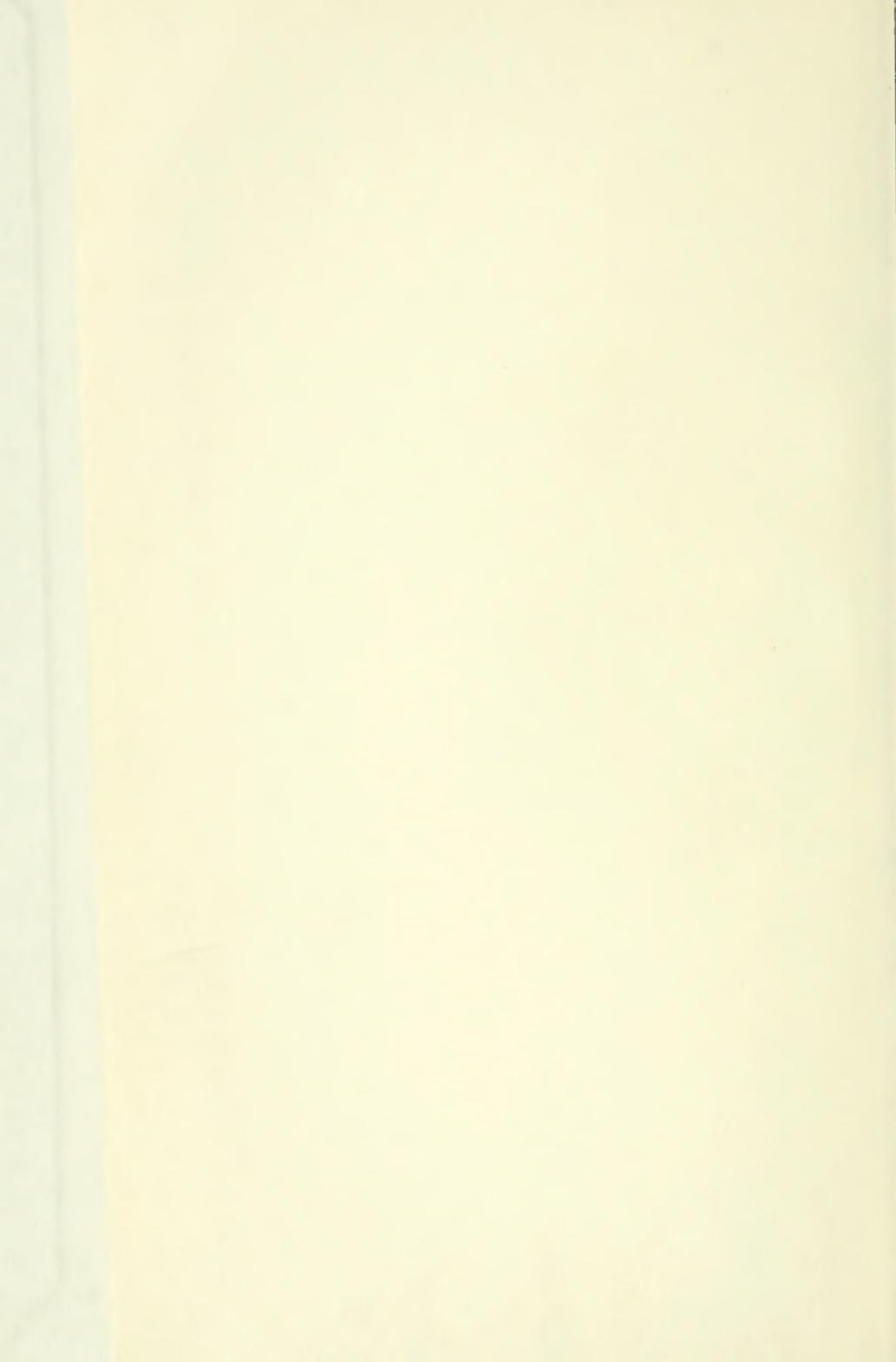
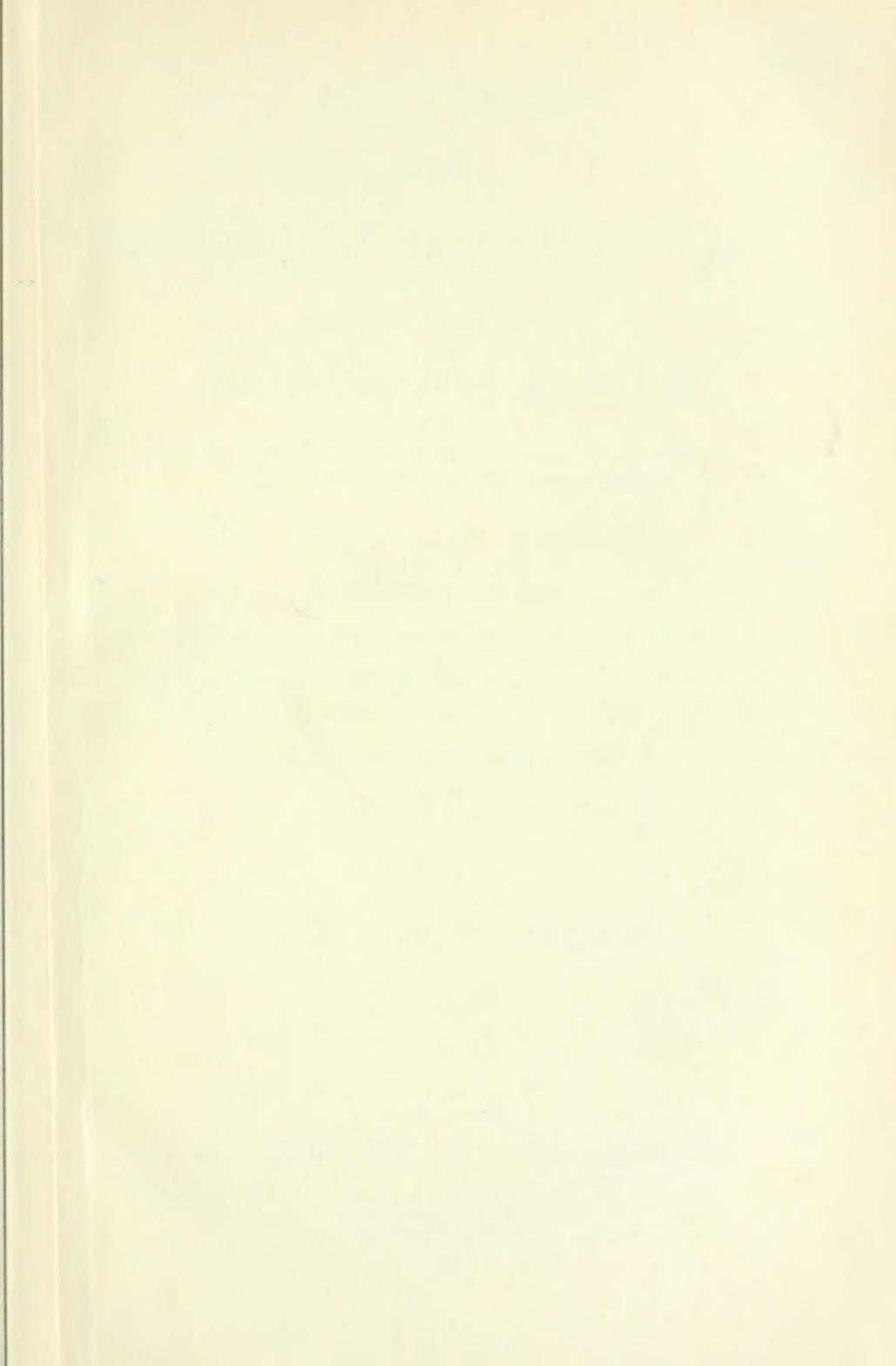


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THE ANNALS
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MAGAZINE OF NATURAL HISTORY,

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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
WILLIAM FRANCIS, F.L.S.

