. no. 665, p. 191 (1902) = *Labia dolicha*, Burr, Ann. & Mag. Nat. Hist. (6) xx. p. 311 (1897); so that the correct name for this species is *Nesogaster dolichus* (Burr).

*Sparatta semifulva*, Borm. Notes from the Leyden Mus. vi. p. 183 (1884), and *Sphingolabis furcifera*, Borm. l. c. p. 194, appear to be respectively the ♀ and the ♂ of the same insect. I have in my collection an insect which agrees perfectly with the description of the first, and with an unpublished drawing of it by de Bormans himself, and another which agrees equally well with the latter and with an unpublished coloured drawing of the same: but these two insects are very obviously the sexes of one species; they resemble in every particular of locality and coloration, were taken together, and differ only in the form of the pygidium and forceps; the "*semifulva*" specimens have all seven visible abdominal segments (that is, are females), and the

"*furcifera*" specimens have always nine (that is, are males): it appears, therefore, that de Bormans was mesmerised by the forceps and pygidium of "*semifulva*," which are unusually developed for a female, and considered the specimens to be males. The second tarsal segment, examined by a microscope, shows practically no dilation; and as *furcifera* is the type of *Sphingolabis*, it effectually removes that genus from the neighbourhood of *Forficula*, and conclusively demonstrates its independence from *Apterygida*, of which the type, *media*, is totally different: unless, therefore, *Sphingolabis* is shown to coincide with some other existing genus, it must be revived for this species, and probably also for *S. hawaiiensis*, Borm., and *S. borneensis*, Borm. It is wrongly revived by Verhoeff for *S. sansibarica* and its allies, as by his very definition of the new genus he excludes the typical species of *Sphingolabis*; his genus certainly holds good, but will require a new name. In the meantime, as the name "*semifulva*" occurs a few pages earlier than "*furcifera*" in the same paper, the former name must stand, and therefore, until the true position of the genus *Sphingolabis* is satisfactorily determined, this insect must be known as *Sphingolabis semifulva*, Borm.

*Chelisothes vittatus*, Burr, Ann. & Mag. Nat. Hist. (7) xi. p. 274 (1903), is identical with *Sphingolabis variegata*, Kirby, Journ. Linn. Soc., Zool. xxiii. p. 326 (1891), as I have seen the types of both; but it seems that both these names must fall before the name employed by Fabricius (Ent. Syst. ii. p. 5, 1793), who described what seems certainly to be the same insect under the name *Forficula flavipennis*. As it is a true *Chelisothes*, it must be called *Chelisothes flavipennis* (Fabr.).

*Chelisothes Shelfordi*, Burr, Ann. & Mag. Nat. Hist. (7) vi. p. 96, pl. iv. fig. 4 (1900), and *Ch. hercules*, Burr, l. c. p. 97, pl. iv. fig. 2, are respectively the ♀ and ♂ of the same species. The former name occurs earlier and so must stand. The form of the forceps of *Ch. Shelfordi* is so unusual for a ♀ that I allowed myself to assume it to be a ♂. In several large Chelisochoidæ the females look like males (e. g. *Ch. glaucopterus*), and probably *Ch. dorieæ*, Borm., is the ♂ of *Ch. superbus*, Dohrn.

Royal Societies' Club,  
St. James's Street, S.W.  
July 1905.

LVI.—On *Hipposiderus diadema* and its closest Allies.

By KNUD ANDERSEN.

*Hipposiderus diadema*, Geoffroy.

*Diagnosis* (as compared with the three species described below).—Anteorbital width\* of skull between 8·5 and 10 mm.; upper tooth-row (exclusive of incisors) 11·3–13·2 mm. Ears moderate: width 24–27·5 mm.; forearm 75·5–91 mm.

*Range*.—The Indo- and Austro-Malayan Subregions, exclusive of Betchian.

*Hipposiderus diadema oceanitis*, subsp. n.

*Diagnosis*.—Anteorbital width 8·5; upper teeth 11·3–12·1. Forearm 78·8–79·2.

*Details*.—Of all the local representatives of the *diadema* type, this form has the slenderest skull and the shortest tooth-rows. But in both of these respects it is almost, or completely, matched by the smallest individuals of *H. d. griseus*, from the Philippines, from which it, however, differs by the somewhat shorter forearm (78·8–79·2 mm., as against 83–88). The three specimens of *oceanitis* at my disposal evidently do not show the extremes of individual variation in size; the external dimensions of this form will, presumably, prove to be very much as in *H. d. pullatus* from New Guinea (forearm 75–81 mm.).

The third (external) supplementary leaflet is smaller than in the other forms of *diadema*, sometimes so small that it requires some attention not to be overlooked.

*Type*.—♂ ad. (in alcohol). Aola, Guadalcanar, Solomon Islands. Collected by C. M. Woodford, Esq. Brit. Mus. no. 88. 1. 5. 23.

*Range*.—Solomon Islands: Guadalcanar; Fauro.

*Hipposiderus diadema griseus*, Meyen.

*Diagnosis*.—Anteorbital width 8·6–9·2; upper teeth 12–13·2. Forearm 83–88.

*Range*.—Philippine Islands: Luzon, Catanduanes, Guimaras, Leyte, Mindanao (Mt. Apo; Zamboanga).

\* The width of the facial portion of the skull, across the front margin of the orbits, immediately above the upper border of the infraorbital foramina.—All the measurements recorded in the "diagnoses" and in the table, p. 507, are of full-grown individuals. For explanation of some of the measurements, see Ann. & Mag. Nat. Hist. (7) xvi. (1905) p. 248, footnote.



*Remarks.*—8 adult and 5 young specimens\*, from all the above-named islands of the Philippine group, have been examined. They all agree closely in cranial and external characters. In the general size of the skull and teeth, as well as in the anteorbital width, there is scarcely more than an average difference between this and the foregoing race, but the forearm is longer. Such at least is the case in all the specimens just referred to. But one adult example, from Zamboanga, collected by A. Everett, is quite extraordinarily small, the forearm measuring only 77·5 mm., the tail 35·8 (in all the others 43–54). The gap between this specimen and the whole of the other series (the young individuals not excepted) is so great that I can hardly believe it to belong to the same form. We find in the Philippines, in the same island, *Rhinolophus arcuatus* and *subrufus*, two distinct species differing in no important respect but size; in Java *Rh. minor* and *acuminatus*, differing much in the same way; in the Solomon Islands *H. d. oceanitis* and *H. dinops*, a small and a large representative of the same type of bat; it is therefore not improbable that in the Philippines there occurs a small and a large form of *H. diadema*. But to decide this more ample material is necessary.

*Technical name.*—The type of "*Rhinolophus griseus*" was from S. Matheo Cave, Luzon †. The figure (half natural size) gives a tolerably good representation of a *H. diadema*; the dimensions, as derived from this figure, are quite as in the Philippine series examined by me. The fur is stated to be "ganz aschgrau," which is certainly not the case in any specimen or any race of *diadema* I have seen; the ears are far too small, the supplementary leaflets not indicated. Notwithstanding these discrepancies there can, in my opinion, be no doubt as to the identification of Meyen's species.

*Hipposiderus diadema pullatus*, subsp. n.

*Diagnosis.*—Anteorbital width 9·2–9·5; upper teeth 11·8–12·5. Forearm 75·5–81.

*Details.*—The anteorbital width is slightly larger than in the foregoing forms, but there is no sharp line of separation, the maximum of *griseus* being equal to minimum of *pullatus*.

\* Five of these thirteen specimens were kindly sent me for inspection by Mr. Gerrit S. Miller, Washington.

† F. J. F. Meyen, "Beiträge zur Zoologie, gesammelt auf einer Reise um die Erde," Nov. Act. Ac. Cæs. Leop.-Car. vol. xvi, pt. 2 (1833) p. 608, pl. xlvii, fig. iv.—According to Peters (MB. Ak. Berlin, 1871, p. 316), the type specimen has been lost.



The general size is as in the Solomon race, markedly smaller than in *griseus*.

*Type*.—♂ ad. (in alcohol). Haveri, British New Guinea, 700 m., November 1893. Collected by Dr. Lamberto Loria. Presented by the Genoa Museum. Brit. Mus. no. 97. 8. 7. 9.

*Range*.—British New Guinea: Haveri; Chad's Bay.

*Hipposiderus diadema vicarius*, subsp. n.

*Diagnosis*.—Anteorbital width as in *H. d. pullatus*; upper teeth 12·1–13·2. Forearm 80·5–85·2.

*Details*.—Similar to *H. d. pullatus*, but on an average larger. The lateral vertical ridges on the front surface of the posterior leaf show some tendency to obliteration: in three out of five spirit-specimens from Sarawak they might by a hasty examination rather easily be overlooked.

*Type*.—♂ ad. (in alcohol). Niah Cave, Sarawak. Collected by A. Everett, Esq. Brit. Mus. no. 92. 9. 6. 23.

*Range*.—N. Borneo (Sarawak); S. Celebes (Kalao); Sumatra.

*Remarks*.—Six specimens from Borneo, one from Celebes, and one from Sumatra have been examined. The skull of the Celebes individual is in all essential points like those from Borneo (three skulls), only a trifle smaller, with somewhat smaller teeth; the nasal swellings as inflated as in any Bornean skull, the anteorbital width as great as in the largest of these latter. The Sumatra skull is slightly more slender than any from Borneo, the teeth somewhat smaller, the nasal swellings less inflated. These differences, very slight as they are, may eventually, when larger series from these islands are to hand, turn out to be quite individual.

*Hipposiderus diadema*, Geoffr., *typicus*.

*Diagnosis*.—Anteorbital width 9·5–9·8; upper teeth 12·3–13. Forearm 84·5–91.

*Details*.—This form is most closely related to *vicarius*, but as a rule larger, and with the facial portion of the skull slightly broader. The size of the teeth is the same as in the Bornean race. Only skins (six specimens) and skulls (five) have been examined.

*Range*.—Java, Timor.

*Technical name*.—The species was originally described from Timor\*. There is a skin from that island in the

\* Geoffroy Saint-Hilaire, "Sur un genre de Chauve-souris, sous le nom de Rhinolophes," Ann. Mus. d'Hist. nat. xx. (1813) pp. 263, 266, pl. vi.

British Museum, closely agreeing with Geoffroy's figure and description.

*Horsfield's Rh. nobilis*\*.—The cotypes † (two skins) of Horsfield's "*Rhinolophus nobilis*," from Java, are in the British Museum; both of them are young adults, *i. e.* evidently full-grown, but the epiphyses of the metacarpals not ankylosed and the teeth unworn. The skull of one of these cotypes, and the skulls of several other examples from Java, are as in the Timor bat. The forearm of five Java skins measures 85–91, of the Timor skin 84·5. It may mean (if it means anything) that, in a large series, Java specimens will turn out to be on an average larger than Timor specimens, in which case Horsfield's name will, of course, have to stand for the former race ‡.

*Hipposiderus lankadiva*, Kelaart.

*Diagnosis*.—Anteorbital width moderate: 9·2–9·8; teeth very large: upper row 14–14·7. Ears moderate: width about 23–24; size very large: forearm 88–94·8.

*Details*.—This species differs from *H. diadema* (all forms) in the following particulars:—

\* Th. Horsfield, 'Zoological Researches in Java and the neighbouring Islands' (London, 1824), no. 7, letterpress (unpaged); figs. L, N, O, P, Q (head and dentition) on black-and-white plate (without number); coloured plate [8] (whole fig.).

† Nos. A and B in Horsfield's Cat. Mamm. Mus. East-Ind. Comp. (London, 1851) p. 35.

‡ *H. diadema* also occurs in the Malay Peninsula. The skull of an example (skin) in the British Museum, from Gunnong Pulai, Johore (collected by W. Davison, presented by A. O. Hume), has the anteorbital width 10 mm., a trifle larger than in the races described above; the size of the teeth (upper row 13 mm.) is quite as in an average form of *diadema*. I should have no hesitation in identifying this bat with Dobson's "*H. Masoni*," from Lower Burma, were it not for the reason that Dobson described this latter as having only one (central) vertical ridge on the front of the posterior leaf, whereas in the Johore specimen the lateral ridges are well developed (the other character of "*Masoni*" mentioned by Dobson, *viz.* a downward projecting process from the symphysis of the mandible, looks so strange that I suppose it may be an individual deformity in the only specimen known). The possibility is perhaps not excluded that Dobson had before him a specimen in which (as I have pointed out above to be sometimes the case in *H. d. vicarius*) the lateral ridges were markedly reduced, therefore easily overlooked. The length of the forearm of the Johore specimen and of the type of "*Masoni*" is almost exactly the same (in the former 86·8, in the latter 85). A safe identification of the Malacca form would require more material both from the Malay Peninsula (specimen "*c*" of *H. diadema* in Dobson's Catalogue (p. 137), from Penang, is a *H. armiger*) and from the type locality of "*Masoni*."

The skull is very large and heavily built (see measurements on p. 507), but the facial portion (antorbital width) comparatively narrow; nasal swellings well developed, inflated, making the upper surface of the facial portion very conspicuously convex\*; portion between nasal swellings and sagittal crest convex or flattened, not distinctly concave, as in *H. diadema*; hinder part of orbits (temporal fossa) markedly broader; sagittal crest higher, more abruptly descending in front; mandible much longer, the rami higher. The teeth considerably larger.

The central projection of the posterior leaf is more prominent than in any other form of the *diadema* type, the upper border of the leaf, therefore, trilobate †, in so far recalling the shape of the posterior leaf in *H. armiger*. In *H. diadema* the central projection is but slightly prominent, the upper border almost evenly convex, as "a segment of the circumference of a circle" ‡. In one specimen of *H. lankadiva* there is a minute fourth lateral leaflet, external to the third; I have seen a similar individual aberration in two *H. d. vicarius* from Borneo.

Range.—Ceylon.

Technical name.—The type locality of *H. lankadiva* § is Kandy, Ceylon ||. Two skins from Dr. Kelaart's collection are in the British Museum, one of them marked (in Kelaart's handwriting?) "*H. lankadiva*; Kelaart; Kandy, 1850," and both of them quite as described above. But in his original description of *H. lankadiva*, Kelaart gives as length of the forearm 3 inches (76·2 mm.), of the third digit  $1\frac{1}{4}$  inches (108 mm.), measurements which, if they are correct (and there is no reason to doubt them), would indicate a bat much inferior in size to any "*lankadiva*" I have seen. There is

\* In this respect *H. lankadiva* is perfectly in accordance with the other bats described in the present paper; I emphasize this important point to prevent confusion with *H. armiger*, a species to which *H. lankadiva* bears a certain superficial resemblance in the general outline of the posterior leaf, but from which it differs widely in the shape of the facial portion of the skull. See the "General Remarks," below.

† The peculiar shape of the posterior leaf in specimens from Ceylon was pointed out by Blyth in 1863 (Cat. Mamm. Mus. Asiat. Soc. p. 26); it seems to have been overlooked by subsequent writers, who are unanimous in putting "*lankadiva*" down as a synonym of "*diadema*." The shape of the leaf is not always easy to ascertain in dried skins; it is quite pronounced in two spirit-specimens at my disposal.

‡ Dobson, Cat. Chir. Brit. Mus. (1878) p. 137.

§ "Lanka," I am informed on good authority, is a Hindu name of Ceylon. Is "-diva" the Sanskrit "deva" (cognate with Ζεύς (*Zeús*, *deús*, *deús*)?)

|| E. F. Kelaart, 'Prodromus Faunæ Zeylanicæ' (Colombo, 1852), p. 19.

the possibility that two distinct forms of the *diadema* type, a small and a large, occur in Ceylon, in which case the name *lankadiva* belongs to the former. So long as this remains uncertain, I prefer to use Kelaart's name for the form here under consideration.

*Hipposiderus euotis*, sp. n.

*Diagnosis*.—Facial portion of skull broad: anteorbital width 10·3–10·6; teeth moderate: upper row 13·2–13·7. Ears large: width 29–29·8\*; size rather moderate: forearm 84·5–89·2.

*Details*.—The skull of this species bears a certain resemblance to that of *H. lankadiva*; it is of about the same size, with very wide temporal fossæ (large zygomatic width), and with approximately the same shape and development of the sagittal crest; but the facial portion is considerably broader, the region between the nasal swellings and the sagittal crest distinctly hollowed out, as in *H. diadema*, not convex or flattened as in *H. lankadiva*. The teeth are markedly smaller than in this latter.

The shape of the posterior leaf is as in *H. diadema*.

*Type*.—Young adult (apparently full-grown), skin. Bat-chian. Collected by Dr. A. R. Wallace. Tomes Collection (unregistered).

*Hipposiderus dinops*, sp. n.

*Diagnosis*.—Facial portion of skull excessively broad: anteorbital width 11; teeth very large: upper row 14·6. Ears excessively large: width 32·5; size the extreme: forearm 96·5.

*Details*.—The skull is of the same size as in *H. lankadiva*, or rather larger, but the facial portion is much broader, the region behind the nasal swellings distinctly concave; the coronoid process of the mandible markedly higher and broader. The premolars and molars are as in *H. lankadiva*, but the upper canines much broader at base.

The lower leg is extraordinarily lengthened: 44 mm., as against 35·8 in the largest *H. lankadiva*. The tail, too, is markedly longer. The third leaflet external to the horse-shoe very small. The upper border of the posterior leaf as in *euotis* and *diadema*.

*Type*.—♀ ad. (in alcohol). Rubiana †, Solomon Islands. Collected by C. M. Woodford, Esq. Brit. Mus. no. 88.1.5.22.

\* Measurements from two dried skins, therefore probably a little too small.

† A minute islet very near the western coast of New Georgia (see map in C. M. Woodford, 'A Naturalist among the Head-hunters,' London, 1890).

## Colour.

The *style* of colour is, broadly speaking, the same in all the forms described above. There is some difference in details, and there seems to be a certain, though not very large, amount of individual variation.

This style of colour, in its most pronounced form, might be described as follows:—

Upperside of the body, anteriorly light-coloured, posteriorly dark-coloured; the two colours contrasting, and the line of demarcation between them sharp; the contrast is simply due to the fact that, in the hinder part of the upperside, the dark hair-tips are sufficiently long to completely cover the light bases of the hairs, in the front part very short or altogether wanting, exposing the light ground-colour; the dark-coloured part of the back corresponds to what I have called the “horseshoe-patch” in *Rhinolophus*. Base of hairs of upperside rather “ecru-drab” with a silvery tinge. Two round patches, whitish or yellowish, on each side of the body, at the shoulder-region, the one behind the other, rather close together. A longitudinal stripe, white or yellowish, bordering each side of the back, along the plagiopatagium. Underside a shade of “wood-brown.”

Putting aside some old skins, the colours of which may not be quite reliable, the chief differences between the species and subspecies, so far as they can be made out from the material to hand, seem to be these (all the skins described are of adult individuals):—

*H. d. vicarius* and *typicus*.—Hinder part of back “mars-brown” washed with “russet.” Patches and stripes well marked, sometimes tinged with yellowish.

*H. d. griseus*.—Not essentially different from *vicarius*; the shade of the brown colour of the hinder back varies somewhat, being sometimes darker, sometimes more tinged with russet.

*H. d. pullatus* (one skin only).—Back very much darker, approaching “seal-brown”; no contrast between anterior and posterior part of back. White patches and stripes very strongly marked\*.

*H. d. oceanitis* (one skin).—Essentially as *pullatus*, but patches and stripes almost completely obsolete. Underside of body considerably darker.

*H. lankadiva*.—As *H. d. vicarius*, but hinder part of back

\* This skin was obtained on July 10th; teeth somewhat worn; fur unabraded. Four spirit-specimens obtained in November seem to be of the same colour.

rather dark "Prout's brown." No patches; longitudinal stripe but very slightly indicated.

*H. euotis*.—Essentially as *H. d. vicarius*.

I have seen no skin of *H. dinops*.

### *Synopsis of the Species* \*.

Anteorbital width 8.5-10; ears moderate: width 23-27.5.	
Upper teeth 11.3-13.2; upper border of posterior leaf forming an arc of a circle: Indo-Austro-Malayan Subregions, exclusive of Batchian	<i>diadema</i> .
Upper teeth 14-14.7; upper border of posterior leaf trilobate: Ceylon	<i>lankadiva</i> .
Anteorbital width 10.3-11; ears large: width 29-32.5.	
Upper teeth 13.2-13.7; forearm 84.5-89.2; lower leg 36.8-37: Batchian	<i>euotis</i> .
Upper teeth 14.6; forearm 96; lower leg 44: Solomons.	<i>dinops</i> .

### *General Remarks.*

*Common characters*.—All the bats reviewed above have been called *H diadema*. They have the following characters in common:—

Nasal swellings always distinctly inflated, the upper surface of the facial portion of the skull never quite flattened, as in *H. armiger* and its allies.  $p^3$  (of course) and  $p_3$  completely wanting. The cingula of  $p_2$  and  $p_4$  strongly in contact, rather often a little overlapping each other, very rarely (in two out of 33 skulls) separated by an extremely narrow interspace; the tendency to overlapping, and the rarity of the exceptions to the general rule, may be taken as evidences that  $p_3$  has been lost for many generations of ancestors (compare the pronounced vacillation in this respect in those highly-developed species of *Rhinolophus* which have lost  $p_3$ ).  $p^2$  very small, and, with rare individual exceptions †, situated in the outer angle formed by the canine and  $p^4$ , *i. e.* on the way towards complete obliteration. The upper canine and  $p^4$ , as a general rule, very distinctly separated; quite often, however, the interspace is small or extremely small; very rarely the cingula are completely in contact ‡.  $p_2$  somewhat reduced in size.

\* On *H. Masoni* and *nicobarensis*, see the "General Remarks," below.

† In one skull, out of 33,  $p^2$  is almost quite in row; the exception is a *H. d. vicarius* from Sumatra.

‡ The details, from an examination of 33 skulls, are these:—In 16  $c$  and  $p^4$  are rather widely separated; in 14 slightly or very slightly; in one almost in contact (*pullatus*); in one in contact on the one side (*griseus*); in one in contact on either side (*dinops*). The variation is quite individual, the extremes, or approximately the extremes, rather often occurring in individuals of the same subspecies (*griseus*. f. i.).

Third metacarpal longer than fourth, and this latter always considerably longer than fifth\*. Second phalanx of third digit, with very slight variation, equal to the first phalanx †. Distal phalanges of fourth and fifth digits much shorter than the proximal phalanges ‡. Compare the wing-indices on p. 507.

Three supplementary leaflets on each side, external to the horseshoe; sometimes (*lankadiva*, *d. vicarius*) with a slight trace of a fourth, rarely with some reduction in the size of the third (*dinops*, *d. oceanitis*). Posterior leaf, with very rare individual exceptions, distinctly broader than the horseshoe. Its upper border forming an arc of a circle, rarely (*lankadiva*), by a stronger development of the median projection, distinctly trilobate. Three vertical ridges on the front face of the posterior leaf; the lateral ridges sometimes tending towards reduction (*d. vicarius*), sometimes completely wanting (*Masoni*, *nicobarensis*). No frontal pore.

They are all bats of considerable size, the forearm varying from 66 (*nicobarensis*) to 96.5 mm. (*dinops*). The sexes do not differ appreciably in size, nor is there any other secondary sexual differences.

*Interrelations.*—*H. diadema* is the least modified of the species: the facial portion of the skull is not excessively broadened, the teeth not very large, the ears moderate.

We have no means of deciding where this type of bat has originated, and how it has spread over the large area now occupied. But it is not unreasonable to suppose that the Philippine race, with its comparatively slender face, comes rather near to the ancestral species; and if it is true that these same islands are also inhabited by a markedly smaller form, we might with more confidence regard the Philippines as having, not improbably, been situated within the centre of dispersal. The equally slender face and rather small teeth in the extreme eastern form, *d. oceanitis* from the Solomon Islands, may, very likely, be due to slight degeneration of the type, if they are not indications that in this remote and isolated place some of the primitive characters of the type have been more faithfully preserved. But the only safe conclusion to be drawn from our examination of these bats

\* Compare the genus *Rhinolophus*: third metacarpal always the shortest; in the more primitive species the fourth, in the more highly-developed the fifth, the longest.

† In primitive *Rhinolophi* always lengthened, in more differentiated species much lengthened.

‡ In *Rhinolophus* longer than, or much longer than, the proximal phalanges.



is that the Solomon Island and New Guinea forms are most closely related to each other, likewise the Philippine and the Celebes-Borneo-Sumatra forms, whereas the Java-Timor form is a trifle more aberrant from what we may well suppose to be the "ancient style."

In *H. d. vicarius* we found a certain tendency to reduction of the lateral ridges on the front of the posterior leaf. In *H. Masoni*, from Lower Burma, they have quite disappeared (provided Dobson's description of this bat is correct). *H. nicobarensis*, in which the same is said to be the case, would seem to be a pigmy form of this modification.

*H. lankadiva* is most closely related to *H. diadema*; the facial width is as in an average form of that species, but the skull is much more heavily built, the teeth markedly larger, and the shape of the posterior leaf a little aberrant\*.

In Batchian (and neighbouring islands?) we find the *diadema* type modified into the large-eared and big-faced *H. eustomis*, but still the teeth have retained their usual size. This form seems to lead to the very large, big-faced, large-toothed, large-eared, and exceedingly long-legged *H. dinops*, from the Solomon Islands †.

Thus the Solomon Islands, though being the extreme eastern limit for the group dealt with in this paper, are inhabited by two modifications of the same type of bat. But it must be remembered that these two forms (*H. d. oceanitis* and *H. dinops*) have been derived from two different branches of the fundamental type, the former from the "*diadema*" branch, the latter, probably, from the "*euotis*" branch, and that they therefore, very likely, have spread to these far eastern islands at different times and by different ways.

\* *H. diadema* has been recorded from the Central Provinces of India (Dobson, Mon. Asiat. Chir. (1876) p. 200, nos. 293-296); I have seen no specimens from the Indian Peninsula.—Dobson also registers an adult female, in the collection of the Calcutta Museum, from Darjeeling (*l. c.* no. 292; see also J. Anderson, Cat. Mamm. Ind. Mus. Calcutta, 1881, p. 115). Is that a *H. diadema* (not a *H. armiger*)?

† The Solomon Islands are indeed peculiarly fertile in the production of giant species: *Mus imperator*, *Mus rex*, *Rana Guppyi*, to which is now added *Hipposiderus dinops*.



Table of Measurements.

	<i>H. diadema.</i>		<i>H. lankeadiva.</i>		<i>H. evotis.</i>		<i>H. dinops.</i>
	Min.	Max.	Min.	Max.	Min.	Max.	
Ears, length .....	28.8	30	27.2	30	26.8	27	mm.
" greatest breadth.....	27	27.5	25.5	27.5	24.2	24.2	33.5
Horseshoe, greatest breadth .....	9	10.3	9.7	10.2	9.3	10.2	32.5
Posterior leaf, breadth.....	10.8	11	11.1	12.2	10	12	12
Forearm .....	78.8	79.2	75.5	81	80.5	85.2	13.8
3rd metacarpal .....	54.5	58	57.5	62	58.5	62.2	96.5
4th metacarpal .....	53.8	56.5	56.5	61.7	56.8	60.2	68
5th metacarpal .....	51.2	52.5	52.8	56.5	52.2	55.2	67
Tail.....	52.5	56.5	43	54	42.5	52	63.2
Lower leg .....	34	35.8	31.5	37	31.2	35.3	64.5
Skull, total length .....	30	31.5	30.8	32.1	31.2	33	44
" mastoid width .....	14.1	14.5	14.3	15.1	14.5	14.7	37
" width of brain-case .....	12	12	12.2	12.8	12	12.5	16.8
" zygomatic width .....	17.3	18	17.2	18.3	17.2	18.2	14.3
" maxillary width .....	11.2	11.6	11.1	12.1	11.8	13	21.2
" anteorbital width .....	8.5	8.5	8.6	9.2	9.2	9.5	13.2
" across cingula of canines .....	7.9	8.1	8	8.5	8	8.7	11
Mandible .....	21.5	22.4	21.7	23.5	22.2	23.3	10.2
Upper teeth .....	11.3	12.1	11.8	13.2	12.1	13.2	27
Lower teeth .....	12.9	13.3	13.2	14.9	13.8	14.8	14.6
							16.6

Wing-indices.

<i>H. diadema, lankeadiva, evotis, dinops.</i>	Forearm.	3rd metac.	III. <sup>1</sup> .	III. <sup>2</sup> .	4th metac.	IV. <sup>1</sup> .	IV. <sup>2</sup> .	5th metac.	V. <sup>1</sup> .	V. <sup>2</sup> .
		1000	716	329	327	636	237	173	640	247

LVII.—*A Revision of the "Genus" Peneus, with Diagnoses of some new Species and Varieties.* By A. ALCOCK, M.B., L.L.D., F.R.S.

CONTENTS.

- I. Introduction.
- II. Definition of the Maniple *Peneus*.
- III. Diagnoses of the constituent Genera and Tables of the Species of the several Genera.
- IV. Diagnoses of Nine new Forms.

I. INTRODUCTION.

The "genus" *Peneus* (type *P. monodon*) was established in the year 1798 by Fabricius for three species from the "Indian Ocean," one of which (*P. planicornis*), since its antennular flagella are described as compressed, should, perhaps, be translated to the genus *Solenocera* of Lucas (Ann. Soc. Entom. France, 2 sér. vol. viii. 1850, p. 219).

Milne-Edwards (Hist. Nat. Crust. ii. 1837, pp. 411-418) deals critically with eleven species which he assigns to *Peneus*; but two of them have since been transferred to *Solenocera*, a genus with which we are not now concerned.

In 1881 in these 'Annals' (vol. viii. ser. 5, p. 169) Spence Bate published, along with a preliminary notice of the 'Challenger' Peneidæ, an account of the results of an examination of Milne-Edwards's types. In this paper the "genus" *Peneus* is left intact, except that certain forms with long antennular flagella are referred to as *Peneopsis*, a MS. name of A. Milne-Edwards. *Peneopsis* was not properly characterized, nor has its type (*P. serrata*) ever, as far as I can ascertain, been described; but if the two species—one of which bore A. Milne-Edwards's MS. label "*Peneopsis ocellaris*"—described under this name by Faxon (Mem. Mus. Comp. Zool. Harvard, xviii. 1895, p. 187) may be taken as typical of the genus, then *Peneopsis* differs from all *Penei* and agrees with all *Peneinæ* except *Peneus* in having two arthrobranchiæ on the penultimate pair of legs. So that *Peneopsis*, like *Solenocera*, may be left out of consideration in a review of the phratry or maniple *Peneus*.

In 1885 S. I. Smith (Proc. U.S. Nat. Mus. viii. p. 170) proposed to restrict the name *Peneus* to those species in which (1) the endopodite of the maxillules is elongate and segmented, (2) the third maxillipeds have an epipodite, and (3) the last thoracic somite carries a pleurobranch. To the

species *not* thus characterized he applied the name *Parapeneus*. In this paper the author objected to the action of Miers and Kingsley in lumping his genus *Xiphopeneus* (1869) with *Peneus*, and emphasized the distinctive characters of *Xiphopeneus*.

In 1891 Wood-Mason, in these 'Annals' (ser. 6, vol. viii. p. 271), pointed out that certain *Parapenei* differed from the type species (*Parapeneus membranaceus*, Risso, = *P. longirostris*, Lucas) in not possessing the characteristic sutures of the carapace and in having a filamentous vestige of an anterior arthrobranch on the penultimate thoracic appendage. To these forms he gave the name *Metapeneus*.

Wood-Mason also recognized that *Peneus styliferus*, Edw., though it possesses the carapacial sutures which are a marked feature of *Parapeneus membranaceus*, Risso, is unlike that species in having curved lamellar exopodites on all the thoracic legs. He therefore separated *P. styliferus* and gave it the MS. name *Parapeneopsis*, probably because *P. styliferus* happens to have the long antennular flagella which Spence Bate had chosen as the distinctive mark of *Peneopsis*. Unfortunately for the aptness of the name *Parapeneopsis*, several of the species which must be transferred to this section or genus have short antennular flagella.

In 1896 de Man ('Zoologischer Anzeiger,' p. 111) published a description of a new Peneid, which, from the peculiar size and length of the first pair of chelipeds of the male, he made the type of a distinct genus, *Heteropeneus*. The observations of Nobili (Boll. Mus. Torino, 1903, no. 455) seem to show that the difference between *Heteropeneus* and *Peneus* is, perhaps, rather less than the difference between the latter genus and *Parapeneus*, *Metapeneus*, &c.; so that *Heteropeneus* should be taken into the mantle *Peneus*.

In 1901, in 'A Catalogue of Indian Deep-sea Crustacea,' p. 15, I suggested that *P. curvirostris*, Stimpson (= *P. anchoralis*, Spence Bate), should be detached from the genus *Parapeneus*, where it had been placed by other authors, and should be made the type of a new subgenus or genus *Trachypeneus*.

In the present paper all the sections—genera or subgenera—into which the old Fabrician genus has gradually become split are tabulated and briefly defined, and an attempt is made to sift all the species that have been described under the name *Peneus* and to distribute them in their proper sections. It is but an attempt, because to allocate the species with confidence requires exact information regarding the grooves and sutures of the carapace, the presence or

absence of exopodites, the disposition of epipodites and branchiæ, the form of the endopodite of the maxillule, and the armature of the telson; and these particulars are often not to be found in descriptions.

Fortunately, however, I have not been entirely dependent on descriptions and figures, for when I was in England in 1897 I was allowed, through the kindness of Professor Jeffrey Bell, to examine at my leisure the collection of *Penei* in the British Museum, which includes the 'Challenger' material determined by Spence Bate, the various species described and identified by Miers, and Henderson's Madras specimens described in the 'Transactions of the Linnean Society' for 1893: all these I went through and tabulated, specimen by specimen, with an eye to a revision of the genus. Moreover, in the Indian Museum I have had at my disposal (1) a collection made about thirty years ago in the Andamans by that discriminating carcinologist James Wood-Mason; (2) miscellaneous donations and purchases from India, China, and Japan; and, chief of all, (3) the many hundreds of specimens trawled and dredged by the 'Investigator' off all the coasts and islands of British India, from the Indus Delta to Mergui, during twenty-four years. A very considerable part of the Indian Museum material had been sorted and named by Wood-Mason before his death in 1893, and I must add that I have incorporated Wood-Mason's rough memoranda and used his MS. names (except where they have been anticipated) in this paper.

I must also add that the contents of this paper refer exclusively to the maniple *Peneus*.

*Solenocera*, *Parasolenocera*, *Peneopsis*, *Philonicus*, *Haliporus*, and *Artemisia* are excluded, as they all have two arthrobranchiæ on the penultimate thoracic leg, and the first five have the cervical groove deeply impressed on the tergum of the carapace.

*Funchalia* is excluded for the present, as it has long, sickle-shaped, cross-cutting mandibles.

## II. DEFINITION OF THE MANIPLE *PENEUS*.

### *PENEUS*, Fabr.

*Peneus* Fabricius, Entomol. Syst. Suppl. 1793, p. 408; Latreille, Hist. Nat. Crust. vi. 1803, p. 246; Leach, Trans. Linn. Soc. xi. 1815, pp. 336, 347, and Malacost. Podophth. Brit., text of pl. xlii.; Desmarest, Consid. Gén. Crust. 1825, p. 224; Milne-Edwards, Hist. Nat. Crust. ii. 1837, p. 411; De Haan, Faun. Japon., Crust. 1849, p. 188; Dana, U.S. Expl. Exp., Crust. pt. i. 1852, p. 601; Bell, Brit. Stalk-

eyed Crust. 1853, p. 317; Heller, Crust. südl. Europ. 1863, p. 292; Miers, P. Z. S. 1878, p. 298; Boas, Stud. ov. Decapod., Vid. Selsk. Skr. 6 Række, nat. o. math. Afd. i. 2, 1880, p. 165; Spence Bate, Ann. & Mag. Nat. Hist. (5) viii. 1881, p. 173, and 'Challenger' Macrura, 1888, p. 229; Haswell, Cat. Austral. Crust. 1882, p. 198; S. I. Smith, Proc. U.S. Nat. Mus. viii. 1885, p. 170; Ortman, in Bronn's Thierreich, Malacostraca, pp. 1118-1120; Holmes, Occas. Papers Calif. Acad. Sci. vii. 1900, p. 217; Kishinonye, Journ. Fisheries Bureau, Tokyo, viii. no. 1 (1900); Alcock, Cat. Indian Deep-sea Crust. 1901, p. 13.

Rostrum well developed, laterally compressed. Carapace with postantennular (antennal) and hepatic spines, sometimes with a small postocular (orbital) tooth or spine, and sometimes with a spine (branchiostegal) at or near its antero-inferior angles. *The cervical groove is never impressed on the tergum of the carapace.* Abdomen long, with some of its posterior somites compressed and their terga carinated.

Eyes large. Basal joint of antennular peduncle hollowed dorsally to lodge the eye; its outer edge terminates in a spine, and from the proximal end of its inner edge there springs a twisted setose scale (antennular scale); the antennular flagella are cylindrical and tapering and may be short or long, but are never as long as the body. Antennal scale large and foliaceous, its outer edge is rigid and terminates acutely; antennal flagellum very long. The mandible has a jagged cutting-edge and a broad grinding crown; its palp (endopodite) is large and broadly foliaceous, consisting of two segments, of which the anterior is very much the larger. The endopodite of the maxillule (first maxilla) may be long and 2-, 3-, or 4-jointed, or may be without segmentation and truncated; that of the maxilla (second) is short.

The endopodite of the first maxillipeds is slender and 5-jointed, that of the second and of the third consists of 7 segments. The exopodite of the second and third maxillipeds is very well developed, being curved, compressed, stiffish, and made up, like the flagella of the antennæ, of numerous small joints. The third maxillipeds are long and pediform. The first three pairs of legs are chelate, the first pair usually being the shortest and the third pair usually the longest. The last two pairs of legs are monodactylous. Exopodites are usually present on all or all but the last pair of thoracic legs, but are sometimes altogether wanting.

No podobranchiæ exist on any of the true legs, and *only one arthrobranch*—the posterior one—is present on the penultimate legs.

The abdominal appendages are of moderate length, the

exopodite being longer than the endopodite. In the first pair there are no endopodites, but in the male their place is taken by a pair of more or less rigid, longitudinally pleated, or convoluted plates, known as the "petasma" or "andricum," which together form a tube or canal. In the second pair the endopodite carries at its base in the male a fleshy papilla.

According to Zittel, the first remains of *Peneus*, so far as is known at present, appear in the Lithographic Slates of Bavaria (Jurassic).

The forms included in the maniple *Peneus* are found in greatest abundance off the coasts of the Indo-Pacific, from the Red Sea and east coast of Africa (as far as 33° S.) eastwards to Japan and Australia. Eastwards of this centre a few species occur in the western meridians of the Pacific, up to the shores of California and Panama; and westwards of it three species are found in the Mediterranean, two of which extend into the N. Atlantic (one of them ranging as far north as St. George's Channel), and about ten occur off the Atlantic coasts of America, from New England, through the Gulf of Mexico and Caribbean, doubtfully as far south as the northern end of Patagonia.

Taking the distribution of the several genera of the phratry or maniple (or subgenera of the genus) in order:—

*Peneus* (s. r.) has the widest range, being found all round the globe, from the Gulf of Mexico, through the Atlantic coasts of N. Africa, the Mediterranean, the Red Sea, and the Indo-Pacific, to California and Panama.

*Heteropeneus* has been found only in the East Indian Archipelago (Singapore and Japan).

*Parapeneus* occurs in the West Indies and off the Atlantic coast of the U.S. America, in the Mediterranean and its western approaches, and in Oriental seas from India to Fiji.

*Metapeneus*: this large genus is almost entirely Indo-Pacific (Red Sea to Polynesia), two doubtful species being found in the West Indies.

*Parapeneopsis* is confined to the Indo-Pacific, ranging from India to China and Japan.

*Xiphopeneus* is confined to the Atlantic coasts of sub-tropical and tropical America.

*Trachypeneus* is found, on the one hand, in the West Indies and neighbouring coasts of America, and, on the other hand, in Oriental seas from India to Japan.

*Atypopeneus* is known with certainty only from the Bay of Bengal, but it probably occurs also in the China Sea.

*Key to the Genera of the Maniple Peneus.*

- I. Rostrum serrated both on its dorsal and on its ventral edge; a pleurobranch on the last thoracic somite (XIV.); exopodites on all or all but the last pair of the thoracic legs.
1. First pair of chelipeds short. . . . . *Peneus* (s. r.).
  2. The first pair of chelipeds of the male are, typically, stouter and vastly longer than the second and third pairs . . . . . *Heteropeneus*.
- II. Rostrum serrated on its dorsal edge only.
1. A pleurobranch on somite XIII. but not on somite XIV.
    - i. Exopodites on all or all but the last pair of the thoracic legs . . . . . *Metapeneus*.
    - ii. The thoracic legs have no exopodites . . . . . *Parapeneus* (s. r.).
  2. No pleurobranchiæ on somites XIII. and XIV.; all the thoracic legs with exopodites.
    - i. Epipodites wanting from at least the last three pairs of thoracic legs. . . . . *Parapeneopsis*.
    - ii. Epipodites absent from only the last two pairs of legs.
      - a. Last two pairs of legs of normal form.
        - A. Antennular flagella short. . . . . *Trachypeneus*.
        - B. Antennular flagella much longer than the carapace . . . . . *Atypopeneus*.
      - b. Last two pairs of legs extremely long and slender (flagelliform) . . . . . *Xiphopeneus*.

III. DIAGNOSES OF THE CONSTITUENT GENERA AND TABLES OF THE SPECIES OF THE SEVERAL GENERA.

1. *PENEUS*, Fabr. (sensu restricto).

*Peneus*, Fabr., Sidney I. Smith, Proc. U.S. Nat. Mus. viii. 1885, p. 170.

Type, *P. caramote*, Risso.

Rostrum toothed both dorsally and ventrally. Antero-inferior angles of carapace not spiniform. Postantennular sulcus of carapace defined by a dorsal as well as a ventral ridge.

Antennular flagella short or of moderate length. Endopodite of maxillules (first maxillæ) elongate and distinctly 3-jointed. Exopodites present on all or all but the last pair of the thoracic legs.



Epipodites present on all but the last two thoracic appendages; pleurobranchiæ present on the six posterior thoracic somites.

Andricum symmetrical, simple, pod-shaped; it consists of two lobes finely interlocking all along their anterior border, and capable of loose apposition in more or less of their posterior border, the opposed faces being concave.

The dactylus of the third maxillipeds often shows modifications of a secondary sexual nature in the adult male.

The branchial formula is as follows:—

Somite.	Podo-branchiæ.	Arthro-branchiæ.	Pleuro-branchiæ.	Total.
VII. ....	ep.	1 (small)	.. =	ep.+1
VIII. ....	ep.+1	2	.. =	ep.+3
IX. ....	ep.	2	1 =	ep.+3
X. ....	ep.	2	1 =	ep.+3
XI. ....	ep.	2	1 =	ep.+3
XII. ....	ep.	2	1 =	ep.+3
XIII. ....	..	1	1 =	2
XIV. ....	..	..	1 =	1
Total ....	6 ep.+1	12	6 =	6 ep.+19

In addition to the Indian forms hereafter specified, I have examined the following species:—*P. caramote*, *P. japonicus*, *P. australiensis*, *P. latisulcatus*, *P. brasiliensis*, *P. setifer*, *P. stylirostris*.

*List of the Species of PENEUS (sensu restricto).*

- Antennular flagella extremely short; usually a postocular (as well as a postantennular) spine and crest on the anterior part of the carapace.*
- Peneus caramote* (Risso), Milne-Edwards, Hist. Nat. Crust. ii. p. 413 et syn. (= *P. trisulcatus*, Leach, Tr. Linn. Soc. xi. 1815, p. 347.)—Mediterranean, W. Africa, England (St. George's Channel).
- Peneus canaliculatus* (Oliv.), Milne-Edwards, *op. cit.* p. 414. (= *P. marginatus*, Randall, Journ. Ac. Nat. Sci. Philad. 1839, p. 146, and ? *P. plebejus*, Hess, Arch. f. Naturges. xxxi. i. 1865, p. 168, pl. vii. fig. 19.)—Indo-Pacific from Red Sea and E. coast of Africa to Sandwich Is.; also W. coast of Africa.
- Peneus canaliculatus*, var. *australiensis*, Spence Bate, 'Challenger' Macrura, p. 248, pl. xxxii. fig. 3.
- Peneus canaliculatus*, var. *japonicus*, Spence Bate, *op. cit.* p. 245, pl. xxxi., pl. xxxii. fig. 4, pl. xxxvii. fig. 2.
- Peneus brevirostris*, Kingsley, Proc. Ac. Nat. Sci. Philad. (1878) 1879, p. 93. (According to Miers doubtfully distinct from *P. canaliculatus*.)—W. coast of Nicaragua.
- Peneus californiensis*, Holmes, Occasional Papers Calif. Acad. Sci. vii. 1900, p. 218. (A doubtful species, originally identified by Holmes with *P. canaliculatus*.)—California.



7. *Peneus latusulcatus*, Kishinouye, Journ. Fisheries Bureau, Tokyo, viii. i. 1900, p. 12, pl. ii. fig. 2. (Perhaps a form of *P. canaliculatus*).—Japan.
8. *Peneus brasiliensis*, Latreille, Milne-Edwards, *op. cit.* p. 414.—Both sides of Atlantic in warm latitudes.

II. *Antennular flagella not so long as their peduncle; no postocular spine and crest.*

9. *Peneus monodon*, Fabr., Milne-Edwards, *Hist. Nat. Crust.* ii. p. 416. (= *P. esculentus*, Haswell, P. L. S. N.S.W. iv. 1879, p. 38; also = *P. ashikaka*, Kishinouye, Journ. Fish. Bur. Tokyo, viii. i. 1900, p. 14, pl. iii.)—Indo-Pacific from E. Africa at least to Japan and Australia.
10. *Peneus carinatus*, Dana, U.S. Expl. Exp., *Crust.* pt. i. p. 602, pl. xl. fig. 2. (Probably = *P. monodon*, Fabr.)—Singapore.
11. *Peneus setiferus* (L.), Milne-Edwards, *op. cit.* p. 414. (= *P. fluviatilis*, Say, Journ. Acad. Nat. Sci. Philad. 1817, p. 233.)—Atlantic coasts of America in warm latitudes.  
(*P. orbignyianus*, Latr., is supposed by Milne-Edwards (*op. cit.* p. 415) to be identical with this species.)

III. *Antennular flagella longer than their peduncle; no postocular spine and crest.*

12. *Peneus indicus*, Milne-Edwards, *Hist. Nat. Crust.* ii. p. 415.—E. Africa to the Malay Archipelago and perhaps beyond.  
*Peneus indicus*, var. *merguensis*, de Man, Journ. Linn. Soc., Zool. xxii. 1888, p. 287, pl. xviii. fig. 8, pl. xix. fig. 1; and Zool. Jahrb., Abth. Syst. x. 1888, p. 680.—All coasts of India, also Java.  
*Peneus indicus*, var. *penicillatus*, Wood-Mason, MS.—Coasts of India.
13. *Peneus occidentalis*, Streets, Proc. Acad. Nat. Sci. Philad. 1871, p. 243. (Supposed by Miers to = *indicus*, Edw.)—Panama.
14. *Peneus stylirostris*, Stimpson, Ann. Lyc. Nat. Hist. N. York, x. 1874, p. 134. (Supposed by Miers to = *indicus*, Edw.)—Panama.
15. *Peneus balboæ*, Faxon, 1893, *vide* Mem. Mus. Comp. Zool. Harvard, xviii. 1895, p. 181, pl. xlvii. figs. 1-1 c.—Off Cocos Island (Panama), 770 fath.

IV. *No exopodite on the last pair of thoracic appendages.*

16. *Peneus semisulcatus*, De Haan, Faun. Japon., *Crust.* 1850, p. 191, pl. xlvi. fig. 1.—E. Africa to Australia and Japan.  
*Peneus tahitensis*, Heller, 'Novara' *Crust.* 1865, pl. xi. fig. 2. (Seems to be identical with *P. semisulcatus*, De H.)—Tahiti.  
*Peneus gracilirostris*, Thallwitz, Abh. u. Ber. Zool. Mus. Dresden (1890-91), 1892, no. 3, p. 3, fig. 5. (Probably identical with *P. semisulcatus*, De H.)—N. Celebes.
17. *Peneus cæruleus*, Stebbing, Marine Investig. S. Africa, *Crust.* pt. iii. 1905, p. 77, pls. xxi., xxi. bis.—E. coast of S. Africa, about 33° S.

2. HETEROPENEUS, de Man.

*Heteropeneus*, de Man, Zool. Anzeiger, 1896, p. 111, and Zool. Jahrb., Syst. Abth. x. 1898, p. 684, pl. xxxviii. fig. 75; Nobili, Boll. Mus. Torino, xviii. 1903, no. 455, p. 4.

Rostrum toothed both dorsally and ventrally. Antero-inferior angles of carapace not spiniform. Postantennular

sulcus defined ventrally only, by the buttress of the post-antennular (antennal) spine.

Antennular flagella short. The first pair of thoracic legs may, in the adult male, be enormously elongate, especially as to the propodite; but in the female, and, as Nobili has shown, in certain adult males, may be of the ordinary *Peneus* form. Exopodites are present on all the thoracic legs.

According to Nobili, epipodites are present on all but the last two thoracic appendages, and pleurobranchiæ on the six posterior thoracic somites.

Andricum symmetrical, simple, much as in *Peneus* (s. r.).

According to Nobili, the branchial formula is the same as that of *Peneus* (s. r.).

Only the following species is known:—

*Heteropeneus longimanus*, de Man, *loc. cit.*; see also Nobili, *loc. cit.*—Java Sea; Singapore.

### 3. METAPENEUS, Wood-Mason.

*Metapeneus*, Wood-Mason, *Ann. & Mag. Nat. Hist.* (6) viii. 1891, p. 271.

Type, *M. affinis*, Edw.

Rostrum toothed on its dorsal edge only. Antero-inferior angles of carapace either rounded or spiniform. Post-antennular sulcus defined only ventrally by the buttress of the postantennular (antennal) spine. No longitudinal or transverse sutures on the carapace.

Antennular flagella short or of moderate length. Endopodite of maxillules (first maxillæ) somewhat abbreviated, two-jointed. Exopodites present on all or all but the last pair of thoracic legs.

Epipodites absent from the third maxillipeds as well as from the last two thoracic appendages. No pleurobranch on the last thoracic somite.

Andricum complicated, symmetrical or asymmetrical: if symmetrical its distal angles are more or less spout-like; if asymmetrical one lobe is either larger or longer than the other, and both are split up into interleafed convoluted lobules.

The third maxillipeds never exhibit secondary sexual characters in the male, but the last pair of thoracic legs sometimes do.