VOL. XV.—SEVENTH SERIES.

81060
6/12/06

LONDON:

PRINTED AND PUBLISHED BY TAYLOR AND FRANCIS.

SOLD BY SIMPKIN, MARSHALL, HAMILTON, KENT, AND CO., LD.;
BALLIÈRE, PARIS: HODGES, FIGGIS, AND CO., DUBLIN:
AND ASHER, BERLIN.

1905.



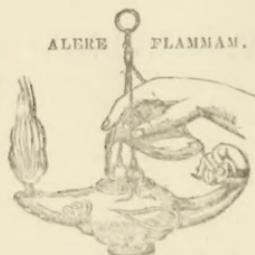
"Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatis humanæ:—ex harum usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini; ex œconomiâ in conservatione, proportione, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper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

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

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

J. TAYLOR, *Norwich*, 1818.

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THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

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

No. 85. JANUARY 1905.

I.—*Notes on some Recent Bryozoa in d'Orbigny's
Collection.* By ARTHUR WM. WATERS.

[Plate I.]

BEFORE completing my memoir * on the Bryozoa collected in the Antarctic by the 'Belgica,' I looked through d'Orbigny's collection to see if it contained any of the species found in the Antarctic. These recent † Bryozoa are in the Palæontological Department of the Muséum d'Histoire naturelle in Paris, and were referred to by d'Orbigny in the 'Paléontologie Française,' Terrains Crétacés, vol. v., and some had already been described by him in 'Voyage dans l'Amérique Méridionale.' However, a large proportion of the species

* "Resultats du Voyage du S. Y. 'Belgica,' Bryozoa," Expéd. Antaret. Belge, 1904.

† The fossil Cyclostomata have been revised by Pergens in "Révisions des Bryozoaires du Crétacé figurés par d'Orbigny," Bull. de la Soc. Belge de Géologie, vol. iii. 1889, pp. 305-400, pls. xi.-xiii.; and the fossil Chilostomata have been revised by Canu in "Révision des Bryozoaires du Crétacé figurés par d'Orbigny, Chilostomata," Bull. Soc. Géol. de France, 3^e sér. vol. xxvii. 1900, pp. 334-463, pls. iv.-vii.

were described in such a way that we have had no idea as to the species intended, for the characters used were not those which we now know are of most importance.

Although my examination was but a very hurried one, it was possible to recognize many species which have since d'Orbigny's time been more fully described; in others the affinities only could be indicated, for it is often only possible to make a determination after prolonged examination and preparation of opercula and other structures, besides reference to the literature. Some of the most important books were at my side during the examination, but it was not possible to have all available as if I had worked in my own study. In some cases nothing more could be said than that the determination of some unsatisfactory specimens is impossible; but even this may save other people time and prevent their trying to make impracticable comparisons and determinations.

Naturally our knowledge of the geographical distribution is increased in many cases, and some of the 'Challenger' species had been previously seen by d'Orbigny, as:—

Thalamoporella labiata, Busk.
Adeonella polymorpha, Busk.
Lepratia japonica, Busk.

| *Haswellia auriculata*, Busk.
 | *Adeonella platatea*, Busk.

It has seemed advisable to refer to the species in the order in which they occur in the 'Paléontologie Française,' giving the page and plates, when figured, then the reference to 'Voyage dans l'Amérique Méridionale' is added, as well as to my memoir of the Bryozoa from the Antarctic collected by the 'Belgica,' and to a paper of mine on Bryozoa from Cape Horn now in the printer's hands. It may be taken that, with few exceptions, the names in the collection are those given in the 'Paléontologie Française,' but a few species have the names given in the 'Voyage,' and some others the convenient name *Cellepora*; but it has not been necessary to refer to these exceptions.

It will be understood that only a part of the recent Bryozoa described by d'Orbigny are here mentioned and that the paper is worked up from rough notes made during a short visit. Fig. 1 (Pl. I.) is drawn from the actual specimen, but the other figures are drawn from rough sketches and must be considered to a large extent diagrammatic.

Pal. Franç. vol. v.	Page.	Plate.	Number.	Name in Pal. Franç.	Locality and Remarks.
28		13608	<i>Cellaria cauleana</i> , d'Orb.	Chinese Seas. = <i>Cellaria subcornioides</i> , Lamx., group.
28		13607	<i>Cellaria ornata</i> , d'Orb. Voy. Amér. Mérid. p. 9, pl. ii. figs. 10-14. <i>Cellaria malvinensis</i> , Waters, Expéd. Ant. Belge, Bry. p. 37, pl. ii. figs. 10 a, b, pl. viii. fig. 5. <i>Cellaria quadrilatera</i> , d'Orb.	Patagonia. = <i>Cellaria malvinensis</i> , Busk.
29		13610	<i>Ternicellaria aculeata</i> , d'Orb. <i>Tricellaria aculeata</i> , d'Orb. Voy. Amér. Mér. pl. ii. figs. 1-4. <i>Bicellaria aculeata</i> , d'Orb. ib. p. 8. <i>Bicellaria punctata</i> , d'Orb. Voy. Amér. Mér. p. 1, pl. i. figs. 9-13. <i>Flabellopora elegans</i> , d'Orb.	Chinese Seas. = <i>Farcinia oculata</i> *, Busk. Widely distributed: Australia, Indian Ocean, Kerguelen, N. & S. Atlantic. Patagonia. In the tube there was a label "Algers," but there was only <i>Membranipora pilosa</i> , so that some change has been made.
48		13611		Patagonia. = <i>Scrypocellaria</i> . The dorsal surface has vibracula and avicularia. Long radiæ from near the avicularium.
50		13612		Malacca. (Pl. I. fig. 5.) This is not what I described as <i>Conescharallia elegans</i> , d'Orb. (Ann. & Mag. Nat. Hist. ser. 5, vol. xx. p. 200, pl. v. figs. 13-17), although d'Orbigny's figure more nearly corresponds with my specimen than with the original from Malacca. There is an oval depressed area, the oral aperture is sinuated, above the aperture there is a small oval avicularium and an opening below; distally to the area there are two openings, which may be replaced by avicularia.
53 & 186 b	661, figs. 1-5		13669		

* This is the *Nellia oculata*, Busk, but the diagnosis of the genus *Nellia* is so unsatisfactory that it cannot be retained. Poutiaux (1867) took the name *Farcinia*, although it had been previously used by Fleming for *Cellaria*; but Fleming's name had been dropped, as being a synonym.

Pal. Franç. vol. v.		Number.	Name in Pal. Franç.	Locality and Remarks.
Page.	Plate.			
59	13616	<i>Vincularia elegans</i> , d'Orb. Voy. Amér. Mérid. p. 21, pl. ix. figs. 25-28. <i>Vincularia labiata</i> , Busk, Zool. Chall. Exp. pl. xxx. p. 73, and fig. 3. <i>Thalamoporella labiata</i> , Waters, "Bry. Cape Horn," J. Linn. Soc., Zool. figs. 6-9. <i>Vincularia pentagona</i> , d'Orb. Voy. Amér. Mérid. p. 21, pl. x. figs. 4-6. <i>Haswellia auriculata</i> , Waters, "Bry. Cape Horn," Journ. Linn. Soc., Zool.	In the lower part of the zoarium there are numerous round openings for the attachment of radicles. I am not prepared to discuss the generic position from the slight examination made, and therefore the name <i>Flabellipora</i> is left provisionally. = <i>Thalamoporella labiata</i> (Busk). To a few zoecia there is a bar across the opesium. = <i>Haswellia auriculata</i> (Busk). Falkland Islands.
59	13618 13620 13620 A 13621	<i>Vincularia sinensis</i> , d'Orb. <i>Eschara retiformis</i> , d'Orb. <i>Eschara retiformis</i> , d'Orb. <i>Eschara pavonina</i> , d'Orb.	Chinese Seas. = <i>Membranipora Savartii</i> , Aud., group. Mediterranean. = <i>Porella</i> or <i>Escharoides</i> . Mediterranean. = <i>Lepralia foliacea</i> , Lill. & Sol. Ile de Ré. = <i>Porella</i> . This is flabelliform, ovicells not much raised, large avicularia, but the avicularian chamber does not extend as far down as in the Antarctic <i>Porella saccata</i> (Busk).
102	13622	<i>Eschara elegantula</i> , d'Orb.	Newfoundland. This is not the <i>E. elegantula</i> of Smitt and others, but has been described by Busk as <i>E. perpusilla</i> (see Waters, "Bry. from Franz-Josef Land," Journ. Linn. Soc., Zool. xxviii. p. 81, pl. x. figs. 13, 18, 19, pl. xi. fig. 1).
188*	13596	<i>Electrina lamellosa</i> , d'Orb.	Dede Noirmontiers. = bilaminate <i>Membranipora pilosa</i> , L.
201	<i>Escharella indica</i> , d'Orb.	= <i>Membranipora</i> , like bilaminate <i>minax</i> , B.

207	.....	13681	<i>Escharellina ramosa</i> , d'Orb.	Pondicherry. = <i>Brachybilgia</i> or <i>Adconella</i> . (Pl. I, fig. 10.) This has a depressed suboral pore, and to all the zoecia except the outside ones there is a pair of large avicularia directed downwards and towards the median line of the zoecium. The outer zoecia have no avicularia and there is a wide denticle in the aperture.
207	.....	13682	<i>Escharellina laminosa</i> , d'Orb.	Ile de Basilan. = <i>Adconella</i> , probably <i>A. polymorpha</i> , Busk. There is only a small piece.
207	.....	13683	<i>Escharellina Cecilleana</i> , d'Orb.	Ile de Basilan. = <i>Adconella platataca</i> , Busk. There may also be another species among the specimens. There are very long vicarious avicularia about the length of two zoecia.
244	.....	13701	<i>Bifustra ramosa</i> , d'Orb.	Manila. = <i>Membranipora Saratii</i> group. I have this erect branching form from Palm Island, N.E. Australia.
244	.....	13702 13716	<i>Bifustra aculeata</i> , d'Orb. <i>Membranipora bipartita</i> , d'Orb. Pal. Fr. p. 543.	Newfoundland. (Pl. I, fig. 1.) There are about the middle of the border of the zoecium two strong processes, which often meet to form a bridge, and they are seen to be each formed of two spines. There are occasionally other smaller processes arising from the border. This was also described as <i>M. bipartita</i> , but I do not think that <i>S. arctica</i> is more than a manuscript name. Although when first seen I expected to find it had subsequently been figured and described, I have not met with any other description.
244	.....	13703	<i>Bifustra puelcha</i> , d'Orb.	Patagonia. <i>Membranipora Saratii</i> group, bilaminatae.
322	.....	13757	<i>Fustra puelcha</i> , d'Orb. Voy. Amér. Mér. p. 18, pl. viii, figs. 15, 16.	= <i>Bugula</i> .
323	.....	13758-9	<i>Ornithopora avicularia</i> , d'Orb. <i>Ornithopora multiserialis</i> , d'Orb.	Patagonia. = <i>Bugula</i> . The specimen is in very poor

* The paging 185-188 is duplicated, and the second set must be called 185 a-188 a.

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331	13600	<i>Acanarthis multiseriatis</i> , d'Orb. Voy. Amér. Mér. p. 10, pl. iii. figs. 9-12.	condition. There is a large avicularium arising from the middle of the zoecium. 2-3 inner spines, 4 outer spines. Patagonia. Poor fragment, apparently <i>Caberea Davaini</i> , Bask.
332	13601	<i>Corda patagonica</i> , d'Orb. Voy. Amér. Mér. p. 9, pl. ii. figs. 5-9.	Brazil. <i>Cellularia</i> group.
333	13602	<i>Cuberea dichotoma</i> , d'Orb.	Australia. Multiserial.
336	13613	<i>Trubacellaria barbata</i> , d'Orb.	Australia. = <i>Cellaria setigera</i> , Desm. & Les.
345	<i>Eschara lobulata</i> , M.-Edw., marked "Vincularia."	= <i>Adeonella</i> .
354	13625	<i>Retepora indica</i> , d'Orb.	Ile de Basilan. Perhaps <i>R. contortuplicata</i> , Bask.
366	<i>Semieschara africana</i> , d'Orb.	Probably <i>Retepora cellulosa</i> , L. Perhaps specimens have been changed.
366	722, fig. 1	....	<i>Semieschara lamellosa</i> , d'Orb.	Newfoundland. Will be <i>Escharoides</i> .
367	13629	<i>Semieschara magna</i> , d'Orb.	Détroit de Malacca. = <i>Lepralia japonica</i> , Bask. In one case there are a few broad triangular avicularia on the front, and on the dorsal surface there are pores of attachment, as in <i>L. dorsipora</i> , B. Specimens from Japan have a broad triangular avicularium near the aperture.
368	13636	<i>Mollia tuberculata</i> , d'Orb.	Calvados. = <i>Gonellipora venusta</i> , Norm. The surface of the zoecia and ovicells is perforated, but until washed this was scarcely distinguishable. There are other species on the shell.
399	13637	<i>Collepora subtorquata</i> , d'Orb. <i>Escharina torquata</i> , d'Orb. Voy. Amér. Mér. p. 11, pl. iv. figs. 1-4.	Rio Janeiro. D'Orbigny's figure is good, but the lateral wings by the side of the sinus project more than is figured.
399	13643	<i>Collepora Bougainvillæ</i> , d'Orb. <i>Escharina Bougainvillæ</i> , d'Orb. Voy. Amér. Mér. p. 12, pl. iv. figs. 9-12.	Falkland Islands. = <i>Hippothoa</i> . A few zoecia on a shell have the thick projection near the aperture and usually one lower down, and there may be more; but

there is not the regularity figured by Busk. Ovicells wide. = *Hippothoa*. Forms a continuous incrustation. The ovicells are perforated, wide, like those figured by d'Orbigny for *Cellepora Bougainvillei*, d'Orb. I do not find the two projections on the front; but there are sometimes pores round the zoecia, though not with projecting tubes, as in *C. Bougainvilliana*, d'Orb. Arica. This is *Schizoporella* with lozenge-shaped zoecia surrounded by a raised border; the surface is perforated; the sinus of the oral aperture is wide, and there is a small oval avicularium by the side of the sinus. In the shape of the zoecium, aperture, and the position of the avicularium this reminds us of *Schizoporella sydneysensis*, Waters, but there are none of the characteristic bosses.

Falkland Islands. = *Hippothoa*. D'Orbigny's figure is not very satisfactory. The structure is more or less porcellanous, and in the younger zoecia there are two oral spines. The oral aperture of the ovicelligerous zoecia is wider than that of the ordinary zoecia, but the sinus in the former is much the narrower. The front wall frequently projects over the aperture, forming a mucro. Probably *H. Edwardsiana*, *H. Bougainvillei*, and *H. chiliana* are only varieties of the same thing. Chili. = *Leprata*. The aperture is Lepalitoïd, there are radiating ribs and a thick ovicell. At the side there is an avicularium directed outwards, as in *E. Alveoliana*, d'Orb., which it much resembles.

On the shell there is *M. Mathesi*, Aud., and *Schizoporella linearis*, and it looks as though it were Mediterranean and as if it were out of place. Nothing like *C. peruviana* was seen.

Cellepora chiliana, d'Orb.
Escharina chiliana, d'Orb. Voy. Amér.
 Mér. p. 11, pl. iv. figs. 5, 8.

Cellepora elegans, d'Orb.
Escharina elegans, d'Orb. Voy. Amér.
 Mér. p. 13, pl. v. figs. 9-12.