The branchial formula is:—

Somite.	Podo- branchiæ.	Arthro- branchiæ.	Pleuro- branchiæ.	Total.
VII. ....	ep.	<i>r</i>	..	= ep. + <i>r</i>
VIII. ....	ep. + 1	2	..	= ep. + 3
IX. ....	..	2	1	= 3
X. ....	ep.	2	1	= ep. + 3
XI. ....	ep.	2	1	= ep. + 3
XII. ....	ep.	2	1	= ep. + 3
XIII. ....	..	1	1	= 2
XIV. ....	..	..	..	= 0
Total ....	5 ep. + 1	11 + <i>r</i>	5	= 5 ep. + 17 + <i>r</i>

In addition, a small filamentous vestige of an anterior arthrobranch is present on the penultimate thoracic somite in all the species I have examined, which include, besides the Canadian species, *M. Joyneri*, *M. tenellus*, *M. Macleayi*, *M. philippinensis*, *M. Richtersi*, and *M. Batei*.

*List of the Species of METAPENEUS, Wood-Mason.*

1. *No marginal subterminal articulating spines on the telson. Last pair of thoracic legs without exopodite; their merus, in the adult male, with a notch and spine or tooth at its proximal end.*
1. *Metapeneus monoceros*, Fabricius, Milne-Edwards, Hist. Nat. Crust. ii. p. 415.—E. Africa to Japan and Australia.  
(*Metapeneus incisipes*, Spence Bate, 'Challenger' Macrura, p. 257, pl. xxiv. fig. 2, seems to be identical with *M. monoceros*.)
2. *Metapeneus affinis*, Milne-Edwards, *op. cit.* p. 416.—Karachi to Japan.  
(*Metapeneus plunicornis*, Fabricius, according to Milne-Edwards, closely resembles *M. affinis*, but may possibly, since it has the antennular flagella compressed, not be a *Peneus* at all.)  
(*Metapeneus mutatus*, Lanchester, P. Z. S. 1901, ii. p. 572, pl. xxxiv. fig. 6, seems to be identical with *M. affinis*.)
3. *Metapeneus Joyneri*, Miers, Ann. & Mag. Nat. Hist. (5) v. 1880, p. 458, pl. xv. figs. 8-10.—Japan.
4. *Metapeneus Dobsoni*, Miers, P. Z. S. 1878, p. 302, pl. xvii. fig. 2.—India and Ceylon.
5. *Metapeneus brevicornis*, Milne-Edwards, *op. cit.* p. 417. (= *M. avirostris*, Dana, U.S. Expl. Exp., Crust. pt. i. p. 603, pl. xl. fig. 3.)—Mauritius to Borneo.  
(*Metapeneus* sp., Lanchester, P. Z. S. 1901, ii. p. 571, pl. xxxiv. fig. 7, does not seem to differ essentially from *M. brevicornis*, Edw.)
6. *Metapeneus lysianassa*, de Man, Journ. Linn. Soc., Zool. xxii. 1888, p. 290, pl. xix. fig. 1.—Orissa to Singapore.

*The following species appear to belong to this group, having no movable spines on the margin of the telson, though the condition of the last pair of thoracic legs as regards exopodite &c. is not on record:—*

7. *Metapeneus tenellus*, Spence Bate, 'Challenger' Macrura, p. 270.—Japan.
8. *Metapeneus crucifer*, Ortmann, Zool. Jahrb., Syst. Abth. v. 1890, p. 451, pl. xxxvi. figs. 5 a, b.—Japan.

9. *Metapeneus Mastersii*, Haswell, P. L. S. N.S.W. 1879, p. 42, and Cat. Austral. Crust. p. 203. (Considered by de Man to be doubtfully synonymous with *M. monoceros*, Fabr.)—Australia.

I. a. *Telson without marginal spines; merus of last pair of thoracic legs of male without notch at base.*

*Metapeneus Deschampsii*, Nobili, Boll. Mus. Zool. Torino, xviii. 1903, no. 452, p. 2, fig. 1.—Pondichery and Mahé. This may possibly be the non-adult form of *M. monoceros*, Fabr.

- ? *Metapeneus villosus*, Guérin, in Voy. 'Coquille,' vol. ii. Zool., Crust. p. 36, and Icon. Règne Animal, pl. xx. fig. 1.—Australia. May perhaps belong here.

II. *Apex of telson with 3 or 4 pairs of lateral marginal spines.*

10. *Metapeneus ensis*, De Haan, Faun. Japon., Crust. p. 192, pl. xlv fig. 2.—Japan.  
(*Metapeneus intermedius*, Kishinouye, Journ. Fish. Bureau, Tokyo, viii. 1900, p. 21, is possibly the same as *M. ensis* (*M. monoceros ensis*) of De Haan.)  
This species, if my identification be correct, has no exopodite to the last pair of thoracic legs.
11. *Metapeneus Macleayi*, Haswell, P. L. S. N. S. Wales, iv. 1879, p. 40, and Cat. Austral. Crust. p. 201. (No exopodite to last pair of thoracic legs; related to *M. ensis*.)—Australia.
12. *Metapeneus Stebbingi*, Nobili, Bull. Mus. d'Hist. Nat. Paris, 1904, p. 229. (Male with a notch and spine on merus of last pair of legs; probably related to *M. ensis*.)—Red Sea, Suez.
13. *Metapeneus cognatus*, Nobili, l. c. (Belongs to *M. ensis* group.)—Djibouti.
14. *Metapeneus philippinensis*, Spence Bate, 'Challenger' Macrura, p. 261, pl. xxxv. figs. 2, 3. (All the thoracic legs with exopodites.)—East Indian Archipelago, 82–150 fathoms.
15. *Metapeneus coniger*, Wood-Mason, Ann. & Mag. Nat. Hist. (6) viii. 1891, p. 272. (All the thoracic legs with exopodites.)—Off coasts of India, 68–250 fathoms.
16. *Metapeneus andamanensis*, Wood-Mason, t. c. p. 271. Variety of *M. coniger*.—Andaman Sea, 100–244 fathoms; and off C. Comorin, 143 fathoms.
17. *Metapeneus gracilis*, Dana, U.S. Expl. Exp., Crust. pt. i. p. 606, pl. xl. figs. 7 a, b. (Probably belongs to *M. philippinensis* group.)—Sulu Sea; Australia.
18. *Metapeneus Richtersii*, Miers, Zool. II.M.S. 'Alert,' p. 564, pl. lii. fig. A. (Has exopodites on all the thoracic legs, and probably belongs to the *M. philippinensis* group.)—Madagascar Seas.
19. *Metapeneus commensalis*, Borradaile, P. Z. S. 1898, p. 1001. (Probably belongs to the *M. philippinensis* group.)—Rotuma, S. Pacific.
20. *Metapeneus stridulans*, Wood-Mason, MS. (All the thoracic legs have exopodites and the antennular flagella are extremely short.) This species may be the same as *M. akayebi*, Rathbun, which, as Miss Rathbun points out, is one of the several species confused by Spence Bate with *M. velutinus*, Dana.—Indian Seas, 20–35 fathoms.
21. *Metapeneus akayebi*, Rathbun, Proc. U.S. Nat. Mus. xxvi. 1902, p. 39. (All the thoracic legs with exopodites; antennular flagella very short.)—Japan.

Some of the 'Challenger' specimens identified by Spence Bate with *velutinus* probably belong here, according to Miss Rathbun.

22. *Metapeneus mogiensis*, Rathbun, *l. c.* (As *stridulans* and *akayebi* as regards exopodites.)—Japan. Two of Spence Bate's specimens of "*M. velutinus*" presented to the Indian Museum are this species.
23. *Metapeneus Dalei*, Rathbun, *t. c.* p. 40. (*M. akayebi* group.)—Japan.
24. *Metapeneus acclivis*, Rathbun, *t. c.* p. 41. (*M. akayebi* group.)—Japan.
25. *Metapeneus consobrinus*, Nobili, Bull. Mus. d'Hist. Nat. Paris, 1904, p. 229. (*M. akayebi* group.)—Djibouti.
26. *Metapeneus Vaillanti*, Nobili, *l. c.* (*M. akayebi* group.)—Red Sea; Suez.
27. *Metapeneus perlurum*, Vaillant, Bull. Mus. d'Hist. Nat. Paris, 1905, p. 158. (*M. akayebi* group.)—Persian Gulf.
28. *Metapeneus lamellatus*, De Haan, Faun. Japon., Crust. p. 193, pl. xlvi. figs. 4, 5. (Probably *M. akayebi* group.)—Japan.
29. *Metapeneus Batei*, Miers, Zool. II.M.S. 'Alert,' p. 296, pl. xxii. fig. D. (Probably *M. akayebi* group.)—Australia.

The following species may possibly come into the *M. akayebi* alliance:—

30. ? *Metapeneus velutinus*, Dana, U.S. Expl. Exp., Crust. pt. i. p. 604, pl. xl. fig. 4.—Sandwich Islands.
31. ? *Metapeneus palmensis*, Haswell, P. L. S. N. S. Wales, 1879, p. 43, and Cat. Austral. Crust. p. 204.—Australian Seas.
32. ? *Metapeneus pubescens*, Stimpson, Ann. Lyc. Nat. Hist. New York, x. 1874, p. 133.—St. Thomas, W. Indies.
33. ? *Metapeneus Goodei*, S. I. Smith, Proc. U.S. Nat. Mus. viii. 1885, p. 176.—Bermuda; Bay of Panama.

#### 4. PARAPENEUS, S. I. Smith (sensu restricto).

*Parapeneus*, S. I. Smith, Proc. U.S. Nat. Mus. viii. 1885, p. 170.

Type, *P. membranaceus*, Risso (= *P. longirostris*, Lucas).

Rostrum toothed dorsally only. Antero-inferior angles of carapace usually with, sometimes without, a branchiostegal spine. Postantennular sulcus defined only ventrally, by the postantennular (antennal) spine.

A longitudinal suture is generally present on either side, extending from the orbital to the posterior border of the carapace, and also a vertical suture extending across the branchiostegite at the level of the second pair of chelipeds.

Antennular flagella of moderate length. Endopodite of maxillules (first maxillæ) abbreviated, unsegmented, the small terminal segment which is present in *Metapeneus* not being differentiated. No exopodites on any of the thoracic legs.

Epipodites absent from the third maxillipeds, as well as from the last two thoracic appendages. No pleurobranch on the last thoracic somite.

Andricum symmetrical.

The third maxillipeds and last pair of thoracic legs are not known to show any modifications in the male.

The branchial formula is the same as that of *Metapeneus*, but the rudimentary arthrobranch of somite VII. (second maxillipeds) seems to be absent, and there is no vestigial filament, representing an anterior arthrobranch, on the penultimate thoracic somite.

In addition to the Indian species I have examined specimens of *P. membranaceus* and *P. serratus*.

*List of the Species of PARAPENEUS, S. I. Smith (sensu restricto).*

- I. *Telson with a single pair of lateral marginal spines, which are fixed; carapace with a fine longitudinal fissure, extending on either side from the orbital to the posterior border; tip of adult andrium cut up into spines or hooks and lobules or filaments.*
  1. *Parapeneus membranaceus* (Risso), Heller, Crust. siidl. Europa, p. 296, pl. x. fig. 11. (= *P. longirostris*, Lucas, Hist. Nat. Anim. Artic. in Expl. Sci. Algérie, Zool. i. pt. 1, p. 46, pl. iv. fig. 6, = *P. Bocagei*, Johnson, P. Z. S. 1863, p. 255, and 1867, p. 900.)—Mediterranean and its western approaches.
  2. *Parapeneus politus*, S. I. Smith, Proc. U.S. Nat. Mus. iii. 1881, p. 144. —N. Atlantic coast of U.S. America.
  3. *Parapeneus megalops*, S. I. Smith, Proc. U.S. Nat. Mus. viii. 1885, p. 172.—W. Indies and neighbourhood, 155–288 fathoms.
  4. *Parapeneus fissurus* (Spence Bate), 'Challenger' Macrura, p. 263, pl. xxxvi. fig. 1.—Bay of Bengal to S. Pacific, up to 115 fathoms.
  5. *Parapeneus investigatoris*, Alcock & Anderson, Ann. & Mag. Nat. Hist. (7) iii. 1899, p. 279.—Gulf of Manár, Bay of Bengal, Andaman Sea, up to 419 fathoms.
  6. *Parapeneus americanus*, Rathbun, Bull. U.S. Fish. Comm. for 1900 (1901) p. 102. ("May prove to be a subspecies of *P. investigatoris*.")—Porto Rico, 220–225 fathoms.
  7. *Parapeneus longipes*, Alcock, *infra*.—Coasts of India and Ceylon,  $7\frac{1}{2}$ –68 fathoms. Distinguished by the absence of a branchiostegal spine.
- II. *Telson with 2 or 3 pairs of articulating marginal spinelets, in addition to the fixed pair; carapace without longitudinal sutures; adult petasma simple, open-pod-shaped.*
  8. *Parapeneus rectacutus* (Spence Bate), 'Challenger' Macrura, p. 266, pl. xxxvi. fig. 2.—Fiji, Philippines, Andamans, Bay of Bengal, 95–418 fathoms.
  9. *Parapeneus serratus* (Spence Bate), *op. cit.* p. 268, pl. xxxvii. fig. 1.—Fiji, 315 fathoms; Torres Strait, 1400 fathoms.

5. PARAPENEOPSIS, Wood-Mason, MS.

*Parapeneopsis*, Alcock, Cat. Indian Deep-sea Crust. 1901, p. 14.

Type, *P. stylifera*, Edw.

Rostrum toothed dorsally only. Antero-inferior angles of carapace sharp or dentiform. Postantennular sulcus defined

only ventrally, by the buttress of the postantennular (antennal) spine.

Carapace with longitudinal and transverse sutures as in most *Parapenei*, but the longitudinal suture never reaches the posterior border.

Antennular flagella either long or short. Endopodite of maxillules (first maxillæ) short, unsegmented. Petaloid exopodites are present on all the thoracic legs.

Epipodites absent from the third maxillipeds as well as from the last three thoracic appendages, sometimes absent from *all* the legs. No pleurobranchiæ on the last two thoracic somites.

Andrium symmetrical. The third maxillipeds and fifth pair of legs are not known to be modified in the male.

The branchial formula is:—

Somite.	Podo-branchiæ.	Arthro-branchiæ.	Pleuro-branchiæ.	Total.
VII. ....	ep.	.. (or <i>r</i> )	.. =	ep.
VIII. ....	ep. +1	2	.. =	ep. +3
IX. ....	..	2	1 =	3
X. ....	ep. or 0	2	1 =	(ep.) +3
XI. ....	ep. or 0	2	1 =	(ep.) +3
XII. ....	..	2	1 =	3
XIII. ....	..	1	.. =	1
XIV. ....	..	..	.. =	0
Total. .	4 (or 2) ep. +1	11 (+ <i>r</i> ?)	4 =	$\frac{4}{2}$ ep. + 16 (+ <i>r</i> ?)

The vestigial arthrobranch of somite VII. is often absent.

#### List of the Species of PARAPENEOPSIS, Wood-Mason.

- I. *Epipodites* present on the second maxillipeds and first two pairs of legs.  
*Telson with lateral marginal spinelets.*
1. *Parapeneopsis stylifera* (Edw.), Milne-Edwards, Hist. Nat. Crust. ii. p. 418.—Coasts of India.  
*Parapeneopsis stylifera*, var. *coromandelica*, nov.—East coast of India.
- II. *Epipodites* present on the second maxillipeds and first two pairs of legs.  
*Telson with small lateral marginal spinelets only as an occasional anomaly.*
2. *Parapeneopsis sculptilis* (Heller), 'Novara' Crust. p. 122, pl. xi. fig. 1.  
—Seas of India and East Indian Archipelago.  
*Parapeneopsis sculptilis*, var. *Mardwickii*, Miers, P. Z. S. 1878, p. 300, pl. xvii. fig. 1.—Coasts of India.  
*Parapeneopsis sculptilis*, var. *cultrirostris*, nov.—Coromandel coast.
3. *Parapeneopsis cornuta* (Kishinouye), Journ. Fish. Bur., Tokyo, viii. 1900, no. 1, p. 23.—Japan; India?

- (*Parapeneopsis macillipedo*, Alcock.—Bombay, Madras, Arakan coast. This species may prove to be identical with *P. cornuta*, Kish.)
4. *Parapeneopsis uncta*, Alcock, sp. n.—Ganjam coast.
5. *Parapeneopsis nana*, Alcock, sp. n.—Coromandel coast.
6. *Parapeneopsis gracillima*, Nobili, Boll. Mus. Torino, xviii. no. 447, 1903, p. 4, fig. 1.—Borneo.

III. *Epipodite present on the second maxillipeds only.*

7. *Parapeneopsis acclivirostris*, Alcock, sp. n.—Persian Gulf, Coromandel coast.
8. *Parapeneopsis Hungerfordii*, Alcock, sp. n.—Hongkong.

6. TRACHYPENEUS, Alcock.

*Trachypeneus*, Alcock, Cat. Indian Deep-sea Crust. 1901, p. 15.

Type, *T. curvirostris*, Stimpson (= *T. anchoralis*, Spence Bate).

Rostrum toothed dorsally only. Antero-inferior angles of carapace fairly well pronounced. Postantennular sulcus defined only ventrally.

Carapace with longitudinal and transverse sutures, but the former is very short, existing only in the orbital region.

Antennular flagella short. Endopodite of maxillules short, unsegmented. Petaloid exopodites are present on all the thoracic legs.

Epipodites absent from third maxillipeds, as well as from the last two thoracic appendages. No pleurobranchiæ on the last two thoracic somites.

Andricum symmetrical. The third maxillipeds and last thoracic legs are not known to be modified in the male.

The branchial formula is:—

Somite.	Podo-branchiæ.	Arthro-branchiæ.	Pleuro-branchiæ.	Total.
VII. ....	ep.	..	..	= ep.
VIII. ....	ep.+1	2	..	= ep.+3
IX. ....	..	2	1	= 3
X. ....	ep.	2	1	= ep.+3
XI. ....	ep.	2	1	= ep.+3
XII. ....	ep.	2	1	= ep.+3
XIII. ....	..	1	..	= 1
XIV. ....	..	..	..	= 0
Total ....	5 ep.+1	11	4	= 5 ep.+16

In addition to the Indian species I have examined specimens of *T. curvirostris* (= *T. anchoralis*) and *T. constrictus*.



List of the Species of *TRACHYPENEUS*, Alcock.

1. *Trachypeneus barbatus* (De Haan), Faun. Japon., Crust. p. 192, pl. xlvi. fig. 3.—Japan.  
(*Trachypeneus curvirostris* (Stimpson), Proc. Acad. Nat. Sci. Philad. 1860, p. 44.—Japan. Probably identical with *T. barbatus* = *P. affinis barbatus*, De Haan.)  
(*Trachypeneus granulosus* (Haswell), P. L. S. N. S. Wales, 1879, p. 41, and Cat. Austral. Crust. p. 202.—N.E. Australia. Probably, as other authors also have thought, identical with *T. curvirostris* = *T. barbatus*.)  
(*Trachypeneus anchoralis* (Spence Bate), 'Challenger' Macrura, p. 258, pl. xxxv. fig. 1.—Arafura Sea; Japan. Probably, as other authors have thought, a synonym of *T. granulosus* = *T. curvirostris* &c.)
2. *Trachypeneus asper*, Alcock, sp. n.—Persian Gulf; Coromandel coast; Andamans.
3. *Trachypeneus constrictus* (Stimpson), Ann. Lyc. Nat. Hist. N. York, x. 1874, p. 135.—Atlantic coast of U.S. America; West Indies.  
*Trachypeneus constrictus*, var. *similis* (S. I. Smith), Proc. U.S. Nat. Mus. viii. 1885, p. 175.—Atlantic coast of U.S. America; West Indies.

7. *XIPHOPENEUS*, S. I. Smith.

*Xiphopeneus*, S. I. Smith, Amer. Journ. Sci. xlviii. 1869, p. 390; see also Proc. U.S. Nat. Mus. viii. 1885, p. 1888.

Type, *X. Kroyeri*, Heller.

Rostrum toothed dorsally only. Antero-inferior angles of carapace subdentiform. Postantennular sulcus defined only ventrally.

Carapace with longitudinal and transverse sutures, but the former is not prolonged to the posterior border.

One of the antennular flagella is very long. Endopodite of maxillule short, unsegmented. All the thoracic legs have exopodites.

Epipodites are absent from the third maxillipeds and last two pairs of thoracic legs. No pleurobranchiæ on the last two thoracic somites.

*The last two pairs of thoracic legs are of great length, their three terminal joints forming a long slender flagellum.*

The branchial formula is:—

Somite.	Podo-branchiæ.	Arthro-branchiæ.	Pleuro-branchiæ.	Total.
VII. ....	ep.	<i>r</i>	..	= ep. + <i>r</i>
VIII. ....	ep. + 1	2	..	= ep. + 3
IX. ....	..	2	1	= 3
X. ....	ep.	2	1	= ep. + 3
XI. ....	ep.	2	1	= ep. + 3
XII. ....	ep.	2	1	= ep. + 3
XIII. ....	..	1	..	= 1
XIV. ....	..	..	..	= 0
Total ....	5 ep. + 1	11 + <i>r</i>	4	= 5 ep. + 16 + <i>r</i>

I have examined the specimens in the British Museum.  
This genus contains the single species :—

*Xiphopeneus Kroyeri* (Heller), SB. k. Akad. Wiss. Wien, 1862, xlv. B, Abth. i. p. 425, pl. ii. fig. 51. (= *X. Harttii*, Smith, Amer. Journ. Sci. xlviii. 1869, p. 390, and Trans. Connect. Acad. ii. 1871, p. 23, pl. i. fig. 1.)—Brazil; W. Indies.

#### 8. ATYPOPENEUS, gen. nov.

Rostrum toothed dorsally only. Antero-inferior angles of carapace rectangular. Postantennular sulcus not defined at all. No longitudinal or transverse carapacial sutures.

*Antennular flagella much longer than the carapace.* Endopodite of maxillules slender. Filamentous exopodites on all the thoracic legs.

Epipodites absent from third maxillipeds and last two pairs of thoracic legs. No pleurobranchiæ on the last two thoracic somites.

The andricum is symmetrical.

Type, *Peneus compressipes*, Henderson, Trans. Linn. Soc., Zool. (2) v. 1893, p. 450, pl. xl. figs. 21, 22.

As Henderson surmised, this is a unique form and is worthy of a separate position.

This genus or section includes, at present, only Henderson's *Peneus compressipes*; but two of Stimpson's species from Hongkong, viz. *P. podophthalmus* and *P. stenodactylus*, may possibly be assigned to it.

#### 9. SEDIS INCERTÆ.

1. *Peneus villosus*, Guérin, in Voy. 'Coquille,' vol. ii. Zool., Crust. p. 36; and Icon. Règne Anim. pl. xx. fig. 1.—Australia. Probably a *Metapeneus*, as the figure shows ventral edge of rostrum smooth, foliaceous exopodites, and no carapacial sutures.
2. *Peneus foliaceus*, Risso, Hist. Nat. Eur. mérid. v. 1826, p. 69, pl. ii. fig. 6.—Mediterranean. Probably a *Parapeneus*, as the figure shows no exopodites to the thoracic legs.
3. *Peneus tenuis*, Dana, U.S. Expl. Exp., Crust. pt. i. p. 605, pl. xl. fig. 6.—Atlantic coast of Patagonia. Position quite uncertain, except that it does not belong to *Peneus* (s. r.).
4. *Peneus stenodactylus*, Stimpson, Proc. Acad. Nat. Sci. Philad. 1860, p. 43.—Hongkong. Appears to be very closely related to *P. compressipes*, Henderson, the type of the section *Atypopeneus*.
5. *Peneus podophthalmus*, Stimpson, loc. cit.—Hongkong. Also seems to resemble *P. compressipes* even more than does *P. stenodactylus*.
6. *Peneus novæ-guineæ*, Haswell, P. L. S. N. S. Wales, 1879, p. 43; and Cat. Austral. Crust. p. 203.—New Guinea. Differs from other *Penei* in not having a hepatic spine.

## IV. DIAGNOSES OF NINE NEW FORMS.

1. *Peneus indicus*, var. *penicillatus*, nov.

*Peneus penicillatus*, Wood-Mason, MS. (name only).

This variety is distinguished by the form of the external maxillipeds of the male. In these appendages the carpus and propodite are much shorter and coarser than they are in *indicus* and *merguiensis*, but, on the other hand, the *dactylus* is a long tapering joint from  $1\frac{1}{2}$  to  $2\frac{3}{4}$  times the length of the propodite, and the pencil of hairs occupying the groove on the inner side of the dactylus is of almost corresponding length.

The rostral crest is not so high as that of *indicus*, var. *merguiensis*, but is higher than that of typical *indicus*, and this intermediate form of rostrum also characterizes females taken in company with males of *penicillatus*, a fact which prevents us, for the present, from regarding *penicillatus* as merely an allomorphic male of *P. indicus*.

This form grows to a length of 6 inches. Numerous specimens have been taken off the Orissa coast and at Bombay, and a few from Karáchi, the Gangetic Delta, and Mergui (Marine Survey collection).

2. *Parapeneus longipes*, sp. n.

Resembles *P. fissurus*, Sp. Bate, from which it is distinguished by the following characters:—

The rostrum in the female barely reaches the end of the first joint of the antennular peduncle. There is no trace of a branchiostegal spine at the antero-inferior angle of the carapace.

The inner (longer) antennular flagellum is about as long as its peduncle in the female, and a little longer in the male.

The external maxillipeds reach the tip of the antennal scale and the last pair of thoracic legs reach a dactylus-length beyond them.

The andrium is formed on the same plan, but in the single male obtained it ends in a pair of (median) ragged petaloid lobes and a pair of (lateral) stiff, curved, horn-like filaments.

The thelycum consists of a broad longitudinally grooved plate occupying all the space between the fifth pair of legs, articulating with a horseshoe-shaped or concave and semi-circular plate lying between the fourth pair of legs.

The female attains a length of  $3\frac{1}{4}$  inches.

Thirty-one females and a male have been collected in the following localities:—Off the Malabar coast (Mangalore) in 21–26 fathoms; off the Orissa and Ganjam coasts in 20–68 fathoms; off the Vizagapatam coast in  $7\frac{1}{2}$ –23 fathoms; and off the south coast of Ceylon in 20 fathoms.

In the single male the rostrum is broken.

This species is distinguished from all those Indian *Parapenei* which have longitudinal and transverse carapacial sutures by the absence of a branchiostegal spine from the antero-inferior angles of the carapace.

### 3. *Metapeneus stridulans* (Wood-Mason, MS.).

*Crotalocaris stridulans*, Wood-Mason, MS. (name only).

Of this species we possess about 130 specimens dredged by the 'Investigator,' and one, identified by Spence Bate as *Peneus velutinus*, Dana, from the 'Challenger' collection.

The species may probably prove to be identical with the *Parapeneus akayebi* of Miss Rathbun.

It is characterized by the presence in both sexes of a pair of stridulating-organs, situated one on each side of the carapace, near the middle of the posterior end of the branchiostegite, in such a way that the anterior edge of the first abdominal tergum can play over them. Each organ consists of a longitudinal row of vertically disposed ridges, which vary in number, being usually five, seldom less than five, and occasionally as many as twelve.

The species is a typical *Metapeneus*, and belongs to the same group as *M. philippinensis* and *coniger*.

Integument remarkably thick, hard, and tomentose.

Rostrum nearly straight, upturned, sometimes reaching to the end of the antennular peduncle, but often shorter, armed dorsally with 5–8 teeth, the last of which is small and isolated (epigastric). No postrostral crest. An indistinct postocular denticle. Postantennular (antennal) spine very strong, produced backwards as a strong convexity defining a broad postantennular sulcus. Hepatic spine small; cervical groove present only in its neighbourhood. Branchial region not defined except by a short crescentic crease below the hepatic spine. Antero-lateral (antero-inferior) angles of carapace spiniform. A pair of stridulating-organs as already defined.

The second abdominal tergum is medially carinated in less than its posterior half, the third in almost all its extent, the carina in both cases being sulcate; the fourth to sixth are all sharply carinated, the carina of the fourth and fifth

being deeply cleft at its after end. The sixth abdominal somite is nearly twice as long as the fifth, but shorter than the telson. The telson is about as long as the inner caudal swimmeret; it ends very acutely and has near the apex four pairs of large marginal spines, the last pair being fixed.

Eyes large. Antennular flagella equal, about one third the length of their peduncle.

The third maxillipeds nearly reach the tip of the antennal scale; the dactylus is slender and is not much shorter than the propodite, with which it articulates end on; the basis bears an antrorse spine. A similar spine is present on the basis of the first two chelipeds and on the ischium of the first.

In the female only there is a pair of sternal spines between the second pair of chelipeds.

All the thoracic legs have longish exopodites.

The andricum, which is built in the same way as that of *M. coniger*, is asymmetrical, the left lobe being the longer; the outer lobule of the left lobe ends in a crown of stiffish filaments.

The thelycum consists of the following parts:—(1) between the fifth pair of legs a transverse lamina more or less distinctly divided into three lobes, the outer of which (abutting on the fifth legs) are bluntly dentiform; (2) between the fourth pair of legs a broad transverse plate, the anterior part of which shows as a large, smooth, somewhat oval facet; (3) in the interval between the fourth and fifth legs a narrow transverse bar, sinuous and shaped like a very open **W**.

Large females may attain a length of  $3\frac{3}{4}$  inches.

The species has been taken in abundance all along the east coast of the Peninsula where any rocky patches occur, from Orissa to Palk Strait, in 20–35 fathoms; in the Gulf of Martaban, in 20 fathoms; and at various places in the Andamans, in 20 fathoms.

#### 4. *Parapeneopsis maxillipedo*, sp. n. ?

? an *Peneus cornutus*, Kishinouye, Journ. Fish. Bureau, Tokyo, viii. 1903, i. p. 23.

Compared with *Parapeneopsis stylifera* (Edw.) it presents the following differences:—

The dorsal half of the carapace is tomentose. The rostrum is recurved at tip, but otherwise is nearly horizontal; it does not reach the end of the antennular peduncle in either sex, and it is armed dorsally with 8–10 teeth (not including the isolated epigastric tooth), which form a very decided crest.

The postrostral carina, which is continued right up to the posterior border of the carapace, is sharp and particularly prominent.

The antero-inferior angles of the carapace are merely dentiform; the sinuous subhepatic ridge (defining the anterior part of the cervical groove) stops far short of the antero-inferior angle of the carapace.

The longitudinal fissure of the carapace extends only a short way behind the level of the hepatic spine.

The telson is short and has no marginal spinelets.

The antennular flagella, which are equal, are about two thirds the length of their peduncle.

All the joints of the third maxillipeds except the dactylus are abnormally broad, coarse, and tomentose.

The fifth pair of thoracic legs reach only to the middle of the antennal scale. The basal spines of the chelipeds are big, and in the female there is one on the third chelipeds as well as on the first and second.

The andricum has on its outer edges the same basal wing-like lobule as that of *Parapeneopsis sculptilis*, Heller, but the organ ends in a pair of long calipers.

The thelycum is concave and three-lobed; the middle lobe is very large and leaf-like; the lateral lobes, lying between the fifth pair of legs, are small and have between them in the middle line a globous tubercle, behind which is a thick tuft of long setæ.

This species, which attains a length of  $4\frac{1}{2}$  inches, has been taken at Bombay, at Madras, and off the Arakan coast. It may turn out to be Kisbinouye's *Parapeneopsis cornuta*, a Japanese species which Nobili has also recorded from Bombay.

##### 5. *Parapeneopsis uncta*, sp. n.

Compared with *Parapeneopsis stylifera* (Edw.) this species exhibits the following points of difference:—

The integument is even thicker and denser, and, though sparsely punctate, has a polished greasy appearance.

The rostrum has but a faint double curve, and, owing to the absence of any styliform prolongation, reaches only to the middle of the second joint of the antennular peduncle in both sexes.

The antero-inferior angles of the carapace are sharply rectangular, not spiniform or dentiform.

As in *Parapeneopsis sculptilis*, Heller, the postrostral carina is canaliculate and the sinuous subhepatic ridge

(defining the anterior portion of the cervical groove) does not reach the antero-inferior angle of the carapace.

Dorsal of the hepatic spine the cervical groove is very distinct up to the longitudinal suture of the carapace, this being a quite distinctive feature.

The longitudinal suture of the carapace runs nearly to the level of the transverse suture.

The sixth abdominal somite is as long as the telson; the telson is very short, not reaching the middle of the inner caudal swimmeret, and is without marginal spinelets.

The antennular flagella are equal and a little shorter than their peduncle.

The third maxillipeds nearly reach the middle of the antennal scale and surpass the tips of the fifth thoracic legs.

The spine on the basis of the first chelipeds is very slender and that on the second chelipeds is not distinguishable.

The andricum, like that of *P. sculptilis*, has on each outer margin a wing-like basal lobule, beyond which it simply tapers, to end in four hooks, of which the anterior pair are small and are concealed by the posterior pair in the flexed position of the organ.

The thelycum consists of a square plate between the fifth pair of legs and a semicircular one between the fourth.

Ganjam coast, 10-11 fathoms.

The largest male is  $3\frac{1}{4}$  inches long.

#### 6. *Parapeneopsis nana*, sp. n.

This is a small species, the largest female being only  $2\frac{1}{4}$  inches long, but from the finished form of the andricum (petasma) I take the representatives of it to be adult.

Compared with *Parapeneopsis stylifera* (Edw.) it shows the following differences:—

The rostrum, though in all respects similar, is shorter, so that its styliform portion does not quite reach the end of the antennular peduncle. The postrostral carina fades away at the posterior fourth of the carapace.

The antero-inferior angle of the carapace is sharp-cut, but not spiniform, and the sinuous subhepatic ridge defining the anterior part of the cervical groove falls far short of it.

The telson is generally shorter than the sixth abdominal somite; its median dorsal groove is short and shallow, and it has no lateral marginal spinelets.

The antennular flagella, which are equal, are about one third the length of their peduncle. The fifth pair of legs reach only to the middle of the antennal scale.



The andricum is slender and ends in a pair of long, straight, stiff filaments, which stand out at right angles to the rest of the organ.

The thelycum resembles that of *Parapeneopsis sculptilis*, Heller, its most conspicuous part being a large leaf-shaped median plate lying between the fourth pair of thoracic legs.

Numerous specimens have been taken off the Ganjam and Orissa coasts up to 68 fathoms and at Madras.

#### 7. *Parapeneopsis acclivirostris*, sp. n.

This small species is quite peculiar among *Penei* in having no epipodites on any of the thoracic legs and *no isolated epigastric tooth*.

Compared with *Parapeneopsis stylifera* (Edw.) it also shows the following points of difference:—

The rostrum in the female, though recurved at tip, is nearly straight and uptilted; it may reach or may fall short of the end of the antennular peduncle; it has seven teeth and is not produced as a carina behind the gastric region.

The antero-inferior angle of the carapace is sharp-cut but not spiniform, and the subhepatic ridge, defining the anterior part of the cervical groove, stops far short of it and is elegantly ciliated.

The longitudinal suture of the carapace reaches some way behind the gastric region.

The sixth abdominal somite is as long as the telson, which is short and has no marginal spinelets.

The antennular flagella are equal and are not much more than half the length of their peduncle.

The external maxillipeds and fifth pair of legs reach nearly to the middle of the antennal scale.

The thelycum consists of a concave semicircular plate lying between the fourth pair of legs and a squarish plate occupying the space between the fifth pair of legs.

This species is found in the Persian Gulf, in Palk Strait, at Madras, and off the Vizagapatam and Ganjam coasts.

All the thirty-four specimens taken are females, and the largest is only  $2\frac{1}{2}$  inches long.

#### 8. *Parapeneopsis Hungerfordi*, sp. n.

This species resembles *P. acclivirostris* in having only one epipodite on each side, namely, the one borne by the second maxillipeds.



In other respects it resembles *P. sculptilis*, Heller, except in the following particulars:—

The antero-inferior angles of the carapace are merely rectangular, not dentiform, and the antennular flagella of both sexes are shorter than their peduncle. In these particulars it resembles *P. uncta*.

The andricum ends in a pair of large petaloid lobules, the tips of which are incurved, and its basal lateral lobules have the free edge deeply notched.

The thelycum is a narrow longitudinal plate, laterally constricted or notched near the middle and almost cut in two by a deep longitudinal furrow; it ends posteriorly in a pair of knob-like facets.

A male and two females from Hongkong, presented by Surgeon-General R. Hungerford.

In the females the rostrum is like that of many specimens of *P. sculptilis*, but in the male it is short, barely reaching the end of the second joint of the antennular peduncle, and nearly straight; it is dangerous, however, to settle the specific form of such a variable structure as the rostrum from an examination of three specimens.

#### 9. *Trachypeneus asper*, sp. n.

Integument very thick and hard, tomentose, finely scabrous.

Rostrum quite straight, uptilted, strongly so in the female, not reaching the end of the second joint of the antennular peduncle; dorsally it is armed with nine or ten teeth (not including the isolated epigastric tooth), which form a crest. Postrostral carina low, broad, and faint, nearly reaching the posterior border of the carapace. An orbital spine. A strong postantennular (antennal) spine, the buttress of which reaches the hepatic fossa. A fine suture runs along the anterior part of the floor of the shallow postantennular sulcus. A similar transverse suture is seen on the branchiostegite at the level of the third pair of chelipeds. Hepatic spine rather small. Antero-inferior angles of carapace distinctly dentiform. A very indistinct subhepatic groove (the anterior part of the cervical groove) runs from the base of the postantennular buttress to the base of the hepatic spine; dorsal of the hepatic spine the groove cannot be distinguished.

On the second abdominal tergum there is a median compressed tubercle. The third to sixth terga are very

sharply carinated. The fifth abdominal somite is about two thirds the length of the sixth, the sixth is about as long as the telson. The telson, which is dorsally grooved, is much shorter than the inner caudal swimmeret, ends rather abruptly, and has on either side a very obscure subterminal marginal spinlet.

The antennular flagella of the male are about three fourths, those of the female about two thirds the length of their peduncle; the lower flagellum is much the coarser. The third maxillipeds are coarse, except the dactylus, and reach into the anterior third of the antennal scale. The last pair of thoracic legs reach at least a dactylus-length beyond the tip of the antennal scale. A basal spine is present on the first two pairs of chelipeds. All the thoracic legs have petaloid exopodites.

The andricum is anchor-shaped.

The thelycum consists of a transverse bar between the fifth pair of legs and a concave semicircular plate between the fourth.

The female reaches a length of  $3\frac{3}{4}$  inches. The colours in life are pink, the abdominal carinæ and thoracic appendages being milk-white.

The species has been taken in the Persian Gulf, off the Vizagapatam and Ganjam coasts in depths of 20-35 fathoms, and off the Andamans in 60 fathoms.

It differs from *T. curvirostris*, Stimpson (= *T. anchoralis*, Spence Bate), of which we have both 'Challenger' specimens from Japan and other specimens from Hongkong, in the following particulars:—

The rostrum is quite straight and has more teeth, and the postrostral carina is much fainter.

The antero-inferior angles of the carapace are sharper and the anterior part of the cervical groove is much less distinct.

The antennules are shorter both in their peduncle and in their flagella, and the fifth pair of legs are longer.

Though the andricum is similar, the thelycum is a good deal different, specimens of the same size being compared.

LVIII.—*Descriptions of new Species of Noctuidæ in the British Museum.* By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c.

[Continued from p. 386.]

*STICTOPTERINÆ.*

*Odontodes metamelæna*, sp. n.

♀. Head and thorax reddish brown mixed with grey and fuscous; pectus grey; tarsi black with pale rings; abdomen fuscous slightly mixed with brown and grey, the ventral surface grey irrorated with fuscous. Fore wing suffused with greenish grey; subbasal line double, the inner line indistinct, rufous, curved from costa to submedian fold; antemedial line double, the outer line indistinct, irregularly waved; orbicular represented by a grey point defined by black; a sinuous rufous medial line, oblique from costa to submedian fold, then inwardly oblique; reniform well-developed, with rather irregular brown outline; postmedial line double, dentate, excurved from costa to vein 4, then incurved; subterminal line indistinct, pale, irregularly waved, defined by rufous on inner side, below vein 4 incurved and with broad rufous band before it extending to postmedial line; a terminal series of brown lunules; a fine pale line at base of cilia. Hind wing deep black-brown with a slight blue gloss; underside with the inner area rather paler, traces of a curved medial line.

*Hab.* S.W. NEW GUINEA, Kapaur (*Doherty*), 1 ♀ type.  
*Exp.* 50 mm.

*Stictoptera crinopis*, sp. n.

♀. Head, thorax, and abdomen brown mixed with grey; frons deep black; tegulæ ochreous at base bounded by a deep black line, then greenish grey; metathorax with slight black crest; pectus whitish; legs very long, the tarsi fuscous with pale rings; abdomen with the slight dorsal crests dark. Fore wing grey suffused with brown and irrorated with black, the basal, inner, postmedial, and apical areas darker, the discal area paler; subbasal line double, oblique, black, from costa to vein 1; antemedial line double, curved, minutely waved; orbicular rather u-shaped; reniform concave towards base and with brown central line forming a spot at lower outer side; a black streak on vein 2 from cell to the postmedial line,

which is double, minutely dentate, excurved from costa to vein 4, then incurved, with a rather dentate black mark beyond it below costa; subterminal line only defined by the area beyond it being paler except at apex, angled outwards at vein 7 and excurved at middle; a terminal series of slight dark lunules. Hind wing with the interspaces of basal half pale, the veins and terminal half fuscous; the under-side with dark discoidal lunule showing through to upperside.

*Hab.* ASHANTI, Obuassi (*Bergmann*), 1 ♀ type. *Exp.* 36 mm.

*Stictoptera hemithyris*, sp. n.

Head, thorax, and abdomen fuscous brown mixed with some grey; pectus mostly grey; abdomen with the dorsal crests dark, the ventral surface whitish. Fore wing dark reddish brown slightly tinged with grey, the basal area rather darker, the discal area paler; a dark elliptical subbasal patch defined by brown from costa to median nervure; a slightly waved antemedial line with striga of raised black scales beyond it from subcostal nervure to submedian fold; a medial line, oblique from costa to submedian fold; reniform moderate, slightly defined by black; postmedial line double, minutely waved, formed of striæ of raised black scales, bent outwards below costa and incurved below vein 3; a similar single line beyond it defined by ochreous on inner side; a fine pale subterminal line, dentate at veins 6, 7 and incurved below vein 3; a terminal series of black striæ. Hind wing with the interspaces of basal half hyaline, the veins and terminal half fuscous; cilia white at tips; the underside greyer.

*Hab.* PUNJAB, Manpuri, 1 ♂; BOMBAY, 1 ♀; MADRAS, Cuddapah (*Campbell*), 1 ♀ type. *Exp.* 24-26 mm.

*Stictoptera phaeobasis*, sp. n.

♀. Head and thorax fuscous brown, mixed with some grey and black; pectus and femora whitish; tarsi fuscous ringed with white; abdomen fuscous with slight whitish segmental lines, a blackish crest on fourth segment, the ventral surface whitish. Fore wing reddish brown, the basal half suffused with black, its outer edge obliquely curved; subbasal line represented by two slight striæ from costa; antemedial line indistinct, waved, defined by whitish on inner side towards inner margin, some striæ of raised black scales beyond it in and below cell; a medial line bounding the

dark area, oblique from costa to submedian fold; reniform incompletely defined by black; postmedial line double, bent outwards below costa, incurved at discal fold and below vein 4; subterminal line strongly dentate, forming a dark mark at costa and incurved below vein 4; a minutely waved dark line just before termen, on which there is a series of black striæ. Hind wing fuscous, with hyaline streaks in the interspaces in, below, and beyond cell, and on middle of inner area; the underside with the inner area whitish.

*Hab.* PERAK, Goping (*Küntler*), 1 ♀ type. *Exp.* 32 mm.

*Stictoptera leucostriga*, sp. n.

♂. Head and thorax red-brown; pectus whitish; tarsi fuscous ringed with white; abdomen fuscous brown with some whitish at base, a blackish crest on fourth segment; the ventral surface white. Fore wing red-brown, sometimes with triangular whitish patch on medial area from just above median nervure to inner margin; subbasal line represented by two slight striæ from costa; two antemedial indistinct lines, approximated below cell, then diverging; reniform with slight ochreous annulus defined by blackish; postmedial line double, strongly bent outwards below costa, then minutely waved, below vein 4 recurved to lower edge of reniform, then excurved again; subterminal line black, its medial part defined on inner side by a white striga, slightly angled inwards below costa and incurved below vein 4; some white points on costa towards apex; a terminal series of black striæ defined by whitish on inner side. Hind wing fuscous, the interspaces of basal half hyaline; cilia with a fine pale line at base.

♀ more fuscous brown; fore wing without the whitish patch on medial area, the two antemedial lines black on inner half forming a somewhat conical mark.

*Hab.* PENANG (*S. S. Flower*), 1 ♀; PERAK, Goping (*Künstler*); SINGAPORE (*Ridley*), 1 ♂, 1 ♀ type. *Exp.* 24-28 mm.

*Stictoptera ferruginea*, sp. n.

♂. Head and thorax rufous; abdomen rufous tinged with fuscous, the anal tuft ochreous, the ventral surface whitish. Fore wing rufous; a faint double subbasal line from costa to submedian fold, angled inwards below costa; a very indistinct, double, minutely waved antemedial line with some dark points on it; a slight discoidal lunule defined by brown; a faint, double, minutely waved postmedial line, with some dark

points on its outer edge, oblique and slightly incurved at discal fold and in submedian interspace; subterminal line indistinct ochreous, minutely dentate, defined by slight dark marks on its inner side below costa and at middle and by a complete series on outer; a terminal series of dark striæ; cilia ochreous with dark points at extremity of the veins. Hind wing uniform fuscous brown; the underside rather paler, with traces of curved postmedial line and diffused subterminal band.

♀ much darker; fore wing with complete series of dark spots before subterminal line.

*Hab.* BORNEO, Sarawak (*Wallace*), 1 ♀; PULO LAUT (*Doherty*), 2 ♂ type. *Exp.* 30 mm.

*Stictoptera anæmia*, sp. n.

♀. Palpi with the third joint long and porrect.

Head and thorax whitish tinged with pale brown; frons white; abdomen grey-white with slight dark dorsal crests, the ventral surface white. Fore wing ochreous white; a very oblique, wedge-shaped, brown mark from costa before middle to submedian fold, with a slight erect line from its extremity to inner margin; some slight brownish marks on terminal half of costa; postmedial line represented by a series of dark striæ from vein 7 to inner margin, excurved between veins 5 and 3, then incurved and with some greyish suffusion beyond them; subterminal line whitish, minutely waved, slightly angled outwards at vein 7 and excurved at middle, with small dentate black mark before it and streak beyond it below costa, and slight blackish marks before it and fuscous suffusion beyond it from vein 5 to inner margin; a terminal series of small black lunules defined by white on inner side. Hind wing pale fuscous, the interspaces of basal half hyaline.

*Hab.* SOLOMON Is., 1 ♀ type. *Exp.* 30 mm.

*Stictoptera hypenistis*, sp. n.

♂. Head and thorax dull brown; abdomen fuscous, the ventral surface greyish. Fore wing pale reddish brown, slightly irrorated with fuscous, the terminal area darker; traces of a double, irregularly waved antemedial line and of two irregularly waved medial lines; an indistinct irregular discoidal mark, constricted at middle; postmedial line oblique, double, filled in with whitish, the inner line indistinct, the outer strong and with a series of black points beyond it on

the veins; a slight dark dentate subterminal line; a slightly waved black terminal line; cilia fuscous with a fine pale line at base. Hind wing fuscous, the interspaces paler and semihyaline, except on terminal area; cilia with a fine pale line at base; the underside with traces of curved postmedial line.

*Hab.* BURMA, Hsipaw (*De Nicéville*), 1 ♂ type. *Exp.* 32 mm.

*Gyrtona dialeuca*, sp. n.

♀. Head and thorax red-brown with white stripes on sides of head and tegulæ and above patagia; palpi whitish at tips; abdomen pale fuscous, whitish at base, the dorsal crests blackish, the ventral surface white. Fore wing rufous with whitish fascia from base of costa through the cell to termen below apex; a white streak on inner margin from near base to subterminal line, towards which it increases in width; two rather interrupted medial lines, bent inwards to costa and terminating at vein 1, where they meet; reniform defined by slight tufts of raised black scales; postmedial line indistinct, double, minutely dentate, bent outwards below costa and oblique below vein 4; subterminal line whitish, excurved at middle, defined by blackish marks before and beyond it at costa and middle and a black spot beyond it above tornus; a terminal series of blackish striæ. Hind wing fuscous brown, the interspaces of basal half semihyaline.

*Hab.* BORNEO, Sarawak (*Wallace*), 1 ♀ type. *Exp.* 26 mm.

*Gyrtona phæozona*, sp. n.

Head and thorax reddish brown; palpi and frons blackish; tegulæ with rather strong black medial line; tarsi blackish with pale rings; abdomen brown tinged with fuscous, the ventral surface whitish. Fore wing reddish brown with slight dark irroration; a subbasal black spot on costa; a double curved antemedial line followed by a rather obliquely curved black band with two curved medial lines beyond it; medial area faintly tinged with fuscous; reniform indistinct, rufous with slight dark outline; antemedial line double, filled in with ochreous, the outer line deep black, erect, slightly excurved at middle; terminal area slightly tinged with fuscous; subterminal line indistinct, greyish, defined on outer side by fuscous, slightly excurved below costa and at middle; a terminal series of black points. Hind wing pale, semihyaline, the veins and terminal area fuscous; the underside with indistinct curved postmedial line.

*Hab.* BOMBAY, N. Canara, Karwar (*Bell*), 1 ♂ type; MADRAS, Nilgiris, 1 ♀. *Exp.* 22 mm.



*Gyrtona glaucobasis*, sp. n.

♀. Head and thorax reddish brown mixed with whitish; frons, pectus, and legs whitish; the tarsi fuscous with pale rings; abdomen grey tinged with fuscous, the ventral surface white. Fore wing reddish brown, mostly suffused with glistening glaucous grey and sparsely irrorated with black, the antemedial area pale glaucous green; antemedial line double with striæ of raised black scales on its edges, obliquely curved; reniform very indistinctly defined by raised black scales on its edges, constricted at middle; post-medial line double, defined by striæ of raised black scales on its edges, those on outer side strong, slightly bent outwards below costa and excurved at middle, with traces of another minutely waved line beyond it; subterminal line grey defined by slight blackish marks on outer side, somewhat dentate and angled outwards at veins 7 and 3, 4; a slight glaucous line before termen; cilia with a series of minute black points. Hind wing uniform fuscous; the underside rather paler with indistinct curved postmedial line.

*Hab.* PULO LAUT (*Doherty*), 1 ♀ type. *Exp.* 22 mm.

*Gyrtona chlorograptæ*, sp. n.

♀. Head and thorax grey mixed with fuscous and brown; palpi blackish at sides; tegulæ with medial black line; abdomen fuscous, the ventral surface whitish. Fore wing grey suffused with brown and fuscous, leaving the costal half of wing, except on basal area, paler; an oblique bright green band from base of costa to inner margin, and a subbasal bar from costa to cell; an antemedial green band from subcostal nervure to vein 1, its edges defined by striæ of raised black scales; a diffused dark spot on middle of costa and traces of a fine, irregularly waved, medial black line; a fine minutely waved postmedial line incurved between vein 4 and submedian fold, with another indistinct waved line beyond it; a minutely dentate white subterminal line defined by black on outer side and with blackish patch before it on costa; a series of small black spots just before termen. Hind wing uniform fuscous; the underside rather paler.

*Hab.* SINGAPORE (*Ridley*), 1 ♀ type. *Exp.* 22 mm.

*Gyrtona plumbisparsa*, sp. n.

♀. Head, thorax, and abdomen dark red-brown; tarsi with pale rings; abdomen with the slight dorsal crests



black. Fore wing dark red-brown, suffused with leaden-silvery scales, especially on inner and terminal areas; traces of two curved subbasal lines from costa to vein 1; three indistinct waved antemedial lines with striæ of raised black scales beyond them in and below cell; an indistinct, waved, brown medial line; two slight, obliquely placed, black discoidal striæ; postmedial line double, sinuous, bent outwards below costa, excurved to vein 4, then retracted to below end of cell, and with traces of a waved brown line beyond it; subterminal line dark defined by leaden-silvery suffusion on inner side and with dark patch before it on costal area, excurved at vein 7 and middle; a series of small dark spots just before termen. Hind wing dark red-brown, the cilia silvery at tips; the underside paler.

*Hab.* SIKHIM, 1 ♀ type. *Exp.* 24 mm.

*Gyrtona polionota*, sp. n.

♀. Head and thorax pale red-brown suffused with grey; abdomen grey, the ventral surface white. Fore wing pale red-brown, mostly suffused with grey and slightly irrorated with fuscous; subbasal line represented by slight black points on the veins; antemedial line indistinct, double, minutely waved, curved, with some black points on it; traces of a double medial line; reniform faintly defined by black points; postmedial line indistinctly double, bent outwards below costa and oblique below vein 4, the outer line somewhat dentate and with some black points on it; subterminal line represented by a series of black points, angled outwards at vein 7 and slightly excurved at middle, followed by an indistinct slightly waved line; a terminal series of small black lunules. Hind wing fuscous, the interspaces of basal half pale and thinly scaled.

*Hab.* WOODLARK (*Meek*), 1 ♀ type. *Exp.* 30 mm.

*Gyrtona polymorpha*, sp. n.

♂. Head and thorax purplish black-brown with some rufous on head, tegulæ, and prothorax; pectus and hind legs greyish; tarsi fuscous with pale rings; abdomen fuscous, whitish below. Fore wing purplish black-brown with traces of waved subbasal, antemedial, and medial lines; reniform defined by black; postmedial line double, minutely dentate, bent outwards below costa, excurved to vein 4, then incurved; a double minutely waved subterminal line, slightly excurved at vein 7 and middle; a terminal series of small black lunules. Hind wing fuscous brown, slightly paler at base; the underside paler with indistinct curved postmedial line.

*Ab.* 1. Fore wing redder brown, the basal area except towards costa, the medial area except towards costa and inner margin, and the area between the two subterminal lines grey-white irrorated with fuscous; a black patch before the antemedial line below cell and another beyond it in and below cell; reniform red-brown largely suffused with black.

♀ like the typical male, but head, thorax, and fore wing redder brown.

*Ab.* 1. Fore wing pale red-brown, the inner half from base to postmedial line suffused with white.

*Ab.* 2. Fore wing ochreous brown.

*Ab.* 3. Fore wing greyish brown, with black point on antemedial line at vein 1 and patch beyond it in and below cell.

*Ab.* 4. Fore wing with the medial and terminal areas dull reddish brown, the basal area and the area between the two postmedial lines, except at costa, ochreous brown.

*Hab.* MAURITIUS, Curepipe (*Tullock*), 2 ♂, 4 ♀ type.  
*Exp.* 30-34 mm.

#### SARROTHRIPINÆ.

##### *Hypothripa ruficirra*, sp. n.

Head, thorax, and abdomen grey, the two former slightly mixed with brown. Fore wing grey; a reddish-brown antemedial shade from costa to submedian fold, with two lines on it formed of raised black scales; an indistinct slightly waved medial line; traces of a dark discoidal point; postmedial line bent outwards with a downward curve from costa to vein 6, minutely dentate to vein 4, then strongly incurved and excurved to inner margin, a rufous shade beyond it from costa to vein 6; subterminal line indistinct, dark, minutely waved, excurved at vein 7 and middle; a rufous shade at apex; a terminal series of black points; cilia brownish. Hind wing brownish grey, the veins and terminal area slightly darker.

*Hab.* JAPAN, Yokohama (*Pryer*), 2 ♂ type; ASSAM, Khásis, 1 ♀. *Exp.* 22-24 mm.

##### *Hypothripa miochroa*, sp. n.

Palpi with the second joint dilated on inner side at extremity.

♀. Head and thorax greenish grey mostly suffused with reddish brown; abdomen greyish fuscous. Fore wing greenish grey, suffused and irrorated with reddish brown,

especially on basal costal area and disk; a double minutely waved subbasal line from costa to submedian fold; a double minutely waved antemedial line from costa to vein 1; a whitish discoidal spot with two black points on it; post-medial line defined by grey on outer side, bent outwards below costa, then minutely dentate, angled inwards at vein 2; subterminal line grey defined by fuscous before and beyond it, slightly excurved at vein 7 and middle; a terminal series of minute black points. Hind wing uniform fuscous brown; the underside paler, except costal area and terminal area to vein 2.

*Hab.* COLOMBIA, St. Marta (*Bouchard*), 1 ♀ type. *Exp.* 24 mm.

*Pardasena ferrigrisea*, sp. n.

♂. Head, thorax, and abdomen grey tinged with pale iron-brown. Fore wing grey suffused with iron-brown; an indistinct subbasal line from costa to submedian fold, excurved below costa, then incurved; antemedial line defined by grey on inner side, minutely waved, oblique from costa to submedian fold where it is obtusely angled; a slight discoidal point; postmedial line defined by grey on outer side, minutely waved, oblique from costa to vein 6, excurved to vein 4, then incurved; subterminal line indistinct, diffused, dark, excurved at vein 7 and middle; a terminal series of minute points. Hind wing grey suffused with pale brown, the basal area slightly paler; cilia grey; the underside paler.

*Hab.* GAMBIA, Bathurst (*Carter*), 1 ♂ type. *Exp.* 18 mm.

*Pardasena deleta*, sp. n.

♂. Head and thorax pale ochreous brown; abdomen whitish tinged with ochreous. Fore wing pale ochreous brown; very indistinct sinuous antemedial and medial lines; traces of a diffused postmedial line excurved from costa to vein 4, then oblique; traces of a subterminal series of dark points; the termen rather darker. Hind wing semihyaline white, the terminal area tinged with brown.

*Hab.* PERU, Callao (*J. J. Walker*), 1 ♂ type. *Exp.* 22 mm.

*Giaura leucophæa*, sp. n.

Head and thorax white and dark brown; palpi with the second and third joints black except at extremities; antennæ dark; tibiæ and tarsi banded with fuscous; abdomen

whitish tinged with fuscous. Fore wing white slightly irrorated with dark brown; a black point at base of costa; a brown patch on costal area with two obliquely placed black points on it before the oblique, slightly sinuous, black antemedial line, with a small black spot beyond it above vein 1; a rather indistinctly double, waved, somewhat oblique medial line with a blackish patch beyond it on costa and in end of cell, another patch beyond lower angle of cell before the rather indistinctly double postmedial line, which is bent outwards below costa, then sinuous and with a black patch beyond it on costa; subterminal line angled inwards below costa and at discal fold, excurved at vein 7, slightly dentate at veins 4, 3, and with black spot on it at submedian fold; a blackish patch at apex and band just before termen down to vein 5; a terminal series of black points; cilia white intersected with fuscous. Hind wing pale, wholly suffused with fuscous.

*Hab.* BORNEO, Kuching, 1 ♂, 1 ♀ type. *Exp.* 20 mm.

*Giaura nigriscripta*, sp. n.

♀. Head and thorax whitish grey; palpi blackish behind; pectus and legs white, the fore tibiæ and tarsi grey in front; abdomen grey, the ventral surface white. Fore wing grey irrorated with fuscous; a slight black streak on base of median nervure; a prominent, oblique, black subbasal line from costa to submedian fold; antemedial line near middle of wing, fine, black, angled outwards in cell and submedian fold and inwards on vein 1; claviform represented by two black streaks extending to the postmedial line; a slight oblique discoidal shade; postmedial line fine, black, very oblique from below costa to vein 6 and incurved below vein 4; a subterminal series of slight dark points; a fine terminal punctiform line. Hind wing white, the termen tinged with brown from apex to vein 2.

*Hab.* BR. E. AFRICA, Kikuyu (*Crawshay*), 1 ♀ type. *Exp.* 22 mm.

*Giaura strigivenata*, sp. n.

♀. Head, thorax, and abdomen whitish tinged with brown; palpi at sides and fore tibiæ in front dark brown. Fore wing whitish irrorated and suffused with reddish brown; a diffused dark brown subbasal band from costa to submedian fold; a diffused blackish streak above median nervure and another in terminal part of cell in discal fold; diffused blackish streaks above vein 1 from before middle

and on the veins beyond end of cell to the subterminal series of somewhat dentate small dark marks and more prominent rounded spot in submedian fold ; a terminal series of slight points. Hind wing white tinged with brown, the terminal area suffused with brown.

*Hab.* NEW SOUTH WALES (*Raynor*), 1 ♀ type. *Exp.* 26 mm.

*Giaura lichenigera*, sp. n.

Palpi with the second joint broadly rounded with scales in front.

♀. Head and thorax greenish grey more or less mixed with reddish brown and black ; palpi reddish brown at sides barred with black ; fore tibiæ reddish brown in front barred with black ; abdomen grey dorsally tinged with fuscous brown. Fore wing grey more or less tinged with green and irrorated with fuscous, sometimes mostly suffused with red-brown ; a diffused black fascia in submedian interspace, sometimes confined to medial area, ending at postmedial line or downcurved at extremity and reaching tornus, another streak above inner margin from near base to postmedial line sometimes present ; a subbasal line of raised black scales, oblique from costa to cell where it is angled and ending at submedian fold ; a very oblique sinuous antemedial line retracted to costa ; a round tuft of raised scales in end of cell ; postmedial line formed of raised black scales, sinuous, very oblique from costa to vein 4, below vein 3 retracted to lower angle of cell, then rather oblique and defined by white on outer side to inner margin, sometimes with a black patch at costa ; subterminal line whitish with diffused fuscous on inner side, excurved at vein 7 and at middle, bent inwards at vein 3, then oblique to near tornus ; a terminal series of black points sometimes with a fuscous band before them from below apex to vein 3. Hind wing fuscous brown with a reddish tinge, the interspaces paler except on terminal area.

*Hab.* SIERRA LEONE (*Clements*), 1 ♀ ; SIKHIM, 1 ♀ ; SINGAPORE (*Ridley*), 3 ♀ type. *Exp.* 18-22 mm.

*Blenina metanyctea*, sp. n.

♂. Head and thorax white and green mixed with some fuscous ; tegulæ black at outer edge and with black line near tips ; pectus and legs yellowish tinged with brown ; fore tibiæ and tarsi banded with black ; abdomen yellow dorsally suffused with brown, the crests at base whitish tipped with

black. Fore wing white largely suffused with bright green; a diffused, irregular, olive-green and reddish-brown band from middle of costa to tornus; a black line close to base, angled in cell and with a black striga beyond it above inner margin; a waved, rather inwardly oblique antemedial line from costa to above inner margin; an indistinct waved medial line; reniform white irrorated with green, its lower part defined on inner side by a curved black line and slightly by black on outer side, its upper part very indistinctly and irregularly defined by green, with a black striga from costa above it; postmedial line indistinct, minutely dentate, strongly incurved in submedian interspace; a minutely dentate subterminal line bent inwards at vein 2, then oblique to near tornus; a dark patch at apex and a terminal series of white spots except towards tornus interrupted by the black terminations of the veins; cilia yellowish with a series of brown spots and points at tips to vein 3, below which the termen is distinctly excised. Hind wing dark brown, the inner margin yellowish; cilia yellowish with series of brown spots to vein 2, whence the termen is excised to tornus; the underside yellow, the inner area tinged with brown, an irregular band from costa to lower angle of cell and a broad blackish band just before termen from costa to submedian fold.

*Hab.* DUTCH NEW GUINEA, Kapaur (*Doherty*), 1 ♂ type. *Exp.* 42 mm.

*Blenina brachyptera*, sp. n.

♀. Head and tegulae green; palpi banded with black; tegulae edged with dark brown; thorax reddish brown; pectus yellowish; legs yellowish and brown, the fore and mid tibiae with green patches; abdomen red-brown, the ventral surface yellowish except towards extremity. Fore wing short and broad, the apex and termen rounded, reddish brown; basal area suffused with green except towards inner margin; a double, diffused, black subbasal line from costa to vein 1, with some whitish on its outer edge; antemedial line black defined by green on inner side, oblique from costa to median nervure, then excurved and angled inwards on vein 1, with slight green streaks on subcostal and median nervures from it to postmedial line; a slight discoidal dark point; postmedial line black defined by green on outer side, obliquely excurved and minutely waved from costa to vein 4, then incurved and with some white beyond the green near inner margin; a slight, minutely waved, green subterminal

line, slightly excurved below vein 7, oblique and whitish from vein 2 to tornus; termen suffused with fuscous. Hind wing orange-yellow with terminal black-brown band, wide at costa, narrowing to vein 2 and expanding towards tornus, some yellowish points on termen between veins 5 and 3; cilia with a fine yellowish line at base except towards tornus. Underside of fore wing fuscous, yellow at base.

*Hab.* NEW GUINEA, Humboldt Bay (*Doherty*), 1 ♀ type.  
*Exp.* 32 mm.

*Blenina triphænopis*, sp. n.

♂. Head and thorax greenish grey mixed with black; palpi with black points at base of third joint; tips of tegulæ and upper edge of patagia sometimes black; tarsi banded with fuscous; abdomen orange-yellow tinged with brown at extremity, the crests at base greenish grey. Fore wing with the termen slightly oblique towards tornus; greenish white irrorated with brown and black; with more or less prominent black suffusion between medial and postmedial lines from costa to lower angle of cell and sometimes with diffused black fascia on inner margin from near base to subterminal line; traces of a wavy line close to base from costa to submedian fold; an irregularly wavy antemedial line bent outwards below costa, then oblique, ending at vein 1; medial line minutely wavy, oblique from costa to median nervure; a black point sometimes present in cell; a slight white discoidal lunule with slight black streaks from its lower extremity to the postmedial line, which is minutely dentate, oblique from costa to vein 7, angled outwards at vein 4, then incurved, with traces of a minutely dentate line beyond it from costa to vein 4; a minutely dentate subterminal line, angled outwards at vein 6, excurved at middle and angled inwards at discal and submedian folds, where there are blackish patches beyond it; cilia white, brownish towards apex, with a fine wavy black line through them. Hind wing orange-yellow with black terminal band, broad at apex, narrowing to a point before tornus; cilia orange, tinged with fuscous at apex and at the angle at vein 2. Underside orange; fore wing with the terminal half blackish except on inner area, a black striga from costa above end of cell with yellow spot beyond it; hind wing with black striga from costa above end of cell, and terminal band as above.

*Hab.* SINGAPORE (*Ridley*), 2 ♂ type; NEW GUINEA (*Mathew*), 1 ♂. *Exp.* 42-45 mm.



*Blenina chlorophila*, sp. n.

♂. Head and thorax bright green slightly irrorated with white; tegulae and patagia with blackish tips; pectus and legs yellowish, fore tibiae green in front, the tarsi black ringed with white; abdomen yellow-brown dorsally tinged with fuscous, the crests green and black, the ventral surface yellow, blackish at extremity. Fore wing whitish almost entirely suffused with bright green; the base of inner area tinged with rufous; subbasal line oblique, waved, from costa to submedian fold, with an indistinct green line beyond it from subcostal nervure to submedian fold; a double medial line, incurved in cell and submedian interspace, excurved at median nervure and to inner margin; a slight black discoidal bar; postmedial line double, obliquely excurved and minutely dentate from costa to vein 4, then single, strongly incurved in submedian interspace, then oblique to inner margin and slightly angled outwards on vein 1, a slight line beyond it from vein 5 to 3, where it is bent inwards, then forming a green band with blackish spot on it in submedian fold; subterminal line black, minutely waved, angled outwards at vein 7, excurved at middle, bent inwards at vein 3 and oblique to near tornus; a slight black shade at apex and oblique shade from subterminal line to middle of termen; a terminal series of black points with white striæ between them; cilia white and green, brownish towards apex, with series of black points on them. Hind wing black-brown, the terminal area darker; an orange postmedial band from vein 6 to 1, incurved below vein 4, obsolescent towards vein 1, and emitting a slight streak towards base in submedian fold; cilia orange, black at apex and tipped with brown and white above middle. Underside orange; fore wing with oblique black medial band dilated at middle, the terminal area black with sinuous inner edge; hind wing with black medial line from costa to below vein 2 and black terminal band narrowing to a point near tornus.

*Hab.* SINGAPORE (Ridley), 2 ♂ type. *Exp.* 46 mm.

*Blenina malachitis*, sp. n.

Head and thorax bright sap-green, the latter with slight dark irroration; palpi above and antennæ black, the palpi of male with the second joint dilated at base and hollowed out at sides, the hollow white; pectus and legs yellowish, fore tibiae green in front, the tarsi brown ringed with white; abdomen reddish brown, the terminal half in male with



lateral fringes of hair curved over dorsum, the ventral surface whitish, blackish at extremity. Fore wing whitish, almost entirely suffused with emerald-green; with more or less blackish suffusion on medial and postmedial area and sometimes some rufous suffusion beyond the cell; an obliquely curved, slightly wavy, black subbasal line from costa to submedian fold with an indistinct dark bar beyond it from cell to submedian fold; a more or less distinct double antemedial line, angled outwards below costa and cell and at vein 1; a slight black discoidal bar with whitish point before it; postmedial line slightly bent outwards below costa, minutely dentate to vein 3, then strongly incurved and oblique to inner margin, with another less distinct line beyond it from costa to vein 3; subterminal line black, green at middle, very minutely dentate, angled outwards at vein 7, excurved at middle, bent inwards at vein 2 and oblique to near tornus; a blackish patch at apex and below vein 6; the tips of the veins with slight black streaks with whitish striae between them; cilia whitish, tinged with green and with brown towards apex, with series of black points on them. Hind wing black-brown, darker towards termen; a more or less developed, curved, yellowish postmedial bar between veins 5 and 2 emitting a streak towards base below cell; cilia yellow, blackish at apex and with some dark points at middle. Underside of fore wing dull yellowish with blackish medial band, diffused except at costa, terminal area blackish with diffused inner edge; hind wing yellowish white with traces of curved medial line and broad terminal black band from apex to submedian fold.

*Hab.* SINGAPORE (*Ridley, Frühstorfer*), 2 ♂, 1 ♀ type.  
*Exp.* 40 mm.

*Blenina miota*, sp. n.

♂. Head and thorax pale green mixed with fuscous; pectus and legs whitish, the fore tarsi fuscous ringed with white; abdomen whitish suffused with fuscous. Fore wing pale green irrorated with fuscous, the area from middle of costa and beyond cell suffused with fuscous down to vein 5; an indistinct subbasal black striga from costa; antemedial line represented by a black striga from costa and point below median nervure; an oblique fuscous striga from middle of costa; two black discoidal points; postmedial line double, bent outwards below costa, minutely dentate to vein 3, then the inner line obsolete, the outer line erect to inner margin; subterminal line formed of small fuscous spots, strongly

excurved from vein 5 to 2, where it is bent inwards, then oblique to tornus; a series of minute fuscous spots just before termen, on which there is a series of black striæ. Hind wing brown with a slight reddish tinge; cilia whitish; the underside whitish, with traces of a curved postmedial line and broad fuscous terminal band.

*Hab.* SIERRA LEONE, Pt. Lokko (*Penny*), 1 ♂ type. *Exp.* 28 mm.

*Blenina leucotis*, sp. n.

♀. Head and thorax white, slightly irrorated with fuscous; palpi blackish above; fore tarsi banded with black; abdomen white. Fore wing glistening white, rather sparsely irrorated with fuscous; a minute black streak in base of cell; subbasal line angled outwards in cell, then oblique to submedian fold; antemedial line double, the inner line indistinct, strongly waved; medial area clouded with black towards costa and from cell to inner margin and with a diffused black mark with two points beyond it in submedian interspace; postmedial line angled inwards below costa, oblique to vein 6, then indistinct and minutely dentate to vein 3, where it is bent inwards, then waved to inner margin, a blackish shade beyond it on costal area followed by two small spots; a diffused fuscous subterminal line angled inwards in discal and submedian folds and excurved at middle; termen clouded with fuscous, a terminal series of black points. Hind wing white, the terminal area tinged with fuscous from apex to vein 2.

*Hab.* BR. E. AFRICA, Uganda Ry., mile 478 (*Betton*), 1 ♀ type. *Exp.* 30 mm.

*Blenina brunnescens*, sp. n.

♂. Head and thorax white, tinged with pale red-brown; fore tarsi blackish at extremity; abdomen brownish white. Fore wing white, suffused with pale red-brown; a slight blackish streak on base of median nervure; an obliquely curved antemedial series of four black points from below costa to median nervure and point on vein 1, an oblique striga beyond them across base of vein 2; two black discoidal points; a postmedial series of minute streak-like points, obliquely excurved from costa to vein 4, then oblique; traces of a subterminal series of small brown spots; a terminal series of black points. Hind wing white with a slight reddish-brown tinge.

*Hab.* BR. C. AFRICA, Nyasa (*de Jersey*), 1 ♂ type. *Exp.* 22 mm.

*Barasa tetragramma*, sp. n.

♀. Head and thorax white, slightly irrorated with fuscous; palpi with black mark at side of second joint; fore tibiæ blackish on inner side, the tarsi blackish at extremity; abdomen white, tinged with grey above, the basal crest blackish at tip. Fore wing grey-white irrorated with fuscous, the medial and terminal areas slightly tinged with brown; a slight black streak in base of cell; a strong obliquely curved black subbasal line from costa to submedian fold; a highly waved medial line with traces of another line before it; a slight diffused rufous discoidal mark; postmedial line bent outwards below costa, incurved at discal fold and below vein 4, angled outwards at vein 1; subterminal line strong, black, not quite reaching costa, on which there is a black point, met below costa by an oblique shade from apex slightly excurved at middle; a terminal series of minute black streaks. Hind wing white, the apical area tinged with brown down to vein 2; the underside with the costal area tinged with brown.

*Hab.* FIJI, 1 ♀ type. *Exp.* 28 mm.

This is the specimen recorded as *Argyrothripa nigrostrigata* by Mr. Bethune-Baker (P. Z. S. 1905, i. p. 93), the type of which, from New Guinea, has, however, the medial line not angled inwards below the cell.

[To be continued.]

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LIX.—*Descriptions of Two new Species of Diurnal Lepidoptera belonging to the Subfamily Nymphalinae.* By HERBERT DRUCE, F.L.S. &c.

*Perrhanæa cubana*, sp. n.

*Male.*—Head, thorax, and abdomen yellowish brown; antennæ black. Palpi, underside of the thorax, and abdomen pale brown. Primaries bright red, the costal margin, apex, and outer margin black, the outer margin spotted with yellowish brown; a short black band at the end of the cell, beyond which a waved rather wide black line crosses the wing from the costal to the inner margin; two small black dots close to the apex; the fringe pale reddish yellow:

secondaries, the basal half of the wing bright red, the outer half deep chrome-yellow; a submarginal reddish-brown line extends from the apex to just above the tail, which is black, irrorated with yellowish-white scales; the fringe almost white. Underside: primaries, the costal half, apex, and outer margin greyish black, with the black markings very similar to those on the upperside; the inner half of the wing reddish brown, thickly irrorated with black scales: secondaries blackish from the base to about the middle, beyond which to the outer margin pale brownish grey, irrorated with black scales; a small black spot above the tail.—*Female* very similar to the male, but with much less red on the primaries, which are chrome-yellow along the outer margin: secondaries almost entirely chrome-yellow, slightly shaded with red near the base: on the underside both wings are more yellow than those of the male.

Expanse, ♂  $3\frac{1}{2}$ , ♀  $3\frac{3}{4}$  inches.

*Hab.* Cuba.

In the collection of Mr. Henley Grose-Smith and Herbert Druce.

*Euphadra Cooksoni*, sp. n.

*Male*.—Head, antennæ, thorax, and abdomen black; a bluish-white dot at the base of the antennæ, two in front of the thorax, one on each side and two at the base of the thorax, and two on each side of the abdomen nearest the base; the point of the antennæ yellow; palpi, underside of thorax, and abdomen chrome-yellow; legs yellowish. Primaries black, greenish grey along the costal margin; a white band crosses the wing near the apex from the costal to the outer margin, slightly shaded with greenish grey on the inner margin of the band; the inner margin from the base to near the apex broadly brownish chrome-yellow, the fringe black: secondaries brownish chrome-yellow, broadly bordered with black from the apex to the anal angle; two bluish-grey spots on the outer margin near the anal angle. Underside: primaries yellow, shaded with greenish black; the white band as above; three black spots in the cell, the first close to the base and two close to the end of the cell; the wing is palest on the inner margin: secondaries chrome-yellow; a black spot at the base and a small one in the cell; a rather wide white submarginal band extends from the base to the apex, where it becomes quite narrow; two indistinct white spots at the end of the cell and four bluish-white dots extending round the outer margin from the anal angle.—*Female* very similar

to the male, with all the white markings on the underside more distinct.

Expanse, ♂  $3\frac{1}{2}$ , ♀ 4 inches.

Hab. N.E. Rhodesia.

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LX.—Description of a new Land-Shell from Christmas Island. By EDGAR A. SMITH, I.S.O.

A SMALL collection of non-marine Mollusca, recently sent to the Natural History Museum for identification by Dr. R. Hanitsch, of the Raffles Museum, Singapore, contains the following new species of *Jaminia* from Christmas Island, in the Indian Ocean, and also two or three other forms previously unknown from this remote locality. These will be referred to in a paper which Dr. Hanitsch proposes to publish as a supplement to the 'Monograph of Christmas Island' by Dr. C. W. Andrews.



*Jaminia proscripta.*

Testa minuta, oblonga, cylindrica, umbilicata, fusco-cornca, lineis incrementi tenuibus striata; anfractus 5, perconvexi, sutura profunda leviter obliqua sejuncti, ultimus antice leviter ascendens, pone labrum indentatus; labrum pallidum, expansum, subreflexum, margine externo in medio intus leviter prominens; apertura quinque-dentata; dentes duo parietales inæquales, columellaris minutus, palatales duo lamelliformes, subæquales, ab margine labri remoti.

Longit. 2.25 mm., diam. .9.

Hab. Flying Fish Cove.

The type will be preserved in the British Museum.

LXI.—On remarkable Specimens of *Rana esculenta* from South-western Persia. By G. A. BOULENGER, F.R.S.

THE collection made by Mr. R. B. Woosnam when accompanying Col. Bailward in Persia contains two specimens of *Rana esculenta*, male and female, which do not fall under the definition of any of the races hitherto distinguished, and for which I think it desirable to propose a new name—var. *susana*—the specimens having been captured not far from the ruins of Susa, at an altitude of about 400 feet.

This variety agrees with var. *ridibunda*, to which I have referred the Persian specimens previously examined by me, in the small size and feeble prominence of the inner metatarsal tubercle, and with the typical form in the comparatively short tibiæ, which barely meet at the heels when they are laid at right angles to the body. Besides, the length of the tibia is less than one half that of head and body, whilst in var. *ridibunda* it usually measures one half or more. The life-colour of the malespecimen, obtained in a small stream on March 20th, is described in Mr. Woosnam's notes as drab colour, with a few dark brown spots; head, shoulders, and upper back light green: the female, caught in the Kerkbah River on March 19th, was of a greenish-brown colour, with dark brown blotches and a broad light stripe along the middle of head and body. Other specimens of *R. esculenta*, obtained by Mr. Woosnam at Kermanshah, 6000 feet altitude, are referable to the var. *ridibunda*.

I append some measurements of these specimens, in accordance with the method proposed in the 'Proceedings of the Zoological Society,' 1891, p. 377:—

			1.	2.	3.	4.	5.
Var. <i>ridibunda</i> .	Kermanshah.	♂ . . . .	67	34	33	9	3½
"	"	♀ . . . .	86	43	40	12	4
"	"	♀ . . . .	75	38	37	11	4
Var. <i>susana</i> .	Susa.	♂ . . . . .	64	29	29	7	3
"	"	♀ . . . . .	63	29	29	7½	3

1. Length (in millimetres) from snout to vent. 2. Length of tibia (in the flesh). 3. Length of foot measured from outer metatarsal tubercle to tip of fourth toe. 4. Length of inner toe. 5. Length of inner metatarsal tubercle.

LXII.—*Rhynchotal Notes*.—XXXVI. By W. L. DISTANT.

## Fam. Cicadidæ.

THERE are a few unique types described by Walker in the British Museum, which have no locality and are female specimens. Their generic identification is a matter of doubt and difficulty, and the following notes have reference to same.

I also append the descriptions of some species from various habitats.

*Purana? hirundo.*

*Cicada hirundo*, Walk. List Hom. i. p. 152 (1850).

This unlocalized type is a female specimen, not "Mas" as stated by Walker, and apparently belongs to the genus *Purana*.

*Purana? confacies.*

*Cicada confacies*, Walk. List Hom., Suppl. p. 35 (1858).

*Dundubia confacies*, Stål, Öfv. Vet.-Ak. Förh. 1862, p. 481.

This species is only represented by a single unlocalized female specimen. It is apparently a species of *Purana*.

*Diceropyga? nodosa.*

*Cicada nodosa*, Walk. List Hom. i. p. 162 (1850).

A single unlocalized female specimen which I have doubtfully referred to this genus, the principal characters of which are found in the male, viz., the opercula and the structure of the anal abdominal segment.

*Diceropyga? acutipennis.*

*Cicada acutipennis*, Walk. Ins. Saund., Hom. p. 20 (1858).

This species is also only represented by a single unlocalized female specimen, and the remarks appended to the previous species equally apply to this one.

*Terpnosia? stipata.*

*Cicada stipata*, Walk. List Hom. i. p. 155 (1850).

Only represented by a single unlocalized female specimen, which seems clearly to belong to this genus. Should this species be proved ultimately to belong to *Terpnosia* its specific name must be altered, as it is already used in the genus.

Subfam. *CICADINÆ*.

## POLYNEURARIA.

*Platycleura attenuata*, sp. n.

Head and thorax above brownish ochraceous, head with the anterior margins of front and the lateral margins of vertex luteous; base of front, a spot near anterior angle of vertex, and a transverse fascia between the eyes black; pronotum with a central longitudinal fascia (not extending through posterior margin), a longitudinal fasciate spot on each side of disk, the incisures, and a small marginal spot black; mesonotum darker in hue, with four obconical spots, of which the two central ones are very short, two rounded spots in front of cruciform elevation, and a spot on each anterior angle of same, black; abdomen with the basal segmental areas black, their apical areas ochraceous; body beneath piceous, clothed more or less with very short greyish hairs; a somewhat macular transverse fascia between eyes at base of face, apices of anterior and intermediate femora, a longitudinal spot on each side of anterior femora, and the lateral and posterior margins of opercula, ochraceous; a spot on each side of anterior femora near their apices and a longitudinal fascia beneath them, central longitudinal sulcation to face, and a suffusion between face and eyes, and the opercula (excluding margins), black; abdomen beneath piceous, the posterior segmental margins ochraceous; tegmina and wings hyaline, the venation fuscous or fuscous brown; tegmina with the costal membrane brownish ochraceous, with a spot at about one third from its base and the whole basal cell piceous; claval area brownish, thickly greyishly pilose, and with some scattered greyish hairs on the basal half of tegmina; transverse veins at bases of apical areas more or less infuscated and submarginal fuscous spots on most of the longitudinal veins to apical areas; wings with the extreme base pale ochraceous, margins of anal area pale fuscous where the veins are piceous.

Long., excl. tegm., ♂ 19 mm.; exp. tegm. 66 mm.

*Hab.* N. Nigeria; Zunguru (*A. L. de M. Mynn*, Brit. Mus.).

The lateral margins of the pronotum are angularly developed, and extend to about half the length of basal cell; the whole body above is more or less greyishly pilose, and the abdomen in male is short and attenuated posteriorly; the opercula do not quite meet inwardly, and their lateral and



posterior margins are convexly rounded and do not pass the base of abdomen; the tegmina are long and narrow, their greatest breadth being a little less than a third of their length; rostrum passing the posterior coxæ.

#### DUNDUBIARIA.

##### *Purana Davidi*, sp. n.

Body above brownish ochraceous; broad lateral margins to face enclosing a pale spot anteriorly, two transverse fasciæ on each lateral area of vertex, and the area of the ocelli black; pronotum with the anterior and posterior margins and a central linear spot to lateral margins, two central longitudinal fasciæ (widened and amplified anteriorly, united posteriorly), and the incisures black; mesonotum with five black longitudinal fasciæ, the central one continuous, one on each side shorter and a little curved, the two lateral fasciæ much broader, crossing mesonotum, but prominently broken near base; a large spot in front of cruciform elevation and posterior segmental margins black; head beneath, sternum, and legs a little paler than above, abdomen beneath ochraceous; face (excluding a basal spot and transverse striations), space between face and eyes, apices of anterior and intermediate femora and the upper surfaces of same (more or less), coxal spots, apex of rostrum, and abdominal tubercles, piceous or black; tegmina and wings hyaline, venation testaceous, in parts piceous; tegmina with the costal membrane testaceous, a distinct stramineous spot at apex of radial area, and the transverse veins at bases of second, third, fifth, and seventh apical areas broadly infuscated; claval areas to both tegmina and wings fuscous; opercula in male transverse, greyish, their extreme margins piceous, their posterior margins oblique, their posterior angles just passing base of second abdominal segment, outer margins nearly straight, inner angles well separated; rostrum reaching apex of basal abdominal segment, abdominal tubercles very large and prominent; spines to anterior femora long, piceous, their apices testaceous.

Long., excl. tegm., ♂ 26-33, ♀ 27; exp. tegm., ♂ ♀, 79-88 mm.

*Hab.* Kiang-Si (*A. David*, 1875, Paris and Brit. Mus.).

##### *Purana pigmentata*, sp. n.

Body above brownish ochraceous; head with some piceous lateral striæ to front; area of the ocelli with a curved fascia

on each side, and inner margins of eyes, black; pronotum with two central longitudinal fasciæ (almost united anteriorly and posteriorly and with a small discal curved fascia on each side), incisures, narrow lateral and posterior margins, and two spots on each side of posterior margin, black or piceous; mesonotum with a central longitudinal somewhat lanceolate fascia, on each side of which is a short somewhat oblique fascia, a longer and broader fascia on each lateral area, and two rounded spots in front of cruciform elevation, black; a broad outer lateral fascia to tympanal coverings, and anal segment above and beneath, black or piceous, posterior segmental margins a little paler and with some obscure lateral and discal fuscous spots; body beneath and legs a little paler than above; sternum and opercula somewhat finely greyishly tomentose, sternum with some obscure discal piceous spots; face with the upper transverse striæ (not meeting centrally) and discal margins of central sulcation piceous, a black transverse line between face and eyes; abdominal tubercles pale castaneous; tegmina and wings hyaline, their bases narrowly ochraceous, venation ochraceous near base and afterwards fuscous; tegmina with the costal membrane and postcostal veins ochraceous, transverse veins at bases of second and third apical areas slightly infuscated; opercula in male oblique, outwardly moderately convex, somewhat widely separated inwardly, their apices moderately obliquely truncate and about reaching anterior margin of basal abdominal segment; rostrum reaching base of abdomen, its apex piceous; anterior femora beneath with two strong spines and a smaller apical one.

Long., excl. tegm., ♂ 17 mm.; exp. tegm. 47 mm.

*Hab.* Siam, Bangkok; Cambodia; Cochin China, Lakhon.

Allied to *P. carmente*, Walk., from which it differs by the concolorous, shorter, and differently shaped opercula in the male, and also by the broad outer piceous lateral margins of the tympanal coverings.

*Sawda Pratti*, sp. n.

♂ ♀. Brownish olivaceous; anterior margin of front and lateral areas of vertex brownish castaneous, area of ocelli black; pronotum with two central fasciæ amplified anteriorly and posteriorly, the incisures, and inner, lateral, and posterior margins, a central longitudinal line crossing the posterior margin, and the whole of the anterior lateral angles, piceous or black; mesonotum with two central obconical spots, their outer margins continued to anterior angles of

cruciform elevation, an obsolete spot on each side of the two central ones and a similar spot in front of cruciform elevation, piceous; abdomen above much suffused with piceous; body beneath, opercula in male, and legs brownish ochraceous; under surfaces of anterior tibiæ, anterior and intermediate tarsi, and apex of rostrum piceous; tegmina and wings hyaline, veins fuscous, a little suffused with pale fuscous brown along the veins, transverse veins at the bases of second, third, fifth, and seventh apical areas more distinctly infuscated; sublaval areas distinctly fuscous and inwardly margined with black; tegmina with the costal membrane and basal cell brownish ochraceous; opercula in male reaching the penultimate abdominal segment; their apices broad and subangularly rounded, narrowed towards base, where they are concavely sinuate on each side, their inner margins contiguous but not meeting on disk of abdomen, their surface distinctly granulose, their edges a little recurved and apices very narrowly cretaceous; rostrum reaching the posterior coxæ.

Long., excl. tegm., ♂ 48, ♀ 51; exp. tegm., ♂ 154, ♀ 168 mm.

*Hab.* Brit. New Guinea, Ekeikei (*Pratt*).

*Sawda Sharpi*, sp. n.

Closely allied to the preceding species (*S. Pratti*), but differing by its smaller size, the opercula in male only reaching the third abdominal segment, and though of same general shape yet much more narrowed at their bases; transverse veins at the bases of apical areas to tegmina a little more infuscated; pronotum and mesonotum with the piceous markings obsolete.

Long., excl. tegm., ♂ 47 mm.; exp. tegm. 132 mm.

*Hab.* Brit. New Guinea; Ekeikei (*Pratt*).

*Diceropyga aluana*, sp. n.

Head and pronotum ochraceous; lateral striæ to front, a spot at anterior angles of vertex, area of ocelli, and extreme basal margin of vertex, piceous or black; anterior margin of pronotum narrowly black; mesonotum greenish ochraceous, sometimes suffused with piceous, with two obconical spots denoted by their dark outer margins; abdomen in male brownish ochraceous, palely pilose, with a lateral series of large black segmental spots on each side and the apex piceous; in female with the lateral spots smaller, more elongate, and fasciate, and with a large cretaceous spot at

base of anal segment; body beneath and legs pale ochraceous, apex of rostrum black; tegmina and wings hyaline, the venation ochraceous or fuscous; tegmina with the costal membrane greenish ochraceous, a small prominent ochraceous spot at apex of radial area, a fuscous spot on transverse veins at bases of second, third, fifth, and seventh apical areas, and marginal fuscous spots near apices of longitudinal veins to apical areas; opercula in male extending to about half the length of abdomen, their apices subacutely rounded, their outer margins concavely sinuate, their inner margins convex; rostrum passing the posterior coxæ; anterior femora with two strong spines beneath.

Long., excl. tegm., ♂ 33, ♀ 24 mm.; exp. tegm., ♂ ♀, 76-80 mm.

*Hab.* Solomon Islands; Alu (Brit. Mus.).

*Pomponia piceata*, sp. n.

Body and legs uniformly piceous brown; mesonotum with four darker obconical spots, the two central ones shortest; tegmina and wings talc-like, a little opaque, but uncertainly discerned in a somewhat discoloured spirit-specimen, their extreme bases piceous; tegmina with the venation fuscous, in some parts ochraceous, costal membrane piceous brown, transverse veins at bases of second, third, fourth, and fifth apical areas slightly infuscated, and a very obscure marginal series of pale elongate fuscous spots at apices of longitudinal veins to apical areas; wings with the venation brownish; face globose, the striations robust; rostrum passing the posterior coxæ; opercula in male transverse, their posterior margins convex, just reaching base of second abdominal segment, their inner angles a little separated.

Long., excl. tegm., ♂ 42; exp. tegm. 108 mm.

*Hab.* Tonkin, Cho-Moï (Roget, Paris Mus.).

*Oncotympana fuscata*, sp. n.

Head and pronotum brownish ochraceous; head with curved striæ to front, broad inner area to eyes, and area of ocelli black; pronotum with extreme margins, incisures, two broad central longitudinal fasciæ (a little amplified anteriorly, and much amplified posteriorly), two spots on disk, and two large oblique spots on each apical area of posterior margin black; mesonotum black, with two subobsolete central obconical spots, and with the following obscure castaneous maculations, viz., a very obscure spot in each of the obconical areas, a spot outside them, a larger spot at their apices, a spot on each

lateral area, and a transverse spot on each side of the lateral angles to cruciform elevation; cruciform elevation dull castaneous, its disk and a spot on its anterior angles black; abdomen above black, the tympanal coverings dull ochraceous, the posterior basal segmental margins testaceous; sternum and opercula greyish ochraceous; legs and abdomen beneath brownish ochraceous; apices of anterior femora, anterior tibiæ (excluding two longitudinal streaks), apical areas of intermediate tibiæ, apex of posterior tibiæ, anterior tarsi, intermediate tarsi (excluding base), and obscure lateral spots to abdomen, black; spiracular spots to abdomen cretaceous; tegmina and wings moderately infusate, the venation fuscous, in parts dull ochraceous; tegmina with the costal membrane testaceous, the transverse veins at the apices of the second, third, fifth, and seventh apical areas moderately infusate; rostrum passing the posterior coxæ; opercula in male broad, convex, and overlapping, reaching the base of the second abdominal segment.

Long., excl. tegm., ♂ 33; exp. tegm. 108 mm.

*Hab.* North China (Paris Mus.).

Allied to *O. maculaticollis*, Motsch., from which, apart from the different coloration, it may be distinguished by the narrower tegmina and the broader cruciform elevation.

*Oncotympana stratoria*, sp. n.

Body and legs brownish ochraceous; head with lateral striæ to front, two spots on each lateral margin of vertex, area of ocelli, and inner margin of eyes black; pronotum with the lateral margins, incisures, two central longitudinal fasciæ (ampliated anteriorly, and united posteriorly) black; mesonotum with four broken and subobsolete obconical spots, the two central ones smaller and only denoted by their margins, a small marginal spot before the lateral spots, and two rounded spots in front of the cruciform elevation black; abdomen above with two large spots on basal, and the greater part of the remaining segments, black; a broad central fascia to face, apices of anterior and intermediate femora, bases and apical areas of anterior and intermediate tibiæ, apex of rostrum, and lateral abdominal marginal spots, black; tegmina and wings hyaline; tegmina with the venation mostly purplish red on basal half, becoming fuscous towards apex, a somewhat large fuscous spot on transverse veins to second, third, fifth, and seventh apical areas, and a marginal series of minute pale fuscous spots near apices of longitudinal veins to apical areas; venation of wings mostly fuscous brown;

rostrum considerably passing the posterior coxæ; opercula centrally overlapping, not quite reaching base of abdomen.

Long., excl. tegm., ♂ 26; exp. tegm. 83 mm.

*Hab.* Yunnan (Paris Mus.).

Allied to *O. virescens*, Dist., but rostrum larger, opercula shorter, and colour different.

Subfam. *TIBICININÆ*.

*CARINETARIA*.

*GUARANISARIA*, gen. nov.

Allied to *Carineta*, but with the tegmina short, not longer than the body, semiopaque and with an additional vein or veinlet crossing the third ulnar area. Other structural characters as in *Carineta*.

Type, *G. dissimilis*, Dist.

*Guaranisaria dissimilis*, sp. n.

♂. Head and thorax above black, shortly palely pilose; a small central spot at base of head, lateral and posterior margins (very narrow) and the incisures to pronotum, and lateral margins to mesonotum ochraceous, the mesonotum also obsoletely displays the margins of two central obconical spots; abdomen above ochraceous, the basal segment and central area of second segment black; exposed tympana greyish white; body beneath black, the lateral margins of both sternum and abdomen ochraceous and longly pilose; tibiæ and tarsi stramineous, bases and apices of anterior and intermediate tibiæ, and apices of tarsi piceous or black; opercula ochraceous, inwardly, outwardly, and apically piceous; tegmina suffused with shining piceous brown, the costal membrane stramineous, the subclaval area roseate; wings hyaline, the venation ochraceous; front robustly protuberant, about as long as vertex; transverse vein at base of second tegminal apical area almost vertical; rostrum reaching intermediate coxæ; opercula transverse, not meeting inwardly, their posterior margins rounded and not quite reaching base of abdomen.

Long., excl. tegm., ♂ 15 mm.; exp. tegm. 34 mm.

*Hab.* Argentina (*Wagner*, Brit. Mus.); Paraguay; Sapucay (Coll. Heidemann).

A female specimen from Paraguay sent me for identification by Mr. Heidemann has the abdomen completely piceous black above with only marginal lateral ochraceous streaks, beneath the lateral ochraceous abdominal margins are traversed by a black median fascia.

## TAPHURARIA.

*Abroma philippinensis*, sp. n.

♀. Body pale testaceous; head with a castaneous or piceous spot at anterior angles of vertex; mesonotum with four subobsolete obconical spots, of which the two central are shortest; sternum somewhat thickly palely pilose; rostrum with its apex piceous and reaching the intermediate coxæ; streaks to coxæ and femora, and a central fascia to abdomen beneath, piceous; tegmina and wings hyaline, venation ochraceous or brownish ochraceous; costal membrane ochraceous, veins at bases of first and second apical areas and a subclaval streak pale fuscous; front distinctly finely longitudinally sulcate; first and third apical areas of tegmina about equal in length and a little longer than second.

Long., excl. tegm., ♀ 15-17 mm.; exp. tegm. 39-41 mm.

*Hab.* Philippine Islands, Palaouan (Paris Mus.).

I have not seen a male of this species.

## PARNISARIA.

*Quintilia Soulii*, sp. n.

♂. Body above black, mostly palely pilose; head with the apical margin of front, lateral margins of vertex, and a central spot at base testaceous; pronotum with the margins and a central fascia which is amplified posteriorly (where it contains a black spot) pale testaceous; mesonotum with the margins and two central elongate fasciæ (each containing a black spot) testaceous; abdomen above with the segmental margins testaceous; body beneath testaceous; face (excluding margins and basal spot), streaks of femora, anterior tibiæ, bases and apices of intermediate and posterior tibiæ, tarsi, and metasternum black; tegmina and wings hyaline, venation ochraceous on basal and fuscous on apical areas; tegmina with the costal membrane ochraceous; wings with the margins of the anal area fuscous.

*Var. a.*—♀. Mesonotum with only faint indications of the pale central elongate fasciæ.

*Var. b.*—♀. Both pronotum and mesonotum without pale central fasciæ.

Long., excl. tegm., ♂ ♀ 17½ mm.; exp. tegm. 39-42 mm.

*Hab.* Yunnan; Tsé-kou (*Mgr. Soulié*, Paris Mus.). Without locality (Brit. Mus.).

Allied to *Q. megannia*, Dist., but tegmina totally pale hyaline, wings with only margins of anal area infuscated, lateral pronotal margins less oblique and more sinuate, &c.



## CHLOROCYSTARIA.

## AKAMBA, gen. nov.

♂. Head with the front anteriorly and somewhat triangularly produced, centrally distinctly longitudinally impressed, about as long as vertex, ocelli much nearer to each other than to eyes, lateral margins of vertex a little upwardly reflexed and discontinuous with margins of front, including eyes a little narrower than base of mesonotum; pronotum considerably shorter than mesonotum, about as long as head, its lateral margins a little convexly sinuate, its posterior angles somewhat strongly ampliate; abdomen longer than space between apex of head and base of cruciform elevation, subglobose, with a central dorsal longitudinal ridge, and with a prominent laterally produced nodosity on each side of basal segment, the anterior margin of which is a little convex, but not centrally conically produced; tympana completely exposed; anal segment in male largely produced; rostrum reaching the intermediate coxæ; opercula small, obtusely angulate, placed at each lateral margin, not extending beyond base of abdomen; tegmina and wings hyaline, the first with the second and third ulnar areas shortest, apical areas eight, basal cell about twice as long as broad; wings with six apical areas; legs somewhat short and slender, anterior femora with one moderately strong spine.

Allied to *Musoda*, Karsch, from which it differs by the non-conically produced basal abdominal segment and its laterally produced nodosities on each side, &c.

Type, *A. ethiopica*, Dist.

*Akamba ethiopica*, sp. n.

♂. Body and legs ochraceous; ocelli red; pronotum with the margins, a central longitudinal fascia, on each side of which is a short curved discal fascia, and the incisures fuscous brown; mesonotum with two short central obconical spots, on each side of these a short anterior elongate spot, followed by three long fasciæ on each lateral area, fuscous brown (these spots and markings are sometimes obsolete); posterior abdominal segmental margins red; tegmina and wings hyaline, the venation ochraceous; tegmina with the costal membrane and postcostal area ochraceous; abdomen above distinctly, finely, palely pilose; lateral pilose protuberances to basal abdominal segment with their margins



fuscous; head with a distinct longitudinal impression on each side of ocelli.

Long., excl. tegm., ♂ 14 mm.; exp. tegm. 39 mm.

*Hab.* West Africa; Free Town, Sierra Leone (*E. E. Austen*, Brit. Mus.). B. E. Africa; Samburu (*C. S. Betton*, Brit. Mus.).

*Gymnotympana olivacea*, sp. n.

Body olivaceous; sternum, opercula, and legs a little paler; head with the anterior margin of front piceous; anterior tibiæ brownish, striped with fuscous, apices of tarsi fuscous; tegmina and wings hyaline, the venation olivaceous; costal membrane of tegmina olivaceous; rostrum just passing the anterior tibiæ, its apex fuscous; opercula in male with their apices broadly rounded, inwardly somewhat obliquely sinuate.

Long., excl. tegm., ♂ ♀ 26-30 mm.; exp. tegm., ♂ 70-78, ♀ 90 mm.

*Hab.* Brit. Centr. New Guinea; Dinawu, 3600 feet (*Pratt*).

Genus PLAUTILLA.

*Plautilla*, Stål, Öfv. Vet.-Ak. Förh. 1865, p. 155; Hem. Afr. iv. p. 2 (1866).

Type, *P. stalagmoptera*, Stål.