Cellepora Edwardsiana, d'Orb.
Escharina Edwardsiana, d'Orb. Voy.
 Amér. Mér. p. 12, pl. v. figs. 1-4.

Cellepora costata, d'Orb.
Escharina costata, d'Orb. Voy. Amér.
 Mérid. p. 14, pl. vi. figs. 5-8.

Cellepora peruviana, d'Orb.
Escharina peruviana, d'Orb. Voy. Amér.
 Mérid. p. 16, pl. vii. figs. 9-12.

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418	13654	<i>Reptolatereschara capensis</i> , d'Orb.	Cape of Good Hope. I do not see that this differs from <i>Schizoporella anantheris</i> , Moll.
420	13657	<i>Celleporaria ramosissima</i> , d'Orb.	The branches are about 3-5 mm. in diameter and anastomose, the ovicell is widely open and imperforate, and there is a stout avicularium by the aperture. Apparently <i>Celleporaria ramosa</i> , L.
216	<i>Celleporaria ramosissima</i> , d'Orb.	Manila. Is probably <i>Celleporaria dichotoma</i> , Hincks.
420	13658	<i>Celleporaria gracilis</i> , d'Orb.	Senegal. The zoarium is branched, mammillated; ovicells much raised, with deep area; oral aperture small, Lepralioid.
216	13659	<i>Celleporaria tuberculata</i> , d'Orb.	L. Labelled <i>Escharrellina africana</i> , but it is <i>Microporella ciliata</i> , Pall. There are only a few zoecia. Perforated all over.
216	<i>Celleporaria tuberculata</i> , d'Orb.	
434	13667	<i>Porina africana</i> , d'Orb.	
442	13672	<i>Reptoporia Isabelleana</i> , d'Orb. <i>Escharina Isabelleana</i> , d'Orb. Voy. Amér. Mér. p. 12, pl. iv. figs. 13-15.	Rio Janeiro. It is much like <i>Schizoporella unicomis</i> , Johnst., and has a similar mucro, but differs in having the ovicell perforated all over, and the sinus in the aperture is somewhat wider. The older zoecia are sometimes erect, as in <i>Cellepora</i> , and are surrounded by a raised border, which usually encloses the avicularium and the ovicell.
442	13673	<i>Reptoporia simplex</i> , d'Orb. <i>Escharina simplex</i> , d'Orb. Voy. Amér. Mér. p. 13, pl. v. figs. 5-8. <i>Schizoporella simplex</i> , Waters, Exp. Antaret. Belge, Voy. p. 51, pl. iii. fig. 6.	Falkland Islands.
443	13675	<i>Reptoporia rugosa</i> , d'Orb.	Ile de Ré. = <i>Schizoporella unicomis</i> , Johnst.
444	13676	<i>Reptoporia hecagona</i> , d'Orb.	Ile de Ré. = <i>Microporella Matusii</i> , Aud.

443	....	13674	<i>Reptoporia cornuta</i> , d'Orb. <i>Escharina cornuta</i> , d'Orb. Voy. Amér. Mér. p. 13, pl. v. figs. 13-16. <i>Reptoporia aspera</i> , d'Orb.	Chili. I do not find any <i>R. cornuta</i> on the shell. There is, however, <i>Smittia Alvareziana</i> , d'Orb.
444	....	13677		Algors. = <i>Schizoporella</i> with small round avicularium below the oral aperture.
444	....	13678	<i>Reptoporia caudana</i> , d'Orb.	(Chinese Seas. = <i>Schizoporella</i> with round avicularium below the sinus, wide globular ovicell.
447	714. figs. 14 16	13679	<i>Conescharrellina angustata</i> , d'Orb.	Ile de Basilan. (Pl. I. fig. 7.) D'Orbigny's figure does not give a correct idea. The zoecia occur in longitudinal rows, and between these rows there is a depressed groove with avicularian or vibracular pores. The zoecia have an oval aperture with an avicularium below it.
447	....	13680	<i>Conescharrellina dilatata</i> , d'Orb.	Manila. (Pl. I. fig. 6.) There are two species in the tube. One has a nearly round oral aperture, with an avicularium below, and between the rows of zoecia there is a depressed groove with a single row of large pores.
453	....	13686	<i>Reptescharrellina Alvareziana</i> , d'Orb. <i>Escharina Alvareziana</i> , d'Orb. Voy. Amér. Mér. p. 14, pl. vi. figs. 1-4. <i>Smittia Alvareziana</i> , Waters, "Bry. Cape Horn," Journ. Imm. Soc., Zool.	Payta (Peru). The figure is pretty good, but the avicularia project further out than figured. No ovicells. Small mucro to aperture.
454	....	13689	<i>Reptescharrellina borealis</i> , d'Orb.	Newfoundland. = <i>Schizoporella vulgaris</i> , Moll.
453	....	13688	<i>Reptescharrellina armata</i> , d'Orb. <i>Escharina armata</i> , d'Orb. Voy. Amér. Mér. p. 15, pl. vii. figs. 5-8.	Falkland Islands. = <i>Microporella ciliata</i> . There is a crescentic pore, granulated surface, avicularium at one side.
453	....	13687	<i>Reptescharrellina regularis</i> , d'Orb. <i>Escharina regularis</i> , d'Orb. Voy. Amér. Mér. p. 15, pl. vi. figs. 13-16.	Payta. This is <i>Microporella</i> , probably <i>M. ciliata</i> , var. <i>californica</i> , Hincks.
454	13690	<i>Reptescharrellina inequalis</i> , d'Orb.	Malacca. (Pl. I. fig. 8.) = <i>Schizoporella</i> . Zoecial surface granular, pores round the border of the zoecium; on one or both sides of the oral aperture an avicularium on a raised chamber directed downwards, and an oval avicularium immediately below the sinus placed

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458	13691	<i>Multescharellina globulosa</i> , d'Orb. <i>Multescharellina candeana</i> , d'Orb.	transversely. There is also another specimen marked "13690 p" from the Ile de Basilan. This is, however, quite different, more like <i>Balopora</i> , with <i>Cemellipora</i> -like aperture, and a large avicularium at one side of the zoecium and a small triangular one above the aperture. Algers. = <i>Lagenipora Costazi</i> , And. Straits of Malacca. = <i>Cellepora</i> of the Holostomatous group. There are denticles on the proximal edge of the aperture and there are vicarious avicularia. There is only one small and poor specimen. = <i>Lepralia Pallasiana</i> , Moll.
458	13692		
462	13694	<i>Semischarella flemosa</i> , d'Orb. <i>Reptescharella Bronquartiana</i> , d'Orb. <i>Escharina Bronquartiana</i> , d'Orb. Voy. Amér. Mér. p. 14, pl. vi. figs. 8-12.	Valparaiso. This is <i>Hippothoa</i> with three forms of oral aperture, namely, the oviceggerous short and wide, the ordinary ones with a wide sinus, and a much smaller one with a narrow sinus; the ovicells are wide and large, as in <i>Hippothoa Bougainvillei</i> , d'Orb. There are pores between the zoecia, but no raised tubes as in the next specimen. Arica. (Pl. I, figs. 2-4.) This specimen was in a tube with <i>R. elegans</i> , d'Orb., and is one of the most interesting things met with, as from the pore-chambers there are erect tubes, either simply tubular or funnel-shaped, and frequently at the proximal end of the zoecium there is a very large tube. The presence of these shafts from the pore-chambers seems to be unknown in any other species, and in some parts of the colony the tubes are hardly raised, while, as already mentioned, in other specimens there were no raised
465	13695		
		13699	<i>Reptescharella Bronquartiana</i> , d'Orb.	

tubes. In *Lepralia Poissonii*, Aud., there are delicate spines round the border of the zoecium, and the function may be similar. The primary zoecium, as seen from below, is nearly round. The primary zoecium, as seen from Falkland Islands. In the tube there is a ticklet, "échancrillon manquant"; but the *Smittia reticulata*, MacG., occurs on other shells, and we may take it that d'Orbigny had *S. reticulata* before him. Straits of Malacca. It is *Cribritina*, probably *radiata* without avicularia. = *Cypularia umbellata*, Desf. Algiers. = *Microporella Heckeli**, Reuss, = *M. violacea*, auct. Corsica. *M. Heckeli*, Reuss. Malacca. There are several species on the shell, but the one referred to will be *Smittia reticulata*, MacG. Manila. There are several species on the shells, but the one which I think was referred to by d'Orbigny is a *Smittia* much like *S. reticulata*, var. *spatulata*, MacG. The oblong rectangular zoecia grow in regular longitudinal lines; they are surrounded by a row of pores, and at one side there is a large curved avicularium. Malacca. = *Membranipora Savantii*, Aud., or allied species. Ile de Noirmontiers. This has a long oval opesium and belongs to the *Pyripora* group of the Membraniporidae. Chili. On one specimen there were 7 spines, but another specimen so named was *M. spinosa*.