By the kindness of Dr. Handlirsch of the Vienna Museum, I have been able to examine a cotype, determined by Stål himself, of *P. stalagmoptera*, the type of the genus.

♂. The tympana are entirely uncovered; the opercula in male large and convex, inflated, and projecting beyond the lateral margins of the abdomen as in the genus *Gymnotympana*; the tegmina are moderately short and broad, their greatest width being a little less than half their length and half as broad again as the wings; tegmina with eight apical areas, bases of the upper vein to lower ulnar area and lower vein to radial area fused; pronotal lateral marginal areas angularly dilated, thus resembling *Zammara*, to which Stål allied *Plautilla*, but which belongs to a different subfamily, by the complete absence of tympanal coverings; head (including eyes) half the width of base of mesonotum; abdomen beneath (excluding apical segment) concave, with a central longitudinal ridge and the lateral margins recurved.

This genus clearly forms the type of a new division, which may be called Plautillaria, to be placed between the Melampsaltaria and Hemidictyaria. To the first it is allied by the venation of the tegmina, and to the second by the head

(including eyes) being only half the width of base of mesonotum.

I refrain, however, from giving fuller characters, as there are apparently other genera to be included and a divisional diagnosis must not be too narrow or exclusive. Thus the *Cicada humeralis*, Walk. (Insect. Saund., Hom. p. 15, 1858), evidently represents an allied but undescribed genus to *Plautilla*, but the unique male type has its abdomen mutilated, and is therefore not in a condition for generic description.

### Fam. Fulgoridæ.

#### Subfam. FULGORINÆ.

#### Genus PYROPS.

*Pyrops*, Spin. Ann. Soc. Ent. Fr. viii. p. 231 (1839); Dist. Tr. Ent. Soc. 1893, p. 443.

*Zanna*, Kirk. J. Nat. Hist. Soc. Bomb. xiv. p. 47 (1902).

#### *Pyrops Rendalli*, sp. n.

Allied to *P. pustulatus*, Gerst., from which it differs by the longer, more robust, and obliquely ascending head; colour of tegmina and wings as in Gerstaecker's species.

I have had in my possession for the last ten years a mutilated specimen (wanting the abdomen and legs), given me by Dr. P. Rendall, who captured it at Zomba; in working over the genus I am now compelled to shortly describe it as above.

Exp. tegm. 72 mm.

Hab. B. C. Africa: Zomba (*Dr. P. Rendall*, Coll. Dist.).

Length of head (*P. pustulatus*, Gerst.) 7-7½ mm.; apex of cephalic process slightly depressed.

Length of head (*P. Rendalli*, Dist.) 10 mm.; apex of cephalic process obliquely erect.

#### *Pyrops pulmunculus*, sp. n.

Head about twice longer than abdomen, somewhat shining brown, obscurely mottled with olivaceous, more prominently so beneath and on apex above, basal area rugose; pronotum olivaceous, mottled with brown, rugose; mesonotum brownish ochraceous, rugosely punctate; abdomen brownish ochraceous, the apical appendage piceous; legs and sternum much shaded with olivaceous, legs with obscure and irregular fuscous markings; abdomen beneath greyish, thickly fuscously punctate; tegmina greyish, with closely reticulate sanguineous and fuscous veins, not extending to the apical area, which is

a little paler, with more regular transverse veins, costal edge finely hirsute; wings dull pale ochraceous, the apex very broadly and the posterior margin moderately pale fuscous; head much longer than space between its base and apex of abdomen.

Long. head, from angle of apex to eyes 17 mm.; eyes to apex of abdomen  $13\frac{1}{2}$  mm.; exp. tegm. 44 mm.

*Hab.* Java: Surabaya (Brit. Mus.).

The principal characters of this species are its very long cephalic process and the distinctive coloration of the tegmina and wings.

*Pyrops tapirus*, sp. n.

Head, pronotum, mesonotum, body beneath, and legs ochraceous; head with large coarse black punctures, most numerous on basal halves of lateral areas, less numerous on basal third of upper surface, on apical half of upper surface two on each outer carination, beneath with about six in sub-longitudinal series on basal half; body beneath with black punctate spots, most conspicuously marked on lateral areas of prosternum, clypeus, and under surface of abdomen; legs spotted with black, anterior and intermediate tarsi black; abdomen above testaceous, posterior segmental margins ochraceous, apex piceous, and somewhat longly ochraceously pilose; tegmina pale ochraceous, the venation a little darker, and the whole surface somewhat thickly sprinkled with small black spots, some a little larger than others; wings creamy white; the cephalic process is robust and distinctly slightly recurved downwards at apex, which has its face marginately but not centrally carinate; the apex of the rostrum is black and reaches the intermediate coxæ; the two outer longitudinal carinations to the cephalic process both above and beneath are much waved.

Long. head, from angle of apex to eyes 12 mm.; eyes to apex of abdomen 19 mm.; exp. tegm. 60 mm.

*Hab.* Java (Horsfield Coll., Brit. Mus.).

A species to be recognized by the robust cephalic process, apically recurved, and distinctly and peculiarly maculately punctured with black.

*Pyrops Dalyi*, sp. n.

Body and legs pale brownish ochraceous; cephalic process finely and thickly blackly punctate on lateral areas, a little more finely so beneath, and very obsoletely so on discal area above, the two outer carinæ beneath with about six sub-tubercular reddish-ochraceous spots; clypeus, sternum, and

legs finely blackly punctate, femora with an apical and anterior and intermediate tibiæ with two incomplete black annulations; abdomen beneath with black spiracular spots, abdomen above with the anterior segmental margins more or less piceous; tegmina greyish white, the venation testaceous, the whole surface more or less sprinkled with minute shining black spots, some a little larger than others; wings creamy white, the venation very pale ochraceous; head horizontally porrect, about as long as space between its base and apex of abdomen, gradually attenuated anteriorly, its face with its margins and a central longitudinal line carinate.

Long. head, from angle of apex to eyes  $11\frac{1}{2}$  mm.; eyes to apex of abdomen 12 mm.; exp. tegm. 34 mm.

*Hab.* Siam: Lacan (*Malcolm Daly*, Brit. Mus.).

A small species, to be identified by its long, horizontally porrect, and anteriorly narrowed cephalic process, with its bright subtubercular reddish-ochraceous spots beneath.

#### Genus FULGORA.

*Fulgora*, Linn. Syst. Nat. ed. xii. i. (2) p. 703 (1767).

*Holinus*, Amy. & Serv. Hém. p. 490 (1843).

*Pyrops*, Kirk. J. Bomb. Nat. Hist. Soc. xiv. p. 47 (1902).

#### *Fulgora siderea*, sp. n.

Body and legs ochraceous; abdomen above thickly cretaceously tomentose; cephalic process above somewhat thickly covered with minute white spots, beneath unspotted; base of head and a short longitudinal fascia not extending beyond the latitude of eyes, two spots between eyes, a spot in front, another behind, and the posterior margins of eyes black; pronotum with a black spot near each anterior angle; mesonotum with six spots arranged in pairs (the two central largest) on anterior margin and a large oblique spot on each lateral margin black; rostrum, anterior and intermediate tibiæ, all the tarsi, and transverse fasciæ to abdomen beneath black; tegmina greenish ochraceous, thickly interspersed with small black maculate markings, four large black spots on costal membrane, a number of large ochraceous spots margined with white arranged in somewhat transverse but much broken series, some of the spots united; wings cretaceous white, the upper area (including apex) purplish red, and containing some irregular black apical spots; cephalic process measured from angle of apex to eyes about as long as from middle of mesonotum to apex of abdomen, nearly its apical half upwardly recurved, its apex broadly laterally compressed.

Long. ceph. process, from angle of apex to eyes 17 mm. ; eyes to apex of abdomen 24 mm. ; exp. tegm. 76 mm.

*Hab.* Borneo (Brit. Mus.).

I have for many years had an unlocalized specimen in my own collection.

*Fulgora evanescens*, sp. n.

Body and legs ochraceous ; rostrum, anterior and intermediate tibiæ, and all the tarsi piceous ; abdomen beneath with small, scattered, fuscous spots ; cephalic process marked above and beneath with very small and obscure pale spots ; tegmina ochraceous, with darker suffusions on apical area and four or five large darker spots in costal membrane ; there are also a number of scattered obsolete paler spots with dark centres, some of which are united ; wings pale hyaline, with an obscure, pale fuscous, curved, fasciate spot above the apex of radial area ; cephalic process long and slender, only slightly upwardly recurved, and from its apex to eyes as long as from eyes to apex of abdomen ; rostrum passing the posterior coxæ.

Long. ceph. process, from angle of apex to eyes 19 mm. ; eyes to apex of abdomen 19 mm. ; exp. tegm. 70 mm.

*Hab.* Nias Island.

Allied to *F. lauta*, Stål.

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LXIII.—*Notes on British Copepoda: Change of Names.*

By THOMAS SCOTT, LL.D., F.L.S.

IN the 'Fifteenth Annual Report of the Fishery Board for Scotland' (1897), part iii. p. 150, I described a species belonging to the Copepoda under the name of *Delavalia mimica* ; but though it exhibited a close affinity with the genus *Delavalia*, especially in the structure of the mandibles and of the fifth pair of thoracic feet, the structure of the first pair more nearly resembled those of *Nitocra* or *Ameira*, the inner branches of that pair being composed of three instead of two joints. In my remarks on the species I referred to this difference ; but because the species had such a general resemblance to *Delavalia* it was provisionally ascribed to that genus.

During recent years many specimens of this species, both from the Scottish and English coasts, have been examined,

and they all agree in showing the marked difference in structure of the first pair of thoracic feet mentioned above, and I now propose to remove this species to another genus rather than modify that to which it was provisionally ascribed. The following is the name and definition of the genus:—

BEATRICELLA \*, T. Scott, gen. nov.

*Definition of the genus*.—Similar to *Delavalia*, G. S. Brady, in general appearance. Antennules eight-jointed. Outer ramus of the antennæ three-jointed. Mandibles as in *Delavalia*, the terminal branch of the mandible-palp being furnished with a long, curved, and moderately stout seta. Other mouth-appendages as in *Delavalia*.

Both branches of the first pair of thoracic feet three-jointed; inner branches longer than the outer ones, first joint longer than or subequal to the second and third joints. The second to the fourth pairs as in *Delavalia*. Fifth pair foliaceous and somewhat similar to those of the genus mentioned.

*Beatricella mimica*, T. Scott.

1897. *Delavalia mimica*, T. Scott, Fifteenth F. B. Report, part iii. p. 150, pl. i. figs. 1-9.

In this species the first joint of the inner branches of the first pair of thoracic feet are as long as the entire length of the three-jointed outer branches, but the second and third joints are very short, being together scarcely half as long as the first joint. The fifth pair resemble those of *Delavalia reflexa*, G. S. Brady, but the basal joint bears interiorly a group of three tolerably short and stout spines and a small spiniform seta. The fifth pair in the male are smaller than those of the female; the basal joint is armed interiorly with a single moderately large and broad spine of a somewhat peculiar shape; it is broad and flattened rather than round, and with the sides parallel except near the distal end, where they rapidly converge and form a triangular extremity; a minute seta springs from each of the lateral angles at the distal end, while the apex is extended to a fine point; the secondary joint is small, subovate in form, and bears three spines on the oblique distal end of the outer margin, a moderately long seta at the apex, and a smaller one on the inner margin.

\* Named in compliment to Miss Beatrice Sprague, daughter of Dr. T. B. Sprague, Edinburgh,—a successful student of the Scottish freshwater Entomostraca.

*Remarks*.—In *Beatricella mimica* the first pair of thoracic feet have a close resemblance to those of certain species of *Dactylopusia* and *Ameira*; hence the specific name.

*Habitat*.—Firths of Forth and Clyde, Moray Firth, vicinity of Plymouth, &c., but not very common\*.

*Delavalia Normani*, T. Scott, nom. nov.

1899. *Delavalia Giesbrechti*, var., T. Scott, Seventeenth F. B. Report, part iii. p. 254, pl. xiii. figs. 20–22.

A few specimens of a *Delavalia* were obtained at Hunterston, Firth of Clyde, in the autumn of 1898; they resembled to some extent a species previously described by T. and A. Scott under the name of *Delavalia Giesbrechti*, but differed in one or two points, and notably in the absence of the peculiar tail-setæ which are so characteristic of *D. Giesbrechti*; but as it was considered that the differences observed might, to some extent at least, be due to difference in *habitat*, and as only one or two specimens had been noticed, they were recorded simply as "*Delavalia Giesbrechti* var."

Subsequently, however, it was ascertained that the Rev. Canon A. M. Norman had collected the same form at Salcombe, South Devon, in 1875, and again in 1903, as well as at other places on the coasts of Devon and Cornwall. The examination of these additional specimens showed that the differences previously observed were constant and not due to difference in local surroundings; this form should therefore be regarded as a distinct species, and the name I propose for it is *Delavalia Normani*.

In this species the two-jointed inner branches are only slightly longer than the outer, the first joint is robust and rather more than half the length of the second, while the second is not only more elongated than the first, but is also distinctly narrower and tapers slightly towards the distal extremity; the apical seta, which is fully longer than the second joint, is moderately stout and spiniform, and there are three setæ on the inner margin of the second and one on the first joint.

In the fifth pair in the female the basal joint is short and furnished interiorly with four tolerably long plumose setæ along its lower edge; they are arranged in pairs, one pair being near the inner angle, the other close behind the

\* A second species—*Delavalia (Beatricella) æmula*, T. Scott,—in which the three joints of the inner branches of the first pair of thoracic feet are nearly of equal length, is described in the Eleventh Report of the Fishery Board for Scotland, pt. iii. p. 204, pl. iv. figs. 36–47 (1893).



secondary joint, so that there is a comparatively wide space between the two pairs. The secondary joint, which is lamelliform and with nearly parallel sides, is about one and a half times longer than broad, the width slightly increasing toward the distal end; it is provided with five setæ, one on the outer margin and four round the distal extremity; the marginal seta, which springs from a notch on the outer edge, is stout and spiniform; the outermost and innermost of the four apical setæ are of moderate length, but the other two are short.

The furcal joints, which are rather shorter than the last abdominal segment, are comparatively widely apart and also somewhat divergent.

#### THOMPSONULA, T. Scott, gen. nov.

My friend the late Mr. I. C. Thompson, of Liverpool, whose interesting discoveries have added so much to our knowledge of the Copepod fauna of the British Islands, described in 1899, under the name of *Jonesiella hyæncæ*, a somewhat curious form that had recently been observed in some collections from Port Erin Bay, Isle of Man. This form was also subsequently obtained in the Firth of Forth and at some other places around our shores, and its distribution as now known is fairly extensive.

Although this form was included in the genus *Jonesiella*, G. S. Brady, it differs from the typical members of that genus in one or two important particulars, and especially in the structure of the first pair of thoracic feet. In the generic definition given by Professor Brady the inner branches of the first pair are described as "two-jointed, and bearing long terminal setæ, but no claws"; in *Jonesiella hyæncæ*, on the other hand, the inner branches are distinctly three-jointed. In my remarks on this species in the 'Eleventh Annual Report of the Fishery Board for Scotland,' part iii. p. 203 (1893), it is stated that "these differences may render it necessary to modify the generic description or to remove *Jonesiella hyæncæ* to another genus"\*. I now propose to adopt the latter of these suggestions, and have named this new genus after my late friend.

*Definition of the genus Thompsonula*.—Somewhat similar

\* It is interesting to note that Mr. I. C. Thompson also realized the difficulty referred to here, but was inclined "to slightly modify an existing genus rather than make a new one."



to *Jonesiella* in general appearance. Antennules (anterior antennæ) short and composed of six joints. Antennæ (posterior antennæ) with the outer ramus well developed, three-jointed, middle joint short. Mandibles distinctly two-branched. First pair of thoracic feet with both branches three-jointed, the inner being more elongated than the outer branches; other thoracic feet somewhat similar in structure to those of *Jonesiella*.

*Thompsonula hyænæ* (I. C. Thompson).

1889. *Jonesiella hyænæ*, I. C. Thompson, Proc. Biol. Soc. Liverpool, vol. iii. p. 193, pl. ix. figs. 1-10.

1893. *Jonesiella hyænæ*, T. Scott, Eleventh F. B. Report, pt. iii. p. 202, pl. iii. figs. 1-6.

In this species the basal joint of the short six-jointed antennules is very stout and comparatively large; it extends forward, while the remaining joints curve outwards, so that the last three are nearly at right angles to the basal joint. The rostrum, which extends forward between the basal joints of the antennules, reaches to beyond the extremity of these joints. The furcal joints are extremely short, and as the last abdominal segment is tolerably broad, the posterior has an abruptly truncated appearance.

Further particulars concerning this interesting species will be found in the papers referred to above.

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LXIV.—*Note on Hexanchus griseus*.

By C. TATE REGAN, B.A.

THE British Museum has recently received, from Captain Alan Owston, a shark of the genus *Hexanchus*, captured in Japanese seas.

The specimen measures 2100 mm. in total length, and for comparison with it I had a small example (600 mm.) of *Hexanchus corinus*, Jordan and Gilbert, from the Pacific Coast of the United States, as well as specimens of the Atlantic *H. griseus*.

The Japanese fish closely resembles the one named *H. corinus* in most respects, but differs notably in the dentition. In the lower jaw the median tooth has about 4 distinct cusps on each side and 3 minute ones on the upper edge, whilst the lateral teeth have from 8 to 10 cusps each. In the upper jaw

the median pair of teeth are slender and unicuspid, the next pair have a minute basal cusp, which becomes well-developed and pointed on the next 3 or 4 on each side. In the smaller fish (*H. corinus*) the lower median tooth has 2 or 3 cusps on each side and none on the upper edge, whilst each lateral tooth has only 6 cusps; the second pair of teeth in the upper jaw are unicuspid, and the next 3 have only a very small and obtuse basal cusp.

In the larger shark the fins are relatively less developed and consequently they are more widely separated from each other. The anal begins below the last  $\frac{1}{4}$  of the dorsal and the length of its base is less than its distance from the caudal, which fin is  $\frac{2}{7}$  the total length of the fish, whereas in the smaller example the origin of the anal is only a little behind the middle of the dorsal, the length of its base is equal to its distance from the caudal, which is more than  $\frac{1}{3}$  the length of the fish.

Examination of a series of examples from the Mediterranean and the Atlantic shows conclusively that these differences are due to the size of the fish and are not specific. The British Museum has large specimens agreeing in dentition and the position of the fins with the Japanese example, and smaller ones which resemble the Californian fish in these respects. Moreover, after a careful comparison, I am unable to find any reason for referring the Pacific and Atlantic specimens to different species, and I am forced to conclude that there is but one living species of *Hexanchus*, viz. *H. griseus*, L., which has a wide distribution.

LXV.—*A new Genus and Two new Species of Bats.*

By OLDFIELD THOMAS.

*Eomops*, gen. nov.

In 1900 \* Dr. Scharff described a bat from Benin under the name of *Mormopterus Whitleyi* and was good enough to transfer the typical specimen to the British Museum.

Later on Dr. W. J. Ansorge obtained on the Lower Niger two examples of the same bat, and in examining these I find that a mistake has inadvertently been made in the dental formula given, and that, instead of being a *Mormopterus*, this

\* Ann. & Mag. Nat. Hist. (7) vi. p. 569.

bat belongs to quite a different group, hitherto unknown in the Old World.

For it proves to have the characteristic incisors of *Molossus*, the upper pair being large, nearly filling up the space between the canines, and touching each other in the middle line. The lower ones are only two in number, not four as originally stated, and while appearing from the front to be of the normal shape—*i. e.*, narrow, broadening upward, each with a deep central notch dividing it into two cusps, of which the inner is the higher—they are curiously deep antero-posteriorly, deeper than broad, their hinder part running back between the canines.

The premaxillary region of the palate is very completely ossified, in great contrast to all the members of the *Nyctinomus* group, the only remnant of the premaxillary notch being two minute foramina on each side of the middle line, between and opposite the centre of the canines.

The skull is smooth and rounded, not broadened and flattened across the muzzle as it is in *Myopterus*, nor specially crested as in *Molossus*. The base of the skull has a narrow median ridge between two well-defined sphenoid pits.

Under these circumstances it is clear that this bat cannot be referred to *Nyctinomus* or *Mormopterus*, but is more nearly allied to *Molossus*, *Myopterus*, and their allies. The peculiar shape of its lower incisors, however, and the detailed structure of its skull prevent its being referred to any one of the existing American genera, and I would therefore propose to erect for its reception a special genus, which might bear the name of *Eomops*.

It is also to be noted that, owing to the bad condition of his specimens, Dr. Scharff described the underside of *Eomops Whitleyi* as "of a light reddish-yellow colour"; but Dr. Ansorge's fresh examples show that this is pure white, as are also the wing-membranes above and below, the digits, and the underside of the interfemoral; the upper surface of the forearms, tibiæ, and interfemoral are pale whitish brown.

#### *Vespertilio Matschiei*, sp. n.

A small sandy-coloured species, in general external appearance very like *Scotophilus Schlieffeni*.

Size small. Fur of medium length, hairs of back about 4 mm. long; strictly confined to the body, not extending on to the limbs or membranes, except slightly at the base of the

tail. General colour of fur uniform sandy buff above, rather paler below, strongly contrasting with the blackish ears and wings; the hairs unicolor throughout. Ears rather short; inner margin strongly convex at base, almost straight above to the rounded tip; outer margin flattened mesially, convex below and ending in a long low antitragal lobe. Tragus short, its inner margin slightly concave, tip rounded, outer margin convex with a well-marked rounded basal lobule. Wings to the metacarpus. Extreme tip of tail projecting.

Skull slender, with a small brain-case, but widely expanded zygomata. Muzzle remarkably flattened, the space between the orbits quite flat or even concave, the strong supraorbital ridges rising up higher than its central line; as a result the upper profile-line of the skull is decidedly concave in its anterior half, only becoming gradually convex over the brain-case. Nasal notch sharply angular behind.

Inner upper incisor conical, unicuspid in the type, but a supplementary cusp may have been worn off; outer incisor similar in shape, about one fourth the size of the inner. Lower incisors crowded, overlapping, tricuspid, the outer notch on each deeper than the inner one.

Dimensions of the type (measured on the skin):—

Forearm 35 mm.

Head and body (c.) 41; tail (c.) 32; third finger, metacarpus 35, 1st phalanx 11, 2nd phalanx 13; tibia 14.

Skull: greatest length 12·3; basal length in middle line 10; front of canine to back of  $m^3$  4·5; front of lower canine to back of  $m_3$  4·7.

*Hab.* Jimel, near Aden. Alt. 850 m.

*Type.* Male. B. M. no. 99. 11. 6. 19. Collected 16th August, 1899, by W. Dodson. One specimen.

This little bat has so remarkable a resemblance to *Scotophilus Schlieffeni* that it was included among the specimens of that species recorded in my paper on the Dodson mammals from Aden\*. Now, however, that its skull has been looked at it proves to be a *Vespertilio*, in which genus its peculiar colour distinguishes it from all described species except *V. Floweri* †, from which its smooth forearms and unusually flattened muzzle readily separate it.

I have named this interesting species in honour of my friend Dr. Paul Matschie, of the Berlin Museum, whose notes ‡

\* P. Z. S. 1900, p. 99.

† *Glauconycteris Floweri*, de Wint. Ann. & Mag. Nat. Hist. (7) vii. p. 45 (1901).

‡ SB. Ges. nat. Fr. Berl. 1893, p. 26.

on *Scotophilus Schlieffeni* and other mammals from Aden formed the first contribution to the mammalogy of that region.

*Hesperoptenus Tomesi*, sp. n.

A large species allied to *H. Tickelli*, but wholly dark brown, like a Noctule.

Size about as in *H. Tickelli*, the skull rather larger but the wing-bones shorter. Fur close and fine, the hairs of the back about 4–5 mm. in length, but those of the nape much longer, attaining 8–10 mm. Base of interfemoral slightly haired above and below, rest of the membranes naked. General colour above uniform dark brown (“burnt umber,” but darker), the hairs darkest at their bases, rather lighter mesially, and with dark tips, but the difference is scarcely perceptible. Under surface similarly uniform brown (about matching Ridgway’s burnt umber) throughout. Wing-membranes everywhere dark brown.

Ears short, rounded above, with a small rounded basal lobule at the base of their inner margin; outer margin ending in a long low antitragal lobule. Tragus very broad, its inner margin faintly concave, tip pointed; outer margin very convex, strongly bowed opposite the base of the inner margin; outer basal lobule rounded; a narrow band of fine hair passing across the front face of the tragus at its broadest point. Wings to the end of the metatarsus. Postcalcereal lobule narrow. Penis long, with a very long bone, similarly Y-shaped to that of *H. Tickelli*, but twice as long (10 mm. in length in the type) and much thicker; whether the glands and prepuce are similar to those of *H. Tickelli* cannot be determined on the dried type.

Skull rather larger than that of *H. Tickelli*, the sagittal crest rather lower, but the posterior “helmet” more projected backward.

Teeth larger and heavier than those of *H. Tickelli*.  $I^1$  large in section, its postero-external side almost touching the canine outside  $i^2$ , which is also very large, placed quite behind  $i^1$ , opposite the middle of the canine, and is separated from the inner corner of the premolar by a distance only equal to its own diameter. Premolar much extended transversely. Below, the incisors are all heavier than in *H. Tickelli*,  $i_3$  being particularly large.

Dimensions of the type (measured in skin):—

Forearm 51 mm.

Head and body 74; tail (vertebræ in place) 44; ear 14;

tragus, inner edge 5, breadth 3; third finger, metacarpus 45, 1st phalanx 22, 2nd phalanx 22; fifth finger 58; lower leg and foot (c. u.) 32.

Skull: greatest length 20.5; zygomatic breadth 15.5; occiput to nasal notch 17; front of canine to back of  $m^3$  8.3.

*Hab.* Malacca.

*Type.* Adult male. Original number 190 A. From the collection of the late Mr. R. F. Tomes.

This fine bat, which is distinguishable at the first glance from its only near ally, *H. Tickelli*, by its uniform dark colour, was recognized by Mr. Tomes as a new species, and marked by him with a name which I would have adopted did it go euphoniously with the long generic name *Hesperoptenus*. But as it does not I am glad to commemorate Mr. Tomes's great interest in bats, and the work he did on them, by naming this species in his honour.

#### BIBLIOGRAPHICAL NOTICE.

*Coloration in Polistes.* By WILHELMINE M. ENTEMAN. Published by the Carnegie Institution of Washington, November 1904. Sm. 4to. Pp. 88, col. pls. vi., and 27 figures in the text.

*POLISTES* is a handsome and widely-distributed genus of wasps allied to *Vespa*; it is, however, unrepresented in Britain, and only one species (*P. gallicus*, L.) is found in Europe, though this has been met with as far north as Lapland. After a general account of the genus the present essay records the results of a careful investigation into individual variation in the colour-pattern of *Polistes*; ontogenesis of the colour-pattern; physical and chemical nature of the pigment; geographical distribution of the types of colour-marking; laws governing colour-differentiation; and considerations with respect to various theories of evolution. Two of the plates are devoted to colour-patterns, two to figures of various species of the genus, and two to maps showing distribution. The parallel drawn between Eurasian and American variation in the genus is specially interesting.

We also meet with occasional references to colour-patterns in other Vespidae, as well as in butterflies &c. The authoress's conclusions are finally summed up under fourteen heads, too long to quote here, and we must confine ourselves to calling attention to a work which should not be overlooked by biologists (whether specially hymenopterists or not) who are interested in coloration, geographical distribution, and the other factors bearing on evolution which are here discussed.

# THE ANNALS

AND

## MAGAZINE OF NATURAL HISTORY.

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LXVI.—*Descriptions of new Species of Noctuidæ in the British Museum.* By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c.

[Concluded from p. 549.]

GENUS *ELÆOGNATHA*, NOV.

Type *E. argyritis*.

Proboscis absent; palpi slender, the second joint reaching vertex of head and with tuft of hair on inner side at extremity, the third long and somewhat dilated at extremity; frons smooth, rounded; eyes large; antennæ of female laminate; head and thorax clothed chiefly with scales, the pro- and metathorax with spreading crests; fore tibiae fringed with long hair on outer side; abdomen with dorsal crest at base and slight subdorsal tufts of hair. Fore wing elongate, the inner margin strongly arched, the apex rounded and the termen obliquely curved; vein 2 from middle of cell, curved at base; 3 and 5 from close to angle of cell; 6 from upper angle or from areole, which is rather long and formed by 9 from 10 anastomosing with 7, 8; 11 from cell. Hind wing with veins 3 and 5 stalked, 4 absent; 6, 7 stalked; 8 anastomosing with the cell to near extremity.

*Elæognatha argyritis*, sp. n.

♀. Head and thorax silvery white; palpi with the second joint dark brown at sides; tips of tegulæ and patagia dark

brown; fore tibiae and tarsi banded with fuscous; abdomen white, dorsally tinged with brown. Fore wing silvery white; some black points at base; silvery-blue streaks in base of submedian fold and above base of inner margin, black at extremities; a waved black subbasal line from costa to just above inner margin; a large rufous patch on middle of costa, defined on inner side by the antemedial line, which is angled outwards on subcostal nervure and ends at submedian fold; medial black striæ from cell and vein 1; a quadrate black spot in middle of cell and obliquely curved discoidal bar, with two slight oblique marks beyond it; postmedial line irregularly waved, oblique from costa to vein 6, then inwardly oblique to vein 2, retracted to cell, then excurved and angled inwards in submedian fold, a brown patch beyond it from costa to vein 6, constricted at middle and with oblique bar from its lower edge; subterminal line rather slight and punctiform, angled outwards at vein 7 and inwards below 7 and 3, some brown beyond it at apex and an oblique streak from it to termen above tornus; a terminal series of black points. Hind wing pale fuscous.

*Hab.* PANAMA, Cana Mines (*Tylecote*), 1 ♀ type.  
*Exp.* 30 mm.

*Elæognatha phæostrota*, sp. n.

♀. Head and thorax clothed with silvery-white, reddish-brown, and black scales; palpi with the second joint blackish at sides; pectus and legs grey, the fore and mid tarsi fuscous above; abdomen grey, dorsally suffused with reddish brown. Fore wing grey, irrorated with black and suffused with dark brown except on terminal area; a very indistinct antemedial series of dark spots; a black point in middle of cell and another on discocellulars; postmedial line bent outwards below costa, then somewhat dentate, incurved between veins 5 and 3, then retracted to the cell, bent outwards between veins 2 and 1, then retracted to before middle of wing and bent outwards again to inner margin; subterminal line fuscous defined by white on inner side, minutely waved, angled outwards at veins 7, 6, retracted at vein 3 and ending at tornus; a terminal series of prominent black spots. Hind wing dark reddish brown; cilia whitish at tips.

*Hab.* PANAMA, Cana Mines (*Tylecote*), 1 ♀ type. *Exp.* 36 mm.



*Iscadia diopis*, sp. n.

*Iscadia aperta*, Druce, Biol. Centr.-Am., Het. ii. p. 474 (part.).

♀. Head and thorax clothed with fuscous, red-brown, and grey scales; palpi with the second joint white in front, black at sides except at tips; pectus and legs grey-brown; abdomen fuscous brown, the ventral surface whitish. Fore wing grey irrorated with black and suffused in parts with dark red-brown; some rufous suffusion at base followed by dark red-brown except towards costa; antemedial line indistinctly double, waved, strongly excurved below cell, followed by some dark red-brown suffusion; orbicular and reniform round brownish ocelli defined by fuscous and with spots of raised black scales in centre; an indistinct irregular medial line angled outwards below costa; postmedial line double, the outer line less distinct, irregularly waved, strongly bent outwards below costa, angled inwards at discal fold and bent inwards at vein 2 to below end of cell, some dark brown suffusion beyond it at discal fold and on inner area; subterminal line grey, defined on inner side by slight dentate dark marks and on outer by dark brown suffusion, minutely dentate, angled outwards at vein 7 and excurved at middle; a series of small black marks just before termen connected by short streaks with a terminal series of small lunules. Hind wing fuscous brown; cilia greyish at tips.

*Hab.* COSTA RICA, Sta. Clara Valley, 1200 feet (Zurcher), 1 ♀ type. *Exp.* 50 mm.

*Iscadia poliopepla*, sp. n.

♀. Head and thorax grey, mixed with dark brown; palpi with the second joint white in front, black at sides except at tips; vertex of head blackish; tegulæ with black medial line; abdomen grey, the dorsal crests blackish at tips. Fore wing grey irrorated with black and suffused with brown except on basal and terminal areas, the basal area whiter; an obliquely curved dark antemedial line; a diffused dark line forming the inner edge of the brownish area; a black point in end of cell and two black discoidal points on a faint whitish bar; postmedial line obliquely excurved from costa to vein 4, then strongly incurved and sinuous, angled inwards just below submedian fold, followed by another minutely dentate line bent inwards below vein 3; subterminal line white, very irregular, oblique at costa, angled inwards below vein 7 and at discal fold, interrupted and bent inwards to the second postmedial line and vein 2, where it forms a

whitish mark irrorated with black, then oblique and sinuous to tornus, some short black streaks beyond it towards apex; a series of prominent black points just before termen forming two striæ above tornus. Hind wing white, the veins and marginal areas slightly tinged with brown; the underside with brown patch on costa before apex.

*Hab.* BRAZIL, Rio Janeiro (*E. Wilson*), 1 ♀ type. *Exp.* 44 mm.

*Plotheia nephelozona*, sp. n.

♀. Head and thorax grey, tinged with pale red-brown; abdomen whitish. Fore wing grey, tinged with pale red-brown and slightly irrorated with black; a broad diffused irregular medial fuscous band expanding on costa towards apex and on inner margin towards base, with a very small elongate tuft of raised scales on it in middle of cell; two minute black discoidal points; faint traces of a subterminal line; a very slight brown shade on apical part of terminal area; a terminal series of minute black points. Hind wing semihyaline white; the termen slightly tinged with brown towards apex and with some slight points at middle; the underside with the costal area slightly tinged with brown.

*Hab.* BR. E. AFRICA, Kikuyu, Nairobi plains (*Crawshay*), 1 ♀ type. *Exp.* 30 mm.

*Plotheia canofusa*, sp. n.

♀. Head, thorax, and abdomen grey-white slightly mixed with brown; fore tarsi tinged with fuscous. Fore wing pale brownish ochreous suffused with grey-white on basal and costal areas and slightly irrorated with fuscous; antemedial line indistinctly double, oblique, waved, angled inwards in submedian fold and on vein 1 and retracted to inner margin, towards which there is some fuscous on its inner side; an oblique pale fuscous shade from costa beyond middle to antemedial line below the cell; two minute black discoidal spots; postmedial line double, bent outwards below costa, then minutely waved, excurved to vein 4, then incurved to near antemedial line, some grey points beyond it on costa; subterminal line faint, dark, oblique from costa to vein 7 and with black spot on it above tornus; a terminal series of slight black striæ. Hind wing semihyaline white, the costal and terminal areas tinged with brown; a fine dark terminal line; cilia white, tinged with brown at apex.

*Hab.* CAPE COLONY, Annshaw (*Miss F. Barrett*), 1 ♀ type. *Exp.* 28 mm.

*Plotheia ferrofusa*, sp. n.

♂. Head and thorax pale grey, the sides of palpi, head, and thorax more or less deeply tinged with ferruginous; fore legs tinged with ferruginous in front; abdomen pale grey slightly tinged with brown on dorsum. Fore wing pale grey, the basal inner area, medial area except at inner margin, postmedial area at middle, and terminal area except at apex and tornus suffused with bright ferruginous; a small fuscous spot below costa near base and subbasal spots below costa and in cell; a double slightly waved antemedial line, strongly excurved from costa to submedian fold, then angled inwards on vein 1; a small tuft of whitish scales in middle of cell and small black discoidal tuft; postmedial line double, arising near antemedial line, very strongly bent outwards below costa, oblique to veins 4, 3, where it is minutely dentate, then bent inwards to vein 2 and erect to inner margin; subterminal line whitish defined by dark brown on inner side, minutely waved, excurved below costa and at middle; a fine blackish terminal line slightly defined by grey on inner side. Hind wing semihyaline white, the termen narrowly reddish brown.

*Hab.* MADRAS, Belgaum (*Watson*), 1 ♂; CEYLON, Colombo (*Green*), 1 ♂ type. *Exp.* 20 mm.

*Plotheia leucogonia*, sp. n.

♀. Head and thorax grey slightly tinged with red-brown; patagia with brown line near tips; abdomen grey, the crests dark at tips. Fore wing with the basal and inner areas grey slightly tinged with red-brown, the rest of wing ochreous suffused with rufous, the grey area defined by a black-brown line from costa to submedian fold, in which it forms a streak to postmedial line, emitting a slight striga from its lower edge before middle; a slight oblique red-brown discoidal bar; postmedial line indistinctly double, very oblique from costa to vein 6, then excurved, slightly angled inwards in discal fold, at vein 2 retracted to near cell, slightly angled outwards at submedian fold and excurved to inner margin; subterminal line represented by some diffused rufous, excurved at vein 7 and middle; a small triangular white mark from termen to postmedial line at vein 2; a tuft of dark scales above tornus; a terminal series of black striæ; cilia rufous. Hind wing white, the terminal area slightly tinged with brown; the underside with the costal area slightly tinged with red-brown.

*Hab.* BR. E. AFRICA, Teita (*Jackson*), 1 ♀ type. *Exp.* 20 mm.

*Subsp.* 1. Head, thorax, and abdomen browner; fore wing with the triangular white mark rather larger; hind wing wholly suffused with dark brown.

*Hab.* SIERRA LEONE (*Clements*), 1 ♀.

*Subsp.* 2. Fore wing without the triangular white mark; hind wing whitish suffused with pale brown.

*Hab.* GAMBIA, Bathurst (*Sir G. Carter*), 1 ♀. *Exp.* 16 mm.

*Plotheia geræa*, sp. n.

♂. Head, thorax, and abdomen grey slightly tinged with fuscous; tegulæ with fine oblique dark streaks, patagia with black upper edge and fine oblique streak across tips. Fore wing grey slightly suffused with fuscous brown and finely irrorated with black; obliquely placed subbasal fuscous points in and below cell; an indistinct double antemedial line, slightly angled inwards on median nervure and oblique below submedian fold; a small black discoidal bar; post-medial line rather indistinct, double, oblique from costa to vein 3, where it is bent inwards to near angle of cell, then oblique and slightly waved to inner margin; an indistinct diffused brown subterminal line, excurved below costa and at middle; a terminal series of slight dark striæ. Hind wing whitish tinged with brown especially on terminal area.

*Hab.* QUEENSLAND, Townsville (*Dodd*), 2 ♂ type. *Exp.* 24 mm.

*Plotheia diplographa*, sp. n.

Head and thorax grey slightly tinged with fuscous; abdomen grey-white. Fore wing grey-white suffused with pale brown; traces of a double subbasal line, bent outwards from costa to subcostal nervure, then slightly sinuous; a prominent double black antemedial line almost at middle of wing, somewhat oblique towards costa, incurved from middle of cell to submedian fold, emitting a slight black streak in submedian fold towards postmedial line; the disk sometimes suffused with rufous, a small brown discoidal spot; postmedial line indistinctly double, sinuous, oblique from costa to vein 6 and bent inwards below vein 4; an indistinct, minutely dentate, whitish subterminal line defined on inner side by slight dentate black marks, angled outwards at vein 7 and excurved at middle; a fine black terminal line. Hind wing white, the terminal area slightly tinged with brown.

*Hab.* PUNJAB, Kangra (*Hocking*), 1 ♀ ; MADRAS, Nilgiris (*Hampson*), 1 ♂ type. *Exp.* 26 mm.

*Nanaguna brunnea*, sp. n.

♂. Head and thorax pale reddish brown more or less tinged with fuscous; abdomen pale reddish brown. Fore wing pale reddish brown slightly irrorated with black, the inner area to postmedial line and sometimes the inner half of terminal area whitish; the costal area near base and at middle, the cell and area just below it sometimes suffused with black; subbasal line represented by an inwardly oblique striga from costa and a very oblique streak from cell to antemedial line at vein 1, obscured in the black suffused specimens; antemedial line almost medial, strongly angled outwards on subcostal nervure and in submedian fold and inwards in cell and on vein 1; traces of a discoidal annulus; postmedial line with series of black points on it and defined by whitish on outer side, very oblique from costa to vein 6, then inwardly oblique and incurved below vein 2, where there is some brownish or fuscous beyond it; some slight fuscous and whitish points on costa towards apex; traces of a waved grey subterminal line with two obliquely placed fuscous points beyond it at vein 2 and sometimes a point on it in submedian fold; a terminal series of black points; cilia ochreous with series of brownish or fuscous spots. Hind wing whitish uniformly suffused with pale reddish brown; the underside whitish, the costal area tinged with brown.

*Hab.* ASSAM, Khâsis, 1 ♂ type; PULO LAUT (*Doherty*), 1 ♂. *Exp.* 26 mm.

*Nanaguna albisecta*, sp. n.

♀. Head and thorax whitish, slightly tinged with brown; tegulæ at tips, slight marks on patagia, and a patch on mesothorax black; fore tibiæ and tarsi banded with fuscous. Fore wing pale olive-grey, slightly irrorated with black; some rufous suffusion below the cell near base and below middle of terminal area; a diffused white fascia from costa near base through the cell and thence to apex, defined below by a black streak ending in a black spot at lower angle of cell; a medial black line, oblique and punctiform from costa to the white fascia, waved below the cell; a rather punctiform black postmedial line defined by whitish on outer side, very oblique from costa to vein 6, then inwardly oblique, some blackish points beyond it on costa and slight streaks from vein 6 to submedian fold; a small wedge-shaped white spot on middle

of termen; a terminal series of black points; cilia pale with some dark spots towards apex and a black patch above tornus. Hind wing whitish tinged with brown, especially on the veins and terminal area.

*Hab.* ASSAM, Khásis; CEYLON, Puttalam (*Pole*), 1 ♀ type; SAMBAWA (*Doherty*), 1 ♀. *Exp.* 20 mm.

*Dilophothripa olivia*, sp. n.

♂. Head and thorax whitish, mixed with pale olive; palpi at sides and antennæ blackish; tegulæ at tips and outer edge of patagia brown; abdomen whitish. Fore wing pale olive; a black patch on costa near base and some fiery-red marks on inner area before the indistinct, oblique, wavy antemedial line; two minute black points in middle of cell and two on discocellulars, and two more prominent obliquely placed points below middle of cell; postmedial line fuscous defined by white on inner side, very minutely wavy, very oblique from costa to vein 6, then inwardly oblique, a fuscous patch beyond it on costa with white streak below it curving up to apex; some white points on costa towards apex; a fuscous mark beyond the postmedial line in submedian fold; subterminal line white with fuscous marks on its inner side, excurved below costa and at middle; a terminal series of black points. Hind wing white, slightly tinged with brown.

*Hab.* BORNEO, Pulo Laut (*Doherty*). *Exp.* 18 mm.

*Sarothripa mesoplaga*, sp. n.

♀. Head and thorax grey-white, mixed with fuscous; fore tarsi fuscous with white rings; abdomen greyish fuscous, ventrally whitish. Fore wing rather silvery white; a fuscous subbasal band defined by wavy black lines from costa to submedian fold; antemedial line oblique from costa to median nervure and angled outwards on subcostal and median nervures, then incurved; a double wavy medial line; a fuscous patch on costa from the inner medial to beyond the postmedial line extending to median nervure; a white discoidal elliptical spot defined by black; a double wavy postmedial line, bent outwards below costa, angled outwards at vein 6, and incurved below vein 4; a dentate subterminal line, bent inwards between veins 6 and 4; some fuscous suffusion on inner and terminal areas except at apex; a terminal punctiform line. Hind wing pale fuscous.

*Hab.* SINGAPORE (*Ridley*), 1 ♀ type. *Exp.* 22 mm.

## ACONTIANÆ.

*Paraxestis mesogonia*, sp. n.

♂. Head and thorax ochreous, tinged with rufous; pectus and legs whitish; abdomen ochreous, the ventral surface white. Fore wing ochreous, the basal and costal areas to postmedial line irrorated with brown, the medial area (except towards costa) and the terminal area suffused with rufous; a brown antemedial line obtusely angled in cell, then oblique and slightly sinuous; a brown postmedial line angled at vein 6, then oblique; traces of a subterminal line towards costa and an ill-defined spot on inner margin; cilia rufous, mixed with brown. Hind wing semihyaline yellowish white with a slight rufous tinge towards termen.

♀. Fore wing with the medial area suffused with dark brown, the terminal area tinged with brown; hind wing more ochreous, the termen brownish.

*Hab.* ABYSSINIA (*Gerrard*), 2 ♂, 1 ♀ type. *Exp.*, ♂ 24, ♀ 26 mm.

*Paraxestis glaucescens*, sp. n.

♀. Head and thorax olive-ochreous, with a slight rufous tinge; palpi, tibiæ, and tarsi rufous; abdomen ochreous, tinged with rufous. Fore wing olive-ochreous, suffused with rufous and with a silky gloss; traces of slightly curved ante- and postmedial rufous lines; termen and cilia deeper rufous. Hind wing ochreous, tinged with rufous, especially on terminal area.

*Hab.* OLD CALABAR (*Crompton*), 1 ♀ type. *Exp.* 22 mm.

*Arcyophora piperita*, sp. n.

♀. Head ochreous; thorax ochreous suffused with brown; pectus, legs, and abdomen whitish. Fore wing ochreous, thickly irrorated with brown, the terminal half tinged with rufous, and the terminal area very minutely striated with brown; an indistinct antemedial line slightly excurved below costa, then oblique; an indistinct postmedial line excurved from below costa to vein 5, then slightly incurved, faint traces of a subterminal line. Hind wing semihyaline white, the termen tinged with ochreous.

*Hab.* NIGERIA, Borgu, Yelwa Lake (*Migeod*), 1 ♀ type. *Exp.* 22 mm.



*Erizada rufa*, sp. n.

♂. Head and thorax red-brown; pectus and legs whitish, fore tibiæ rufous, the tarsi banded with rufous; abdomen whitish, dorsally tinged with red, except at base. Fore wing rufous, the basal costal area brown; a brown patch on costa from middle to near apex, with a very oblique diffused rufous band from it to inner margin; cilia deep rufous at base, whitish at tips. Hind wing pale red, the basal and costal areas slightly paler. Underside of fore wing suffused with fiery red except at marginal areas.

*Hab.* SULA (Wallace), 1 ♂ type. *Exp.* 22 mm.

## Genus POGONUZADA, nov.

Proboscis fully developed; palpi porrect, extending about the length of head, the second joint thickly scaled above; antennæ of male almost simple; mid and hind tibiæ thickly fringed with hair above, the latter with the spurs long and with tufts of long hair between them, the first joint of hind tarsi with very large fringes of hair above. Fore wing broad, the costa and inner margin arched, the apex and termen rounded; vein 2 from well before angle of cell; 3 and 4 from angle; 5 from just above angle; 6, 7, 8, 9, 10, 11 from cell. Hind wing short and contorted, the tornus lobed, the inner and terminal areas clothed with rough hair; the underside with large tufts of rough scales on tornal area; the lower part of cell short; veins 3 and 5 from near angle; 6, 7 stalked and bent downwards, separating widely after origin; 8 approximated to cell to middle, then curved upwards.

*Pogonozada distorta*, sp. n.

♂. Head, thorax, and abdomen rufous, the thorax dorsally tinged with fuscous. Fore wing rufous, slightly irrorated with darker brown, the inner area tinged with fuscous; some slight oblique brown striæ from basal half of costa; four obliquely curved faint brown lines from terminal half of costa towards tornus; a slight black streak on vein 2 towards tornus, with striæ from its extremities to inner margin; cilia tinged with fuscous. Hind wing rufous, suffused in parts with brown.

*Hab.* C. CHINA, Ichang (Mrs. Pratt), 1 ♂ type. *Exp.* 18 mm.



*Tortriciforma chloroplaga*, sp. n.

♀. Head and thorax grey-white; palpi, pectus, legs, and abdomen ochreous, tinged with rufous. Fore wing ochreous white, the base and terminal area more grey-white, the costa faintly tinged with rufous; a small fiery-red streak on base of inner margin; an irregularly elliptical dark sap-green subbasal patch from costa to median nervure, its lower part suffused with some reddish brown on subcostal nervure; a black discoidal point; a faint diffused brownish medial line from vein 2 to inner margin; an oblique sap-green streak from costa just beyond middle to vein 7, with traces of a sinuous postmedial line arising from it, some rufous on costa beyond it with some grey below it before the subterminal line, which is represented by a series of small obscure blackish marks strongly angled outwards at vein 7 and middle; a whitish subapical spot. Hind wing yellow, the inner area tinged with fiery red; a red discoidal point; a diffused red subterminal line and narrow terminal band. Underside of fore wing tinged with fiery red; hind wing with some red irroration on costal area, a red discoidal lunule, sinuous red postmedial and subterminal lines from costa to vein 5, some grey on termen.

*Hab.* PERAK, Larut Hills (*S. S. Flower*), 1 ♀ type. *Exp.* 24 mm.

*Metaptya lucida*, sp. n.

♂. Head, thorax, and abdomen brownish grey; palpi white in front; tarsi with fuscous bands. Fore wing ochreous brown, suffused with glistening grey and irrorated with a few black scales; a fine, obliquely curved, whitish antemedial line; a slight black point at upper angle of cell; a fine whitish postmedial line excurved from costa to vein 4, then incurved; some slight black streaks on costa towards apex; subterminal line represented by some black scales, a small spot below costa and rather bifid spot between veins 5 and 3; cilia blackish at the angle at vein 4. Hind wing ochreous brown suffused with glistening grey; a slight black and white striga on inner margin above tornus. Underside fuscous brown, the inner area of fore wing and hind wing (except terminal area) whitish, both wings with rather diffused, slightly sinuous postmedial line and dark point at upper angle of cell.

*Hab.* BALI, Low Country (*Doherty*), 1 ♂ type. *Exp.* 26 mm.

*Urbona microcyma*, sp. n.

♂. Head and thorax grey-white largely suffused with rufous or dark brown; palpi with the second joint blackish above; tarsi banded with fuscous; abdomen brownish white. Fore wing whitish, tinged with rufous and more or less thickly irrorated with fuscous; a black point in middle of cell and two discoidal points or small spots; an oblique minutely dentate brown line from costa near apex to middle of inner margin, sometimes slightly defined by white on outer side. Hind wing whitish tinged with brown; the underside whiter, sometimes with traces of postmedial line on costal half.

♀. Head, thorax, and fore wing much darker red-brown; abdomen fuscous; fore wing with the discoidal points conjoined into a lunule.

*Hab.* NIGERIA, Akasa (*Lugard*), 1 ♂ type; Sapele (*Sampson*), 5 ♂, 3 ♀; Old Calabar (*Crompton*), 1 ♂. *Exp.* :8-32 mm.

*Westermannia cuprea*, sp. n.