Reptescharella rimulata, MacG.
Escharina rimulata, d'Orb. Voy. Amér.
Mér. p. 15, pl. vii. figs. 1-4.

Reptescharella indica, d'Orb.

Discoporella Berardana, d'Orb.

Reptoporellina porosa, d'Orb.

Reptoporellina porosa, d'Orb.

Reptoporellina costata, d'Orb.

Reptescharipora complanata, d'Orb.

Flustrellaria candiana, d'Orb.

Pyripora ramosa, d'Orb.

Membranipora echinata, d'Orb. Voy.
Amér. Mém. p. 16, pl. vii. figs. 13-17
(misprinted in text *eschinata*).

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* Neviani has made a genus *Heckeli* for this form ("Bri. foss. d. Farnesina e Monte Mario," Pal. Ital. p. 106 (30), pl. v. figs. 27, 29).

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542	13708	<i>Membranipora spinosa</i> , d'Orb. Voy. Amér. Mér. p. 16, pl. viii. figs. 1-4.	Peru. The specimen has no spines, and perhaps spongespicules were mistaken for spines; but there is a <i>Membranipora</i> from Chili with 17-18 spines which is <i>M. spinosa</i> .
542	13709	<i>Membranipora irregularis</i> , d'Orb. Voy. Amér. Mér. p. 17, pl. viii. figs. 5, 6.	Peru. There is no <i>Membranipora</i> on the shell, only <i>Microporella Matsui</i> , Aud.
542	13713	<i>Membranipora sinensis</i> , d'Orb.	Chinese Seas. (Pl. I. fig. 9.) It has a large round opesium, a small cap-like ovicell, and by the distal edge a long slightly curved avicularium. This reminds us of <i>M. nigraus</i> , Hincks, but the avicularia are much longer.
543	13714	<i>Membranipora malaccensis</i> , d'Orb.	Malacca. = <i>M. Savartii</i> , Aud., group.
543	13714 A	<i>Membranipora malaccensis</i> , d'Orb.	Ile de Galega. This is quite a different thing.
543	13716	<i>Membranipora bipartita</i> , d'Orb.	Newfoundland. = <i>Difflustra aculeata</i> , d'Orb. Pal. Fr. p. 244 (see page 5).
543	13715	<i>Membranipora ciliata</i> , d'Orb.	Calvados. Someone had written in the box " <i>spinifera</i> ," probably <i>M. spinifera</i> , Johnston.
561	13718	<i>Discoflustrella doma</i> , d'Orb.	There are stout spines round the border, and it is probably <i>M. spinifera</i> , Johnston.
570	13722	<i>Pyroflustrella arctica</i> , d'Orb.	Algers. Zoecium hexagonal, with the oral aperture subtriangular.
571	13721	<i>Reptoflustrella americana</i> , d'Orb.	Spitzbergen. = <i>Microporella</i> with large zoecia; surface coarsely granular, few small pores over the surface; median pore round, not far from the oral aperture.
582	13724	<i>Reptoflustrina arctica</i> , d'Orb.	Newfoundland. This is what Norman has called <i>Callopora unicornis</i> , var. <i>armifera</i> , Hincks (Ann. & Mag. Nat. Hist. ser. 7, vol. xi. p. 591).
				Spitzbergen. = <i>Membranipora</i> with large oval opesium, a wide cap-like ovicell, with a small avicularium at each corner of the ovicell.

581	.....	13723	<i>Reptolustrina complanata</i> , d'Orb.	Indian Sea. Seems to be <i>Membranipora membranacea</i> .
595	.....	13725	<i>Serialaria cornuta</i> , Lamk.	Australia. In the tube is only <i>Tugula</i> .
595	.....	13726	<i>Serialaria crispata</i> , Lamk.	Australia. Is like <i>Anathia lentigera</i> , L. Label inside " <i>cornuta</i> ."
599	.....	13729	<i>Crista sinensis</i> , d'Orb.	Chinese Seas. Fragments too poor for determination.
600	.....	13731	<i>Crista punctata</i> , d'Orb.	Ile Venado, California. Fragments of <i>Filisparsa</i> .
602	.....	13732	<i>Bicrista Edwardsiana</i> , d'Orb. <i>Cristida Edwardsiana</i> , d'Orb. Voy. Amér. Mér. p. 7, pl. i. figs. 4-8.	Patagonia. There are four small specimens. There are first a number of basal joints without any zoecia, then follow others with two or three zoecia, the internodes being separated by black chitinous joints. There are but few spines, and these have joints, as figured by d'Orbigny.
602	.....	13734	<i>Myriozoum subgracile</i> , d'Orb.	Newfoundland. There is also the same species labelled "Ile de Ré," but without any number. This last specimen has probably been displaced.
608	.....	13735	<i>Fasciculipora ramosa</i> , d'Orb. Voy. Amér. Mér. p. 21, pl. ix. figs. 22-24.	Falkland Islands. On the specimen or on the stone are also <i>Stomatopora</i> , <i>Schizoporella simplex</i> , d'Orb., and <i>Cribrella latimarginata</i> , Busk.
675	.....	13737	<i>Discofascigera cupulata</i> , d'Orb.	Spitzbergen. It is a worn <i>Lichenopora</i> which it would be impossible to determine.
675	.....	13738	<i>Discofascigera caudata</i> , d'Orb.	Ile Chuzan. One of the two specimens might be basal growth of <i>Heteropora</i> or might be <i>Lichenopora</i> .
678	.....	13739	<i>Froundipora verrucosa</i> , Lamx.	Spitzbergen. It is the basal growth described as <i>F. reticulata</i> , Blain.
731	.....	13742	<i>Idmonea dilatata</i> , d'Orb.	Ile de Ré. Small piece, doubtless <i>I. serpens</i> .
731	.....	13743	<i>Idmonea angustata</i> , d'Orb.	Newfoundland. May be <i>I. atlantica</i> , but there is only a small piece.
731	.....	13744	<i>Idmonea rustica</i> , d'Orb.	Manila. All the specimens <i>Filisparsa</i> .
732	.....	13743	<i>Idmonea Micheneri</i> , d'Orb. Voy. Amér. Mér. p. 20, pl. ix. figs. 17-21.	Falkland Islands. The ovicell is near a bifurcation, not much raised and not extending over many zoecia.
732	.....	13746	<i>Idmonea canariensis</i> , d'Orb.	Teneriffe. Fragments of what Smit described as <i>Crista Hochstetteriana</i> , Stol. Floridan Bry. p. 6, pl. ii. figs. 11-13.