♂. Head, thorax, and abdomen white, slightly tinged with brown; palpi blackish at sides. Fore wing golden cupreous, the inner area white, slightly tinged with brown from base of costa to inner margin near tornus, which is greyish; the costal area, the cell before antemedial line, and the area beyond the cell to postmedial line down to vein 2 suffused with blue-grey; the veins slightly streaked with white, more prominently on postmedial area from costa to vein 6; an oblique loop-shaped subbasal mark defined by a fine white line from subcostal nervure to the inner white area; antemedial line pure white, inwardly oblique and incurved from below costa to the white area; orbicular and reniform finely defined by white, the former somewhat elongate elliptical, the latter with its lower part defined by grey, with white point on its inner lower edge and small elliptical spot on its outer; postmedial line white, oblique from costa to vein 7, where it is acutely angled outwards, then incurved to vein 3, where it is less acutely angled, and again incurved to inner margin; a subterminal series of small black spots, with fine, oblique, slightly waved, white line on their outer edge from costa to vein 7; the white streaks on veins 7, 6 meeting at termen in an acute angle in the interspace. Hind wing pale brown.

*Hab.* ASHANTI, Obuassi (*Bergmann*), 1 ♂ type. *Exp.* 32 mm.

*Westermannia leucogonia*, sp. n.

♀. Head, thorax, and abdomen pale rufous. Fore wing pale rufous, with slight dark irroration; an oblique white subbasal line from costa to submedian fold, with a small round rufous spot defined by a fine white annulus beyond it in cell; the area to antemedial line suffused with grey-white from costa to submedian fold; antemedial line white, extremely oblique from costa to median nerve near lower angle of cell, then incurved to vein 1, where it meets the postmedial line and terminates; a pear-shaped rufous discoidal spot defined by a fine white annulus, some grey suffusion beyond upper and lower angles of cell, the veins from lower angle streaked with white; postmedial line white, very oblique from costa to vein 7, oblique below vein 3 to vein 1, where it terminates, curving round to join the antemedial line; a triangular white patch beyond it from costa to vein 7, then slightly defined by grey on outer side and below vein 3 by white; a somewhat irregular subterminal series of slight blackish spots; a fine pale line at base of cilia. Hind wing pale rufous, the costal area paler; the underside whitish, with slight brown discoidal spot.

*Hab.* OLD CALABAR (*Crompton*), 1 ♀ type. *Exp.* 30 mm.

*Westermannia agrapha*, sp. n.

♀. Head, thorax, and abdomen pale rufous; palpi in front, pectus, legs, and ventral surface of abdomen whitish. Fore wing pale rufous; a fine white streak from base of costa along vein 1 to tornus, emitting a slight streak along median nerve to the slight very oblique white antemedial line, the angle between these lines tinged with grey; a rather triangular cupreous discoidal spot defined by a fine whitish annulus; postmedial line indistinct, fine, whitish, oblique from costa to vein 6, and below vein 4 bent inwards to below end of cell, then erect to inner margin; terminal area suffused with golden cupreous; a white subterminal point on costa. Hind wing pale rufous, the underside whitish.

*Hab.* SIERRA LEONE (*Foxcroft*), 1 ♀ type. *Exp.* 26 mm.

*Westermannia argyropлага*, sp. n.

♂. Head and tegulæ white, palpi above and antennæ rufous, the tegulæ with some rufous scales at edges; thorax white suffused with rufous; pectus and legs pale rufous; abdomen white tinged with rufous. Fore wing pale rufous, with some darker rufous irroration; a large oblique quadrate

silvery-white patch extending on costa from base to near middle and down to vein 1 and below end of cell, where it is confluent with a broad, curved, silvery-white band from costa beyond middle, extending down to submedian fold, and emitting a short spur inwards below costa, its outer edge slightly indented at discal fold; traces of a dark rufous subterminal line, incurved at submedian fold; a fine dark terminal line. Hind wing white. Underside of fore wing whitish, suffused with fuscous except inner and terminal areas.

*Hab.* UGANDA, Marengi (*Christy*), 1 ♂ type. *Exp.* 28 mm.

*Westermannia trigonica*, sp. n.

♂. Head, thorax, and abdomen pale brown; palpi greyish in front, blackish at sides; pectus and legs greyish; abdomen greyish at base, the ventral surface greyish, with dark patch at middle. Fore wing with the basal area white tinged with brown; a large triangular golden-bronze patch extending on costa from near base to beyond middle, its apex at middle of inner margin, defined by white lines, the area beyond it white shading into golden bronze on terminal area; an indistinct rather maculate subterminal line unusually remote from termen, angled outwards at vein 7 and inwards in discal and submedian folds and excurved at middle. Hind wing pale golden bronze. Underside of fore wing pale golden bronze, with the inner area whitish.

♀. Fore wing with the basal and postmedial areas much browner.

*Hab.* NIGERIA, Old Calabar (*Crompton*), 1 ♂ type; Akassa (*Lugard*), 1 ♂; Sapele (*Sampson*), 1 ♀. *Exp.* 28 mm.

*Westermannia aræogramma*, sp. n.

♀. Head, thorax, and abdomen whitish suffused with rufous. Fore wing pale rufous irrorated with darker rufous; an indistinct double oblique line from costa before middle to inner margin beyond middle; an indistinct, rather large, oblique, elliptical discoidal spot defined by a slight pale annulus, with some slight dark suffusion beyond its lower extremity; an indistinct double postmedial line excurved from costa to vein 3, then bent inwards to below end of cell, and almost meeting the antemedial line at inner margin; a slight pale line at base of cilia. Hind wing white, faintly

tinged with rufous. Underside of fore wing whitish slightly tinged with rufous.

*Hab.* BR. C. AFRICA, Chiromo (*de Jersey*), 1 ♀ type. *Exp.* 26 mm.

*Westermannia nocturna*, sp. n.

♂. Head, thorax, and abdomen pale greyish brown. Fore wing with the inner margin highly arched, the termen obliquely curved; pale reddish brown suffused with greyish and irrorated with a few dark scales; an oblique brown striga from middle of costa; a slight curved discoidal bar; an oblique brown streak from costa beyond middle to vein 6, with a greyer patch beyond it; traces of a subterminal line excurved below costa and at middle. Hind wing uniform, rather pale red-brown; the underside greyer, tinged with fuscous from lower angle of cell to termen.

*Hab.* NIGERIA, Old Calabar (*Crompton*), 1 ♂ type. *Exp.* 38 mm.

*Westermannia phæopepla*, sp. n.

♀. Head, thorax, and abdomen pale grey-brown; pectus and ventral surface of abdomen whitish. Fore wing pale greyish fuscous brown, the costal area (except on medial area) paler, with an ochreous tinge and slight dark irroration; antemedial line indistinct, dark, very slightly incurved; an obscure dark discoidal bar; postmedial line indistinct, dark, diffused, oblique from costa to vein 6, then inwardly oblique, a faint dark spot beyond it at vein 4. Hind wing fuscous brown, with a faint reddish gloss. Underside pale grey; fore wing suffused with fuscous except marginal areas.

*Hab.* NIGERIA, Sapele (*Sampson*), 1 ♀ type. *Exp.* 28 mm.

*Westermannia stalactitis*, sp. n.

♀. Head and thorax greyish brown; palpi whitish in front; abdomen fuscous brown. Fore wing pale reddish brown with a cupreous tinge, the basal area glossed with grey; a somewhat oblique slightly sinuous antemedial line, with a minute dark wedge-shaped mark from costa before it; a wedge-shaped chocolate patch from middle of costa to vein 1, its edges defined by whitish lines and waved, its point bent outwards and acute; three white discoidal points, the lowest rather larger; a sinuous postmedial line, oblique from costa to vein 6, excurved at median nervules, then incurved; a somewhat semicircular chocolate patch on costa

towards apex, with two pale points on costa, its edge defined by a pale line, slightly indented on inner side and angled outwards on outer; a subterminal series of minute black and white spots, the spot below costa slightly larger; cilia with a fine pale line at base. Hind wing fuscous brown with a reddish gloss; the underside whitish, suffused and irrorated with brown down to median nervure and vein 2; an indistinct curved postmedial line.

*Hab.* NIGERIA, Old Calabar (*Crompton*), 1 ♀ type. *Exp.* 28 mm.

*Westermannia geminastra*, sp. n.

♀. Head and thorax pale reddish brown; palpi whitish in front; abdomen fuscous brown. Fore wing reddish brown with a cupreous gloss; an oblique, slightly sinuous, brown antemedial line, defined by whitish on inner side; two pure white discoidal spots, the lower rather larger and placed on a diffused paler rufous patch; postmedial line brown, defined by whitish on outer side, excurved from costa to vein 4, then incurved; a fine pale line at base of cilia. Hind wing pale with a reddish gloss; a fine pale line at base of cilia; the underside whitish tinged with reddish brown.

*Hab.* NIGERIA, Old Calabar (*Crompton*), 1 ♀ type. *Exp.* 24 mm.

*Westermannia digramma*, sp. n.

♂. Head and thorax pale red-brown; abdomen greyish brown, the dorsal crest and anal tuft dark at tips, the genital tufts whitish. Fore wing pale rufous; an oblique, straight, dark brown antemedial line; two black discoidal points with a few white scales on them; postmedial line slightly excurved from costa to vein 6, then oblique; a slight pale line at base of cilia. Hind wing brown with a silky gloss; the underside whitish slightly irrorated with brown.

*Hab.* NIGERIA, Old Calabar (*Crompton*), 1 ♂ type. *Exp.* 28 mm.

*Westermannia selenitis*, sp. n.

♂. Head and thorax grey mixed with brown and fuscous; palpi blackish above; abdomen whitish, dorsally tinged with fuscous. Fore wing pale rufous sparsely irrorated with black; traces of an oblique slightly sinuous antemedial line; a small blackish spot in middle of cell and crescentic discoidal spot; postmedial line arising from costa towards apex, fuscous, defined by whitish on outer side, slightly excurved

from costa to vein 4, then slightly incurved; a fine pale line at base of cilia. Hind wing whitish, uniformly tinged with pale brown; the underside rather whiter.

*Hab.* NIGERIA, Sapele (*Sampson*), 1 ♂ type. *Exp.* 30 mm.

*Aiteta costiplaga*, sp. n.

♀. Head and thorax rufous; palpi with the extremity of second and third joints white; frons with white patch below; vertex of head and thorax with whitish patches; abdomen pale rufous. Fore wing pale brownish rufous slightly tinged with grey; antemedial line indistinct, outwardly oblique, arising from a slight olive triangular patch on costa; postmedial line indistinct, inwardly oblique, arising from apex of a triangular olive patch on costa; traces of a sinuous punctiform subterminal line; cilia grey at base, with brown line through them and whitish tips. Hind wing and underside of both wings orange.

*Hab.* NIGERIA, Onitsba, 1 ♀ type. *Exp.* 30 mm.

*Aiteta meterythra*, sp. n.

♂. Head and thorax deep rufous; fore tibia and tarsi and mid and hind tibiæ streaked with rufous, the fringe of very long hair on hind tibiæ tinged with fuscous; abdomen orange-red, the base and extremity of dorsum tinged with brown. Fore wing deep rufous, slightly suffused with grey except on medial area and with slight dark irroration; antemedial line defined by grey on inner side, outwardly oblique, almost straight; a slight blackish point in cell towards extremity and blackish discoidal bar; postmedial line defined by greyish on outer side, with some deeper rufous suffusion on each side of it, slightly oblique from costa to vein 6 and incurved below vein 4; subterminal line fine, blackish, slightly waved, angled outwards at vein 7, excurved at middle, and ending on termen above tornus. Hind wing and underside of both wings fiery red.

♀. Thorax and abdomen sometimes dorsally tinged with grey; fore wing with the ground-colour deep rufous or more or less entirely suffused with grey.

*Hab.* NIGERIA, Sapele (*Sampson*), 1 ♂, 2 ♀ type; Old Calabar (*Crompton*), 3 ♀. *Exp.*, ♂ 30, ♀ 26-28 mm.

*Carea acypera*, sp. n.

♂. Fore wing with the apex acute, the termen nearly straight.



Head, thorax, and abdomen pale grey-brown; palpi with the third joint blackish; pectus, legs, and ventral surface of abdomen whitish. Fore wing pale grey-brown, sparsely irrorated and striated with raised black scales; a slightly more prominent black discoidal point; cilia white at base, brown at tips except towards tornus. Hind wing greyish brown with blackish discoidal point; cilia whitish; the underside brownish white, irrorated and striated with raised black scales, the black discoidal spot prominent.

*Hab.* BALI (*Doherty*), 1 ♂ type. *Exp.* 30 mm.

*Carea tumida*, sp. n.

Fore wing with the costa strongly arched and forming a lobe towards apex in male, slightly in female, the termen evenly curved.

Head and thorax deep rufous; palpi blackish; frons whitish at base, with blackish bar above and between antennæ; tegulæ with black line near base; fore legs blackish in front; pectus whitish; abdomen rufous, dorsally tinged with fuscous. Fore wing bright rufous, suffused with silky grey on inner area, as a wedge-shaped patch from basal half of costa to near tornus and from postmedial line to near termen, subbasal line represented by an oblique black striga from costa; an indistinct, oblique, slightly curved antemedial line; postmedial line double, black, from costa beyond middle to tornus; an indistinct subterminal line, somewhat oblique and maculate from costa to vein 6 and obscurely angled inwards at vein 5. Hind wing fiery red, the inner area fuscous brown. Underside fiery red; fore wing with the apical area suffused with grey; hind wing tinged with grey.

*Hab.* PENANG (*S. S. Flower*), 1 ♀; SINGAPORE (*Ridley*), 1 ♂; BORNEO, Sadong (*Shelford*), 1 ♂ type, 1 ♀. *Exp.* 48 mm.

*Carea diplogramma*, sp. n.

Fore wing with the apex somewhat produced and acute, the termen excurved at middle.

♀. Head and tegulæ dark red-brown; frons greyish at base; thorax rufous; pectus and legs pale; abdomen dorsally fuscous, ventrally rufous. Fore wing rufous, the costal and inner areas slightly tinged with brown; an indistinct oblique antemedial line, slightly angled outwards at median nervure; a slight discoidal striga; a double line from costa near apex to tornus. Hind wing fiery red, the



inner area fuscous brown. Underside pale fiery red; fore wing with the costal area greyish; hind wing with the inner area whitish, traces of a dark subterminal line except towards tornus.

*Hab.* MALACCA, Johore (*Ridley*), 1 ♀ type. *Exp.* 40 mm.

*Carea holophæa*, sp. n.

Fore wing with the apex somewhat produced and acute, the termen excurved at middle.

♀. Head and tegulæ black-brown; palpi rufous, greyish in front; frons at base and basal joint of antennæ in front whitish; thorax rufous more or less tinged with grey; pectus and legs greyish, the fore legs dark in front; abdomen fuscous, ventrally rufous. Fore wing rufous more or less suffused with grey; an indistinct dark subbasal line from costa to submedian fold; a pale green subbasal patch on inner margin; antemedial line fine, black, obliquely excurved from subcostal nervure to inner margin; a large triangular patch of blackish suffusion on costa before the double oblique black postmedial line, and extending to below lower angle of cell; a slight fuscous tinge on termen below apex. Hind wing fuscous brown with a slight rufous tinge; termen and cilia rufous. Underside fiery red, the costal area tinged with grey towards apex; hind wing with the inner half whitish.

*Hab.* MALACCA, Johore (*Ridley*), 1 ♀; Perak Hills (*Ridley*), 1 ♀ type. *Exp.* 34 mm.

*Carea biviata*, sp. n.

♂. Head and thorax fiery red mixed with some yellow; fore tibiae and tarsi tinged with fuscous; pectus and mid and hind legs whitish; abdomen grey tinged with rufous, the anal tuft blackish. Fore wing with the apex slightly produced, the termen nearly evenly curved, fiery red sparsely irrorated with black; the base of inner area yellowish, the apical area tinged with grey; an oblique straight dark line from costa before middle to middle of inner margin; an oblique line from costa beyond middle to tornus, slightly excurved below costa; the inner margin dark except towards base. Hind wing pale fiery red; the underside whitish, with the costal and terminal areas irrorated with brown.

♀. Fore wing with the ground-colour nearly uniform fiery red; the lines slightly more diffused, the postmedial line hardly excurved below costa; a dark discoidal point.

*Hab.* PENANG (*S. S. Flower*), 1 ♂ type; PERAK, Larut Hills (*S. S. Flower*), 1 ♀. *Exp.*, ♂ 32, ♀ 40 mm.

*Carea endophaea*, sp. n.

♂. Head and thorax deep chocolate-red; fore tibiae and tarsi pure white in front; mid and hind tibiae mostly white, the tarsi ringed with white; abdomen fuscous, the anal tuft white, the ventral surface fiery red. Fore wing deep chocolate-red; the costal edge pure white, the medial and terminal areas with a more or less prominent greyish gloss; two indistinct rather diffused antemedial lines, very slightly excurved below costa and incurved in submedian interspace; a black discoidal point surrounded by a grey annulus; an indistinct somewhat diffused postmedial line, slightly angled outwards below costa and at middle, with a still less distinct diffused red line beyond it, slightly excurved from costa to middle, then incurved; an indistinct, dark, somewhat dentate subterminal line with series of white points on its outer edge, slightly excurved at vein 7 and middle. Hind wing fiery red, the inner area to cell and vein 2 fuscous brown. Underside of both wings fiery red, the apices tinged with chocolate, the inner area of hind wing greyish.

*Hab.* TRAVANCORE, Pimád (*Imray*), 4 ♂ type. *Exp.* 44 mm.

*Carea pallida*, sp. n.

♀. Head and thorax pale red-brown; abdomen pale brown; pectus and ventral surface of abdomen whitish. Fore wing pale red-brown, finely and thickly irrorated with dark brown; the costal edge pure white; an indistinct oblique antemedial line, very slightly excurved below costa and incurved in submedian interspace; a black discoidal point; postmedial line rather indistinct, slightly excurved below costa and at middle, angled inwards at discal fold and incurved below vein 4; traces of a subterminal line excurved at vein 7 and middle, cilia whitish. Hind wing white, faintly tinged with red and the inner area with fuscous; the underside white faintly tinged with red.

*Hab.* BURMA, N. Shán States (*Bingham*), 1 ♀ type. *Exp.* 38 mm.

*Carea leucocraspis*, sp. n.

♂. Head and thorax bright rufous; fore tibiae and tarsi white in front; mid tibiae white at base; abdomen pale

fuscous brown. Fore wing bright rufous, the costal edge pure white; a very indistinct antemedial line oblique from costa to submedian fold; a very faint postmedial line excurved below costa and at middle; traces of a sinuous subterminal line. Hind wing fiery red, the inner area pale fuscous brown; the underside fiery red, with the basal and inner areas whitish.

*Hab.* BORNEO, Sandakan (*Pryer*), 1 ♂ type. *Exp.* 42 mm.

*Carea rubrifusa*, sp. n.

♂. Head and thorax bright rufous; pectus, legs, and abdomen whitish brown. Fore wing whitish brown tinged with rufous, the basal area (except at base of inner margin) suffused with bright rufous to the antemedial line, which is oblique, angled outwards below costa and at median nervure and inwards in cell and submedian fold; a minute discoidal point; postmedial line rufous, obliquely incurved from costa to vein 6, where it is acutely angled outwards, then incurved, some rufous suffusion beyond it; an indistinct, somewhat diffused, subterminal line, incurved at discal fold; some rufous suffusion on termen from apex to vein 2. Hind wing whitish suffused with pale red. Underside whitish tinged with red.

*Hab.* BORNEO, Sandakan (*Pryer*), 1 ♂ type. *Exp.* 40 mm.

*Carea auritincta*, sp. n.

♂. Palpi with the third joint tufted with hair on inner side; hind tibiæ not dilated, without groove and tuft of hair; fore wing short and broad, the termen erect, curved.

Head and thorax rufous with a silky gloss; palpi in front, pectus, and legs white; fore and mid tibiæ partly rufous, the tarsi rufous ringed with white; abdomen pale rufous, the ventral surface white. Fore wing rufous with a greenish-golden gloss, especially towards costa; the costa with antemedial and medial black and white points, towards apex with dark brown streaks interrupted by three white points. Hind wing fiery orange-red; cilia white at tips. Underside of fore wing orange-red, the inner area and costal area to beyond middle suffused with white; hind wing white tinged with red.

*Hab.* NIGERIA, Old Calabar (*Crompton*), 1 ♂ type. *Exp.* 26 mm.

*Carea gamma*, sp. n.

♂. Head, tegulæ, and patagia greyish brown, the tegulæ with deep chocolate medial patch; thorax leaden grey; pectus pale; coxæ fiery red, the tufts of hair on hind tibiæ fuscous; abdomen greyish on dorsum, reddish at sides and below, the crests at base black, the extremity blackish. Fore wing greyish brown to an oblique line from middle of costa to inner margin before middle, the basal costal area suffused with reddish brown; the terminal half black-brown; a black point defined by a slight pale annulus in end of cell; a slight silvery gamma-shaped mark on discocellulars with black point between its arms, its tail extending obliquely beyond lower angle of cell; an indistinct black postmedial line oblique from costa to vein 4, then bent inwards to vein 2 and outwards towards tornus, a diffused blackish fascia from it to termen above vein 5. Hind wing yellow suffused with fiery red, especially towards apex. Underside of fore wing fiery red.

*Hab.* NIGERIA, Sapele (*Sampson*), 1 ♂ type. *Exp.* 32 mm.

*Carea metaleuca*, sp. n.

♀. Head and thorax bright rufous; palpi at base, pectus, legs, and abdomen white. Fore wing bright rufous with very slight dark irroration on costal, inner, and terminal areas; subbasal line represented by a black striga from costa; antemedial line fuscous, defined by white on inner side, slightly bent inward to costa, then oblique; a black discoidal point; postmedial line fuscous, defined by white on outer side, oblique and slightly excurved below costa and at middle; two white points on costa towards apex; a subterminal series of slight dark spots, somewhat excurved at vein 7 and middle. Hind wing white tinged with yellow, the inner area slightly with brown. Underside white.

*Hab.* BR. C. AFRICA, Chiromo (*de Jersey*), 1 ♀ type. *Exp.* 24 mm.

*Carea mesocausta*, sp. n.

♂. Head, thorax, and abdomen grey; pectus and base of legs white; tarsi red-brown ringed with white; abdomen with a little fiery red on terminal segment, the anal tuft white at tip, the ventral surface whitish tinged with red towards extremity. Fore wing grey sparsely irrorated with black, the medial area strongly suffused with red-brown, with some large black-pencilled scales below the cell; an

oblique antemedial line, excurved in cell and incurved in submedian interspace; an oblique black discoidal bar, defined by grey on outer side; an oblique postmedial line ending at tornus, excurved below costa and at middle; a subterminal punctiform fuscous line ending on termen above tornus, angled outwards at vein 7 and excurved at middle; a terminal series of black points; cilia white intersected by pale brownish. Hind wing fuscous brown; the underside whitish suffused with fuscous.

*Hab.* BORNEO, Sandakan (*Pryer*), 1 ♂ type. *Exp.* 28 mm.

*Carea albipicta*, sp. n.

♀. Head and thorax grey-white mixed with purplish red; palpi rufous; pectus and legs whitish, tarsi rufous ringed with white; abdomen white. Fore wing white, the costal, inner, and terminal areas suffused with purple-grey and irrorated with rufous; some rufous suffusion at base of costa; the medial and postmedial areas (except towards costa and inner margin) striated with bright ferruginous; an ill-defined waved antemedial line, diffused towards costa and somewhat inwardly oblique; a ferruginous discoidal bar; a somewhat oblique, sinuous, white postmedial band, incurved in submedian interspace; a dark brown subterminal line, excurved at vein 7 and middle; a dark brown terminal line expanding into small spots in the interspaces; cilia ferruginous. Hind wing semihyaline white. Underside of fore wing white, the costal area suffused with grey and red-brown.

*Hab.* FIJI, 1 ♀ type. *Exp.* 32 mm.

*Maurilia albirivula*, sp. n.

♀. Head and thorax pale rufous; second joint of palpi and tegulæ slightly tipped with white; pectus and legs whitish; abdomen fuscous brown, the ventral surface whitish. Fore wing pale rufous, the medial area dark reddish brown, extending below vein 6 to just beyond postmedial line and below vein 4 to termen; a small patch of brown suffusion in cell before the antemedial line, which is white defined by brown on outer side, oblique, waved, more strongly incurved in submedian interspace; postmedial line white defined by brown on each side, slightly waved, oblique from costa to vein 4; some whitish points on costa towards apex; a subterminal series of small obscure fuscous spots except towards costa, excurved below vein 4 to near termen; some brown suffusion on terminal area below apex, with

slightly darker streaks on the veins. Hind wing fuscous brown, the cilia ochreous white. Underside of fore wing fuscous brown, the inner area and hind wing whitish.

*Hab.* NIGERIA, Old Calabar (*Crompton*), 1 ♀ type. *Exp.* 30 mm.

*Maurilia heterochroa*, sp. n.

Head, thorax, and fore wing varying from bright rufous to greyish rufous or greyish fuscous; palpi irrorated with white; frons with white patch; pectus and base of legs white; tibiae and tarsi white mixed with rufous; abdomen fuscous, the anal tuft rufous, the ventral surface white tinged with rufous towards extremity. Fore wing with double, waved, very oblique antemedial line; black points in end of cell and on discocellulars; a double, somewhat waved post-medial line, oblique from costa to vein 6, slightly angled inwards in discal fold, then excurved and incurved in submedian interspace; a slight somewhat sinuous fuscous shade from apex to antemedial line below the cell; a subterminal punctiform black line slightly excurved at vein 7 and incurved at discal fold; the termen rather darker from just below apex to vein 2. Hind wing fuscous brown to deep fuscous; cilia greyish at tips. Underside of fore wing fuscous black, the costal and terminal areas red, with some whitish on costa towards apex, inner area whitish; hind wing red, the basal and inner areas grey-white.

*Ab.* 1.—Fore wing with the inner area from near base to subterminal line and extending to upper angle of cell suffused with dark red-brown.

*Ab.* 2.—Fore wing with this area deep ferruginous red, with a large, darker ferruginous, somewhat triangular patch on it beyond the cell.

*Ab.* 3.—Fore wing greyish fuscous.

*Ab.* 4.—Fore wing greyish fuscous, with a similar dark fuscous patch on inner area.

*Ab.* 5.—Fore wing greyish fuscous, with diffused black wedge-shaped patch beyond the cell.

*Hab.* NIGERIA, Old Calabar (*Rutherford, Crompton*), 4 ♂, 2 ♀ type; Sapele (*Sampson*), 2 ♂. *Exp.* 36–40 mm.

*Maurilia phaea*, sp. n.

♂. Olive-fuscous; head, thorax, and fore wing sometimes tinged with dull rufous; pectus and base of legs and abdomen whitish. Fore wing with two dark, oblique, waved ante- and postmedial lines, the latter somewhat excurved

below costa and at middle and ending near tornus; a slight oblique dark discoidal bar; a subterminal series of small fuscous spots, somewhat oblique from costa to vein 6, slightly incurved at discal fold and excurved at middle. Hind wing and underside uniform fuscous brown.

*Hab.* NIGERIA, Old Calabar (*Miss Kingsley, Sampson, Crompton*), 4 ♂ type. *Exp.* 32–38 mm.

*Tyana acypera*, sp. n.

*Tyana pustulifera*, Leech, Trans. Ent. Soc. 1899, p. 203 (nec Wlk.).

♂. Hind wing with a large glandular swelling at tornus clothed with flocculent hair on underside, the inner margin fringed with long hair; fore wing with the apex extremely produced and acute, the termen almost straight.

Head and thorax bright green; palpi red, white below; frons yellow, with crimson line above; antennæ red ringed with white; pectus and legs white, the fore tibiæ and tarsi red; abdomen dorsally brown, ventrally whitish. Fore wing bright green; the costal edge brown irrorated with grey, the extreme tip of apex crimson; brown points at angles of cell; cilia yellow. Hind wing pure white, the hair on inner margin slightly tinged with fuscous.

♀. Fore wing with the apex less produced, the termen rounded; vertex of head crimson and yellow; tegulæ and base of patagia yellow, with some crimson on shoulders; abdomen white, with minute crimson tuft at base. Fore wing with the ground-colour whitish, almost completely covered with green irroration, the costa and inner margin white; a small crimson annulus with yellow centre at lower angle of cell, sometimes filled in with crimson.

*Hab.* CENTR. CHINA, Omei-shan, 1 ♂ type; Pu-tsu-fong, 2 ♀. *Exp.* 38 mm.

*Ariola xanthobasis*, sp. n.

♂. Head and thorax pale yellow; palpi, tegulæ (except at middle), and metathorax tinged with rufous; pectus whitish, legs mostly dark brown; abdomen fuscous brown, ochreous at base, the claspers large, white at sides, the ventral surface white. Fore wing with the basal area pale yellow, bounded by a curved, rather diffused, brilliant silver line from costa before middle to middle of inner margin, the costa tinged with rufous; the rest of wing uniform very deep chocolate-brown. Hind wing uniform fuscous brown; the underside pale, the costal and terminal areas broadly suffused with



fuscous, leaving a diffused whitish patch on costal area before apex.

♀. Pectus and legs more ochreous; hind wing with a slight rufous tinge.

*Hab.* NIGERIA, Akassa (*Lugard*), 1 ♂ type; Sapele (*Sampson*), 1 ♀. *Exp.* 24 mm.

*Sinna floralis*, sp. n.

♂. Head and thorax bright yellow; third joint of palpi and antennæ blackish, brilliant crimson stripes on back of head and tegulae, on dorsum of thorax, and obliquely from base of fore wing across patagia to metathorax; pectus, legs, and abdomen white, the last with broad black-brown band on ventral surface of penultimate segment, the extremity blackish. Fore wing whitish suffused with yellow, the apical area from costa beyond middle to above tornus deep golden yellow; three quadrate black spots on basal half of costa with brilliant crimson bands arising from them, oblique and not reaching inner margin, but bifurcating and uniting to form reticulations in and below cell, enclosing three irregular patches of the ground-colour and a point at lower angle of cell; an oblique black fascia on medial part of vein 3; a black spot at apex and a curved series of three spots from costa before apex to termen above middle; a black bar on termen at tornus. Hind wing nearly pure white. Under-side white; fore wing with oblique blackish bar from middle of costa expanding into an elliptical discoidal patch, the spots on terminal area as above.

*Hab.* PENANG (*S. S. Flower*), 1 ♂ type. *Exp.* 40 mm.

*Sinna atrifusa*, sp. n.

♂. Head and thorax white; antennæ brown; tegulae and shoulders with small fuscous spots with some crimson scales on them; abdomen white, dorsally suffused with fuscous except at base, leaving whitish segmental lines and dorsal streak. Fore wing black-brown; an oblique white fascia from base of costa along inner margin to before middle; the costal edge white, expanding into a slight patch just before middle; an almost obsolete oblique crimson fascia from below costa near base, and thence above vein 1 to near termen joined by traces of medial, postmedial, and subterminal crimson bands; an apical yellowish-white patch bounded on inner side by an obliquely curved black band from just below costa to near termen; the termen narrowly yellowish



white to submedian fold. Hind wing pale ochreous yellow, the costal area whiter. Underside pale ochreous yellow, the fore wing tinged with fuscous except apical area.

*Hab.* JAVA, Arjuno, 3000 feet (*Doherty*), 1 ♂ type. *Exp.* 40 mm.

*Titulcia meterythra*, sp. n.

♀. Head and thorax dull yellow, irrorated with fuscous, the vertex of head, collar, and patagia marked with white; abdomen rufous. Fore wing with the basal area, costa, and termen greenish yellow irrorated with fuscous; two subbasal white points; an irregular antemedial white band; a broad postmedial fuscous-brown band with sinuous edges, narrowing to costa and followed by a white band not reaching costa. Hind wing rufous, the costal area white.

*Hab.* BORNEO, Pulo Laut (*Doherty*), 1 ♀ type. *Exp.* 20 mm.

*Siglophora hæmatica*, sp. n.

♂. Head, thorax, and abdomen yellow suffused with red, the base of abdomen yellow with dorsal red crest. Fore wing yellow suffused with red, especially on terminal half, leaving yellow ante- and postmedial semicircular patches on costa and small medial and apical spots; traces of an obliquely incurved antemedial line and of wavy medial and postmedial lines; a slight brownish discoidal spot; termen narrowly greyish fuscous from apex to vein 3. Hind wing with the basal half yellow, the apical half red. Underside with the red areas deeper fiery red.

*Hab.* BORNEO, Pulo Laut (*Doherty*), 1 ♂ type. *Exp.* 22 mm.

*Chandica semiflava*, sp. n.

♀. Head whitish mostly suffused with crimson; palpi in front, base of frons, and basal joint of antennæ in front white, antennæ reddish; tegulæ white edged with rufous and fuscous; patagia rufous and fuscous; thorax whitish; pectus, legs, and abdomen white, fore tibiæ crimson in front, abdomen dorsally brownish tinged with crimson except at base. Fore wing red-brown to beyond middle, shading into blackish, its outer edge oblique from costa to vein 6; terminal area pale bright yellow, with some crimson suffusion on edge of dark area, from apex to angle of dark area, and as a very ill-defined line from this angle to termen above tornus; a terminal series of minute crimson points. Hind wing with the basal

half whitish tinged with fuscous, the terminal area pale yellow with a faint crimson tinge on edge of basal area and on termen at apex and middle.

*Hab.* BORNEO, 1 ♀ type. *Exp.* 20 mm.

*Cacyparis cyclops*, sp. n.

♂. Head and thorax olive-brown mostly suffused with brilliant silver; palpi and legs yellowish; abdomen reddish brown, the extremity and ventral surface yellow. Fore wing grey thickly irrorated and striated with fuscous, the costal area to middle and at apex and the middle of inner margin olive-brown; brilliant silver irroration from base of costa along inner margin to middle, where there is a boss of black scales suffused with silver, with a silver point beyond it; an oblique silver line from costa before middle to median nervure; a silver striga from middle of costa and boss of silver scales in upper angle of cell; a round blue-black subapical ocellus defined by a yellow annulus, and with minute yellow streak in centre, some silver before the ocellus; the termen pale yellow-brown, with a maculate silver line on termen and a small fuscous patch above tornus. Hind wing pale brown suffused with fuscous, the costal area ochreous to near apex. Underside ochreous; fore wing with broad subterminal band of fuscous suffusion not reaching costa or inner margin.

♀. Abdomen and hind wing ochreous yellow, the latter with some fuscous suffusion on basal inner area and a large subapical patch.

*Hab.* SOLOMONS, Guadalcanar I. (*Meek*), 1 ♂, 1 ♀ type; Isabel I. (*Meek*), 1 ♂, 1 ♀; Rendover I. (*Meek*), 1 ♂. *Exp.* 40 mm.

LXVII.— *On new Species of Histeridæ and Notices of others.*  
By G. LEWIS, F.L.S.

THE last paper on the Histeridæ was published in the September number of this Magazine; the present one is the twenty-sixth of the series.

*List of Species.*

<i>Pygocœlis strigosifrons.</i>	<i>Omalodes bullatus.</i>
<i>Teretrius distinctus, Lew.</i>	— <i>tuberculatus.</i>
<i>Platysoma lævidorsum.</i>	<i>Hister impiger.</i>
— <i>rosselense.</i>	<i>Pachycrærus pullus, Gerst.</i>
— <i>rufopygum.</i>	<i>Paratropus chelonitis.</i>
— <i>pygidiale.</i>	— <i>testudo, Gerst.</i>
— <i>dorsale.</i>	<i>Plegaderus rumanie.</i>
<i>Omalodes striatipectus, Lew., 1900.</i>	<i>Saprinus cæruleatus.</i>

*Pygocælis strigosifrons*, sp. n.

Cylindricus, niger, nitidus; fronte dense strigosa; rostro apice truncato, leviter sinuato; pronoto ante medium partim strigoso; prosterno marginato; pygidio valide punctato; tibiis anticis 4-dentatis.

L.  $3\frac{1}{2}$  mill.

Cylindrical, black and shining; the head, the anterior part is densely strigose with a small fovea on its vertex, behind which there is a small smooth space; the thorax is conspicuously sinuous at the sides with the lateral striæ well-marked, surface rather closely and coarsely punctured, punctures shallow and crescent-shaped anteriorly, others before the middle but not close to the sides are strigose; the elytral punctures are less close and smaller; the pygidium is coarsely and densely subocellately punctured and in the female but slightly concave on its disk; the prosternum is as long again as broad, marginate on its four sides and slightly sinuous at the coxæ, where the margin is reddish, the anterior and posterior edges are both sinuous, the surface has somewhat shallow and elongate points; the mesosternum, the anterior part projects somewhat in the middle, the marginal stria is interrupted behind the prominence, the lateral margin is reddish near the coxæ, and on the surface the punctures are relatively fewer and less close (yet evenly set) than those of the prosternum and are more conspicuously cucullate; the metasternum is similarly punctured; the anterior tibiæ are 4-dentate.

The prosternum of this species is shorter than that of *P. africanus*, Lew., and the species is narrower and not so large as *P. usambicus*, Kolbe.

*Hab.* Antongil Bay, Madagascar (*Mocquerys*).

*Teretrius distinctus*, Lew., 1902.

This species, a native of Cape Colony, has been bred by Mr. C. O. Waterhouse in the British Museum from Acacia-bark infested with *Xylopertha* and *Sinoxylon*.

*Platysoma lævidorsum*, sp. n.

Oblongo-ovatum, convexiusculum, nigrum, nitidum; fronte plana, stria integra; pronoto stria laterali ante basin sinuata; elytris striis 1 integra, 2 basi abbreviatis, 3 basi obliqua, tenuiter impressa; propygidio impunctato, utrinque læviter foveolato;

pygidio laterali conspicue impresso, vix dense punctato, margine externo densissime punctulato; prosterno haud striato; mesosterno sinuato et marginato; tibiis anticis 4-dentatis.

L.  $5\frac{1}{2}$  mill.

This species closely resembles *P. sesquistriatum*, Mars., but differs by the frontal stria not being broken, the thoracic stria being sinuous before the base, the second dorsal stria is not interrupted near the middle, and the outer margin of the pygidium is densely punctulate. The propygidium is without a "transverse train of punctures."

*Hab.* Dutch New Guinea.

*Platysoma rosselense*, sp. n.

Ovato-parallelum, subdepressum, nigrum, nitidum; fronte concava, stria transversa integra; pronoto stria laterali valida, antice late interrupta, utrinque subsinuata; elytris striis 1-3 integris, sinuatis, 4 brevi apicali; propygidio basi irregulariter punctato, utrinque foveolato; pygidio basi conspicue bifoveolato, sparse punctato; prosterno inter coxas sinuato; mesosterno sinuato marginatoque; tibiis anticis 4-dentatis.

L.  $3\frac{3}{4}$  mill.

The elytral striation of this species and its facies generally correspond with *P. Puugami*, Le Guillou: the head is, however, more transverse, the lateral thoracic stria is not parallel to the edge but sinuous, the propygidium is wider and partly smooth; the pygidium is bifoveolate at the base, with rather fine punctures, instead of coarse closely set points; and the prosternal keel is sinuous between the coxæ.

*Hab.* Rossel Island, Louisiade Archipelago.

*Platysoma rufopygum*, sp. n.

Ovale, subdepressum, nigro-piceum, nitidum; fronte concava, stria integra; antennis, mandibulis, femoribus pygidioque rufo-brunneis; elytris striis 1-4 integris, 5 basi abbreviata, suturali ante medium terminata.

L.  $2\frac{1}{2}$  mill.

Oval, rather depressed, piceous, with the antennæ, mandibles, and legs, especially the thighs, reddish brown, the anterior angles and lateral margins of the thorax with the pygidia and abdominal segments are also reddish brown; the head anteriorly concave, stria complete, surface visibly punctured; the thorax, marginal stria complete, strongest behind the head, lateral margins broadly, but not densely, punctured; the elytra, striæ 1-4 complete, 5 well shortened before the base,

sutural is apical and does not reach the middle; the pygidia are rather coarsely, evenly, and rather closely punctured; the propygidium has two rather shallow foveæ which are apical rather than basal; the prosternum is smooth and without striæ; the mesosternum is sinuous and very clearly marginate; the anterior tibiæ are 4-dentate.

In form this species agrees closely with *P. debile*, Mars., but the dorsal striæ and the coloration are very different. In outline it is also similar to *P. depressum*, Lec.

*Hab.* Palembang, Sumatra.

*Platysoma pygidiale*, sp. n.

Ovatum, convexiusculum, nigro-piceum, nitidum; fronte plana, stria integra late sinuata; pronoto impunctato, stria integra margine laterali parallela; elytris striis 1-3 integris, 4 apicali, 5 dimidiata; propygidio transversim grosse punctato; pygidio anterius punctato, sed apice in totum lævi; prosterno angustato, haud striato; mesosterno sinuato, marginato; tibiis anticis 4-5-dentatis.

L.  $2\frac{1}{2}$ - $3\frac{1}{4}$  mill.

This species frequently has a short discal sutural stria, which is, however, not constant in length. *P. pygidiale* is similar to *P. elingue*, Lew., from Ceylon in its general facies, while the sculpture of the pygidium agrees closely with that of *P. Confucii*, Mars. The epistoma is wide in both *elingue* and *pygidiale* and the fifth dorsal stria turns slightly away from the suture anteriorly, especially in *elingue*, in which species the stria is longer.

*Hab.* Sumatra (*H. Rolle*). I have many examples, but no special locality.

*Platysoma dorsale*, sp. n.

Ovatum, convexiusculum, nigrum, nitidum; fronte impressa, stria recta; pronoto stria integra, parum forti, margine laterali parallela; elytris striis validis, impunctatis, 1-3 integris, 4 dimidiata, 5 ultra medium abbreviata, antice sinuata, suturali brevi media; propygidio sat dense punctato; pygidio dense punctato, margine parte exteriori late lævi; prosterno inter coxas bistriato; mesosterno emarginato, stria integra, in medio retrorsum acuminata; tibiis anticis 4-5-dentatis.

L.  $3\frac{3}{4}$  mill.

This species may be recognised from the known species which resemble it by its short discal sutural stria, by the fifth dorsal stria being anteriorly sinuous, by the prosternal striæ being confined to the region of the posterior lobe and being joined before and behind, and by the mesosternal stria

being angulate in the middle. It may be grouped with *P. integrum* and *silvestre*, Sch., and *thugnaum* and *élingue*, Lew., and others, which are oval and more or less convex, with the lateral thoracic stria parallel to the margin.

*Hab.* Anamalai Mountains, S. India (*Andrewes*, No. 692).

*Omalodes striatipectus*, Lew., 1900 = *O. amazonius*, Mars., 1861.

*Omalodes bullatus*, sp. n.

Oblongo-ovatus, parum convexus, niger, nitidus; fronte læviter punctulata, canaliculata, stria retrorsum acuminata; pronoto lævi, stria marginali integra; elytris striis punctatis, 1-2 integris, 3 basi dimidiata; propygidio tuberculato, sat dense subtiliter punctulato; prosterno bistriato; mesosterno stria marginali late interrupta; tibiis anticis 4-dentatis.

L.  $5\frac{1}{4}$  mill.

This species is more oblong than *O. tuberculipygus*, Sch., and the mesosternal marginal stria is not complete. The prosternal striæ are as long as the keel and diverge from each other equally before and behind. The tubercles on the propygidium also are more prominent than the other three species known with tubercles. *O. tuberculipygus*, Sch., is the only species at present known with a tuberculate propygidium and a complete mesosternal stria, but this latter character was not noticed by Schmidt.

*Hab.* Jatahy, Province of Goyaz, Brazil.

*Omalodes tuberculatus*, sp. n.

Ovatus, parum convexus, niger, nitidus; fronte læviter punctata, canaliculata, stria retrorsum acuminata; pronoto lævi, stria marginali integra; elytris striis punctatis, 1-3 integris, suturali postice punctis indicatis; propygidio tuberculato; prosterno bistriato, sed striis brevibus; tibiis anticis valde 4-dentatis.

L.  $5\frac{1}{2}$  mill.

This species differs from *O. bullatus* in being more oval, in having three dorsal striæ complete, and the prosternal striæ are short and occupy nearly one half (the anterior part) of the keel only. In this last respect they are similar to *O. tuberosus*, Lew., which is, however, a larger species, with a more circular outline, being described as "breviter ovatus."

*Hab.* French Guiana.

*Hister impiger*, sp. n.

Breviter ovalis, parum convexus, niger, nitidus; stria frontali semicirculari; pronoto stria laterali unica integra post oculos sinuata; elytris striis subcrenulatis, 1-3 integris, 4 basi vix abbreviata rudimento aucta, 5-6 ultra medium abbreviatis; propygidio pygidioque dense punctatis; prosterno inter coxas bistriato.  
L.  $3\frac{1}{2}$  mill.

*H. impiger* is shorter and much more convex than *H. navus*, Mars., and *niponicus*, Lew. It is most similar to the last, but differs from it in having the thorax less wide, and the lateral stria is incurved at the base and there is a shallow antescutellar fovea near but not on the edge; the elytral fifth and sixth striæ are longer and the punctuation of the pygidia is closer and rather finer. The prosternal striæ are short and intercoxal, like those of *navus*; in *niponicus* they extend along the sides nearly to the end of the keel.

*Hab.* Yunnan (*Donckier*).

*Pachycrerus pullus*, Gerstäcker.

*Platysoma pullum*, Gerst. Archiv für Naturg. xxxiii. p. 31 (1867); Lew. Ann. & Mag. Nat. Hist. ser. 7, vol. iv. p. 11 (1899).

I copy here Gerstäcker's description for the sake of reference:—

“*Platysoma pullum*, Gerstäcker.

“Oblongum, cylindricum, nigrum, nitidum, æneo-micans; prothorace estriato, subtiliter punctulato; elytrorum stria suturali utrinque, secunda pone basin abbreviata, sequentibus subintegris.  
“Long. 2 mill.

“E minimis hucusque cognitis speciebus. Caput confertim subtiliter punctulatum, fronte utrinque sulcata, sulcis clypeum versus convergentibus. Prothorax transversus, lateribus parallelus, angulis anticis late rotundatis, posticis rectis, basi in medio angulata, supra ubique punctis subtilibus, basin versus majoribus obsitus. Coleoptera prothorace dimidio longiora, parallela, apicem versus crebre punctata: singula 6-striata, striis evidenter punctatis, suturali basi apiceque, 2<sup>a</sup> laud procul pone basin, 6<sup>a</sup> antrorsum dimidiatim abbreviata, 5<sup>a</sup> omnino integra, 3<sup>a</sup> et 4<sup>a</sup> utrinque parum abbreviatis. Propygidium fortius, pygidium subtilius crebre punctata, nitida æneo-micantia: pedes sanguinei.

“Specimen unicum ad Kisuani, Masailand (mens Oct. 1862), captam.”



*Paratropus chelonitis*, sp. n.

Breviter ovalis, nigro-piceus, supra impunctatus, vix nitidus; clytris striis dorsalibus 1-4 integris, 5 versus, suturali ultra medium abbreviatis; propygidio basi tenuissime punctato.

L. 4 mill.

In outline this species is much less oval than *P. ovides*, Mars., from Senegal, of which there are three examples in the Museum of Paris, but otherwise the excellent figures in Marseul's monograph well represent the sculpture both above and below. I have seen specimens of *P. chelonitis* labelled *P. testudo*, Gerst., but the elytral striæ differ from Gerstäcker's species in the first four being complete. Gerstäcker, in counting the dorsal striæ, called the sutural the first; his third and fifth striæ correspond, therefore, with the fourth and second of Marseul and other writers on the Histeridæ. Marseul (Ann. Soc. ent. France, Bull. p. lxvi, 1871) recorded this species, of which there is a single specimen in the Museum of Paris, as referable to *P. testudo*, but the subjoined diagnosis of Gerstäcker's will show he was mistaken. The *Pelorurus* also noticed by Marseul (*l. c.*) from Abyssinia was described by Schmidt in 1890 as *P. formosus*; there are specimens also of it in the Paris Museum. *Pelorurus glaucopterus*, Mars., which I have lately received from Beira, is much larger than *P. formosus* and has a red pygidium.

*Hab.* Abyssinia (*Raffray*). In my own collection and in the Museum of Paris.

*Paratropus testudo*, Gerst. Beitr. Ins. Zanz. p. 87 (1866).

Breviter ovalis, nigro-piceus, supra lævis, nitidus; antennis pedibusque rufo-brunneis; clytris stria suturali basin versus, secunda arcuata anto medium abbreviatis, tertio quintoque integris.

L. 4 mill.

*Hab.* Kisuani, E. Africa.

*Plegaderus rumanicæ*, sp. n.

*P. discisi* simillimus, sed angustior; prosterno lobo impunctato et margine antice utrinque sinuato; tibiis anticis abrupte dilatatis.

L. 1¼ mill.

Above, this species is extremely similar to *P. discisus*, Er., but it is narrower in form generally, the lateral margin of the thorax is less wide and the punctuation of its surface is finer and much more sparse, especially behind the transverse sulcus, and the inner elytral oblique stria is well marked and sulciform; in *P. discisus* the stria is obsolete. The elytral



surface also in *P. rumanica* is less closely punctured, and some of the punctures near the scutellum are much larger than those of *P. discisus*. Beneath, the differences are greater. The anterior prosternal lobe is smooth and convex (similar to that of *nitidus*, Horn) and slightly sinuous on either side of the anterior margin, and the median canalication of the metasternum is wide and deep throughout its course and markedly smooth. The anterior tibiæ also are dilated abruptly, not rounded off like those of *P. discisus*.

The anterior lobe of the prosternum of *P. discisus* is very clearly and closely punctured, but this character is not noticed by Marseul in his monograph of 1856, p. 272.

*Hab.* Comana Vlasca, Rumania (*A. L. Montandon*).

*Saprinus cæruleatus*, sp. n.

Circularis, convexiusculus, cæruleus, antennis pedibusque rufobrunneis, supra undique dense strigosus vel punctatus, striis dorsalibus (subhumerali et suturali exceptis) obsolete; pygidio dense punctato.

L. 3 mill.

Almost circular in outline, rather convex, blue, and somewhat shining; the head is densely and rugosely punctured, with a lateral stria over the eyes only, there is a slight impression on the vertex; the thorax, marginal stria complete, surface rugosely punctate behind the head, markedly and densely strigose on the other parts; the elytra, striæ, outer humeral fine and complete, continuing along the apex and joined to the sutural, which is obliterated by the sculpture close to the scutellum, there are several indications of striæ on the humeral area, the oblique humeral being the most distinct, the surface is densely and rugosely punctate and is without the marked strigosity of the thorax; the pygidia are densely punctate; the prosternum, the keel is widely sinuous laterally, with microscopic strigosity and irregular punctures on its surface, the base widens out and is hatchet-shaped, the striæ do not follow the outline at the base, but they are similarly joined before and behind in the form of an arch; the mesosternum is nearly straight anteriorly, but the marginal stria is widely sinuous, the surface has shallow punctures, not closely set, on the metasternum the points are smaller; the antennæ are reddish brown, with the club and scape darker.