Pal. Franç. vol. v.		Number.	Name in Pal. Franç.	Locality and Remarks.
Page.	Plate			
752	13749	<i>Reptotubigera costiensis</i> , d'Orb.	Newfoundland. It is probably <i>Idmonea serpens</i> , L. The colour is violet.
817	13756	<i>Filisparsa marginata</i> , d'Orb.	Teneriffe. Worn <i>Idmonea</i> .
817	13757	<i>Filisparsa rugosa</i> , d'Orb.	Chuzan. Zoëcia very close together, as in some <i>Entalopora</i> .
827	758, figs. 10-12	13760	<i>Diatopora latomarginata</i> , d'Orb.	Newfoundland. This is well figured by d'Orbigny.
832	13762	<i>Tubulipora organisans</i> , d'Orb. Voy. Amér. Exp. Ant. Belge, Bry. p. 92.	Falkland Islands. Zoöcial tube 0.14 mm. On the specimen <i>Zucratea ambigua</i> , d'Orb., is growing.
832	13764	<i>Tubulipora gregaria</i> , d'Orb.	Australia. <i>Tubulipora</i> with fasciculate growth.
836	13765	<i>Stomatopora eburnea</i> , d'Orb. <i>Atecto eburnea</i> , d'Orb. Voy. Amér. Mér. p. 20, pl. ix, figs. 14-16.	Falkland Islands.
847	13766 A	<i>Stomatopora eburnea</i> , Waters, Exp. Ant. Belge, Bry. p. 88, pl. ix, figs. 7 a, b. <i>Trochoscina serpens</i> , F. ab.	Ile de Ré. There is <i>Idmonea serpens</i> , L., and <i>Stomatopora</i> .
847	13766	<i>Trochoscina dichotoma</i> , d'Orb. <i>Criserippia dichotoma</i> , d'Orb. Voy. Amér. Mér. p. 19, pl. ix, figs. 7-13. <i>Stomatopora dichotoma</i> , Waters, Exp. Ant. Belge, Bry. p. 87.	Falkland Islands.

Newfoundland. Large spreading *Stomatopora*. Straits of Malacca. This is *Diastopora* with inter-zoecial tubules (zoocules) by the oral aperture, as in the Arctic *Diastopora obelii*, var. *arctica*, Waters (see "Bry. Cape Horn," Journ. Linn. Soc., Zool.). Mediterranean. Some specimens are *Diastopora obelii*, Johnston, and others are a *Diastopora* without inter-zoecial tubules (zoocules), and in these the closure of the zoecia has tubules. Algiers. This is *Entalophora* with the ends of the branches clavate. Falkland Islands.

Mediterranean. There is *H. frondiculata*, Lamx., and another *Horrera* is either *H. lichenoides*, Pont., or *H. mediterranea*, Waters. The zoecia are uniserial, slightly raised; zoecia and cancelli about the same size. This does not seem to be the *Discoporella californica*, Busk.

Falkland Islands. This is of the *Lichenopora hispida*, Flenk., group. The zoecia are larger than the cancelli.

847	.....	<i>Proboscina latifolia</i> , d'Orb.	
847	.....	<i>Proboscina malaccensis</i> , d'Orb.	
862	760, figs. 7, 9	<i>Berenicia prominens</i> , Lamx.	
890	.....	<i>Cladocaula africana</i> , d'Orb.	
894	.....	<i>Clausa rustica</i> , d'Orb. <i>Trastopora rustica</i> , d'Orb. Voy. Amér. Mér. p. 22, pl. x. figs. 13, 15.	
919	.....	<i>Bifurcaria rustica</i> , Waters, Exp. Ant. Belge, Bry. p. 60, pl. viii. figs. 19 a, b. <i>Horrera lichenoides</i> , Pont.	
972	.....	<i>Unicavea californica</i> , d'Orb.	
972	.....	<i>Unicavea clypeiformis</i> , d'Orb. Voy. Amér. Mér. p. 19, pl. ix. figs. 4-6.	

Other species seen.

Monoporella albicans, Hincks, 13782, occurs from Cuba with *Unicavea*.

Microporella parvipora, Waters, 13676, Falkland Islands, with *Stomatopora*. Exp. Ant. Belge, p. 43, pl. iii. figs. 2 a, b.

Smittia reticulata, MacG., 13676, Falkland Islands.

Eucratea ambigua, d'Orb., 13672, Falkland Islands, with *Tubulipora organisans*, d'Orb.

Laminopora? contorta, d'Orb., locality not given. Michelin, Magasin de Zoologie, 1842, pl. iii. This does not seem to be uncommon in the North Atlantic, as unnamed specimens occur in several museums. Many of the characters resemble those of *Schizoporella bimimita*, Hincks. Busk marked a specimen now in the British Museum from John Adams Bank, Cape de Verde, "Herald," with the manuscript name *Adeonella dolichostoma*, Busk.

Smittia pavonella, Alder, occurs from Teneriffe.

EXPLANATION OF PLATE I.

- Fig. 1.* *Membranipora aculeata* (d'Orb.). No. 13702, as *Biflustra aculeata*, d'Orb. Newfoundland. $\times 25$. Page 5.
- Fig. 2.* *Hippothoa Brongniartiana* (d'Orb.). No. 13639. From Arica, without name. Copied from sketch. Page 10.
- Fig. 3.* Ditto. The erect tubes seen from the side.
- Fig. 4.* Ditto. Diagrammatic section across the zoecium, showing the zoecial chambers (z.c.) and the interstitial pore-chambers (p.c.), from which the erect tubes arise.
- Fig. 5.* *Flabellopora? elegans*, d'Orb. No. 13669. From Malacca. Drawn from outline-sketch. Page 3.
- Fig. 6.* *Conescharellina? dilatata*, d'Orb. No. 13680. From Manila. From outline sketch. Page 9.
- Fig. 7.* *Conescharellina? angustata*, d'Orb. No. 13679. From Ile de Basilan. Copied from sketch. Page 9.
- Fig. 8.* *Schizoporella (Reptescharellina) inaequalis*, d'Orb. No. 13690. From Malacca. Copied from sketch. Page 9.
- Fig. 9.* *Membranipora sinensis*, d'Orb. No. 13713. From Chinese Seas. From sketch. Page 12.
- Fig. 10.* *Bracebridgia (Escharellina) ramosa*, d'Orb. No. 13681. From Pondicherry. The right-hand zoecia are on the border of the zoarium. From sketch. Page 5.

II.—On a Collection of Fishes from the Inland Sea of Japan made by Mr. R. Gordon Smith. By C. TATE REGAN, B.A.

[Plates II. & III.]

THE British Museum has recently received from Mr. R. Gordon Smith a large series of fishes collected by him in the Inland Sea of Japan, containing examples of thirteen species which appear to be new to science.

In the following list I have included the new species, with some which appear to be new to the Japanese fauna and others which it seems useful to notice or to redescribe.

1. *Clupea zunasi*, Bleek.

Günther places this species in the section with toothless palate, but although the palate appears to lack teeth in the typical example preserved in the British Museum, several specimens collected by Mr. Gordon Smith have small teeth on the palate, as stated by Bleeker in his description of the species.

2. *Ophichthys intermedius*, sp. n.

Depth of body $2\frac{2}{3}$ in the length of head, which is $3\frac{1}{5}$ in the length of the trunk or $10\frac{2}{3}$ in the total length of the fish. Length of tail $1\frac{3}{5}$ that of head and trunk. Diameter of eye $1\frac{4}{5}$ in the snout, which is $5\frac{1}{2}$ in the length of head. Teeth pointed, in a single series in each jaw. Pectoral a little more than $\frac{1}{3}$ the length of head. Origin of dorsal above anterior $\frac{1}{4}$ of pectoral. Upper part of the body brown, with some yellow blotches or irregular bands; lower part of the body yellowish. Dorsal with alternate light grey and blackish blotches and with a blackish edge; anal grey, black-edged; pectoral blackish.

A single specimen, 910 mm. in total length.