I do not know of any species similar to this.

*Hab.* Plateau de l'Androy, Région d'Ambovombe, Madagascar.

LXVIII.—*On new and little-known Species of Eastern and Australian Lepidoptera.* By Colonel CHARLES SWINHOE, M.A., F.L.S., &c.

Family Hesperiidæ.

*Casyapa dissimilis*, nov.

♂. Antennæ ochreous with brown bands; palpi, frons, and head dark ochreous; thorax, abdomen, and wings of a uniform ochreous brown, entirely covered with dark ochreous scales, without any markings; cilia pale ochreous. Underside dark ochreous brown, without the ochreous suffusion and also without any markings; fore legs with long dark ochreous hairs.

♀. Antennæ brown, a long white space before the hooked tip; palpi dark ochreous; head, body, and wings of a uniform dark olive-brown: fore wings with a broad, nearly uniform white band, from the costa beyond the middle to the outer margin above the hinder angle, where it is joined to a curved white spot; cilia of both wings brown. Underside pale, but more blackish: fore wings with the band as above, the hinder margin and base suffused with grey; hind wings with about the outer half coloured like the fore wings, the abdominal half suffused with grey: body grey, legs dark ochreous.

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

German N. Guinea; one pair.

Allied to *C. nævifera*, Mab., from Batjan, but can easily be separated by the absence of the strong black mark at the end of the cell of the fore wings in the male, which is so prominent a character in Mabilles's species. There is a pair from N. Guinea in the B.M. unnamed.

*Tagiades curiosa*, nov.

♂. Antennæ black, white on the underside of the club; palpi, head, thorax, and fore wings dark olive blackish brown with an olive tint; frons white, containing a brown band; palpi white beneath: fore wings with an obscure discal band, of three obscure duplex spots, rather near the outer margin, rising from near the hinder margin more than halfway up the wing; spots white, all small and linear, with the exception of the outer three, which are round—one at the end of the cell, two above it, one below it, all in an oblique line, one above but outside the last, two above this

one, near the costa, and the outer three subapical, near together but almost at right angles to each other: hind wings with the upper half of the same colour as the fore wings but paler, lower half pure white; marginal border black, composed of large spots joined together; an obscure spot opposite the apex and a prominent one below it, both rather close to the margin; cilia brown, white towards anal angle of hind wings: abdomen with the basal half brown, the rest white. Underside black: fore wings with the spots as above, some white suffusion at the end of the cell, and a broad submarginal band of broad, duplex, obscure white spots, which curves inwards below the apex, the duplex spot near the hinder margin the largest and most prominently white; hind wings pure white, with a broad dark black costal border, the spots as above: body and legs white.

Expanse of wings  $2\frac{2}{10}$  inches.

German N. Guinea; one example.

Allied to *T. clericus*, Butler, which has a black abdomen and has no smeared whitish markings on the outer portions of the fore wings below. There is an example from Aru Isl. in the B.M. unnamed.

#### Genus *ILMA*, nov.

Antennæ slender, two thirds the length of the costa, club long, tip curved and of moderate length; palpi upturned, rising as high as the vertex, densely covered with thick hair, third joint short, smooth, and with a blunt point; thorax and abdomen moderately stout, the abdomen reaching a little lower than the hind wings; legs hairy, tarsi smooth and without spurs: fore wings with the costa arched at the base, outer margin oblique, apex consequently rather produced, hinder margin straight, slightly longer than the outer margin, hinder angle rounded: hind wings with the costa and apex rounded, outer margin waved below the middle, anal angle blunt, abdominal margin waved; vein 5 from above the middle of cell.

#### *Ilma jovina*, nov.

♂ ♀. Of a uniform dark bright olive-brown colour; palpi below white, with brown hairs: fore wings with a broad ochreous band from the costa of fore wings at the middle to near the hinder margin before the hinder angle, the band is fairly uniform in breadth but has irregular margins on both

its sides and is excavated on its inner side on the submedian vein; cilia of fore wings brown, of hind wings white.

Expanse of wings, ♂  $2\frac{2}{10}$ , ♀  $2\frac{4}{10}$  inches.

East Celebes; one pair.

I received these three years ago from a dealer on the Continent under the name of *Hidari joviana*, and there are two males in the Crowley Collection in the B.M. as *H. Irvini*, but I can find no reference for either name; I have gone through a great deal of literature, and can only come to the conclusion that the species has never been described and published. Except on the waved outer margin of the hind wings it has the shape of *Erionota thrax*, but this and the third joint of the palpi separate it from the genus *Erionota*; the neurulation is similar, but so it is in many genera of this family.

*Telesto uniformis*, nov.

♂. Palpi beneath ochreous grey with brown hairs; frons with an ochreous-grey ring, brown in the centre; antennæ blackish brown with ochreous-grey dots on the underside and with the underside of the club suffused with the same colour; head, body, and wings of a uniform dark blackish brown, without any markings, except for the sexual and linear brand, which runs in a more or less waved line from near the origin of vein 4 of the fore wings to the hinder margin beyond the middle and is grey in colour; underside paler, without any markings.

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

Ké Island; two examples.

*Telesto saxula*.

*Hesperilla saxula*, Mab. Ann. Soc. Ent. Belg. 1891, p. lxxxii, ♀.

♂. Of a uniform olive-brown colour; palpi white below, black above, last joint black: fore wings with the sexual linear brand pale, nearly white, outwardly lined with black, a white dot outside its upper end, two subapical white dots, rather far apart from each other; no other markings; cilia a little paler than the wings, with a tinge of ochreous. Underside paler than above, the hinder marginal space of fore wings pale, the three white dots as above; fore legs and body with white hairs.

Expanse of wings  $1\frac{3}{10}$  inch.

Mackay, Queensland; three examples.

Mabille's female type came from Cooktown, Queensland,

and his description fits my examples very well, considering the usual sexual differences in this family.

In his Monograph of the Hesperidæ in Wytsmau's 'Genera Insectorum,' fasc. 17<sup>d</sup>, p. 132 (1904), by some extraordinary error, Mabille puts his species under Godman and Salvin's genus *Halotis*, with Costa Rica as its locality. In the 'Biologia,' Insecta, Lep.-Rhop. ii. p. 505, pl. xcv. ff. 42, 43, 44, ♂ (1900), a Hesperiid from Costa Rica is described and figured as the type of the genus *Halotis*; but neither the description nor the figures represent the Queensland insect. One of the 'Biologia' examples, it is said, is labelled as having been compared by Salvin with the type of *Hesperia sazula*, Mab., a description of which could not be found; this must refer to some Hesperiid from Costa Rica so named by Mabille, which never was described and published; it can have no reference to the Cooktown insect.

#### *Mimas melie*.

*Mimas melie*, de Nicé. Journ. Bomb. N. H. Soc. ix. p. 394, pl. Q. f. 55, ♀ (1895).

♂. Both wings and cilia dark brown with an ochreous tinge: fore wings with obscure ochreous streaks from the base in the interspaces, the two lowest extending to the discal dull ochreous oblique band, which is composed of three spots, the lowest the largest: hind wings with the inner portion of the wing smeared with dull ochreous, extending on the abdominal margin from the base to one third from the anal angle, narrowing inwards to a large square ochreous spot in the upper disk. Underside rich purplish brown, markings pale ochreous yellow, a large spot at the end of the cell, a large space commencing with the uppermost spot of the discal band, widening hindwards and extending on the hinder margin from the middle of the wing to the hinder angle, a duplex subapical spot in a line with the inner margin of the band, and four linear subcostal spots close together, a little on the inner side of the wing: hind wings with two large spots—one below the origin of vein 2, and the other towards the outer margin in the interspace above vein 4: palpi, head, and body with ochreous hairs; legs dull ochreous grey.

Expanse of wings  $1\frac{7}{10}$ – $1\frac{9}{10}$  inch.

Humboldt Bay, N. Guinea; two examples.

The female, as described and figured by de Nicéville, has no band on the fore wings, but the peculiarly marked underside is identical; vein 5 of the hind wings is also absent, and the

neuration similar. Both are from the same locality; I therefore cannot help being convinced that they are sexes of the same species. One example has on the hind wings below an extra dot near each spot.

*Padraona tranquilla*, nov.

♂ ♀. Palpi brown with ochreous hairs, white beneath and at the tips; head, body, and wings red-brown with a dull olive tinge; head and thorax with ochreous hairs: fore wings with a thin, oblique, dull ochreous discal band composed of six spots close together and three similarly coloured incurved subcostal dots near apex: hind wings with a short discal band of five spots close together; cilia of both wings ochreous. Underside: fore wings nearly all black, a subcostal ochreous streak from base to beyond the middle, some ochreous suffusion on the apical space, the discal band and dots as above: hind wings ochreous, the band as above but with a black outline; both wings with the outer marginal line black, cilia ochreous: face and pectus white; thorax grey; legs grey with white stripes; abdomen white.

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

Milne Bay, N. Guinea; one male. Type female in B.M.

This is not a typical *Padraona*, there being a sex-mark consisting of a line of raised scales on the fore wing of the male, bordering the inner sides of the first four spots forming the discal band. When more examples are procured, it will come into a new genus between *Padraona*, Moore, and *Oxybydastes*, Heron.

*Padraona tabla*, nov.

♂. Dark brown, tinged with ochreous; markings orange-ochraceous: fore wings with a small spot at the upper end of cell, two obscure streaks from the base in the two lowest interspaces touching the discal band, which is linear, outwardly oblique, and consists of three spots; four small subapical spots in pairs, almost at right angles to each other; these spots are obsolete in one example: hind wings with a discal band, broader than the band of the fore wings, consisting of five conjoined spots; cilia of both wings orange-ochreous; palpi, frons, and head with ochreous hairs. Underside bright orange-brown, the whole surface suffused with orange-colour; spots as above, with the addition of a spot at the end of the cell of the hind wings.

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

Humboldt Bay, N. Guinea (*Doherty*); two examples.

Resembles *P. concinna*, Elwes, from the Nilgiri Hills, of which I have many examples.

*Padraona batchiana*, nov.

♂. Dark brown, suffused with ochreous; palpi and frons with bright orange-ochreous hairs; wings with dark orange-ochreous markings: fore wings with some obscure longitudinal streaks near the base and an obscure streak along the hinder margin, on the inner side of the discal band, which is outwardly oblique and composed of three spots, the lowest lunular, the middle spot with its inner edge a little more inwards than the others, and two small linear spots close together below the costa, almost in a line with the band: hind wings with an upper discal short band of rather larger spots divided by the veins into four spots; cilia of both wings orange-ochreous. Underside bright orange-brown; spots on the fore wings same as above, the lowest spot of the band with two suffused white spots in a line towards the base, some black suffusion above these spots, and some more at the hinder angle of the wing: hind wings without markings; some indistinct, suffused ochreous stripes in the interspaces on the outer portions of both wings.

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

Batjan (*Doherty*); one example.

*Padraona silativa*, nov.

♂. Ochreous brown; palpi at the sides and frons orange-ochreous, some hairs of the same colour on the head and on the sides, basal end of thorax, and anal tuft; wings marked with orange-ochreous: fore wings with a thin costal streak on basal half, a broad basal streak in the cell, divided by a black line, its upper part running nearly to the end of the cell; two basal streaks on the two lowest interspaces, reaching the discal band, which is oblique and consists of five large spots, the uppermost ones the smallest, then two dots joining it to the three linear subapical spots, which are close together: hind wings with a wedge-shaped spot in the cell, with its point inwards, a discal band divided into five spots and a dot by the veins, some long ochreous hairs forming two obscure stripes near the abdominal margin; cilia of the fore wings brown, ochreous towards hinder angle; cilia of the hind wings entirely ochreous. Underside paler; markings as above, except that the wedge-shaped spot is replaced by a small yellow spot, and there are some obscure



streaks in the interspaces on the outer portions of the wings ; pectus ochreous ; legs striped with ochreous ; tarsi entirely ochreous.

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

Humboldt Bay, New Guinea ; one example.

Resembles *P. sperthias*, Felder ; has a very obscure sinuous sex-mark of andraconia scales on the inner side of the discal band of the fore wings.

*Ismene lysima*, nov.

♀. Of a uniform dark pink-brown with an ochreous tinge, clubs of the antennæ ochreous beneath, as also is the underside of the palpi ; both wings with some dark orange suffusion in the basal portions, formed by obscure streaks in the interspaces, no other markings. On the underside the wings are slightly paler, a broad dull orange-red streak along the costa of fore wings and some obscure streaks of the same colour in the interspaces on the outer portions of the wing : hind wings with a broad space on the costa at the base smeared with the same colour ; no other markings : legs streaked with ochreous.

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

Ké Island ; one example.

*Hasora palinda*, nov.

♂. Of a uniform dark pink-brown ; underside of palpi ochreous, some blackish suffusion at the anal angle of hind wings ; wings without any markings above. On the underside the fore wings have a pale streak at the end of the cell and a pale transverse submarginal streak on the upper half ; the hinder marginal area whitish : hind wings with a pale discal thin band, quite straight from the costa near apex, terminating in a short white mark where it joins the large black rounded space on the anal angle ; a whitish spot on the abdominal margin, just outside the black mark : legs with long ochreous hairs.

Expanse of wings  $2\frac{4}{10}$  inches.

Soekaboeni, Java ; one example.

Like *H. Ribbei*, Plotz, but that form has the hind wings glossed with blue below.

Family Aganaidæ.

*Asota latiradia*, nov.

♀. Palpi with first two joints ochreous, brown stripes at



the sides above, the upper third white beneath, last joint black, white beneath; frons, head, and thorax dull ochreous, tinged with greenish grey; thorax with six small black spots in front; abdomen bright orange-ochreous, with short black dorsal bands on the segments: fore wings purplish brown, basal patch coloured like the thorax, containing small black spots, three subcostal, one below near the base, and three in a row on the outer margin of the patch, all the spots circled with white, the white on the outer spots angled outwards; a very broad white medial streak, its upper part occupying half the cell, its lower part gradually produced almost to a point along vein 2 about one sixth from the outer margin, the outer edge irregular; vein 1 and the hinder margin white for about half the distance from the base: hind wings white, with a black marginal border, broad at the apex, evenly and gradually attenuated to the anal angle, which it does not quite reach.

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

Babber Island, west of Timor-Laut; one example.

There is nothing like it in my collection, but Dr. Jordan tells me it somewhat resembles streaked specimens of *A. timorana*, Roths. Nov. Zool. iv. p. 349.

*Asota symmorpha*, nov.

♂ ♀. First two joints of the palpi, frons, head, thorax, and abdomen bright orange-ochreous; the palpi with a streak above and the last joint black; two large black spots on the collar and two behind them; thorax with a broad black longitudinal stripe; abdomen with broad black segmental bands above and below, disconnected at the sides and at the middle below: fore wings purplish brown with the basal patch very small, containing two large black spots; a white narrow stripe along the median vein, with a round club at the end, extending a little beyond the end of the cell, and in the male not reaching the base: hind wings white, a small blackish spot at the end of the cell, and broad marginal black borders, slightly broadest at the apex, running up the abdominal margin.

Expanse of wings  $2\frac{4}{10}$  inches.

Saparua Island; one pair.

Allied to *A. doryca*, Boisdl., which I have from Ké, N. Ireland, N. Guinea, and Fergusson Islands, but differs in its bright yellow body and has no streaks on its veins and no points extending from the club; the bands on the abdomen of the female are less pronounced than those in the male.

## Family Arctiidæ.

*Diacrisia aurapsa*, nov.

♀. Antennæ ochreous; palpi, head, thorax, and fore wings dark brown with a pinkish-ochreous tinge; abdomen dull crimson above, with short segmental dorsal bands, leaving a broad crimson band on each side. Body below and legs dark brown without markings: fore wings with very indistinct traces of markings, a brown spot at upper end of cell, and two lines or thin bands across the disk, arising rather close together on the hinder margin beyond the middle, separating upwards, the outer line apparently reaching the apex: hind wings paler brown without markings.

Expanse of wings  $1\frac{8}{10}$  inch.

Saparua Island; one example.

Allied to *D. landaka*, Moore, from Java.

## Family Drepanulidæ.

*Tridrepana adelpha*, nov.

♂. Of a uniform pale ochreous colour; shafts of the antennæ, costal line of fore wings, and cilia of both wings dark pinkish brown; a pale purplish spot in the cell of fore wings and another at the end; both wings with traces of antemedial and postmedial recurved lunular lines; a large pale purplish patch in the centre of each wing, each containing three brown spots: fore wings with a narrow brown mark below the apex, limited by a brown submarginal line which runs near the margin from the middle of the wing to the apex. Underside much paler, the patches on the wings showing through; no other markings.

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

Khasia Hills; many examples.

Allied to *T. sadana*, Moore, from Sikhim, and generally mixed up with that species, but no one with a series of each before him could possibly put them together.

## Family Acontiidæ.

*Erastria crotopha*, nov.

♂ ♀. Palpi, head, and thorax olive-brown, a white spot on the frons, some white dots on the thorax; abdomen and the tufts dark brown, some whitish at the sides, the first two segments and anal tuft also whitish: fore wings olive-ochreous, irrorated with olive-brown, bands and markings

dark olive-brown, a sinuous subbasal line, inside of which is a patch on the costa and a small spot, also on the costa between it and the medial band, which is contracted above the middle and is slightly outwardly curved; a discal crenulate thin band, a large subapical costal patch, and two smaller costal patches between it and the medial band; a paler patch at the apex, some markings below it and a black line on the margin of disconnected lunules, inwardly edged with whitish; cilia with a brown line and pale spots: hind wings pale brown without markings. Underside pale brown; a cell-spot on the hind wings and a brown, outwardly curved, discal line across both wings.

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

Khasia Hills; five males and one female.

Allied to *E. aurata*, Moore, from Sikkim; the female is paler than the male. There are two examples from the Khasia Hills in the B.M., Drawer 181.

*Eublemma atimeta*, nov.

♂ ♀. Frons and head whitish; body and wings of a uniform dull whitish ochreous: fore wings with the costal line dull pink, two transverse oblique lines, rather indistinct, the first from near the hinder margin before the middle to near the costa beyond the middle, the other a little beyond, parallel, extending to the apex, and apparently duplex; the outer margin shaded with pinkish ochreous, with cilia of the same colour, and a row of duplex points near the outer margin: hind wings without markings: abdomen below whitish towards the extremity.

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

Padang, Sumatra; one pair.

*Tarache procrita*, nov.

♂. Frons and vertex of head white; collar broadly dark chestnut-brown; thorax brown with a white band in front: fore wings with the ground-colour white, the bands and markings dark chestnut-brown; a patch on the costa before the middle, complete in some examples, broken in the type; a broad medial band, more or less dislocated and much constricted at the end of the cell, widening on the hinder margin with a white spot within it, absent in some specimens; a dislocated marginal band, connected above the middle with the medial band; a white spot at the apex; the white portions of the wing more or less irrorated and marked with brown

atoms: hind wings and abdomen dull brown. Underside with the fore wings dull brown; a white dot on the costa before the apex and a white spot at the apex: hind wings dull whitish suffused with pale brown, a brown dot at the end of the cell; medial and discal brownish thin bands.

Expanse of wings  $\frac{8}{10}$  inch.

Khasia Hills; several examples.

Somewhat resembles *T. noloides*, Butler, from Japan.

*Rivula magniplaga*, nov.

♂. Palpi with black stripes above and below and ochreous brown at the outer sides, ochreous inside, whitish at the tips; frons and vertex greyish brown, collar pale; thorax and fore wings brownish ochreous: fore wings with a broad, even, outwardly oblique, medial black band, which only reaches the middle of the end of the cell and is limited on its outer side by a white line which is abruptly angled inwards on to the costa; from the angle of this line there is a brown patch which widens on to the outer margin below the apex, and from its middle to the hinder margin there is a thin, somewhat sinuous, brown band; on the margin within the patch is a white line and the cilia of both wings are brown: hind wings ochreous grey, without markings. Underside much paler than above, with a large brownish triangular patch occupying the greater part of the basal half of the fore wing; tarsi with white spots.

Expanse of wings 1 inch.

Khasia Hills; two examples.

Family *Quadrifidæ*.

Genus *MASCA*, Walker.

*Masca*, Walker, xvi. 8 (1858).

*Phagytra*, Walker, xxxiv. 1508 (1865).

*Masca abactalis*.

*Masca abactalis*, Walker, xvi. 9.

Khasia Hills; one pair.

The type from Singapore is in Mus. Oxon.; it is not mentioned by Hampson in his 'Moths of India.'

In Cat. Het. Mus. Oxon. ii. p. 165 (1900) I put *Phagytra leucogastralis*, Walker, xxxiv. 1508, type from Java in B.M., = *Metria platypoda*, Felder, Reise Nov., Lep. pl. 120. f. 44 (1873), type Amboina, in Coll. Rothschild, as a synonym to the above; but in this I think I was wrong; *leucogastralis*

is a darker insect with the hind wings more heavily bordered. My Khasia Hills examples are identical with Walker's Singapore type; I have *abuctalis* also from Singapore, Obi Island, and Waigiu Island, and *leucogastralis* from Gilolo, Fergusson Island, and Amboina.

### Family Focillidæ.

#### *Egnasia rudmuna*, nov.

♂. Palpi, antennæ, head, thorax, and fore wing ochreous brown: fore wings with ante- and postmedial outwardly curved whitish lines, inwardly lined with brown, the former with an outward brown spot on the costa, the latter with a costal spot on each side; both lines rather acutely bent inwards below the costa; the first line with a white spot just outside it in the cell; the second line with a much larger and distorted white spot inside it at the end of the cell; a submarginal brightly sinuous white line, curved round a large blackish subapical spot, and some black lunules on the inner side of the line; some marginal black lunular points outwardly marked with white; marginal line ochreous; cilia ochreous, with a pale brown interline or band: hind wings pale ochreous grey, brownish on the outer portions; indications of a waved pale submarginal thin band; two black white-pointed spots, one above the other, near the abdominal margin above the anal angle; marginal line black, lunular; cilia as in the forewings. Underside ochreous grey: fore wings with indications of the upperside markings: hind wings with three transverse, highly sinuous, brown lines with some very prominent black spots on them, including a lunular mark at the end of the cell; antennæ bipectinate, with stiff bristles and cilia: fore wings narrow, not angulated, outer margin oblique; hind wings normal.

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

Kina Balu; three examples.

#### *Rhesala tenuilinea*, nov.

♂. Of a uniform grey-brown: fore wings with five white costal points on the apical third; both wings with five thin, sinuous, and outwardly curved brown lines, subbasal, ante-medial, medial, discal, and submarginal, at equal distances apart, the third running through an 8-shaped orbicular mark, the last composed of dots: hind wings with three similar lines, corresponding to the last three of the fore wings; both wings with a brown marginal crenulated line; a similar line

in the cilia, which have ochreous spots at the tips. Underside paler; costa of fore wings and basal portions of both wings with some whitish suffusion; lines as above, reniform and orbicular white and prominent; tarsi banded with white.

Expanse of wings 1 inch.

Padang, W. Sumatra; one example.

Near *R. commoda*, Walker, and *R. nigriceps*, Hmps. n.

### Family Deltoididæ.

#### *Bocana subalbida*, nov.

♂. Antennæ white, tinged with pink; palpi pure white beneath; palpi above, head, body, and wings pale pinkish brown, almost a rosy tint: fore wings with a white dot near base of cell, a large ear-shaped white mark at the end; antemedial, postmedial, and discal, transverse, slightly sinuous brown lines, terminating in white dots on the costa, the first crossing the white dot, the second outwardly curved: hind wings with the costal space broadly white; an indistinct cell-mark and three transverse brown lines, medial, discal, and submarginal; marginal line of both wings brown; abdomen with a pure white anal tuft. Underside: fore wings with the upper half pale pinkish brown, the lower part white, unmarked; hind wings pure white on the basal portions, the outer pale pinkish-brown lines as above, a prominent black cell-spot; body and legs pure white.

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

Batjan; one example. There is one from Amboina and another from Fergusson Island in the B.M. unnamed, Deltoid drawer 36.

#### *Oxænanus magniplaga*, nov.

♂. Antennæ, palpi, head, body, and wings pale brown, tinged with pinkish and ochreous: fore wings with sinuous, ante- and postmedial transverse grey lines, the former inwardly and the latter outwardly oblique, being rather close together on the hinder margin of the wing; the former ends in a black spot on the costa with a black dot below it inside the cell; a very large ear-shaped black patch at the end of the cell, extending up to the costa, edged outwardly with whitish, with a sinuous grey line running down from it to the hinder margin; a broad pale space across the disk of the wing, which is continued across the middle of the hind wings, through which is a sinuous grey line; the hind wings otherwise unmarked; marginal line of

both wings ochreous, with black lunular points. Underside much paler, with corresponding transverse lines and a black spot at the end of each cell.

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

Khasia Hills; one example.

One example from Sikkim in the B.M., Deltoid drawer 37, with *Mosopia megaspila*, Walker, Hampson, Moths India, iii. p. 50; but it is quite distinct from Walker's Penang type.

#### Genus LIGNICIDA, nov.

♂. Antennæ with minute cilia; palpi as long as the head and thorax, second joint porrect, with long brush-like hair above, a small brush standing out at the end below, third joint nearly as long as the second, abruptly erect, short thick hair on the underside, a thick brush of long hair on the upperside; thorax and abdomen smooth, the latter not extending beyond the wings; legs moderately hairy; hind tibiæ with two pairs of spurs: hind wing with vein 5 from near lower end of cell: fore wing long, rather narrow, apex acute, angled at the middle of the outer margin; costa rounded at the base: hind wings with the apex somewhat produced, the outer margin nearly straight, rounded at the anal angle.

Type, *L. echana*, nov.

#### *Lignicida echana*, nov.

♂. Antennæ and palpi red-brown; body and wings of a uniform ochreous brown: fore wings with four rather large black spots on the costa, at nearly equal distances apart, being terminations of very indistinct, highly sinuous, transverse brown lines, the third the most distinct and continued across the middle of the hind wing; a faint indication of a pale discal band across both wings between the last two lines, marginal lunular black points; cilia pale, containing a thick blackish line. Underside paler and more ochreous, the last two transverse lines prominent, and a brown dot at the end of each cell; body and legs without markings.

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

Palawan (*Waterstradt*); one example.

There is an example from Bali in B.M. unnamed, Deltoid drawer 14.

#### Family Hypenidæ.

#### *Britha biguttata*.

*Britha biguttata*, Walker, xxxiv. 1147 (1865); Hmpsn. Moths India, iii. p. 94 (1895).



*Herminia* (?) *incertalis*, Walker, xxxiv. 1518.

*Hypena colabalis*, Felder, Reise Nov., Lep. pl. cxx. f. 29 (1873).

Type, Moreton Bay, in B.M.

Type (*incertalis*), Java, in B.M.

Type (*colabalis*), Amboina, in coll. Rothschild. I have it from Queensland, Pulo Laut, Sarawak, and Ceylon. Felder's name and reference have been heretofore overlooked.

#### Family Epiplemidæ.

##### *Epiplema pæciliaria*, nov.

♂. Palpi black, a white band at the base of third joint; frons white; head and collar chocolate-pink, the latter with a white line in it; thorax and a broad band on hinder margin of fore wings pure white; the remainder of the fore wings with the ground-colour white but thickly irrorated with chocolate-pink, especially on the outer portions of the wing; a white spot in the cell, divided by a black mark, another at the end; a pink indistinct band from the middle of the costa, angled outwards, and is lost in the brownish suffusion in the disk; this is margined outwardly by a white band, which is indistinctly traceable in an attenuated and recurved form to the hinder angle, where there are three black spots in a line on its outer edge; outside this band on the apical portion of the wing there is some dark brown suffusion; marginal line and cilia pale pink with some brown spots: hind wings with the costal third pure white, its outer edge irregular and very sinuous, the remainder of the wing brown-pink; a short white band, lined with black, at the middle of the abdominal margin; some blackish transverse short lines, a white dot in the disk; abdomen pinkish grey. Underside: fore wings suffused with dark brown, a white band on the hinder margin; hind wings white, slightly suffused with pinkish grey on the lower portions; body and legs white.

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

Padang, W. Sumatra; one example.

Fore wings with the outer margin rounded; hind wings with two tails. Superficially like a very large example of *E. desistaria*, Walker.

#### Family Boarmiidæ.

##### *Tristrophis veneris*.

*Urapteryx veneris*, Butler, Ann. & Mag. N. H. (5) i. p. 392 (1878).



*Tristrophis veneris*, Butler, Journ. Linn. Soc., Zool. xvii. p. 200, pl. ix. fig. 34 (1883); Swinhoe, Cat. Het. Mus. Oxon. ii. p. 230 (1900).

Jaintia Hills; one example.

The type from Yokohama is in the B.M. I have it also from the same place and from Asama Yama. It is not recorded by Hampson.

*Pogonopygia nigralbata*.

*Pogonopygia nigralbata*, Warren, Nov. Zool. i. p. 681 (1894); Hmps. Moths India, iii. p. 619 (1895).

Jaintia Hills; one example.

I have it also from Japan. There is no specific difference between the Japanese and Indian example, and Sir George Hampson was therefore wrong in doubting the Tring localities. Warren quotes Japan, Central China (many examples), and Khasia Hills (two examples) as his localities, but he does not state the locality of the specimen on which he bases his type.

*Leptesthes circumflexaria*.

*Ennomos circumflexaria*, Kollar, Hügel's Kasch. iv. p. 485 (1842).

*Lagyra megaspila*, Moore, P. Z. S. 1867, p. 616.

*Hyposidra* (*Leptesthes*) *megaspila*, Hmps. Moths India, iii. p. 215 (1895).

Kollar's type came from Massuri; Moore's type from Bengal is in the B.M. I have it from the Khasia Hills. *L. circumflexaria* is not mentioned by Hampson.

*Medasina pallidimargo*, nov.

♀. Frons and head white; body and wings grey, thickly irrotated with dark brown: fore wings with an outwardly curved, antemedial, black band, bluntly angled below the costa, and again below the cell, where it is bent inwards and then straight to the hinder margin, one fourth from base, and includes a black spot inside the cell; a straight black band from the middle of the costa to a black spot at the end of the cell; two short, black, costal bands between this and the apex, at equal distances apart, the last being the termination of an irregular band which limits the white outer marginal space, this limitation is bent inwards on vein 3 and then is continued in a somewhat sinuous form to the hinder margin near the hinder angle; in some examples there is a discal lunular black line from the penultimate costal band which is continued across the hind wing a little beyond the

middle, and on this wing there is a black spot at the end of the cell, and a submarginal irregular and indistinct band, limiting the white marginal space, which is more covered with irrorations than it is on the fore wings; cilia of both wings brown with white spots: the underside is paler and whiter, markings mostly visible, the white marginal space much clearer.

Expanse of wings  $2\frac{4}{10}$  inches.

Kashmir; nine examples, all females.

Allied to nothing I know of.

*Abraxas languidata.*

*Abraxas languidata*, Walker, xxiv. 1122 (1862).

*Calabraxas languidata*, Cotes & Swinhoe, Cat. Moths India, ii. no. 3726 (1888); Hmps. Moths India, iii. p. 518 (1895).

Khasia Hills; a fine series.

I have it also from Japan; there is no specific difference. Walker's type is recorded from Nepal (*Hearsay*), but Hampson states it is from Japan and omits it from the Indian record. Hearsay never collected in Japan.

Family Sterrhidæ.

*Emmiltis elyra*, nov.

♂. Of a uniform dull yellow colour; frons black with a yellow band: wings with a black spot at the end of each cell; a pale grey, straight, thin band from near apex of fore wings to the abdominal margin of hind wings before the middle; a crenulated grey line from near apex of fore wing to the hinder margin near the angle, then across the disk of the hind wings; on the fore wings inside this line is a row of black spots, some of which on the lower portion of the wing are large and prominent; on the hind wing there is a submarginal similar line, rather close to the discal line, with four rather large black spots inside it. Underside paler, cell-spots on all the wings; on the fore wings the two bands are visible and some brown suffusion at the base.

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

Kashmir; one example.

The hind wings are angled at the middle.

*Anthometra unipuncta*, nov.

♂. Of a uniform ochreous-white colour; top of head black; costal space of fore wings slightly irrorated with ochreous grey, and a very slight tinge of that colour on all

the margins of both wings; a black spot at the end of each cell; no other markings.

Expanse of wings  $1\frac{8}{10}$  inch.

Kashmir; one example.

Family Geometridæ.

*Microloxia vestigiata*, nov.

♂. Palpi above orange-red, whitish beneath; antennæ orange, shafts and base white; frons orange-red, with a pale band; top of head and abdomen ochreous white; thorax and wings of a uniform pale grass-green; costal line of fore wings pale ochreous white; cilia white, no markings above or below; body below white; legs tinged with ochreous.

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

Kashmir; three examples.

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LXIX.—*Notes on the various Forms of Arvicanthis pumilio*,  
*Sparrm.* By R. C. WROUGHTON.

THE Natural History Museum possesses a very fine series of specimens of this common South-African mouse, amounting to over 130 individuals from more than thirty localities. The majority of these and the best prepared have been obtained by Mr. C. H. B. Grant in connexion with the exploration of the mammal fauna of South Africa now being carried on by Mr. C. D. Rudd, by whom they have been presented to the Museum. Those from Deelfontein were obtained by the same collector working for Col. Sloggett, and other smaller series are due to Mr. F. C. Selous, Mr. J. folliott Darling, Sir H. H. Johnston, Mr. R. B. Woosnam, Dr. W. J. Ansorge, Mr. F. J. Jackson, and others.

A detailed examination of this collection has satisfied me that the general pattern of the coloration in this species (or group of species) is, without exception, absolutely constant in all the forms, which are spread over Africa south of the Equator.

The coloration, on the other hand, is almost as variable as the pattern is constant. From one or two localities there are series which are fairly evenly coloured, but in the majority of cases there are almost as many variations of colour as there are individuals in a series.

I have found, however, that the size of the bullæ furnishes

a reliable character on which to base a differentiation of forms, which agrees very fairly with their geographical distribution, and have thus been able to distinguish four groups with bullæ whose antero-posterior lengths are respectively 6·5, 6, 5·5, and 5 mm.

Group I. covers the country, roughly speaking, south of 25° S. lat. and west of 25° E. long.

Group II. runs along the coast from the Cape to Zululand, but a form of this group crops up in Angola. The area directly north of Group I. is unrepresented in the collection except by a single specimen from Matopo, but this specimen falls also into Group II.

Group III. occupies the whole of the country north of 25° S. lat. and east of 25° E. long, except in two small isolated patches.

Group IV., so far, is represented by specimens from two isolated areas, viz. :—

1. Basutoland, and a small area adjoining, along the crest of the Drakensberg.

2. The Mlangi Plateau, Nyasaland.

The specimens from both these localities are labelled "6000' Alt.," and possibly even this altitude is a comparatively lower level surrounded by still greater heights; it certainly is so in the case of the Basutoland specimens. In any case, however, this group is evidently a high-level form.

Each of these groups contains, as will be seen, more than one form, and I have found it very difficult to decide as to the systematic status which should be given to these forms. I think that each of these four groups should probably rank as a species; but if *pumilio* is once broken up consistency would require that other species besides these should be formed (e. g. *pumilio* and *vittatus*, both taken at Cape Town, &c.). I have come to the conclusion that, in view of the absolute identity of pattern, the variability of coloration, and the difficulty of deciding the inter-relationship of the different forms, the simpler and safer way is to call them all subspecies of the original species *pumilio*.

The following is a key to the various forms I have been able to differentiate :—

- A. Antero-posterior length of bullæ 6·5 mm.  
 a. Hind foot 27 mm. or more ..... *bechuanæ*, Thos.  
 b. Hind foot less than 27 mm.  
 a<sup>1</sup>. Length of tooth-row 5 mm.  
 a<sup>2</sup>. Hind foot 25 mm. or more ..... *cinereus*, Thos. & Schw.  
 b<sup>2</sup>. Hind foot at most 25 mm. .... *meridionalis*, subsp. n.  
 b<sup>1</sup>. Length of tooth-row 4·6 mm. .... *griquæ*, subsp. n.

- B. Antero-posterior length of bullæ 6 mm.
- a. Length of tooth-row 4·8 mm.
    - a<sup>1</sup>. Basilar length of skull 24 mm. . . . . *pumilio*, Sparrm.
    - b<sup>1</sup>. Basilar length of skull 21 mm. . . . . (?) *vittatus*, Waguer.
  - b. Length of tooth-row less than 4·8 mm.
    - a<sup>1</sup>. Hind foot 23 mm.; basilar length of skull 23 mm.; length of tooth-row 4·7 mm. . . . . *angolæ*, subsp. n.
    - b<sup>1</sup>. Hind foot 22 mm.; basilar length of skull 21·5 mm.; length of tooth-row 4·6 mm. . . . . *intermedius*, subsp. n.
    - c<sup>1</sup>. Hind foot 21 mm.; basilar length of skull 20 mm.; length of tooth-row 4·5 mm. . . . . (Matopo specimen.)
- C. Antero-posterior length of bullæ 5·5 mm.
- a. Hind foot 22 mm.; basilar length of skull 24 mm.; length of tooth-row 4·5 mm. . . . . *Chakæ*, subsp. n.
  - b. Hind foot 20 mm.; basilar length of skull 23·5 mm.; length of tooth-row 4·5 mm. . . . . *diminutus*, Thos.
  - c. Hind foot 20 mm.; basilar length of skull 22 mm.; length of tooth-row 4·4 mm. . . . . *dilectus*, de Wint.
- D. Antero-posterior length of bullæ 5 mm.
- a. Brighter coloured. Basutoland . . . . . *Moshesh*, subsp. n.
  - b. Sombre-coloured. Nyasa . . . . . *nyasæ*, subsp. n.

*Arvicanthis pumilio bechuanæ*.

*Isomys pumilio bechuanæ*, Thomas, P. Z. S. 1892, p. 551.

57. 1. 28. 10. "Bechuanaland." (Type.)

81. 3. 8. 8. ♀. Great Namaqualand.

The type specimen is a very old one, and the skull is not available, but the enormous hind foot is alone sufficient to differentiate this form from any other.

*Arvicanthis pumilio cinereus*.

*Arvicanthis pumilio cinereus*, Thos. & Schw. P. Z. S. 1903, vol. ii, p. 336.

4. 2. 3. 68-74. Klipfontein, Namaqualand. Alt. 3104'. Rudd Collection.

98. 9. 3. 5-7. Garies, Namaqualand. (No skulls.) Dr. R. Broom.

In the original description the length of the hind foot is given, from the collector's label, as 28 mm., but this measurement is not, I think, reliable; measured on the specimen, the majority of the series show a hind foot of 26 mm. or slightly over. Judging from the other dimensions recorded by the collector, the tail in this form is slightly longer than the head and body.

The following are the normal dimensions of an adult individual:—

Head and body 120 mm.; tail 125; hind foot 26.

Skull: basilar length 24; length of tooth-row 5; ant.-post. length of bullæ 6·5.

The following are measurements taken on a few selected specimens:—

		Hind foot.	Basilar length of skull.	Length of tooth-row.	Bullæ.
4. 2. 3. 69.	♂. V. old*	26	24·5	5	6·5
4. 2. 3. 74.	♀. Old	26	24	5	6·5
4. 2. 3. 70.	♂. Y. adult	26	23	5	6·5
98. 9. 3. 5.	♂. ?	27	?	?	?

*Arvicanthis pumilio meridionalis*, subsp. n.

95. 9. 3. 11–12. Rondebosch, Cape Town. F. C. Selous.

3. 7. 2. 32, 34. Tokai Retreat, Cape Town. Alt. 600'.

Rudd Exploration.

2. 9. 1. 63. Deelfontein. Col. Sloggett.

The normal dimensions of this form are:—

Head and body 125 mm.; tail 120; hind foot 25.

Skull: basilar length 24; length of tooth-row 5; bullæ 6·5.

This form differs but little in dimensions from *cinereus* except that the hind foot is slightly but constantly shorter.

Whereas *cinereus*, however, is one of the few forms which are constant in their coloration, in which there is no trace of rufous or fulvous, *meridionalis*, on the other hand, has no two individuals alike, though all are markedly tinged with fulvous.

The following are dimensions taken from selected specimens of *meridionalis*:—

		Hind foot.	Basilar length of skull.	Length of tooth-row.	Bullæ.
95. 9. 3. 11.	♂. Old	25	24·3	5	6·5
95. 9. 3. 12.	♂. Adult	25	23·5	5	6·5
(Type) 3. 7. 2. 34.	♀. V. old	25	24	5	6·5
2. 9. 1. 63.	♂. Adult	24	23	5	6·5

*Arvicanthis pumilio griquæ*, subsp. n.

4. 10. 1. 61, 4. 4. 8. 15–21. Kuruman, Bechuanaland.  
Alt. 4000'.

\* These age classes throughout this paper are:—Young: basilar suture not closed. Y. adult: all teeth unworn. Adult: posterior molar worn. Old: all teeth slightly worn. V. old: teeth worn flat.

4. 1. 6. 4-7. Abraham's Kraal, Modder River. Alt. 4500'.

? 97. 1. 13. 1. Kimberley, O.R.C.

This form is exceptionally constant in its coloration, but the modifying tinge is rufous rather than the ordinary fulvous.

The normal dimensions may be taken to be as follows:—

Head and body 115 mm.; tail 110; hind foot 24.

Skull: basilar length 22; length of tooth-row 4.6; bullæ 6.5.

The following are actual measurements of some selected specimens:—

		Hind	Basilar	Length of	Bullæ.
		foot.	length of	tooth-row.	
			skull.		
(Type)	4. 1. 6. 5. ♀. Old . . . .	24	22	4.6	6.5
	4. 4. 8. 15. ♂. V. old ..	24	22	4.6	6.5
	4. 4. 8. 20. ♀. Y. adult.	23	20.5	4.6	6.5
	97. 1. 13. 1. ♂. Old . . . .	24	23	4.6	6.5

The Kimberley specimen has an abnormal length of skull, but as by its other measurements and geographically it belongs here, I have ranked it as *griqueæ*.

### *Arvicanthis pumilio*.

*Mus pumilio*, Sparrman, Vet.-Akad. Handl. 1784, p. 339.

*Arvicola pumilio*, Desmarest, Mamm. 1822, p. 285.

*Mus pumilio major*, Brants, Muiz, 1827, p. 103.

*Mus lineatus*, Cuv. Mamm. 1829, pl. clxi.

*Mus Donovanii*, Donovan, Nat. Repos. 1834, vol. iii. pl. lxxiii.

*Mus septemvittatus*, Schinz, Synops. Mamm. ii. 1845, p. 155.

*Mus striatus*, Sundeval, Cefv. Vet.-Ak. For. Stockh. 1846, p. 88.

The *Mus pumilio major* of Brants is said to come from the country interior to Cape Town and it is stated that it does not occur in Cape Town itself, while the habitat of *Mus Donovanii* is given as "the same part of Africa" as that from which Sparrman's *Mus pumilio* came. There is nothing in either description by which any particular form can be recognized, and both descriptions give a length of head and body of  $5\frac{3}{4}$  inches (say 145 mm.). No specimen in the Museum collection reaches even 130 mm. Under these circumstances there is nothing for it but to rank both names as synonyms of "*pumilio*." As Sparrman erected *pumilio* on a quite immature specimen, I am compelled to select as the representative of typical *pumilio* the specimen which nearest coincides with it in habitat. Sparrman states that

he obtained his specimens "in the Sitsicamma Forest hard by Slangen River," and his map shows that the "Sitsicamma" district extended along the shore of Algoa Bay as far as Cape Padrone, just short of which "Slang River" entered the sea. In the Museum collection are some specimens received from the Grahamstown Museum and labelled "Uitenhage" and "Fish River"; these, therefore, being practically topotypes, may be accepted as typical *pumilio*. This being so, I recognize the following specimens in the collection as being typical *pumilio* :—

97. 11. 5. 26-30. Uitenhage, C.C.

5. 5. 7. 67-75. Knysna, C.C. Alt. 1400'.

3. 6. 2. 14, 15. Port St. John, Pondoland.

4. 12. 3. 81. Umfolosi, Zululand. Alt. 230'.

3. 7. 2. 23, 25, 26, 28. Newlands, Cape Town. Alt. 700'.

3. 7. 2. 29-31. Tokai Retreat, Cape Town. Alt. 50-500'.

The normal dimensions of *A. pumilio* may be taken to be as follows :—

Head and body 120 mm. ; tail 116 ; hind foot 24.

Skull : basilar length 24 ; length of tooth-row 4·8 ; bullæ 6.

The series from Knysna are quite constant in colour amongst themselves and show almost no tinge of either fulvous or rufous ; they are probably a forest form, and it is noticeable that they come from a markedly higher elevation than the others. The remainder show the usual individual variation in the amount of fulvous colouring. The following are measurements of some selected specimens :—

			Hind foot.	Basilar length of skull.	Length of tooth-row.	Bullæ.
97. 11. 5. 28.	♀.	V. old . . . . .	24	?	4·8	6
5. 5. 7. 70.	♂.	Y. adult . . . . .	24	23	4·8	6
5. 5. 7. 73.	♂.	V. old . . . . .	24	24·3	4·8	6
3. 6. 2. 15.	♀.	V. old . . . . .	24	24	4·8	6
4. 12. 3. 81.	♀.	Old . . . . .	24	24·3	4·8	6
3. 7. 2. 23.	♂.	Adult . . . . .	24	24	4·8	6
3. 7. 2. 31.	♂.	Old . . . . .	24	23·5	4·8	6

Unfortunately the Grahamstown Museum skulls are much broken and in no case is the "basilar length of skull" available ; but the one whose dimensions are given above has a "greatest length" of 30 mm., which is about the same as that of all the others in the table.



The following specimens—

		Hind	Basilar	Length of	Bullæ.
		foot.	length of	tooth-row.	
			skull.		
3. 7. 2. 22.	Y. adult	24	20.5	4.8	6
3. 7. 2. 24.	Y. adult	24	20.5	4.8	6
3. 7. 2. 27.	Young	24	19	4.8	6
3. 7. 2. 33.	Adult	24	21.6	4.8	6

—among those taken at Cape Town seem to point to a distinct form having a far shorter head than *pumilio*. Unfortunately all the specimens are comparatively young. I have given the antero-posterior length of bullæ in these specimens as 6, but it is, I believe, slightly less, though greater than 5.5; this measurement is a difficult one to take uniformly, and I have not dared to record differences of less than  $\frac{1}{2}$  mm. Should the receipt of more specimens, especially old ones, show later that this is a good form, the name of *vittatus*, Wagner (Arch. Naturg. viii. 1842, p. 11), is, perhaps, available for it, the name having been based on specimens from the Cape “Promontory”; till then I fear *vittatus* must rank as a synonym of *pumilio*.

*Arvicanthis pumilio intermedius*, subsp. n.

- |                         |                |
|-------------------------|----------------|
| 2. 9. 1. 62, 65, 69-71. | } Deelfontein. |
| 3. 1. 4. 52-55.         |                |
| 1. 7. 9. 35, 36.        |                |

This is a form which combines some characters from each of its neighbours, *griquæ* on the north and *pumilio* on the east. From the former it differs by its smaller hind foot and bullæ and from the latter by its smaller hind foot and tooth-row. It is most variable in its coloration, no two specimens being exactly alike, and, judging from collector’s measurements, the tail is slightly longer than the head and body.

The normal dimensions may be taken as:—

Head and body 105 mm.; tail 108; hind foot 22.

Skull: basilar length 21.5; length of tooth-row 4.6; bullæ 6.

The measured dimensions of some selected specimens are as follows:—

		Hind	Basilar	Length of	Bullæ.
		foot.	length of	tooth-row.	
			skull.		
	2. 9. 1. 69. ♀. Old....	22	?	4.6	6
	2. 9. 1. 70. ♀. Y. adult.	22	20.5	4.6	6
	2. 9. 1. 71. ♀. Adult..	22	21	4.6	6
(Type)	3. 1. 4. 53. ♂. V. old..	22	21.5	4.6	6
	1. 7. 9. 35. ♀. Old....	22	21.5	4.6	6

*Arvicanthis pumilio angolæ*, subsp. n.

5. 5. 9. 41-46. Caconda, Angola. Alt. 4700'.

This form, though belonging to the group with medium bullæ, is completely separated from the other members of the group noticed above. It is rather smaller all round than *pumilio* and has a fairly constant though dull coloration, resembling that of *dilectus*. The tail is apparently markedly shorter than the head and body, much more so than in any other form.

The normal dimensions may be put as:—

Head and body 118 mm.; tail 95; hind foot 23.

Skull: basilar length 23; tooth-row 4·7; bullæ 6.

The skulls are unfortunately much broken and the actual basilar length cannot be measured in any one of them; but the greatest length and zygomatic breadth are about 28 and 13·5 mm. against 30 and 14 in *pumilio*. I have therefore taken 23 mm. as the probable "basilar length of skull." The following measurements are from selected specimens:—

		Hind	Basilar	Length of	Bullæ.
		foot.	length of	tooth-row.	
			skull.		
5. 5. 9. 43. ♀.	Adult ..	23	?	4·7	6
(Type) 5. 5. 9. 45.	Old ....	23	?	4·7	6

There is a single specimen from Matopo with dimensions as follows:—

		Hind	Basilar	Length of	Bullæ.
		foot.	length of	tooth-row.	
			skull.		
4. 10. 1. 87. ♀.	Adult .....	21	19·5	4·5	6

and the label gives—head and body 89 mm.; tail 96.

I do not venture to give a specific name to this form represented by only a single specimen (and that a comparatively young individual), but have thought the existence of this specimen worthy of record as seeming to indicate that the country west of *dilectus* and north of Group II. will be found, when examples from it are available, to be peopled by a form with medium-sized bullæ, linking up this specimen with *angolæ*.

*Arvicanthis pumilio Chakæ*, subsp. n.

4. 5. 1. 68-74. Sibudeni, Zululand. Alt. 3500'.

4. 12. 5. 27-29. Estcourt, Natal. Alt. 4500'.

4. 6. 6. 14, 15. Notinsila, Pondoland.

4. 9. 1. 62, 65-67. Wakkerstroom, Transvaal. Alt. 6000'.

4. 9. 1. 61. Zuurbron, Transvaal. Alt. 4600'.

This form has slightly larger teeth than the other forms with small bullæ. It appears to range between the Drakensberg and the coast at somewhat high elevations, meeting the form of Basutoland and the Eastern Transvaal at Wakkerstroom. The Pondoland and Natal specimens are dull-coloured as compared with the more northern individuals, but there is much variation in colour.

The normal dimensions may be taken as :—

Head and body 115 mm. ; tail 105 ; hind foot 22.

Skull : basilar length 23 ; tooth-row 4·6 ; bullæ 5·5.

The following are some measurements of selected specimens :—

			Hind foot.	Basilar length of skull.	Length of tooth-row.	Bullæ.
	4. 5. 1. 65.	♀. Y. adult..	22	22	4·6	5·5
	4. 5. 1. 68.	♀. V. old ..	22	24	4·6	5·5
(Type)	4. 5. 1. 72.	♂. Old.....	22	23	4·6	5·5
	4. 6. 6. 14.	♂. V. old ..	22	23·5	4·6	5·5
	4. 9. 1. 62.	♂. V. old ..	22	24	4·6	5·5
	4. 12. 5. 27.	♂. Adult ..	22	22·5	4·6	5·5

I have named this form after Chaka, the famous Zulu chief.

*Arvicanthis pumilio dilectus*.

*Arvicanthis pumilio dilectus*, de Wint. P. Z. S. 1896, p. 803.

95. 11. 3. 25-27. Mazoe, Mashonaland. Alt. 4000'.

1115, 1117, 1118, 1122, 1123, 1135, 1140, 1150. Zoutpansberg, Transvaal. Alt. 4400'. Rudd Exploration.

98. 4. 4. 22. Krugersdorp, Transvaal. Alt. 4900'.

The normal dimensions of this form may be taken as :—

Head and body 105 mm. ; tail 95 ; hind foot 20.

Skull : basilar length 22 ; tooth-row 4·4 ; bullæ 5·5.

Mr. de Winton based his subsp. *dilectus* on the specimens from Mazoe and spoke of them as dull-coloured ; the specimens from the N.W. Transvaal are brighter and curiously resemble *A. p. griquæ* in coloration, though they are darker than that form.

The following are some measurements from selected specimens :—

	Hind foot.	Basilar length of skull.	Length of tooth-row.	Bullæ.
(Type) 95. 11. 3. 25. ♂. Old ..	20	22	4.4	5.5
95. 11. 3. 26. ♂. V. old.	20	22.3	4.4	5.5
95. 11. 3. 27. ♂. Y. adult.	20	21	4.4	5.5
1117. ♂. V. old ....	20	22.5	4.4	5.5
1135. ♂. Adult .....	20	21.5	4.4	5.5
1140. ♀. Old .....	20	21.5	4.4	5.5
98. 4. 4. 22. ♂. V. old.	20	22.5	4.4	5.5

*Arvicanthis pumilio diminutus.*

*Isomys pumilio diminutus*, Thos. P. Z. S. 1892, p. 551.

93. 2. 3. 39, 40. Mianzini, Masailand.

99. 8. 4. 85-88. Ravine Station, B.E.A.

The normal dimensions are :—

Head and body 94 mm. ; tail 62 ; hind foot 20.

Skull : basilar length 23.5 ; tooth-row 4.5 ; bullæ 5.5.

The coloration, as shown by the half-dozen specimens, is very constant, showing a bright golden tinge throughout the dorsal ground-colour and bright, almost white, interspaces between the dorsal stripes.

Though not markedly larger than *dilectus* in any one dimension, it is distinctly though slightly larger all round. The following are some actual measurements :—

	Hind foot.	Basilar length of skull.	Length of tooth-row.	Bullæ.
93. 2. 3. 39. ? Old .....	20	23	4.5	5.5
99. 8. 4. 35. ♂. Old.....	20	23.5	4.5	5.5
99. 8. 4. 85. ♀. Y. adult ....	20	20	4.5	5.5

*Arvicanthis pumilio Moshesh*, sp. n.

4. 12. 5. 48-51. Maseru, Basutoland. Alt. 5000'.

4. 9. 1. 59, 60. Zuurbron, Transvaal. Alt. 4600'.

4. 9. 1. 63, 68. Wakkerstroom, Transvaal. Alt. 6000'.

98. 3. 23. 7. Potchefstroom, Transvaal.

97. 8. 5. 7. Krugersdorp, Transvaal. Alt. 4900'.

4. 5. 1. 69, 74. Sibudeni, Zululand. Alt. 3500'.

This is a form with very small bullæ, which seems to have its habitat in the country along the crest of the Drakensberg. At Krugersdorp it appears to meet *dilectus*, the form of the N.W. Transvaal &c., and at Wakkerstroom and Sibudeni the below Berg form (*Chakæ*). Whether it is or is not found immediately northwards, however, there is unfortunately no evidence to show ; a very similar form has been

found on the high plateau south of Lake Nyasa (see below). It is fairly constant in coloration, showing but a slight fulvous tinge over the ground-colour of the back; the dorsal stripes are black and the interspaces differ in no way from the general dorsal coloration.

The normal measurements may be taken as:—

Head and body 110 mm.; tail 90; hind foot 21.

Skull: basilar length 22; tooth-row 4·5; bullæ 5.

The following are some actual measurements:—

			Hind foot.	Basilar length of skull.	Length of tooth-row.	Bullæ.
	4. 9. 1. 59.	♀. Y. adult.	21	20·5	4·5	5
	4. 5. 1. 74.	♀. V. old..	21	22	4·5	5
(Type)	4. 12. 5. 48.	♂. Adult..	21	21·5	4·5	5
	4. 12. 5. 50.	♀. Old....	21	21·5	4·5	5
	98. 3. 23. 7.	♂. V. old..	21	21·5	4·5	5
	97. 8. 5. 7.	♀. V. old..	21	22·5	4·5	5

I have named this species after Moshesh, the founder of the present ruling dynasty of Basutoland.

*Arvicanthis pumilio nyasæ*, subsp. n.

92. 8. 1. 41–44. Mlanje Plateau, Nyasa. Alt. 6000'. Sir H. H. Johnston.

So far as the measurements go, on which I have chiefly relied, I can find no difference between this form and *Moshesh*. However, I regard the 600 or 700 miles which separate their habitats as a strong argument for separating the forms. *nyasæ* is more sombre-coloured, *i. e.* less fulvous tinged, has a stouter broader skull, and a slight difference in the shape of the posterior molar, which is pentagonal or subcircular in horizontal section, while in *Moshesh* this tooth is laterally compressed in an oblique direction across the jaw, sloping backwards and slightly outwards. The skulls available are much broken, but I quote the following measurements:—

			Hind foot.	Basilar length of skull.	Length of tooth-row.	Bullæ.
	92. 8. 1. 41.	? Old.....	21	?	4·5	?
(Type)	92. 8. 1. 43.	? Old.....	21	22	4·5	5

LXX.—*On the Habitat of Rana Blanfordii.*

By G. A. BOULENGER, F.R.S.

IN the 'Catalogue of Tailless Batrachians in the British Museum,' published in 1882, I described and figured a new frog under the name of *Rana Blanfordii*, from two specimens presented by the late Dr. Blanford in 1880 along with a collection of reptiles and batrachians, partly from Darjeeling, partly from Muscat, partly from other localities. The specimens were in a bottle with a *Bufo Andersonii*, Blgr., a toad which has since been rediscovered at Muscat; and Dr. Blanford himself informed me that all three specimens probably came from Muscat, although he was not absolutely certain of the locality. A query was therefore inserted after the indication of the habitat, which follows the description. I am now convinced that the two frogs came from Darjeeling, having received a third specimen of the same species from Capt. F. Wall, C.M.Z.S., who obtained it in the Himalayas, at Mussoorie, at an altitude of 7000 to 8000 feet. As I pointed out a short time ago in these 'Annals' (xv. 1905, p. 378), *R. Blanfordii* is closely allied to *R. Pleskei*, Gthr., from Tibet, but it has longer hind limbs and the toes are dilated into small disks at the extremity. *R. vicina*, Stol. (1872), of which a description and figure have been given by Mr. W. L. Sclater in 1892 (P. Z. S. p. 342, pl. xxiv. fig. 1), is still more closely related to *R. Blanfordii*, and I should have felt inclined to unite the two except for the statement that the toes of *R. vicina* are "webbed to the extreme tips."

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LXXI.—*On a small Collection of Fishes from the Kasai River (Congo).* By G. A. BOULENGER, F.R.S.

IN concluding my Address to the Zoological Section of the British Association at Cape Town in August last, I mentioned the fishes of the southern tributaries of the Congo River as among the most important desiderata in our knowledge of the freshwater fish-fauna of Africa. I was therefore delighted to hear, on my return home, that Dr. J. L. Todd and the regretted Dr. J. E. Dutton had collected some fishes for the Congo State Museum, among which was a series from Lusambo, on the Kasai River. These specimens are

now in my hands for study, and I here offer a list of the species represented in the Kasai collection:—

1. *Polypterus ornatipinnis*, Blgr.

This species was described in 1902 from a single specimen from Monsembe, presented to the British Museum by the Rev. J. H. Weeks. The specimen from Lusambo is a little larger than the type, measuring 46 centimetres. 10 dorsal spines; 63 scales along the body, 24 between the occiput and the first dorsal spine, 42 round the middle of the body.

2. *Mormyrops attenuatus*, Blgr.

A single specimen, measuring 185 mm. D. 41; A. 64. Lat. l. 90. Depth of body 8 times in total length, length of head  $5\frac{1}{2}$  times.

3. *Gnathonemus elephas*, Blgr.

4. *Hydrocyon lineatus*, Bkr.

5. *Alestes Liebrechtsii*, Blgr.

6. *Alestes Fuchsii*, Blgr.

7. *Distichodus Antonii*, Schilth.

8. *Distichodus fusciolatus*, Blgr.

9. *Distichodus seafasciatus*, Blgr.

10. *Clarias lazera*, C. & V.

11. *Chrysichthys Duttoni*, sp. n.

Depth of body  $4\frac{1}{3}$  times in total length, length of head  $3\frac{2}{3}$  times. Head once and a half as long as broad, with granular rugosities above; eye one fourth length of head, nearly equalling interorbital width; snout broadly rounded, extending a little beyond lower jaw; vomero-ptyergoid teeth forming a long but very narrow band; nasal barbel  $\frac{2}{3}$  diameter of eye; maxillary barbel a little longer than head, extending nearly to extremity of pectoral spine. Dorsal I 6; spine strong, serrated behind; first soft ray as long as head; adipose fin as long as deep, its base a little more than its distance from the rayed dorsal. Anal IV 7. Pectoral spine  $\frac{2}{3}$  length of head, very strongly serrated behind. Caudal fin deeply notched, with rounded lobes. Caudal peduncle nearly

once and a half as long as deep. Brown above, white beneath.

Total length 130 mm. A single specimen.

Most nearly related to *U. punctatus*, Blgr., but maxillary barbels and soft rays of dorsal fin much longer.

12. *Auchenoglanis occidentalis*, C. & V.

13. *Synodontis angelicus*, Schilth.

14. *Synodontis Greshoffi*, Schilth.

15. *Paratilapia Toddi*, sp. n.

Depth of body equal to length of head,  $2\frac{2}{3}$  times in total length. Eye  $\frac{2}{3}$  length of snout, 4 times in length of head, exceeding a little interorbital width; maxillary extending to below anterior border of eye; teeth small, in 3 or 4 rows; 6 series of scales on the cheek. Gill-rakers short, the larger T-shaped, 13 on lower part of anterior arch. Dorsal XVI 10; spines subequal in length,  $\frac{1}{3}$  length of head; longest soft rays not quite half length of head. Anal III 7. Pectoral obscurely pointed,  $\frac{2}{3}$  length of head. Ventral reaching origin of anal. Caudal rounded. Caudal peduncle a little deeper than long. Scales ctenoid,  $30\frac{2}{13}$ ; lateral lines  $\frac{20}{11}$ . Dark olive-brown above, whitish beneath; soft dorsal and caudal fins barred with blackish; a few large ocellar dark spots on the anal fin.

Total length 150 mm. A single specimen.

Most nearly related to *P. macrocephala*, Blgr., but scales larger, especially on the back.

16. *Pelmatochromis lateralis*, Blgr.

LXXII.—On a Collection of Fishes from Lake Bangwelo.

By G. A. BOULENGER, F.R.S.

IT is a very great satisfaction to me to be able to fill up a second desideratum in our knowledge of the ichthyology of the Congo basin by offering a list of fishes from Lake Bangwelo. No sooner had I reported on the Kasai fishes enumerated in the preceding paper than I received from Mr. Frank H. Melland a series of fishes collected by him, with the cooperation of the Rev. Father Foulon, in Lake



Bangwelo, the fish-fauna of which was totally unknown. The native names have been supplied by Father Foulon.

The specimens have been presented to the British Museum by Mr. Melland.

1. *Gnathonemus macrolepidotus*, Peters.

Native name: *Mutesa*.

2. *Gnathonemus Monteiri*, Gthr.

Native name: *Lukesu*.

3. *Hydrocyon lineatus*, Blkr.

Native name: *Mehene* or *Munda*. Specimens have been caught averaging up to 51 lbs. 11 oz., but the fish is said to run a great deal beyond this weight.

4. *Alestes macrophthalmus*, Gthr.

Native name: *Lumanse*.

5. *Alestes imberi*, Peters.

Native name: *Lusaku*.

6. *Alestes grandisquamis*, Blgr.

Native name: *Mutula*.

7. *Distichodus maculatus*, Blgr.

Native name: *Chikamalunski*.

8. *Labeo altivelis*, Peters.

Native name: *Pumbu*.

9. *Barbus bangwelensis*, sp. n.

Depth of body equal to length of head, 4 times in total length. Snout rounded, slightly projecting beyond the lower jaw, equal to diameter of eye and to interorbital width,  $3\frac{2}{3}$  times in length of head; barbels two pairs, very small, barely  $\frac{1}{3}$  diameter of eye. Dorsal III 7, equally distant between end of snout and root of caudal, originating above first ray of ventral; last simple ray flexible, not enlarged, a little shorter than head. Anal III 5, longest ray not quite  $\frac{2}{3}$  length of head. Pectoral  $\frac{2}{3}$  length of head. Caudal peduncle twice as long as deep. Scales  $28\frac{2}{3}$ , 2 between lateral line

and root of ventral, 12 round caudal peduncle. Silvery, brownish on the back, posterior border of scales blackish; a black streak along the side of head, passing through the eye; fins greyish.

Total length 90 mm.

A single specimen. Native name: *Busonga*.

Allied to *B. congicus*, Blgr. Distinguished by the shorter barbels and the more numerous scales in the lateral line.

#### 10. *Clarias Mellandi*, sp. n.

Depth of body  $5\frac{1}{2}$  times in total length, length of head  $3\frac{1}{4}$  times. Head once and  $\frac{2}{3}$  as long as broad, feebly granulate above; occipital process angular; frontal fontanelle  $\frac{1}{3}$  length of head; occipital fontanelle very small; diameter of eye  $3\frac{1}{2}$  times in length of snout,  $5\frac{1}{2}$  times in interorbital width. Vomerine teeth granular, forming a large semielliptic patch, squarely truncate behind, its longitudinal diameter 3 times that of the band of præmaxillary teeth. Nasal barbel  $\frac{2}{3}$  length of head, maxillary barbel  $\frac{2}{3}$  length of head. Gill-rakers long, about 35 on first arch. Dorsal 65, its distance from the occipital process  $\frac{1}{5}$  length of head, its distance from the caudal fin  $\frac{1}{4}$  length of head. Anal 55, very narrowly separated from the caudal. Pectoral spine serrated on the outer border,  $\frac{3}{4}$  the length of the fin. Ventrals slightly nearer end of snout than caudal. Olive-brown above, marbled with darker, whitish beneath; a dark streak on each side of the throat.

Total length 315 mm.

A single specimen. Native name: *Muta* or *Mulenga*.

Said to reach a weight of over 6 lbs.

A very distinct species, unique in the form of the patch of vomerine teeth.

#### 11. *Clarias Fouloni*, sp. n.

Depth of body  $6\frac{1}{2}$  times in total length, length of head 5 times. Head once and  $\frac{1}{2}$  as long as broad, smooth above; occipital process angular; frontal fontanelle  $\frac{1}{4}$  length of head, twice as long as the occipital fontanelle; diameter of eye 3 times in length of snout, 5 times in interorbital width. Vomerine teeth conical, forming a crescentic band, which, in the middle, is a little broader than the band of præmaxillary teeth. Nasal barbel  $\frac{2}{3}$  length of head, maxillary barbel  $\frac{4}{5}$  length of head. Gill-rakers about 20 on first arch. Dorsal 83, its distance from the occipital process  $\frac{1}{3}$  length of head; anal 68; both dorsal and anal embracing the root of the

caudal. Pectoral spine not serrated on the outer border,  $\frac{3}{4}$  the length of the fin. Ventrals twice as distant from the extremity of the caudal as from the end of the snout. Blackish brown, belly paler brown.

Total length 200 mm.

A single specimen. Native name: *Mulenfi*.

Closely allied to *C. Theodoræ*, M. Weber, and *C. amplivicauda*, Blgr. Distinguished from both by the longer head.

## 12. *Schilbe mystus*, L.

Native name: *Lupata*.

## 13. *Chrysichthys mabusi*, sp. n.

Depth of body  $4\frac{1}{2}$  times in total length, length of head  $3\frac{1}{3}$  times. Head once and a half as long as broad, with feeble granular rugosities above; diameter of eye 6 times in length of head, twice and  $\frac{1}{2}$  in interorbital width; snout broadly rounded, extending a little beyond lower jaw; vomeropterygoid teeth forming a long but narrow band, narrowly interrupted in the middle; nasal barbel nearly as long as eye; maxillary barbel half length of head, not reaching base of pectoral spine. Dorsal I 6; spine strong, serrated behind; second soft ray longest, a little shorter than head; adipose fin a little longer than deep, its base  $\frac{2}{3}$  its distance from the rayed dorsal. Anal IV 7. Pectoral spine half length of head, very strongly serrated behind. Caudal fin deeply notched, with pointed lobes. Caudal peduncle once and  $\frac{2}{3}$  as long as deep. Olive-brown above, white beneath.

Total length 250 mm.

A single specimen. Native name: *Mubusi*.

This species is characterized by its short maxillary barbels, combined with long dorsal rays and pointed caudal lobes.

## 14. *Auchenoglanis occidentalis*, C. & V.

Native name: *Bowa*.

## 15. *Synodontis nigromaculatus*, sp. n.

Depth of body equal to length of head, 4 times in total length. Head a little longer than broad; snout rounded; diameter of eye 6 times in length of head,  $2\frac{1}{2}$  times in length of snout and in interorbital width; maxillary barbel without distinct fringe, reaching middle of pectoral spine; mandibular barbels with long branches. About 30 slender mandibular teeth. Humeral process sharply pointed, without keel.

Dorsal I 7; spine as long as head, smooth in front, serrated behind. Adipose fin 4 times as long as deep, twice and  $\frac{1}{2}$  as long as its distance from the rayed dorsal. Anal IV 7. Pectoral spine as long as head, strongly serrated on both sides. Caudal deeply forked. Skin without villousities. Greyish above, white beneath, covered all over with round black spots, some of which, on the posterior part of the body, are confluent.

Total length 210 mm.

A single specimen. Native name: *Chirima*.

Closely allied to *S. zambesensis*, Peters. Distinguished by the strong serrature on the anterior border of the pectoral spine.

16. *Anabas multispinis*, Peters.

Native name: *Lukomo*.

17. *Paratilapia robusta*, Gthr.

Native names: *Nsuku*, *Polwe*, *Mubantasa*.

18. *Paratilapia Mellandi*, sp. n.

Depth of body  $2\frac{1}{2}$  times in total length, length of head 3 times. Eye  $\frac{3}{4}$  length of snout, 4 times in length of head, equal to interorbital width; maxillary not extending to below anterior border of eye; teeth small, in 3 or 4 rows; 4 series of scales on the cheek. Gill-rakers short, 13 on lower part of anterior arch. Dorsal XV 13, spines equal in length from the 7th, which measures  $\frac{2}{3}$  length of head; longest soft ray  $\frac{2}{3}$  length of head. Anal III 10. Pectoral acutely pointed, slightly shorter than head. Ventral reaching origin of anal. Caudal rounded. Caudal peduncle as long as deep. Scales cycloid,  $37\frac{4\frac{1}{2}}{13}$ ; lateral lines  $\frac{23}{16}$ . Brownish; dorsal fin edged with yellowish; soft dorsal and caudal with numerous round blackish spots; anal with round white spots; ventral blackish.

Total length 150 mm.

A single specimen. Native name: *Mbilila*.

Closely related to *P. moeruensis*, Blgr., but soft dorsal rays more numerous and pectoral fin longer.

19. *Pelmatochromis lateralis*, Blgr.

Native name: *Nsangula*.

20. *Tilapia natalensis*, M. Weber.

Native names: *Mutuba* (young) and *Kamba* (full-grown).

21. *Tilapia melanopleura*, A. Dum. (*lata*, Gthr.,  
*Rendalli*, Blgr.).

Native name: *Lupondo*.

22. *Tilapia Sparrmani*, A. Smith.

Native name: *Chikundu*.

23. *Tilapia Fouloni*, sp. n.

Depth of body  $2\frac{1}{4}$  times in total length, length of head  $3\frac{1}{3}$  times. Eye  $\frac{2}{3}$  length of snout, 4 times in length of head,  $\frac{2}{3}$  interorbital width; mouth small, maxillary not extending to below anterior border of eye; teeth small, in 4 rows; two series of scales on the cheek. Gill-rakers short, 10 on lower part of anterior arch. Dorsal XV 11, spines increasing in length to the last, which measures  $\frac{2}{3}$  length of head; longest soft ray  $\frac{4}{5}$  length of head. Anal III 10. Pectoral acutely pointed, as long as head. Ventral reaching origin of anal. Caudal rounded, subtruncate. Caudal peduncle a little deeper than long. Scales cycloid, 29  $\frac{3}{10}$ ; lateral lines  $\frac{19}{12}$ . Brownish; a black opercular spot; soft dorsal with rather indistinct round blackish spots.

Total length 140 mm.

A single specimen. Native name: *Mituku*.

Distinguished from *T. Sparrmani* by the smaller mouth and the longer pectoral fin.

24. *Mastacembelus signatus*, sp. n.

Depth of body  $10\frac{1}{2}$  times in total length, length of head 7 times. Vent equally distant from end of snout and base of caudal. Length of head  $2\frac{2}{3}$  times in its distance from vent, 4 times its distance from first dorsal spine; snout 3 times as long as eye, ending in a trifid appendage which is twice as long as eye; mouth extending to below nostril; a strong præorbital spine; three strong præopercular spines. Vertical fins united with the rounded caudal. Dorsal XXIX 85. Anal III 85. Pectoral about  $\frac{1}{3}$  length of head. About 20 scales between origin of soft dorsal and lateral line. Brownish above, yellow beneath; a series of 14 large X-shaped blackish markings on each side of the body.

Total length 275 mm.

A single specimen.

Closely allied to *M. congicus*, Blgr.

LXXIII.—*A List of the Species and Subspecies of the Genus Rhinolophus, with some Notes on their Geographical Distribution.* By KNUD ANDERSEN.

THE present paper gives a brief summary of the systematic, phylogenetic, and zoogeographical conclusions at which I have arrived by a study of the bats of the genus *Rhinolophus* preserved in the British Museum and the United States National Museum. For the details that have served as a basis for the conclusions I must refer to my former papers on this subject\*.

*A Systematic List of the Species and Subspecies.*

A. *The Rhinolophus simplex Group.*

1. *Rh. simplex*, K. And.—Lombok †.
2. *Rh. megaphyllus*, J. E. Gray.—Eastern Australia; Louisiade Archipelago.
  - 2 a. *Rh. megaphyllus* f. *typica*.—Eastern Australia (Queensland, N. S. Wales).
  - 2 b. *Rh. megaphyllus monachus*, K. And.—Louisiade Archipelago (St. Aignan's Isl.).
- ? *Rh. keyensis*, Ptrs.—“Key Islands.”
3. *Rh. truncatus*, Ptrs.—Datchian.
4. *Rh. nanus*, K. And.—Goram Island.
5. *Rh. celebensis*, K. And.—Celebes (Makassar, Menado).

\* Andersen and Matschie, “Ueber einige geographische Formen der Untergattung *Euryalus*,” SB. Ges. naturf. Fr. Berlin, 1904, no. 5, pp. 71–83.

Andersen, “Five new *Rhinolophi* from Africa,” Ann. & Mag. Nat. Hist. (7) xiv., Nov. 1904, pp. 378–388.

Id., “On von Heuglin's, Rüppell's, and Sundevall's Types of African *Rhinolophi*,” t. c., Dec. 1904, pp. 451–458.

Id., “Further Descriptions of new *Rhinolophi* from Africa,” op. cit. (7) xv., Jan. 1905, pp. 70–76.

Id., “On the Bats of the *Rhinolophus philippinensis* Group, with Descriptions of Five new Species,” op. cit. (7) xvi., Aug. 1905, pp. 243–257.

Id., “On the Bats of the *Rhinolophus arcuatus* Group, with Descriptions of Five new Forms,” t. c., Sept. 1905, pp. 281–288.

Id., “On the Bats of the *Rhinolophus macrotis* Group, with Descriptions of Two new Forms,” t. c., Sept. 1905, pp. 289–292.

Id., “On some Bats of the Genus *Rhinolophus*, with Remarks on their Mutual Affinities, and Descriptions of Twenty-six new Forms,” Proc. Zool. Soc. 1905, ii. (Oct.) pp. 75–145, pls. iii., iv.

† When not otherwise stated, the record of the geographical distribution of the species and subspecies is based exclusively on examples examined by myself (a few localities quoted from literature are printed between inverted commas).

6. *Rh. borneensis*, Pters.—N. Borneo; S. Natunas; Karimata Archipelago.  
 6 a. *Rh. borneensis* f. *typica*.—N. Borneo; Labuan; Banguey.  
 6 b. *Rh. borneensis spadix*\*, Miller.—S. Natunas (Sirhassen); Karimata Archipelago (Karimata, Pulo Sarutu).
7. *Rh. virgo*, K. And.—Luzon.
8. *Rh. malayanus*, Bonhote.—Malay Peninsula (Jalor); ? Siam (Laos Mts.).
9. *Rh. nereis*, K. And.—Anambas Archipelago (Pulo Siantan).
10. *Rh. simulator*, K. And.—Mashonaland (Mazoe).
11. *Rh. Denti*, Thos.—Bechuanaland (Kuruman); Wakkerstroom (Zuurbrom).
12. *Rh. stheno*, K. And.—Malay Peninsula (Selangor, Penang).
13. *Rh. Rouxi*, Temm.—From S. China, through the Himalayas, to the Indian Peninsula and Ceylon.  
 13 a. *Rh. Rouxi sinicus*, K. And.—Lower Yangtse Valley.  
 13 b. *Rh. Rouxi* f. *typica*.—Himalayas (Darjeeling, Nepal, Masuri); S. India (Nilghiri, Kanara); Ceylon.
14. *Rh. capensis*, Lichtst.—S. Cape Colony.
15. *Rh. Thomasi*, K. And.—Burmah (Karin Hills).
16. *Rh. affinis*, Horsf.—From the N.W. Himalayas to S. China; through Indo-China, the Malay Peninsula, and N. Natunas, to Sumatra, Java, and Lombok.  
 16 a. *Rh. affinis himalayanus*, K. And.—Himalayas (Masuri, Nepal, Darjeeling); S. China (Nanking).  
 16 b. *Rh. affinis tener*, K. And.—Pegu.  
 16 c. *Rh. affinis macrurus*, K. And.—Burmah (Karin Hills).  
 16 d. *Rh. affinis superans*, K. And.—Lower Siam; Malay Peninsula; Sumatra.  
 16 e. *Rh. affinis nesites*, K. And.—N. Natunas (Bunguran Isl.).  
 16 f. *Rh. affinis* f. *typica*.—Java.  
 16 g. *Rh. affinis princeps*, K. And.—Lombok.
17. *Rh. andamanensis* †, Dobson.—S. Andamans.
18. *Rh. elivovus*, Cretzschm.—“Arabia (Mohila)”; Berbera.
19. *Rh. Darlingi*, K. And.—Mashonaland (Mazoe); Angola.
20. *Rh. acrotis*, Heugl.—From Erythrea to Lower Egypt.  
 20 a. *Rh. acrotis* f. *typica*.—Erythrea.  
 20 b. *Rh. acrotis Andersoni* †, Thos.—Eastern Egyptian Desert.  
 20 c. *Rh. acrotis brachygnathus*, K. And.—Lower Egypt.
21. *Rh. ferrum-equinum*, Schreb.—From S. China and Japan, through the Himalayas, the Mediterranean Subregion (exclusive of Egypt) and Central Europe, to S. England.  
 21 a. *Rh. ferrum-equinum nippon*, Temm.—S. China (Shanghai); Pt. Hamilton; Japan.  
 21 b. *Rh. ferrum-equinum tragatus*, Hodgs.—Darjeeling; Nepal.  
 21 c. *Rh. ferrum-equinum regulus*, K. And.—Almora; Masuri.  
 21 d. *Rh. ferrum-equinum proximus*, K. And.—Gilgit.  
 21 e. *Rh. ferrum-equinum* f. *typica*.—From Transcaspia and the Euphrates Valley, through Southern and Central Europe, exclusive of the Spanish Peninsula.  
 21 f. *Rh. ferrum-equinum obscurus*, Cabrera.—Spanish Peninsula (with Balearics); Algeria.

\* Doubtfully distinct from the typical form of *Rh. borneensis*.† Perhaps a local form of *Rh. affinis*.‡ Doubtfully distinct from the typical *Rh. acrotis*.

22. *Rh. augur*, K. And.—Orange River tract; Natal; Lower Zambesi.  
 22 a. *Rh. augur* f. *typica*.—Orange River tract (Transvaal, Orange River Colony, Bechuanaland, Namaqualand).  
 22 b. *Rh. augur zuluensis*, K. And.—Zululand; Natal; Pondoland; K. Williamstown.  
 22 c. *Rh. augur zambesiensis*, K. And.—Lower Zambesi tract (Mazoe, Nyasa).  
 23. *Rh. Deckeni*, Ptrs.—Ukambani tract; Zanzibar coast.

B. *The Rhinolophus lepidus Group.*

24. *Rh. lepidus*, Blyth.—S. India (Wynaad); Ganges Valley.  
 25. *Rh. monticola*, K. And.—Masuri.  
 26. *Rh. refulgens*, K. And.—Malay Peninsula (Perak, Selangor).  
 27. *Rh. acuminatus*, Ptrs.—Java; Lombok.  
 27 a. *Rh. acuminatus* f. *typica*.—Java.  
 27 b. *Rh. acuminatus uudax*, K. And.—Lombok.  
 28. *Rh. sumatranus*, K. And.—Sumatra.  
 29. *Rh. calypso*, K. And.—Engano.  
 30. *Rh. minor*, Horsf.—Java; ? Siam; ? Darjeeling.  
 31. *Rh. minutus*, Miller, nec Montagu.—Anambas Archipelago.  
 32. *Rh. cornutus*, Temm.—Japan.  
 32 a. *Rh. cornutus pumilus*, K. And.—Loo-choo Islands (Okinawa); ? S. China (Foochow).  
 32 b. *Rh. cornutus* f. *typica*.—Japan proper.  
 33. *Rh. gracilis*, K. And.—Malabar coast.  
 34. *Rh. subbadäus*, Blyth.—“Nepal”; “Assam (Garo Hills).”  
 35. *Rh. monoceros*, K. And.—Formosa.  
 36. *Rh. empusa*, K. And.—Nyasa.  
 37. *Rh. Andreinii*\*, Senna.—“Erythrea.”  
 38. *Rh. Blasii*, Ptrs.—Mediterranean Subregion.  
 39. *Rh. Landeri*, Martin.—Fernando Po; Gaboon.  
 40. *Rh. lobatus*, Ptrs.—Zambesi tract (Shupanga, Shire, Nyasa); Ukambani tract.  
 41. *Rh. Dobsoni*, Thos.—Kordofan.  
 42. *Rh. euryale*, J. H. Blasius.—Mediterranean Subregion.  
 42 a. *Rh. euryale judaicus*, K. And. & Mtsch.—Euphrates Valley; Palestine; Lower Egypt.  
 42 b. *Rh. euryale Mehelyi*, Mtsch.—Dobrudsha; N. Bulgaria.  
 42 c. *Rh. euryale* f. *typica*.—Dalmatia; Po Valley; Liguria.  
 42 d. *Rh. euryale tuscanus*, K. And. & Mtsch.—Tuscany (Pisa); Latium (Roma).  
 42 e. *Rh. euryale carpetanus*, Cabrera.—Guadiana Valley.  
 42 f. *Rh. euryale Cabrerae*, K. And. & Mtsch.—Tajo Valley (Madrid, Cintra).  
 42 g. *Rh. euryale atlanticus*, K. And. & Mtsch.—France; Galizia.  
 42 h. *Rh. euryale barbarus*, K. And. & Mtsch.—Morocco to Tunisia (coast form).  
 42 i. *Rh. euryale meridionalis*, K. And. & Mtsch.—Algeria (probably mountain form).

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\* Stated to differ from *Rh. Blasii* in the shape of the sella (Angelo Senna, “Contributo alla conoscenza dei Chiroterri Eritrei,” Archivio Zoologico, ii. pt. 3, pp. 256-260, pl. xvi. fig. 1, pl. xviii. figs. 7-16; Sept. 30, 1905).



C. *The Rhinolophus midas Group.*

43. *Rh. midas*, K. And.—Persian Gulf (Jask).  
 44. *Rh. hipposiderus*, Bechst.—From Gilgit to Ireland, from the Baltic to Sennar.  
 44 a. *Rh. hipposiderus minimus*, Heugl.—Erythrea and Sennar; the Mediterranean Subregion.  
 44 b. *Rh. hipposiderus f. typica*.—From the extreme N.W. Himalaya (Gilgit), through N.W. Persia (Urmi) and Armenia (Van), over the whole of Central Europe.  
 44 c. *Rh. hipposiderus minutus*, Montagu.—England; Wales; Ireland.  
 ? *Rh. phasma*, Cabrera.—“Central Spain (Tajo Valley).”

D. *The Rhinolophus philippinensis Group.*

45. *Rh. philippinensis*, Waterh.—Philippines.  
 46. *Rh. achilles*, Thos.—Key Islands.  
 47. *Rh. mitratus*, Blyth.—“N. India (Chaibassa).”  
 48. *Rh. Maclaudi*, Pous.—“Conakry Island” (off Senegambia).  
 49. *Rh. sedulus*, K. And.—N. Borneo; Malay Peninsula (Pahang).  
 50. *Rh. lanosus*, K. And.—N.W. Fokien.  
 51. *Rh. trifoliatius*, Temm.—Java; Sumatra; N. Borneo; Malay Peninsula; Lower Siam; Tenasserim.  
 52. *Rh. solitarius*, K. And.—Banka.  
 53. *Rh. Beddomei*, K. And.—S. India (Wynaad).  
 54. *Rh. luctus*, Temm.—Java; N. Borneo; Malay Peninsula.  
 55. *Rh. geminus*, K. And.—Java.  
 56. *Rh. perniger*, Hodgs.—Himalayas (Sikkim, Nepal, Masuri).

E. *The Rhinolophus macrotis Group.*

57. *Rh. macrotis*, Hodgs.—Masuri; Nepal.  
 58. *Rh. hirsutus*, K. And.—Philippines.  
 59. *Rh. æthiops*, Ptrs.—Angola.  
 60. *Rh. Hildebrandti*, Ptrs.—Zambesi tract (Mazoe, Nyasa); Ukambani tract (Taita, Machakos, Kenya).  
 61. *Rh. eloquens*, K. And.—Uganda.  
 62. *Rh. fumigatus*, Rüpp.—British East Africa; Abyssinia; Somaliland; Erythrea.  
 62 a. *Rh. fumigatus exsul*, K. And.—British East Africa.  
 62 b. *Rh. fumigatus f. typica*.—Abyssinia (Shoa, Adowa); Somaliland (Pozzi Dass, Jifa Medir); Erythrea.  
 63. *Rh. Pearsoni*, Horsf.—Himalayas, eastwards to Fokien.  
 63 a. *Rh. Pearsoni f. typica*.—Himalayas (Masuri, Darjeeling); “Yunan”; “Szetchuen.”  
 63 b. *Rh. Pearsoni chinensis*, K. And.—Fokien.

F. *The Rhinolophus arcuatus Group.*

64. *Rh. arcuatus*, Ptrs.—Philippines.  
 64 a. *Rh. arcuatus f. typica*.—Luzon.  
 64 b. *Rh. arcuatus exiguus*, K. And.—Zamboanga; Guimarás.  
 65. *Rh. subrufus*, K. And.—Philippines.  
 66. *Rh. inops*, K. And.—Mindanao.  
 67. *Rh. Creaghi*, Thos.—N. Borneo.  
 68. *Rh. colophyllus*, Ptrs.—Malay Peninsula (Kedah); “Lower Burmah (Moulmein)”; Upper Burmah (Tsagine).

69. *Rh. euryotis*, Temm.—Batchian; Amboina; Key Islands.  
 69 a. *Rh. euryotis timidus*, K. And.—Batchian.  
 69 b. *Rh. euryotis* f. *typica*.—Amboina.  
 69 c. *Rh. euryotis præstans*, K. And.—Key Islands.

G. *Incertæ sedis*.

- (70) *Rh. angolensis*\*, Seabra.—“Angola (Hanhá).”  
 (71) *Rh. alcyone*†, Temm.—“Gold Coast.”

*A Geographical Review of the Species, with some Notes on their probable Interrelations.*

Bats, as being possessed of a greater facility of locomotion than other mammals, are commonly supposed to be deceptive guides for the zoogeographer. It may well be that this is in part, perhaps chiefly, due to the fact that very often distinct, and sometimes widely distinct, species have been covered by one technical name †. If we draw the lines of separation between the species (and their local modifications) somewhat more closely in accordance with the lines drawn by nature, we shall, no doubt, find that in most instances bats are as good and reliable zoogeographical guides as other small but non-flying mammals. Such at least is the case with the bats of the genus here under consideration. There is a great similarity between the *Rhinolophus* fauna of N. Borneo and that of the Malay Peninsula (see below), but hardly greater than between the mammalian faunas of these countries in general. In the Philippines, on the other hand, we find a remarkable assemblage of very primitive *Rhinolophi*, most of them essentially different from those of the opposite continent,

\* The “lobo central do appendice nasal” is described by Seabra as “*bifurcado* como no *Rh. Blasii*” (Jorn. Sci. Math. Phys. Nat. Lisboa, (2) v. Dec. 1898, p. 250). If this means that the connecting-process is high and pointed and the sella deltoid (triangular, with pointed summit), *Rh. angolensis* is certainly a distinct species and of much interest as a West-African representative of the *empusa* type, which as yet, within the Ethiopian Region, is known from Nyasaland and Erythrea only.

† There is not in the original description of the only known specimen of this bat (Leiden Museum) one single word of any value for identifying the species or determining its affinities. It is as thoroughly unknown as if it had never been recorded.

‡ E. g.: *Rh. “ferrum-equinum,”* made up of *Rh. ferrum-equinum*, *augur*, *acrotis*, and *fumigatus*, and therefore distributed over the whole of the Ethiopian and the whole temperate part of the Palearctic Region; *Rh. “affinis”* as a collective name for *Rh. borneensis*, *steno*, *Rouvi*, and *affinis*; *Rh. “minor”* for *Rh. lepidus*, *monticola*, *refulgens*, *minor*, *cornutus*, *gracilis*, and *subhadius*; &c.

only one species (*hirsutus*), itself a primitive form, being a genuine Himalayan type, though as a species quite distinct; this, again, is perfectly in accordance with the general character of the Philippine fauna. The immigration of Rhinolophine types from south into the Philippines, and the radiation from these islands southwards into the Austro-Indo-Malayan Archipelago, have by no means been greater than of other mammals—rodents, f. i. A very narrow tract of water can form an apparently insurmountable barrier for the spreading of a *Rhinolophus* (*Rh. ferrum-equinum* in England, not in Ireland), as it has formed for the voles. The *Rhinolophus* fauna of Lower Egypt\* is markedly different from that of Palestine; not even the direct land-connexion has caused a more extensive interchange of species than in the case of non-flying mammals. All this—and a series of similar instances could be adduced—tends to show that for the spreading of the *Rhinolophi* their power of flight has been a factor of very little importance; their present distribution, like that of non-flying mammals, has been determined by the history of the type to which the species belongs and the geological history of the continent or island in question.

AUSTRALIA:—*Rh. megaphyllus typicus*.—The only Australian species is most closely related to *Rh. simplex*, from Lombok.

LOUISIADE ARCHIPELAGO:—*Rh. megaphyllus monachus*.—The Louisiade form seems to be a not quite perfectly differentiated offshoot of the Australian species.

NEW GUINEA.—As yet no species is known from New Guinea, although the genus is represented both east (Louisiane Archipelago), south (Australia, Key Islands), and west (Moluccas) of the island.

KEY ISLANDS:—“*Rh. keyensis*”; *Rh. achilles*; *Rh. euryotis præstans*.—*Rh. achilles* is a peculiar modification of the *philippinensis* type. *Rh. euryotis præstans* has its nearest, scarcely more than subspecifically distinct, allies in Amboina and Batchian. “*Rh. keyensis*,” a still very imperfectly known form, is probably closely related to *Rh. simplex* and *megaphyllus*. The *Rhinolophus* fauna of the Key Islands, therefore, points partly north-westwards, to the Moluccas and the Philippines, partly westwards.

\* Of the four Palestine species (*Rh. ferrum-equinum*, *Blasii*, *euryale judaicus*, *hipposiderus minimus*), one only (*euryale judaicus*), so far as I know, has spread from the Asiatic side of the Mediterranean to Lower Egypt. The only other species recorded from Lower Egypt (*Rh. acrotis*) is unknown in Syria and Palestine.

GORAM:—*Rh. nanus*.—A representative of the common Austro-Malayan *simplex* type.

AMBOINA:—*Rh. euryotis typicus*.—This form has its closest, only subspecifically distinct, allies to the north (Batchian) and to the south-east (Key Islands); but the *euryotis* type belongs to a group of the genus (the *arcuatus* group) which now has its most primitive representatives in the Philippines.

BATCHIAN:—*Rh. truncatus*; *Rh. euryotis timidus*.—*Rh. truncatus* is a well-marked species of the widely distributed *simplex* type. *Rh. euryotis* points, as already stated, in the last instance northwards, to the Philippines.

LOMBOK:—*Rh. simplex*, *Rh. affinis princeps*; *Rh. acuminatus audax*.—*Rh. simplex* seems to be the most primitive member of the section which I have proposed to call the *Rh. simplex* group; it has very close relatives in (probably) the whole of the Austro-Malayan and Indo-Malayan subregions. *Rh. affinis princeps* is the extreme south-eastern outpost of a species now distributed from the Himalayas through Indo-China, Sumatra, and Java; the Lombok form seems to be more closely related to the Malacca-Sumatra race (*Rh. a. superans*) than to the Java race (*Rh. a. typicus*). *Rh. acuminatus audax* is a local form of a Java species.

THE AUSTRO-MALAYAN SUBREGION.—Out of 69 species known, only 8 are found in this subregion (9, if *Rh. keyensis* is regarded as a species). Of these 8 species, two (*Rh. affinis princeps*, *Rh. acuminatus audax*) are south-eastern outposts of Indo-Malayan or Indo-Chinese species. Of the remaining 6 no less than 4 (*Rh. simplex*, *megaphyllus*, *truncatus*, *nanus*) are representatives of the *simplex* type, which also numbers several very primitive species in the Indo-Malayan Archipelago. The last two species (*Rh. achilles* and *euryotis*) can be traced back to the Philippines.

CELEBES:—*Rh. celebensis*, a representative of the *simplex* type, in certain cranial characters rather intermediate between the Austro-Malayan and the genuine Indo-Malayan species of the *simplex* group.

PHILIPPINES:—*Rh. virgo*; *Rh. philippinensis*; *Rh. arcuatus*, *Rh. subrufus*, *Rh. inops*; *Rh. hirsutus*.—The Philippine *Rhinolophus* fauna is remarkable for its richness in primitive, even extremely primitive, types, and the total absence of highly differentiated forms. *Rh. virgo* is closely related to *Rh. borneensis*, both of them species on a low level of development. *Rh. philippinensis* is the most primitive representative known of the *philippinensis* group; so far as concerns the

dentition, it has apparently remained on a slightly lower level than any other species of the genus. *Rh. arcuatus* and *subrufus* are the most primitive members of the *arcuatus* group; *Rh. inops* a representative of the same group, chiefly characterized by its peculiarly modified sella. *Rh. hirsutus* is a very primitive species of the *macrotis* group, closely related to the Himalayan *Rh. macrotis*.—*Rh. philippinensis* and *Rh. arcuatus* cannot be brought into close genetic connexion with any other known bat; in the absence of palæontological evidence to the contrary, we may therefore regard them as autochthonous Philippine types—*i. e.* as the least modified survivors of types which have originated in the Philippines, or, more likely, in a tract of land of which the Philippines are the relicts. We can still trace their radiation out from that centre: the *philippinensis* type has spread both southwards, to the Key Islands (*Rh. achilles*), and westwards, through India (*Rh. mitratus*) as far as the Ethiopian Region (*Rh. Maclaudi*), while a third offshoot has given rise to the slightly more aberrant Indo-Malayan *sedulus-trifoliatus* branch; the *arcuatus* type has spread southwards and become differentiated into the comparatively rather highly developed Austro-Malayan *Rh. euryotis*. The presence of the *simplex* type (*Rh. virgo*) in the Philippines is evidence of an immigration *into* the islands from the south; the close relationship between the Himalayan *Rh. macrotis* and the Philippine *Rh. hirsutus* points to a former connexion with the continent.

N. BORNEO:—*Rh. borneensis* (*typicus*); *Rh. sedulus*, *Rh. trifoliatus*, *Rh. luctus*; *Rh. Creaghi*.—*Rh. borneensis* is a bat of the *simplex* type, slightly more advanced than *Rh. celebensis*. *Rh. sedulus*, *trifoliatus*, and *luctus* are members of the *philippinensis* group; the former species in its cranial characters rather primitive, in its essential external characters close to *trifoliatus*; *Rh. trifoliatus* and *luctus* are more highly developed species of the group. *Rh. Creaghi* is a peculiar modification of the *arcuatus* type.—The fauna points partly (*Rh. borneensis*) eastwards, to Celebes and the Austro-Malayan islands, partly and most decidedly north-eastwards, to the Philippines (all the other species). It is very closely connected with the *Rhinolophus* fauna of the Malay Peninsula, no less than three species (*sedulus*, *trifoliatus*, *luctus*) being common to both countries.

S. NATUNAS AND KARIMATA ARCHIPELAGO:—*Rh. borneensis spadix*, extremely closely related to (or identical with) the Bornean form of the species.

MALAY PENINSULA, LOWER SIAM, SOUTH TENASSERIM:—*Rh. malayanus*, *Rh. stheno*, *Rh. affinis superans*; *Rh. reful-*

*gens*; *Rh. sedulus*, *Rh. trifoliatus*, *Rh. luctus*; *Rh. cælophyllus*.—The first three species belong to the *simplex* group: *Rh. malayanus* is very closely related to *Rh. borneensis*; *Rh. stheno* a more thorough modification of the *borneensis* type; *Rh. affinis superans* is but a local race of a Himalayan species. *Rh. refulgens*, a bat of the *lepidus* group, has its closest relative in the Himalayas (*Rh. monticola*). *Rh. sedulus*, *trifoliatus*, and *luctus*, all of the *philippinensis* group, are common to Borneo and the Malay Peninsula. *Rh. cælophyllus* is a highly peculiar species of the *arcuatus* group, probably rather closely related to the Bornean *Rh. Creaghi*.—Of the eight species here under consideration, six (*Rh. malayanus*, *stheno*, *sedulus*, *trifoliatus*, *luctus*, *cælophyllus*) bear evidence of the very close faunistic connexion between Borneo and the Malay Peninsula; the remaining two (*affinis*, *refulgens*) are but slightly modified immigrants from the north.

SOUTH ANDAMANS:—“*Rh. andamanensis*.”—Although as yet very imperfectly known, this bat is undoubtedly closely related to *Rh. affinis superans* from the Malay Peninsula.

SUMATRA:—*Rh. affinis superans*; *Rh. sumatranus*; *Rh. trifoliatus*.—*Rh. affinis superans* and *Rh. trifoliatus* are common to Sumatra and the Malay Peninsula. *Rh. sumatranus* belongs to a small section of the *lepidus* group, closely connected with *Rh. refulgens* from the Malay Peninsula.

ENGANO:—*Rh. calypso*.—It is worth noticing that the only *Rhinolophus* as yet known from Engano is closely related to, but specifically distinct from, *Rh. sumatranus*.

BANKA:—*Rh. solitarius*, a local representative of the *philippinensis* type, closely allied to, but specifically distinct from, *Rh. trifoliatus* from the Malay Peninsula and Sumatra.

JAVA:—*Rh. affinis typicus*; *Rh. minor*, *Rh. acuminatus typicus*; *Rh. trifoliatus*, *Rh. luctus*, *Rh. geminus*.—The Java form of *Rh. affinis* seems to be closer related to the Himalayan race than to *Rh. a. superans* from Sumatra and the Malay Peninsula. *Rh. minor* is either identically the same species as found in Siam and Darjeeling or a very closely allied form. *Rh. acuminatus* has no closer relative than *Rh. sumatranus*. *Rh. trifoliatus* and *luctus* are common to Java, Borneo, and Malacca. *Rh. geminus*, a bat of the *luctus* type, is very closely related to the Himalayan *Rh. penniger*.—As a summary: of six species, three (*Rh. affinis*, *minor*, *geminus*) point to a closer faunistic affinity between Java and the Indo-Chinese and Himalayan tracts than between Java and the geographically nearer Sumatra, Malacca, and Borneo; the remaining three are common Indo-Malayan types.

N. NATUNAS:—*Rh. affinis nesites*, an apparently well-differentiated form, most closely related to *Rh. a. superans* from Malacca.

ANAMBAS ISLANDS:—*Rh. nereis*; *Rh. " minutus."*—The two species point to a connexion both with Borneo and with the continent, the former being an offshoot of the *borneensis* type, the latter of the *minor* type.

THE INDO-MALAYAN SUBREGION.—Of 69 species known, 26 (38 per cent.) are found in this subregion, and no less than 24\* are, *as species*, apparently autochthonous; of the remaining two, one (*Rh. affinis*) is certainly, the other (*Rh. minor*) probably, Indo-Chinese.—To form a clearer idea of the affinities and probable origin of this fauna it is best, however, to consider the primary groups of species represented within the subregion; we then arrive at the conclusion that all the species of the *simplex* group (seven in number; see footnote) probably, in the very last instance, are descendants of Austro-Malayan types; that the five species of the *lepidus* group and the only species of the *macrotis* group can be ultimately traced back to some part of what we now call Indo-China; whereas the eleven species of the *philippinensis* and *arcuatus* groups may very likely have originated from purely autochthonous types. If this be so, we have as a total result 15 species which (at least as "types") can be traced back to places outside the subregion as against 11 apparently purely autochthonous.