The genus *Microdonophis*, distinguished from *Ophichthys* by having the origin of the dorsal in front of the base of the pectoral instead of behind it, seems hardly worth recognition. The species described above approaches more nearly to *Microdonophis* in respect of this character than to most species of *Ophichthys*.

3. *Belone annulata*, Cuv. & Val.

Previously recorded from China and various Indo-Pacific localities.

4. *Exocoetus Solandri*, Cuv. & Val.

Previously recorded from the Indian Ocean.

5. *Ammodytes alascanus*, Cope.

Previously recorded from Alaska.

6. *Sphyræna pinguis*, Günth.

Previously recorded from Chiefoo.

7. *Bregmaceros Maccllellandi*, Thomps.

Previously recorded from the Indian Ocean, China, and the Philippine Islands.

8. *Caprodon Schlegelii*, Günth.

Depth of body $2\frac{2}{3}$ in the length, length of head $3\frac{2}{3}$. Snout nearly as long as eye, the diameter of which is $3\frac{2}{3}$ in the length of head. Maxillary extending to below posterior edge of pupil, the width of its distal extremity $\frac{2}{3}$ the diameter of eye. 24 gill-rakers on the lower part of anterior arch. Dorsal X 21, the spines increasing in length to the fourth, which is $\frac{2}{3}$ the length of head and nearly as long as the longest soft rays. Anal III 8. Pectoral $1\frac{1}{3}$ the length of head; ventral shorter than the head, not extending to the anal. Caudal truncate. Scales $66\frac{6}{21}$. Lateral line 62. Pink; two yellow stripes in front of the eye; fins yellowish; posterior part of spinous dorsal with an irregular blackish blotch.

Total length of the specimen described, 270 mm.

This species is principally distinguished from the South Pacific *C. longimanus*, Günth., by the wider mouth and the truncate caudal.

9. *Chaetopterus Sieboldii*, Bleek.

Body ovate, moderately compressed. Depth of body $2\frac{1}{3}$ in the length, length of head $3\frac{2}{3}$. Snout shorter than eye, the diameter of which is $3\frac{1}{3}$ in the length of head, interorbital width $2\frac{2}{3}$. Mouth oblique; jaws equal anteriorly; maxillary exposed, without supplemental bone, extending to below anterior $\frac{1}{4}$ of eye, the width of its distal extremity $\frac{2}{3}$ the diameter of eye; premaxillaries protractile; small villiform teeth in bands in jaws and on vomer and palatines; both jaws with a moderately enlarged outer series of teeth and with 2 or 3 moderate canines on each side anteriorly. Præorbital

narrow. Interorbital region, snout, jaws, suborbitals, and præoperculum naked; rest of the head scaly. Cheek with 6 series of scales; præoperculum rounded and slightly produced at the angle, with radiating ridges and crenulate margin; operculum with two spines. Pseudobranchiæ well developed; gill-rakers as long as gill-fringes, 20 on the lower part of anterior arch; six branchiostegals. Dorsal X 10, the spines increasing in length to the fourth, which is nearly $\frac{1}{2}$ the length of head, the last a little more than $\frac{1}{3}$ the length of head. Anal III 8. Dorsal and anal fins scaleless. Pectoral falcate, with 17 rays, longer than the head, extending to above the origin of anal. Ventrals commencing a little behind the pectorals, extending to the vent. Caudal deeply forked, covered with scales except near the posterior margin. Scales finely denticulated, 72₁₀. Lateral line concurrent with the dorsal profile. Uniformly olivaceous.

Total length of the specimen described, 230 mm.

This species has been referred by Jordan and Snyder to the genus *Aprion*, Cuv. & Val. I have compared it with the type species, *A. virescens*, which differs notably in the more elongate body, larger mouth and stronger dentition, deeper præorbital and very short pectoral. It is also evident that the structure of the skull must be very different. I have also compared *C. Sieboldii* with *Aspilus dentatus*, Guichenot, which is the type of the genus *Tropidinius*, Gill, but is placed by Messrs. Jordan and Evermann in *Aspilus*, Cuv. & Val. The two species appear to me to be closely allied and certainly congeneric. On the other hand, *Aspilus fuscus*, the typical species of the genus *Aspilus*, seems to be a very different fish, especially in lacking canine teeth. I am therefore inclined to retain the genus *Chaetopterus* and to regard *Tropidinius* as a synonym of it.

GYMNAPOGON, gen. nov.

Allied to *Telescopias*, Jord. & Snyder. Body oblong, compressed; scales entirely wanting; sides of head with a network of series of small pores; body with 20 or more vertical series of small pores on each side, and with the lateral line apparently represented by a longitudinal series running to below the soft dorsal and usually commencing again on the middle of the side and running to the base of the caudal. Mouth wide, oblique; jaws equal anteriorly; maxillary exposed; teeth pointed, in a single series in the jaws and on the palatines; vomer with a few teeth; lower jaw with 3 or 4 curved canines on each side, placed laterally;

upper jaw with 2 or 3 anterior canines on each side. Præoperculum entire, with a produced membranous flap at the angle. Gill-membranes not united; seven branchiostegals; gill-rakers slender. Two dorsals, with VI, I 10-11 rays, the spines slender; anal with II 9-10 rays; dorsal and anal fins scaleless. Pectoral symmetrical, rounded or obtusely pointed, with 13 or 14 rays. Caudal subtruncate or rounded, the posterior edge usually slightly emarginate.

10. *Gymnapogon japonicus*, sp. n.

Depth of body 4-5 in the length, length of head 3. Snout as long as eye, the diameter of which is $4-4\frac{1}{2}$ in the length of head and nearly equal to the interorbital width. Maxillary extending a little beyond the posterior edge of eye. Gill-rakers as long as gill-fringes, 9 or 10 on the lower part of anterior arch. Dorsal VI, I 10-11, the fourth spine the longest, less than $\frac{1}{3}$ the length of head; longest soft rays about $\frac{1}{2}$ the length of head. Pectoral $\frac{3}{4}$ the length of head; ventral not extending to anal. Caudal peduncle about twice as long as deep. Olivaceous; caudal often blackish posteriorly.

Numerous specimens, measuring up to 45 mm. in total length.

11. *Pagrus unicolor*, Quoy & Gaim.

The habitat of this species is thus given by Dr. Günther: "New Zealand; Australian Seas. (Chinese Seas?)"

12. *Sciæna albiflora*, Richards.

Previously recorded from China.

13. *Minous monodactylus*, Bl. Schn.

Minous Adamsi, Richards., cannot be maintained as a distinct species. I have compared numerous specimens from Japan with examples of *M. monodactylus* from the Indian Ocean, and am quite unable to see specific differences. I regard *Minous echigonius**, Jord. & Starks, as merely a nominal species; it is based on a single specimen, and the characters which are supposed to differentiate it from *M. Adamsi* are all subject to considerable variation, as I have convinced myself by examining a large series of examples.

14. *Pterois Jordani*, sp. n.

Depth of body 3 times in the length and equal to the

* Proc. U.S. Nat. Mus. xxvii. 1904, p. 153, fig. 14.

length of head. Snout as long as eye, the diameter of which is 3 times in the length of head and twice the interorbital width. Maxillary extending to below anterior $\frac{1}{3}$ of eye. Interorbital space concave, scaly; supraorbital tentacles feeble; supraorbital ridge with 2 or 3 teeth and anteriorly and posteriorly with smaller denticulations; suborbital ridge denticulated, separated from the eye by a space as wide as $\frac{1}{2}$ the diameter of eye; præoperculum with 3 spines. Scales deciduous, about 35 in a longitudinal series. Dorsal XIII 10, the fourth and fifth spines the longest, nearly $\frac{2}{5}$ the length of the fish (without caudal). Anal III 6. Pectoral without detached rays, extending to base of caudal; ventral extending a little beyond origin of anal. Caudal peduncle $1\frac{1}{3}$ as long as deep. Olivaceous; vertical fins pale, the soft dorsal with a few dark spots; pectoral and ventral blackish.