TENASSERIM TRACT (including Karennec):—*Rh. Thomasi*, *Rh. affinis macrurus*; *Rh. cælophyllus*.—*Rh. Thomasi* is a very peculiar modification of the Chinese and Himalayan *Rouxi* type; *Rh. affinis macrurus* a local representative of a Himalayan species. *Rh. cælophyllus* has come from the south (Malay Peninsula).

PEGU TRACT:—*Rh. affinis tener*, very closely related to the Himalayan form of *Rh. affinis*.

ASSAM TRACT:—*Rh. subbadius*, also known from Nepal.

SOUTH CHINA AND FORMOSA:—*Rh. Rouxi sinicus*, *Rh. affinis himalayanus*, *Rh. ferrum-equinum nippon*; *Rh. cornutus pumilus*, *Rh. monoceros*; *Rh. lanosus*; *Rh. Pearsoni chinensis*.

\* Seven species of the *simplex* group: *Rh. cælebensis*, *borneensis*, *virgo*, *malayanus*, *nereis*, *sthenos*, *andamanensis*. Five of the *lepidus* group: *Rh. refulgens*, *acuminatus*, *sumatranus*, *calypso*, " *minutus*." Six of the *philippinensis* group: *Rh. philippinensis*, *sedulus*, *trifoliatus*, *solitarius*, *luctus*, *geminus*. Five of the *arcuatus* group: *Rh. arcuatus*, *subrufus*, *inops*, *Creaghi*, *cælophyllus*. One of the *macrotis* group: *Rh. hirsutus*.



—Three of these species (*Rh. affinis*, *ferrum-equinum*, *Pearsoni*) are most probably of Himalayan or, at least, Indo-Chinese origin; *Rh. cornutus* has no closer relative than the Himalayan *Rh. minor*; *Rh. monoceros*, known from Formosa only, is a modification of the Himalayan *Rh. subbadius*. Thus, five out of the seven species point westwards; with the two remaining, *Rh. Rouxi* and *Rh. lanosus*, the case is different—the former species, though also found throughout the Himalayas, is most closely related to *Rh. borneensis*, the latter to the Bornean *Rh. sedulus*.

SOUTH KOREA, LOO-CHOO ISLANDS, AND JAPAN PROPER:—*Rh. ferrum-equinum nippon*; *Rh. cornutus*.—Both species are undoubtedly immigrants from China.

HIMALAYAS:—*Rh. Rouxi typicus*, *Rh. affinis himalayanus*, *Rh. ferrum-equinum tragatus* and *regulus*; *Rh. monticola*, *Rh. minor* (?), *Rh. subbadius*; *Rh. perniger*; *Rh. macrotis*, *Rh. Pearsoni typicus*.—Four of these species (*Rh. affinis*, *ferrum-equinum*, *macrotis*, *Pearsoni*) may very likely be of Himalayan origin; the two former have spread far beyond this tract. *Rh. monticola*, *minor* (?), and *subbadius* may also, as species, be of Himalayan origin, but they have slightly more primitive allies in the Indian Peninsula. *Rh. Rouxi* is, as already stated, probably an immigrant from east, derived from the *borneensis* type. *Rh. perniger* is most closely related to *Rh. geminus* from Java.

THE HIMALAYAN AND INDO-CHINESE SUBREGION (including Korea and Japan).—Of 69 species known, 14 (*i. e.* 20 per cent.) occur in this subregion, but one of them (*Rh. calophyllus*) is probably a *direct* immigrant from south. The four forms of the *simplex* group (*Rouxi*, *Thomasi*, *affinis*, *ferrum-equinum*) have, most probably, as species originated within the area; when traced back to their remotest origin, they are descendants of a more eastern type. The same is the case with the representatives of the *philippinensis* group (*lanosus*, *perniger*). The five species of the *lepidus* group (*monticola*, *minor*, *cornutus*, *subbadius*, *monoceros*) seem to have a slightly more primitive relative in the Indian Peninsula. *Rh. macrotis* is the only Indo-Chinese species which I fail to trace back to any other known type of the genus\*; it may be the very primitive survivor of a genuine (autochthonous) Himalayan type; in any case, its origin evidently

\* It is highly probable that the *macrotis* type originated from an ancient *philippinensis*-like bat which had not acquired the peculiar specialization of the nose-leaves characteristic of all the now-existing representatives of the *philippinensis* group (see my paper on the *Rh. macrotis* group, *loc. cit.* pp. 290–292).



dates back to a period when the distribution of land and water in this part of the world was essentially different from what it is nowadays, for we find representatives of the *macrotis* type in the now thoroughly isolated Philippine Islands (*Rh. hirsutus*) and in a vast part of the Ethiopian Region (*Rh. aethiops*, *Hildebrandti*, *eloquens*, *fumigatus*). *Rh. Pearsoni* is a comparatively highly developed Himalayan and S. Chinese modification of the *macrotis* type.

GANGES VALLEY:—*Rh. lepidus*; *Rh. mitratus*.—The former is a very primitive (perhaps the most primitive) member of the *lepidus* group; the latter a representative of the *philippinensis* group, much more closely related to the Indo-Austro-Malayan *Rh. philippinensis* and *achilles* (and the Ethiopian *Rh. Maclaudi*) than to the geographically nearer Himalayan form of the same group.

SOUTH INDIA:—*Rh. Rouxi typicus*; *Rh. lepidus*; *Rh. Beddomei*.—*Rh. Rouxi* is no doubt an immigrant from the Himalayas, where identically the same race occurs. *Rh. lepidus* is also found in the Ganges tract. *Rh. Beddomei* is closely allied to *Rh. luctus* from Borneo and the Malay Peninsula.

CEYLON:—*Rh. Rouxi typicus*, common to Ceylon and S. India. (A bat of the *philippinensis* type occurs in Ceylon, presumably *Rh. Beddomei*; I have seen a very young individual only.)

MALABAR COAST:—*Rh. gracilis*, a bat of the probably Himalayan *minor* type.

THE INDIAN AND CEYLONESE SUBREGIONS.—Only five species occur, one of them (*Rouxi*) Indo-Chinese. *Rh. gracilis* points northwards; *Rh. mitratus* and *Beddomei* to the Indo-Malayan countries. One species (*Rh. lepidus*) may represent a purely autochthonous type.

SOMALILAND, ERYTHREA, ABYSSINIA, AND BAHR-EL-ABIADTRACT:—*Rh. clivosus*, *Rh. acrotistypicus*; *Rh. Andreinii*, *Rh. Dobsoni*; *Rh. hipposiderus minimus*; *Rh. fumigatus typicus*.—The first two species are modifications of the Himalayan *affinis* type. *Rh. Andreinii* (very closely related to *Rh. Blasii*) and *Rh. Dobsoni* (very close to *Rh. lobatus*) point back to the Himalayan *Rh. subbadius*. *Rh. hipposiderus* has no nearer known ally than the Persian *Rh. midas*, and the particular race (*minimus*) here under consideration is the same as now distributed over the Mediterranean countries. *Rh. fumigatus* is a very highly developed species of the Himalayan *macrotis* type.

UGANDA:—*Rh. eloquens*, a bat of the *macrotis* type, in certain characters rather intermediate between *Rh. Hildebrandti* and *Rh. fumigatus*.

UKAMBANI TRACT AND ZANZIBAR COAST:—*Rh. Deckeni*; *Rh. lobatus*; *Rh. Hildebrandti*, *Rh. fumigatus exsul*.—*Rh. Deckeni* is an Ethiopian representative of the Oriental *ferrum-quinum* type. *Rh. lobatus* belongs to a small group of Ethiopian species (*Landeri-lobatus-Dobsoni*) which have their more primitive counterpart in the Himalayan *Rh. subbadius*. *Rh. Hildebrandti* and *fumigatus* can be traced back ultimately to a bat like *Rh. macrotis*.

ZAMBESI TRACT:—*Rh. simulator*, *Rh. Darlingi*, *Rh. augur zambesiensis*; *Rh. lobatus*, *Rh. empusa*; *Rh. Hildebrandti*.—*Rh. simulator* is a bat of the *borneensis* type; *Rh. Darlingi* of the Himalayan *affinis* type; *Rh. augur* of the Oriental *ferrum-quinum* type. *Rh. empusa* is an Ethiopian representative of the *Rh. Blasii* stage, which, however, again leads back to the Oriental *minor-subbadius* stage. The two remaining species (*lobatus*, *Hildebrandti*) are common to this and the foregoing tract.

LIMPOPO TRACT:—*Rh. augur typicus*; on the species, see Zambesi tract, above.

ZULULAND, NATAL, EASTERN CAPE COLONY:—*Rh. augur zuluensis*.—This small, but zoogeographically rather well-marked, district is inhabited by a special race of the widespread Ethiopian *Rh. augur*.

S.W. CAPE COLONY:—*Rh. copensis*, an Ethiopian representative of the Oriental *Rh. Rouxi* type.

ORANGE RIVER TRACT:—*Rh. Denti*, *Rh. augur typicus*.—*Rh. Denti*, closely related to *Rh. simulator* from the Zambesi tract, is a bat of the *borneensis* type. On the affinities of *Rh. augur*, see the Zambesi tract above.

BENGUELA AND LOANDA:—*Rh. Darlingi*; *Rh. angolensis*; *Rh. athiops*.—*Rh. athiops* is a highly developed representative of the Himalayan *macrotis* type. *Rh. Darlingi* is common to this district and the Zambesi tract. *Rh. angolensis* is unknown to me (but see footnote above on p. 652).

LOWER GUINEA:—*Rh. Landeri*, closely related to the Eastern Ethiopian *Rh. lobatus* and *Dobsoni*, all of them bats of the Oriental *subbadius* type.

GOLD COAST:—*Rh. aleyone*; unknown to me.

GAMBIA TRACT:—*Rh. Maclaudi*, a bat of the Indo-Malayan *philippinensis* type.

THE ETHIOPIAN REGION:—19 out of 69 known \* species

\* Leaving the imperfectly known *Rh. angolensis* and the practically quite unknown *Rh. aleyone* out of consideration.

have as yet been recorded from the Ethiopian Region. To sum up the probable affinities of these species: *Rh. Denti* and *simulator* represent the *borneensis* type; *Rh. capensis* the *Rouxi* type; *Rh. clivosus*, *Darlingi*, and *acrotis* the *affinis* type; *Rh. augur* and *Deckeni* the *ferrum-equinum* type; *Rh. empusa* and *Andreinii* one branch, *Rh. Landeri*, *lobatus*, and *Dobsoni* another branch, of the *minor-subbadius* type; *Rh. hipposiderus* the *midas* type; *Rh. Maclaudi* the *philippinensis* type; *Rh. æthiops*, *Hildebrandti*, *eloquens*, and *fumigatus* the *macrotis* type.—Thus, the distribution of the primary groups of the genus within the Ethiopian Region is, broadly speaking, as follows:—the *simplex* group (8 species) from the Cape Colony to Lower Egypt (beyond the limits of the Region), and on the western side of the Continent as far north as Angola; the *macrotis* group (4 species) from Abyssinia to the Lower Zambesi, across the Continent to Angola; the *lepidus* group (4 species) in a broad tract across the Continent from about 15° N. to 20° S.; the *midas* group (1 species) confined to the extreme north-eastern corner; the *philippinensis* group (1 species) to the north-western corner (probably of wider distribution).—It is a matter of some zoogeographical importance that all the Ethiopian species of the genus *Rhinolophus*, without exception, also have representatives in the Oriental Region; but still more important is the fact that all the Ethiopian species have *more primitive* representatives in S. Asia or the Indo-Malayan Archipelago. In view of this, and bearing in mind that in the absence of all palæontological evidence we have to base our conclusions exclusively on what we know about the now-existing forms, we are justified in supposing that all the Ethiopian *Rhinolophi* are, in the last instance, derived from Oriental forms. The passage from the Oriental to the Ethiopian Regions must have been considerably easier in past times than now.

EASTERN EGYPTIAN DESERT:—*Rh. acrotis Andersoni*. The species is Ethiopian.

LOWER EGYPT:—*Rh. acrotis brachygnathus*; *Rh. euryale judaicus*.—*Rh. acrotis* is undoubtedly an immigrant from the Ethiopian Region. *Rh. euryale* has come from the Asiatic side of the Mediterranean; examples from Lower Egypt are indistinguishable from the Palestine-Euphrates race; the species does not seem to have spread south of Lower Egypt.

THE MEDITERRANEAN SUBREGION (exclusive of Lower Egypt):—*Rh. clivosus*, *Rh. ferrum-equinum* (*proximus*, *typicus*, and *obscurus*); *Rh. midas*, *Rh. hipposiderus minimus*; *Rh. Blasii*, *Rh. euryale*.—*Rh. clivosus* is known only from

the border districts of the Ethiopian and Palæartic Regions (Red Sea coasts), *Rh. midas* from the shore of the Persian Gulf. These, as well as the four truly "Mediterranean" species, are undoubtedly of Oriental origin. Worth noticing is the close faunistic connexion between the Spanish Peninsula and N.W. Africa (Algeria): the same race (*obscurus*) of *ferrum-equinum*.

CENTRAL EUROPE:—*Rh. ferrum-equinum typicus*; *Rh. hipposiderus typicus*.—The Central European *Rh. hipposiderus* is slightly different from the Mediterranean form.

BRITISH ISLANDS:—*Rh. ferrum-equinum*; *Rh. hipposiderus minutus*.—Both of the Central European species have reached the British Islands. *Rh. hipposiderus*, as being the more hardy of the two species, as having spread over the whole of England and to several places in Ireland, and as having become to a certain slight degree different from the continental form, was probably the earliest comer. The range of *Rh. ferrum-equinum* is restricted to the southern part of England.

THE WHOLE AREA OF THE GENUS.—All the now-existing species can be referred to six "types." All the types can be traced back to some part or other of the Oriental Region. From there they have spread eastwards as far as Eastern Australia and Japan, south-westwards over the whole of the Ethiopian Region, westwards to Southern and Central Europe.

#### LXXIV.—On the Oscules of *Cinachyra*.

By R. KIRKPATRICK.

[Plate XIV.]

WHILE engaged in the investigation of specimens of *Cinachyra barbata*, Sollas, obtained by the 'Discovery' from the Antarctic, I was led to examine examples of that species obtained by the 'Challenger' from Kerguelen and described by Sollas in his Report on the Tetractinellida.

Specimens of this species are spheroidal or ovoidal in shape and with a root-tuft; the surface bristles with a pile-like coat of spicules, which are mostly protriænes. Arranged round the sides of the sponge are flask-shaped recesses with oval or circular orifice and with the margins guarded by a

fringe of needles rising above the general surface; on the upper part of the surface are smaller orifices, likewise surrounded by a spicular fringe.

Sollas (9, pp. xxxv, 27) regarded the flask-shaped recesses as being either vestibules or cloacas, though he failed to find any structural differences in them, and for convenience of description he called them all oscules. The smaller orifices and pits near the summit were considered to be young undeveloped vestibules and cloacas of the same kind as those on the rest of the surface.

The good state of preservation of numerous specimens from the Antarctic has enabled me to clearly distinguish two kinds of depressions—vestibular and cloacal; and later I was able to note the same distinction in the 'Challenger' specimens.

*Cinachyra barbata* in its adult condition (Pl. XIV. fig. 1) shows three zones:—(1) a basal root-tuft zone; (2) a broad "equatorial" zone of poral vestibules; and (3) a superior or "polar" zone of oscules (*sensu stricto*). In good specimens these zones are clearly obvious to the naked eye, for the surface pile of spicules is higher and looser in the poral than in the oscular zone and slopes downwards; the pile in the oscular area is shorter and denser and points vertically upwards, presenting, in fact, a stubble-like appearance.

The orifices of the poral vestibules are usually wide open, though even large ones may be closed; but in almost every instance the oscules are tightly shut, the marginal fringes being closed over them in the form of conical stacks.

The shape of many of the specimens from Kerguelen is oval and the poral zone and oscules are arranged obliquely to the long axis. Often, too, at first sight no trace of oscular fringes or oscules is apparent; but by rubbing off the surface pile at the superior end of the body, so as to leave a tonsure-like patch, the oscules become visible as minute dark pin-points on the surface (Pl. XIV. fig. 3).

Prof. Sollas has given such a full account of the poral vestibules that there is no need to say anything further about them here. The oscules are few in number in comparison with the vestibules; in one specimen there are seven of the former arranged in an open spiral on the summit and over forty of the latter.

Usually the oscules appear as low monticules each with a shallow crater-like cup, but occasionally they may be flush with the surface. On making a section so as to cut vertically through an oscule, usually, owing to the extreme state of contraction, no passage can be seen, but simply a break in the continuity of the white cortex, the fleshy tissues of the

oscular channel being pale reddish. On dissection and magnification, however, a simple canal with deep longitudinal folds is easily made out; below the cortex the passage leads into a main exhalant canal coming from the centre and into large lateral canals (Pl. XIV. fig. 2).

As regards the homologies of the poral vestibules and the shallow, crater-like, oscular depressions, these both seem to be ectodermal invaginations, and the vertical intracortical preoscular tube to be the terminal exhalant canal (or gastral cavity?).

Lendenfeld (7, p. 26), who records eight species of *Cinachyra*, gives as the definition of the genus:—"Ausströmungsöffnungen klein, zu Gruppen vereint am grunde kahler, schalen-, kelch-, oder sackförmiger Einsenkungen der Oberfläche." Obviously this definition must be emended, since in *C. barbata*, the type of the genus, the oscules are simple and separate and open each into a single intracortical channel, which latter receives the main exhalant canals. If for "Ausströmungsöffnungen" the word "Poren" were substituted, the definition might stand.

On referring to the descriptions and figures of other species of *Cinachyra* it seems to me possible that misinterpretations concerning the pores and oscules may have been made in some of them also. In *Cinachyra Schulzei*, Keller, from the Red Sea, Keller (3, p. 337, pl. xix. figs. 41, 42) figures a sponge with numerous depressions all apparently alike in general character: fig. 42 depicts an enlarged view of a section showing the surface of one of these depressions; here we see pores with inhalant canals radiating out from them into the body of the sponge; at the base of the depression are slightly larger orifices opening into wider canals. Keller assumes that the larger orifices are the oscular openings of exhalant canals. The latter, except that they are a little wider, look very like the inhalant ones, and, *à priori*, it seems unlikely that excrementitious orifices should be situated in the floor of a deep pit surrounded by inhalant orifices, natural selection tending to keep the inhalant and exhalant systems each out of the way of the other. A comparison with *C. barbata* would lead one to suggest that the depressions in *C. Schulzei* are poral vestibules, and that extremely contracted oscules situated elsewhere (probably near the summit) have escaped notice.

*Cinachyra eurystoma*, Keller (3, p. 338, pl. xix. figs. 46, 48), from the Red Sea, looks like a young immature form; young specimens of *C. barbata* have several relatively large

vestibules, with, perhaps, only one minute oscule. The figure of a section of a depression (3, fig. 48) shows small openings leading each by a narrow tube to moniliform canals; possibly here also the vestibules are purely poral, and a careful search might reveal a much contracted oscule. Similarly the circular zone of depressions shown in the figure of *C. trochiformis*, Keller (3, p. 340, pl. xix. figs. 44, 45), from the Red Sea, is possibly vestibular, and an examination of the conical summit might show the existence of oscules in the form of minute contracted points.

*Cinachyra amboinensis* (Kieschnick), from Amboina (4, p. 556), is globular or egg-shaped and has a zone of poral depressions and a single osculum at the summit.

*Cinachyra hirsuta* (Dendy) (2, p. 75), from the Gulf of Manaar, is spheroidal and firmly attached by a broad base to a piece of rock. Here there is a zone of depressions and one large osculum situated to one side of the summit. Dendy believed that some of the depressions were pore-areas, others oscular areas; after an examination of the specimen I have come to the conclusion that all the depressions are poral vestibules. The variation in shape and depth, some being shallow and hemispherical, others deep and tubular, appears to me to result from differences in age and in the degree of contraction.

*Cinachyra Voeltzkowi*, Lendenfeld (6, p. 101, pl. ix. fig. 39), from Zanzibar, appears, at first sight, to present in the arrangement of its pores and oscules a complete exception to what is found in other species of *Cinachyra*. The three specimens are spherical. Two of the examples are only 8 mm. in diameter and have only one depression each; a larger one, 2 cm. in diameter, has fifteen depressions. Lendenfeld observes (6, p. 101):—"An der oberfläche finden sich allenthalben Poren, doch sind in den Weingeistexemplaren nur jene an den konvexen, pelztragenden Teilen offen, die, wie es scheint kleineren und zahlreicheren, in den kahlen Vertiefungen dagegen, geschlossen. Von den ersteren ziehen offene Kanäle herab, welche die rinde durchsetzen."

Lendenfeld regards the "Poren" on the general surface as inhalant and those in the depressions as exhalant, and describes one of the depressions themselves as "glattwandiger praescularraum" (*l. c.* p. 129). He observes (*l. c.* p. 103) that very possibly pores are present on the surface of *C. bar-*



*bata* outside the depressions and that they have been overlooked by Sollas. I have carefully searched for these pores and have not been able to detect any; indeed, it would be surprising if pore-canals could penetrate the dense palisade of cortical oxeas. Since the depressions are smooth-walled and the pores in their walls are smaller and more numerous than those on the general surface, I think that probably the depressions are poral vestibules similar to those of *C. barbata*, that some of the "Poren" on the surface are oscules, possibly much contracted, and that this kind will be found occupying a more or less definite area.

An eighth species of *Cinachyra* mentioned in Lendenfeld's list, viz. *C. robusta* (Carter), from Mergui (1, p. 79), remains to be noticed. The Natural History Museum possesses one half of the type specimen. Judging from its appearance, I should take it to be a macerated specimen of *Tetilla* which has become much worn down with age and rough usage from strong currents, so that the whole of the cortex has become denuded, leaving large open spaces and caverns between the radiating fibres of the skeleton. Carter (*l. c.* p. 79) writes:—"The spicules of the interior, which project so abundantly as to produce a hispid condition of the surface, are so matted together by the mud in which the sponge has grown on the subjacent rock that, in taking off this crust, the 'forks' and 'anchors,' together with the projecting ends of the 'body-spicules,' all come away with it." Sollas's designation (9, p. 48), viz. *Tetilla robusta*, of Carter's *Tethya cranium*, var. *robusta*, seems to me correct.

Apparently only one of the seven species at present retained in the genus *Cinachyra* has a cortex with a dense palisade of oxeas, though several of the others appear to possess a thick fibrous cortex.

Very young specimens of *Cinachyra* are conical and have only one large poral vestibule, situated inferiorly and at one side, the one oscule being at or near the summit. This asymmetrical arrangement calls to mind the sponge *Spongocardium Gilchristi*, Kirkp. (5, p. 224), from South Africa. I now think that *Spongocardium* must be regarded as a synonym of *Fangophilina*, O. Schmidt (8, p. 73, pl. x. fig. 3), in spite of the fact that *F. submersa* has a well-developed root-tuft, and *F. Gilchristi* appears not to possess this appendage, though a root-tuft may have been torn off in dredging.



*F. Gilchristi* has two deep depressions, poral vestibular and cloacal, the former having smooth walls perforated by minute pores and the latter having orifices of oscules in its base.

Judging from his description and figure, Schmidt, I believe, mistook the nature of these depressions, describing the poral as cloacal and *vice versâ*; for the smooth-walled deep depression of *F. Gilchristi* is undoubtedly a poral vestibule and not a cloaca. Without a knowledge of the development it would be difficult to say whether the openings in the floor of the cloacal depression in the latter species are to be regarded as an assemblage of oscules or as orifices of exhalant canals opening into a cloaca terminating in one oscule; the first hypothesis seems the more probable one.

To sum up: the depressions on the surface of the seven species of *Cinachyra* are probably in every instance poral vestibules, the oscules being separate and distinct.

#### Literature.

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- (8) SCHMIDT, O. 'Die Spongien des Meerbusen von Mexico.' 1879.
- (9) SOLLAS, W. J. "Report on the Tetractinellida collected by H.M.S. 'Challenger.'" Zoology, vol. xxv. 1888.

#### EXPLANATION OF PLATE XIV.

- Fig. 1.* *Cinachyra barbata*, Sollas, from the Antarctic, natural size. *a*, zone of poral vestibules; *b*, zone or area of oscules.
- Fig. 2.* Vertical section through an oscule,  $\times 5$ . *a*, oscule; *b*, cortex; *c*, main excurrent canal; *d*, foraminiferan shell.
- Fig. 3.* *Cinachyra barbata* from Kerguelen ('Challenger'). The surface pile of spicules has been rubbed off in the oscular region to show the oscules, which are here contracted to pin-points. *a*, oscules.

LXXV.—*Rhynchotal Notes*.—XXXVII.

By W. L. DISTANT.

Fam. Cicadidæ.

POLYNEURARIA.

*Platypleura lineatella*, sp. n.

♀. Body and legs very pale tawny brown; head with a very obscure piceous fascia between the eyes; pronotum with the central anterior edge of the posterior margin and the lateral dilated areas pale ochraceous; mesonotum with sub-obsolete traces of ill-defined obconical spots; abdomen above thickly palely pilose, with a central segmental longitudinal series of black spots, the segmental margins and the anal segment also black; body beneath and legs concolorous; tegmina and wings subhyaline, talc-like, the venation greenish ochraceous, their extreme bases and the basal cell of tegmina ochraceous.

Long., excl. tegm., 22 mm.; exp. tegm. 72 mm.

*Hab.* Sunda Islands; Salayer (*Everitt*).

I am compelled to found this species on a female specimen, in order that it may find a place in my catalogue. The lateral margins of the pronotum are broadly angularly ampliate, and the rostrum extends beyond the middle of the abdomen; the head (including eyes) is about as wide as the mesonotum; the apical segment of the abdomen beneath has a small fuscous spot on each side.

*Platypleura lindiana*, sp. n.

Body and legs dull dark obscure ochraceous; head with a basal fascia to front, a transverse line at each anterior angle of vertex, a linear transverse fascia between eyes, and inner margins of eyes black; pronotum with a transverse fascia near anterior margin and a central longitudinal fascia black; mesonotum with four anterior obconical spots, of which the two central ones are shortest, a central lanceolate spot, and a small spot near each anterior angle of the cruciform elevation black; abdomen above with the bases of the segments broadly black; head beneath with a broad black transverse fascia between the eyes; tegmina pale subhyaline, nearly basal half pale tawny, radial area containing two large pale spots, beneath which are other two pale spots in the fourth ulnar area; the remaining subhyaline area with small subobsolete darker spots, the transverse veins at the bases of the first, second,

third, fourth, fifth, and seventh apical areas infuscated, and a double series of small submarginal fuscous spots placed one on each side of the longitudinal veins to apical areas; wings very pale ochraceous, about apical third hyaline, the outer margin of the ochraceous area slightly tinged with fuscous; opercula short, transverse, their anterior angles well separated; rostrum passing posterior coxæ, its apex piceous; lateral margins of pronotum ampliate and broadly angulated; head (including eyes) about as wide as mesonotum.

Long., excl. tegm., ♂  $16\frac{1}{2}$  mm.; exp. tegm. 56 mm.

Hab. B. East Africa; Lindi.

Belonging to the group of species represented by *P. Afzeli*, Stål.

#### *Platypleura mira*.

*Platypleura mira*, Dist. Ann. & Mag. Nat. Hist. (7) xiv. p. 333 (1904).

*Platypleura laotiana*, MS., Paris Mus.

Since describing the male (*supra*) I have seen the other sex, also contained in the Paris Museum.

♀. Differs from ♂ in the tint of the tegmina, the ground-colour of which is greyish brown and not brownish ochraceous; the two oblique piceous fasciæ are also deeper and brighter in hue, and the outer one distinct and not fused with the dark markings on the apical area.

#### *Platypleura Murchisoni*, sp. n.

♂. Head, thorax, body beneath, and legs pale tawny; abdomen black, the tympana pale tawny; body somewhat thickly, finely, greyishly pilose; mesonotum with four anterior obconical spots, denoted by their black margins, the two central ones much the shorter, and with two small, rounded, black spots in front of the cruciform elevation; tegmina very pale tawny, obscurely mottled with paler or greyish suffusions; the radial area greyish with two very pale fuscous spots, the innermost preceded by a similar spot on costal membrane, the outer halves of the first to third ulnar areas and the whole of the apical areas greyish, semiopaque, with very obscure pale tawny macular mottlings, principally on the longitudinal veins, and a double series of small outer submarginal fuscous spots placed one on each side of the longitudinal veins to apical areas; wings pale ochraceous, the apical area and the subposterior margin pale tawny brown, apex of anal area and posterior and apical margins greyish, semiopaque; head (including eyes) about as wide as

mesonotum, lateral margins of the pronotum ampliate and convex; opercula short, transverse, their inner margins slightly overlapping, their posterior margins broadly convex; rostrum reaching basal segment of abdomen.

Long., excl. tegm., ♂ 22 mm.; exp. tegm. 65 mm.

*Hab.* Transvaal; Murchison Range (C. R. Jones, Brit. Mus.).

Allied to *P. stridula*, Linn.

*Platypleura Ridleyana*, sp. n.

♀. Body and legs pale castaneous brown; posterior abdominal segmental margins somewhat broadly olivaceous green; tegmina hyaline, the costal membrane ochraceous, the venation (excluding that of basal cell) testaceous red, about basal half more or less opaque, a large quadrangular black spot before middle of radial area and a smaller fuscous spot near its extremity, an oblong spot at bases of first and second ulnar areas, two similar spots at base of third ulnar area, a spot at base of the long sixth and of the seventh and eighth apical areas, two spots in fourth ulnar area, the innermost of which is very large, and a spot at apex of fifth ulnar area, dark fuscous or piceous; a fuscous fascia crossing bases of first to fifth apical areas connected with an irregular apical fascia of the same colour, a double series of fuscous marginal spots on the longitudinal veins to apical areas; wings piceous, with the venation testaceous-red, the base broadly opaque creamy yellow, the apical half of anal area and more than posterior margin pale hyaline; head (including eyes) about as wide as mesonotum, lateral margins of the pronotum broadly ampliate and obtusely angulate; rostrum about reaching the middle of abdomen.

Long., excl. tegm., ♀ 17½ mm.; exp. tegm. 52-56 mm.

*Hab.* Straits of Malacca; Ding Ding Islands (H. N. Ridley, Brit. Mus.). North Borneo (*Banguay*, Paris Mus.).

*Platypleura Harmandi*, sp. n.

Head ochraceous; a large spot at base of front, a transverse fascia between eyes and the inner margin of eyes black; pronotum brownish ochraceous, slightly obscurely piceous on anterior and posterior margins, two small obsolete piceous spots before middle of posterior margin; mesonotum ochraceous, with four anterior obconical spots, of which the two central are shortest, a central discal lanceolate spot, a discal spot to cruciform elevation, and a small spot in front of each

anterior angle to same, black; abdomen and tympana piceous, thickly finely ochraceously tomentose on the segmental margins; head beneath, sternum, and opercula thickly finely tawny pilose; legs tawny brown; abdomen beneath brown, its lateral margins cretaceously tomentose; face with the central sulcation and transverse striæ black and between face and eyes a fascia of the same colour; tegmina very pale tawny brown, becoming paler and greyish on the upper half of radial area, in the upper ulnar area, and particularly so in the apical areas; wings orange-yellow, about apical half dark castaneous, containing two pairs of orange-yellow spots placed near anterior and posterior margins. Head (including eyes) about as wide as mesonotum; lateral margins of pronotum ampliate and broadly angulate; opercula short, rounded, not quite meeting centrally and not passing base of abdomen; rostrum reaching the posterior coxæ, its apex black.

Long., excl. tegm., ♂ 16 mm.; exp. tegm. 47 mm.

Hab. Cochin China; Lakhon (*Harmand*, Paris Mus.).

Allied to *P. arminops*, Noualh.

#### *Kongota Muiri*, sp. n.

♀. Head, pronotum, and mesonotum ochraceous, the latter inclining to olivaceous; front of head with a large discal spot anteriorly connected with two narrow, lateral, marginal fasciæ, black; vertex with a short transverse fascia on each side of base of front and a discal transverse fascia passing through the area of the ocelli and connected with the eyes at lateral margins black; pronotum with a central lanceolate fascia not extending behind the middle, a short curved fascia on each side of disk, all the fissures, two small rounded spots at centre of posterior margin, and the posterior lateral margins black; mesonotum with a narrow, central, longitudinal fascia, two short curved fasciæ at anterior margin, a transverse series of four spots in front of cruciform elevation, a spot on anterior angles of same, and a transverse spot on each side of it, black; abdomen above black, a large basal spot and the segmental margins pale castaneous; body beneath and legs ochraceous, inclining to virescent; waved fasciæ between the eyes crossing anterior portion of face, margin of face before clypeus, apical annulations to femora, basal annulations and apices to tibiæ, and apices of tarsi black; tegmina brownish ochraceous, a little paler on costal membrane and apical area, with piceous spots and suffusions, a double subapical marginal series of piceous spots being very

distinct, and between the outermost are a series of larger obscure ochraceous spots, in the radial area a piceous spot at base, and three central, longitudinal, piceous fasciæ; wings orange-yellow, the five upper radial areas with castaneous ray-like fasciæ, and a narrow submarginal fascia of the same colour.

Long., excl. tegm., 23 mm.; exp. tegm. 73 mm.

*Hab.* Natal; Durban (*F. Muir*, Brit. Mus.).

This is the second described species in the genus, and is not to be confused with *K. punctigera*, Walk.; the type specimen being a female the structural characters of the opercula cannot be described.

### Fam. Fulgoridæ.

#### Subfam. *FULGORINÆ*.

#### Genus PHRICTUS.

*Phricus*, Spin. Ann. Soc. Ent. Fr. viii. p. 216 (1839).

#### *Phricus auromaculatus*, sp. n.

Body above dull brownish ochraceous; head above with two small spots on disk of vertex, the lateral angular areas of same, and the lateral marginal areas black; pronotum (excluding disk) suffused with black or piceous; mesonotum with three large black spots; abdomen above (excluding segmental and lateral margins and a broken, longitudinal, central fascia) black; body beneath, rostrum, and legs black or piceous; cephalic process beneath ochraceous; coxal and sternal spots and a lateral abdominal series of spiracular spots somewhat silvery white; tegmina with about basal two thirds brownish ochraceous, with the thickly reticulate venation piceous, that on the costal membrane virescent, divided by transverse black spots, the whole speckled with small distinct yellow spots, apical area brownish ochraceous, with a few scattered, irregular, piceous spots; wings with about basal half bright yellow, with some scattered small white spots and two oblique black maculate fasciæ; anal area fuscous brown, with the fine reticulate venation greyish; the apical area black, speckled with small bluish spots; cephalic process prominently angulate on each side in front of eyes, and then narrowed before apex, which is broadly widened and somewhat upwardly raised, the two central longitudinal ridges

are crenulate, the anterior apical transverse ridge angularly sinuate, and centrally united with the carinate anterior margin by a longitudinal ridge, beneath including face having its margins entire, centrally ridged on its dilated anterior area, where the margins are also carinate, its surface finely rugulose; posterior tibiæ with five long spines; rostrum reaching middle of abdomen.

Long., excl. tegm., 27-30 mm.; exp. tegm. 65-67 mm.

*Hab.* Bolivia (*I. Steinbach*, Brit. Mus.).

The cephalic process is shorter than in any of the previously described species and the coloration is very distinct.

### Genus EPISCIUS.

*Episcius*, Spin. Ann. Soc. Ent. Fr. viii. p. 249 (1839).

#### *Episcius bolivianus*, sp. n.

Head above, pronotum, and mesonotum testaceous brown; abdomen above castaneous, its apex tomentosely cretaceous; body beneath and legs brownish ochraceous, the femora and abdomen more or less suffused with piceous; tegmina pale umber-brown, a little more than basal half, only reaching costal margin at extremity, dark fuscous brown, margins with scattered minute fuscous striæ and a few also on apical area; wings with about basal two thirds purplish red, here and there slightly suffused with pale fuscous, outwardly broadly and irregularly margined with fuscous, the posterior margin of anal area greyish, apical area hyaline; vertex longer than broad, moderately concave, rugulose; pronotum finely rugulose, centrally tricarinate, the area bounded by the carinations quadrangular; mesonotum very finely rugulose, tricarinate, the central carinations very much waved and almost meeting anteriorly; rostrum slightly passing the middle of abdomen; legs marginally longly pilose, posterior tibiæ with seven spines.

Long., excl. tegm., 23 mm.; exp. tegm. 58 mm.

*Hab.* Bolivia (*I. Steinbach*, Brit. Mus.).

Apart from the different coloration, this species may be distinguished from *E. platyrhina*, Germ., by the quadrangular carinate area of the pronotum; in Germar's species it is anteriorly convexly rounded.

LXXVI.—*Note on some British Culicidæ.*

By CHAS. O. WATERHOUSE, F.E.S.

HAVING had occasion to collect and make observations on the larvæ of Culicidæ, I was fortunate enough to rear from a larva found in the New Forest a species which appears to be new and of which I subjoin a description kindly drawn up for me by Mr. F. V. Theobald. I also reared the male of *Culex diversus*, Theobald, which was not previously known. My attention was first directed to the larva of *C. Waterhousei* by the length of time it remained under water without coming to the surface for air. This larva, which was of a very pale green, almost always rested in deep water on its back or in an oblique position. The longest time I ever actually watched it was half an hour; but on one occasion I was working close by the aquarium for two hours, and looked at it at frequent intervals. Having carefully noted its position, I feel certain that it never moved during the whole of that time. This is in great contrast with the larva of *C. cantans*, which rarely remains down in the water for more than half a minute.

The following are Mr. Theobald's descriptions:—

*Culex Waterhousei*, sp. n.

Thorax black, clothed with pale golden to creamy scales. Abdomen deep brown, with pale basal bands. Palpi of male brown, with yellowish mottling in places, two basal white bands to the two apical segments, and two yellow bands towards the base. Legs deep brown, femora and tibiæ mottled with yellow; metatarsi and first two tarsals of fore and mid legs with narrow basal white bands; in the hind legs the white bands are broad. Apical segment of male claspers with spines; median processes broadly expanded apically. Fore and mid ungues unequal, hind ungues equal, all uniserrated.

♂. Head deep brown, clothed with rather large, creamy, curved scales, long, narrow, ochreous, upright, forked scales in front, with rather broader and shorter ones behind, and flat, creamy, lateral scales. Palpi with the two apical segments nearly the same length, deep brown, with an irregular, white, scaled basal area to each, and with blackish hair-tufts; the long antepenultimate segments with two broad, creamy, scaled bands, the two apical segments with black hair-tufts and also black hairs on the apex of the antepenultimate. Antennæ with very deep brown plume-hairs. Proboscis deep brown, unbanded.

Thorax black, with rather large, curved, pale golden scales,



somewhat paler over the roots of the wings; scutellum testaceous, deep brown along the border of the mid-lobe, and with a deep brown patch on each side between the mid- and side-lobes, clothed with rather large, narrow, curved scales of similar hue to those of the mesothorax; posterior border-bristles dense, pale golden; pleuræ deep brown, with pale creamy flat scales; metanotum brown. Abdomen blackish, with basal creamy bands and pale brown to dull golden hairs; basal segment with many pale scales.

Legs with the femora and tibiæ mottled brown and yellow, the fore and mid metatarsi with narrow basal white bands, also the first two tarsals; in the hind legs the bands are broader and are present on all the segments; fore and mid ungues large, unequal, both uniserrated, the hind equal and uniserrated.

Wings with rather broad lateral vein-scales, especially on the branches of the second long vein; many scales on the first long vein somewhat *Teniorhynchus*-like. First submarginal cell considerably longer and narrower than the second posterior cell, their bases nearly level; stem of the first submarginal cell nearly as long as the cell; stem of the second posterior longer than the cell; mid cross-vein longer than either the supernumerary or posterior cross-veins, the latter about its own length distant from the mid cross-vein.

Male genitalia with claspers long and broad, spiny towards the apex, the apical segment short and thick; one side of the apex of the basal lobes armed with short hook-like spines; a large pineapple-shaped densely tuberculate process from the base of each side; the two median processes long, composed of two segments, the apical one broadly knife-shaped and curved on its inner edge.

*Length* 5.5 mm.

*Habitat.* New Forest, Brockenhurst (*C. O. Waterhouse*).

*Observations.* Described from a single male easily told from all other dark-banded-legged European species by the very marked male genitalia. The male genitalia of the type are preserved in balsam. The squamose characters of the wing exclude it from *Culex*; but until female material is examined I prefer to leave it provisionally in that heterogeneous genus.

### *Culex diversus*, Theobald.

Mon. Culicid. p. 73 (1901) (♀ only described).

♂. Palpi deep violet-black, with traces of yellow scales at the base of the two apical segments and on the antepenultimate segment, the penultimate and apex of the antepenultimate

with dense dusky hair-tufts, the apical one with scanty hairs, the two apical segments and apex of the antepenultimate slightly swollen, the last two of nearly equal length, apical segment blunt; the hair-tuft on apex of antepenultimate segment very dense. Proboscis deep brown, with dull yellow scales at the base. Antennæ deep brown, with deep brown plume-hairs.

Thorax as in the female. Abdomen blackish, with basal pale bands, moderately hairy, hairs pale. Genitalia densely hairy, hairs golden; apical joint of claspers curved, with the terminal segment long and bent at the tip, a few short spines below its junction with the larger part of the clasper, basal lobe densely hairy in places, especially on the inner side; between the basal lobes a long dense mass of golden hairs, two long curved processes with short spines on their inner lower edge, and a curious group of flattened curved spines forming a prominent object between them and the basal lobes.

Legs deep blackish brown, except the femora, which are pale beneath. Fore and mid unguis unequal, the larger biserrated, the smaller uniserrated; hind unguis large, simple, uniserrated.

Wings with the first submarginal cell longer and narrower than the second posterior cell, its base nearer the apex of the wing, its stem a little longer than the cell; stem of the second posterior cell also longer than the cell; posterior cross-vein about its own length distant from the mid cross-vein.

Length 5.5 to 6 mm.

*Habitat.* New Forest, Brockenhurst.

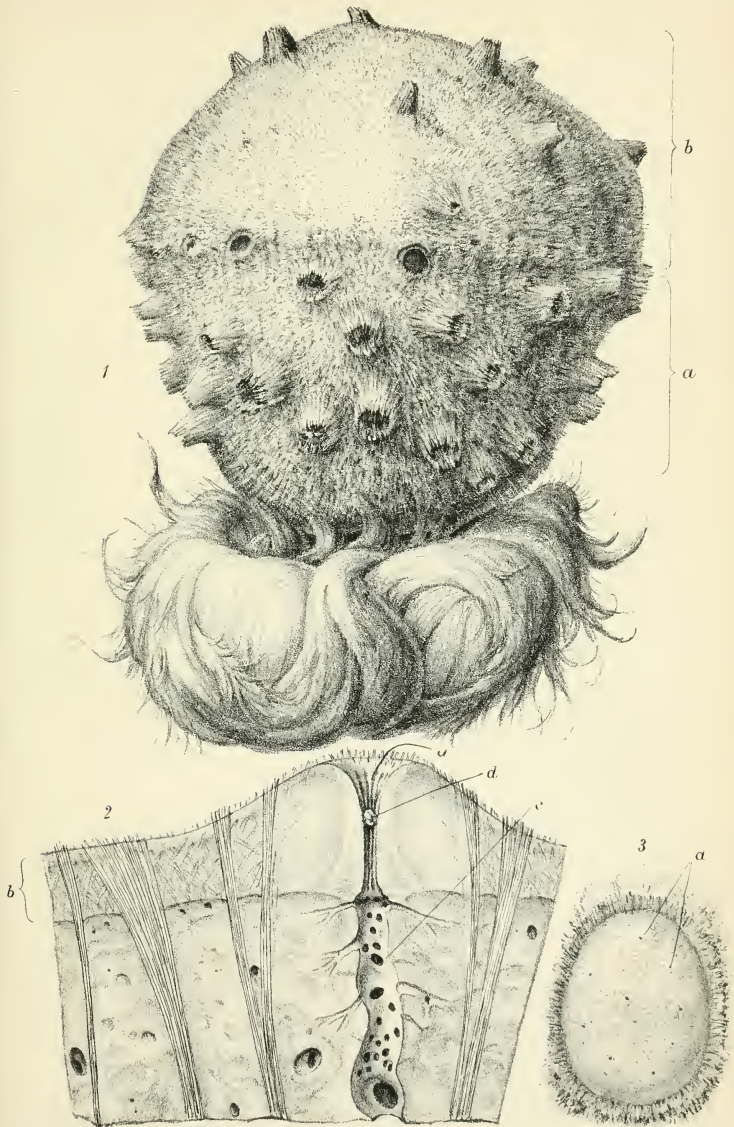
*Observations.* Bred by Mr. Waterhouse. The male genitalia are very marked.

#### MISCELLANEOUS.

*On the Affinities of Herpetomonas subulata*\*, and the Phylogeny of the Trypanosomes. By LOUIS LÉGER.

THE structure of *Herpetomonas subulata* points to its extremely close affinity with certain species of *Crithidia* previously described by me. To *Crithidia minuta* of *Tabanus tergstinus*, Egg., especially, the resemblance of the young gregarine and monad forms is such that it is impossible to distinguish these two Flagellata in these stages.

\* [This parasite is described by M. Léger in the number of the Comptes Rend. Hebd. des Séances de la Soc. de Biologie (Dec. 30, 1904, pp. 613-615) from which the present extract is taken. He states (*loc. cit.* p. 613) that he met with it in the alimentary canal of *Tabanus glaucopsis*, Mg. (a species of horse-fly which occurs in Great Britain), in the south of France. According to M. Léger it is not common, and he found it only four times in sixty specimens of *Tabanus* and *Hamatopota* collected in autumn upon cattle and horses.—TRANSL.]



P. Highley, de et lith

Highley, imp

*Cinachyra barbata.*



This peculiarity has led me to take up afresh the study of *C. minuta* in the monad form, which I had not met with in its fully developed state at the time of my first observations. As a result I was able to convince myself that in this form *C. minuta* exhibits all the characters of *Herpetomonas*, and should consequently be assigned to this latter genus. *H. minuta* is distinguished from *H. subulata* only by being shorter and not tapering posteriorly. The genus *Crithidia* must therefore be restricted at the present time to two species—*C. fasciculata* of *Anopheles* and *C. campanulata* of *Chironomus*—which are characterized by the bulky, piriform, or campanulate form of their body.

There is little further need to insist on the weakness of this systematic arrangement, which, although necessary, is undoubtedly destined to have to submit to serious attacks in proportion as we become better acquainted with the development of these Flagellata. A certain number of these crithidian or herpetomonad forms found in the biting insects are probably stages of Hæmoflagellates met with in Vertebrates. This opinion, which I advanced as early as 1902, has been justified by the admirable researches of Schaudinn \*, which showed that *Trypanosoma noctue* multiplies in *Culex* in a crithidian form. In the case of the *Crithidia* of *Anopheles* the fact is scarcely open to question, and as regards the herpetomonad forms found in species of *Tabanus* and *Hematopota*, by reason of their hosts' mode of feeding, and of the number, form, and minute size of the parasites, it is also very possible that we have to deal with stages of Hæmoflagellates †; but this is not certain, for we know that species of *Herpetomonas* are found in insects that do not bite (*Musca*, *Sarcophaga*, *Pollenia*, and *Fucellia*, according to recent observations of my own, &c.), in which their entire life-cycle takes place (cf. *Herpetomonas musce domesticæ*, according to Prowazek).

The establishment of this fact, taken in conjunction with the close relationship between the three genera, *Herpetomonas*, *Crithidia*, and *Trypanosoma*, which has recently been well brought to light by Laveran and Mesnil ‡, and further strengthened as it is by the striking similarity of their young stages and the morphology of *Herpetomonas subulata*, should lead us to search among the species of *Herpetomonas* for the ancestors of the *Trypanosomes with a morphologically anterior flagellum* (of the type of *Trypanosoma noctue* according to Schaudinn) §.

While at first performing their entire life-cycle in non-biting insects these herpetomonad forms underwent progressive modification in those among the latter that became hæmatophagous. Here a much richer nutritive medium constituted by the blood, which

\* Schaudinn, 'Arbeiten a. d. kaiserlichen Gesundheitsamte,' Bd. xx. (1904).

† From this point of view one cannot refrain from noticing the great resemblance between the little fixed forms of *Herpetomonas subulata* and *Piroplasma*.

‡ Laveran and Mesnil, 'Trypanosomes et Trypanosomiasis' (Paris, 1904).

§ Schaudinn, *loc. cit.*

was absorbed and then digested, provoked an enormous multiplication of the parasite and at the same time prepared it to live in a new medium, the circulating blood of Vertebrates, into which it was bound finally to make its way, by reason of its minute size and its host's mode of feeding. Thus was brought into existence the type of *Trypanosome with anterior flagellum* by progressive development of an undulating membrane, which, with Senn \* and Laveran and Mesnil †, I regard as a character of the adaptive order, in relation to the consistency of the medium in which the parasites live.

The Trypanosomes of the blood, therefore, represent merely a partial and secondary adaptation of a parasite primitively intestinal or enterocœlomic of Invertebrates, and this explains why they have to return into the latter in order to perform their sexual reproduction.

The same considerations are, moreover, applicable to the *Plasmodium* of malaria, in which schizogony alone takes place in the blood of man, the sexual reproduction requiring the return of the parasite into the mosquito.

As regards the *Trypanosomes with a morphologically posterior flagellum* (of which, according to Schaudinn ‡, *Trypanosoma Ziemanni* is the type), the lineage of these appears to be phylogenetically very different from that of the former. We know as a matter of fact from Schaudinn's observations that they attach themselves by the pole opposite to the flagellum; now, since in the case of *Herpetomonas* and *Crithidia* the fixative rostrum is homologous with an anterior flagellum, it is reasonable to suppose that these Trypanosomes are derived from forms primitively provided with two oppositely directed flagella (but not bipolar)—such as the species of *Trypanoplasma*, for example.

As the result of a morphological study of the latter genus § I had been led to consider Trypanosomes in general as species of *Trypanoplasma* which had lost their anterior flagellum. This mode of regarding them is, however, too exclusive, as I have shown above, but I think that it may still apply to the Trypanosomes with a posterior flagellum. It follows then that we have in the Trypanosomes two very distinct types, which have sprung from different stems, to which there correspond, moreover, according to the researches of Schaudinn ||, two different types of development of the ookinete.

One of the most important points in connexion with the morphology and the classification of the Trypanosomes would therefore be to determine their pole of fixation, which, as regards the majority of species, is at present unknown.—*Comptes Rendus Hebdomadaires des Séances de la Société de Biologie*, tome lvii. pp. 615–617.

\* Senn, 'Archiv f. Protist.' Bd. L. Heft 2, 1902, p. 353.

† Laveran and Mesnil, *loc. cit.*

‡ Schaudinn, *loc. cit.*

§ Léger, *Comptes Rendus Acad. d. Sc.*, March 28 and April 4, 1904.

|| Schaudinn, *loc. cit.*

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