A single specimen, 68 mm. in length to the base of caudal.

Allied to *P. nigripinnis*, Gilchrist, which has a smaller eye and broader interorbital region.

Named after Dr. D. S. Jordan, who has so greatly added to our knowledge of the Fishes of Japan during the last few years.

15. *Erisphea achrurus*, sp. n. (Pl. II. fig. 3.)

Depth of body $2\frac{3}{4}$ -3 in the length, length of head $3\frac{1}{4}$ - $3\frac{1}{2}$. Snout as long as eye, the diameter of which is $\frac{1}{4}$ the length of head and equal to the interorbital width. Maxillary extending a little beyond anterior margin of eye. Præorbital with 2 spines, the posterior the longer; præoperculum with 4 spines, the uppermost the longest. Body covered with velvety prickles; lateral line with about 12 pores. Dorsal XII 12, the first spine $\frac{1}{2}$ the length of head, the third and fourth the shortest and about $\frac{1}{3}$ the length of head, from it the rays increase in length to the middle soft rays, which are $\frac{2}{3}$ the length of head. Anal II 10. Pectoral extending to origin of anal or a little beyond. Ventral I 2. Caudal subtruncate. Reddish brown, marbled with darker; dorsal, anal, and pectoral with dark markings or nearly uniformly blackish; caudal pale, sharply separated from the dark ground-colour of the body.

Four specimens, measuring up to 70 mm. in total length, from depths of 30-40 fathoms.

Comparison of the largest example with one of *E. Pottii*, Stehr., of 76 mm., shows the latter species to differ in having a larger head and larger mouth, as well as in coloration.

16. *Lepidotrigla Smithii*, sp. n. (Pl. II. fig. 4.)

Depth of body about 4 in the length, length of head 3. Diameter of eye $3\frac{1}{2}$ -4 in the length of head, interorbital width about 4. Snout $\frac{2}{3}$ the length of head or less, with a slightly emarginate or notched and feebly serrated or entire anterior edge, and with a pair of short spinous processes, the distance between the apices of which is equal to or a little greater than the diameter of eye. Maxillary extending to below anterior margin of eye; depth of suborbital nearly equal to the length of snout; no distinct transverse groove behind the orbits. Scales of the lateral line each with a short spine, 58-63 in number, each of the anterior ones corresponding to two of those below it; 23-26 spiny scutes along the bases of the dorsal fins. Dorsal VIII-IX, 15, the second and third spines subequal and $\frac{1}{2}$ the length of head. Anal 14. Pectoral as long as the head, extending to above anterior $\frac{1}{3}$ of anal. Ventral extending a little beyond origin of anal. Caudal truncate. Olivaceous, with a tinge of pink; a blackish spot on the upper part of the spinous dorsal between the fourth and sixth spines; an obscure dark stripe along the soft dorsal; inner surface of pectoral blackish, with small white spots; other fins uniformly pale.

Five specimens, 70 to 90 mm. in total length.

17. *Gobius elapoides*, Günth.

*Pterogobius dainio**, Jord. & Snyder, should be added to the synonymy of this species, from which it is said to differ in the absence of a band on the caudal. The numerous specimens I have examined certainly belong to one species; in some there is no trace of a dark vertical bar at the base of the caudal, in others there is a bar or vertically expanded spot, usually rather faintly marked, more rarely as dark as the bars on the body and like them edged with yellow.

18. *Tridentiger marmoratus*, sp. n. (Pl. II. fig. 2.)

Depth of body 5 in the length, length of head $3\frac{1}{2}$. Snout as long as eye, the diameter of which is 5 in the length of head. Width of osseous interorbital space $\frac{3}{4}$ - $\frac{5}{8}$ the diameter of eye. Maxillary extending to below posterior edge of eye. 50-52 scales in a longitudinal series, 16 or 17 between soft dorsal and origin of anal. Dorsal VI, 13, the third and fourth spines the longest, $\frac{2}{3}$ the length of head and a little longer than the longest soft rays. Anal 12. Pectoral $\frac{2}{3}$ the length

* Proc. U.S. Nat. Mus. xxiv. 1901, p. 91, fig. 17.

of head, extending to above the vent. Ventral $\frac{3}{5}$ – $\frac{2}{3}$ of the length of head or of the distance from its base to origin of anal. Caudal rounded. Caudal peduncle $1\frac{1}{2}$ as long as deep. Brownish, marbled with darker; a dark stripe from eye to upper part of opercle; fins dark greyish; first ray of each dorsal light, with 3 or 4 blackish spots; anal with a blackish intramarginal stripe; pectoral blackish at the base and with a white cross-bar.

Two specimens, 62 and 74 mm. in total length.

19. *Tridentiger genimaculatus*, sp. n. (Pl. II. fig. 1.)

Depth of body $4\frac{3}{4}$ in the length, length of head $3\frac{1}{2}$. Snout shorter than eye, the diameter of which is $4\frac{2}{3}$ in the length of head. Width of osseous interorbital space $\frac{2}{3}$ the diameter of eye. Maxillary extending nearly to below middle of eye. 55 scales in a longitudinal series, 16 between soft dorsal and origin of anal. Dorsal VI, 12, the third and fourth spines the longest, $\frac{1}{2}$ the length of head and about as long as the longest soft rays. Anal 11. Pectoral nearly as long as the head, extending to above the vent. Ventral $\frac{3}{4}$ the length of head, extending nearly $\frac{3}{4}$ of the distance from its base to the origin of anal. Caudal subtruncate. Caudal peduncle $1\frac{2}{3}$ as long as deep. Olivaceous, with obscure darker cross-bars; sides of head with light spots; fins pale greyish; dorsals with alternate light and dark longitudinal stripes in their basal halves; caudal obscurely spotted; anal with a dark intramarginal stripe; pectoral blackish at the base, and with an indistinct pale cross-bar.

A single specimen, 53 mm. in total length.

20. *Luciogobius elongatus*, sp. n.

Depth of body 10–12 in the length, length of head 7–8. Eyes small, rather widely separated; cheeks swollen; cleft of mouth oblique, extending to below middle of eye. Dorsal and anal fins short and low, the former with about 7 rays, the latter with about 9. Pectoral about $\frac{2}{3}$ the length of head. Ventrals represented by a very small scale-like flap, without distinct rays. Caudal rounded. Olivaceous, with numerous small dark spots.

Several specimens, measuring up to 40 mm. in total length.

21. *Callionymus ornatipinnis*, sp. n. (Pl. III.)

Depth of body 7–8 in the length, length of head (measured to the gill-opening) nearly 4. Snout longer than eye, the

diameter of which is equal to or a little less than its distance from the gill-opening. Interorbital space slightly concave, its width $\frac{1}{3}$ the diameter of eye or less. Head covered with smooth skin; maxillary not extending to below the eye; gill-opening small, superior; præopercular spine rather short and stout, $\frac{2}{3}$ the diameter of eye or less, with 3 (rarely 2) recurved spines at the tip and with a small forwardly directed spine at the base. A single lateral line. Dorsal IV, 9. Anal 9. (In one specimen D. IV, 10; A. 10.) Males with the dorsal spines produced into filaments; the second the longest, a little longer than the first and about equal to the distance from tip of snout to gill-opening. Females with none of the dorsal spines produced; the first and second subequal, about $\frac{2}{3}$ of the distance from tip of snout to gill-opening. Soft dorsal with the 2 or 3 anterior rays longer than the 4 or 5 succeeding ones, about $\frac{1}{2}$ the distance from tip of snout to gill-opening; last ray longer, extending to the base of caudal (females) or beyond (males). Caudal fin $\frac{1}{3}$ the length of the fish (without caudal) or less. Brownish; upper part of head and body covered with small dark rings enclosing lighter areas; sometimes 3 or 4 dark cross-bars on the back; usually 3 or 4 blackish spots along the middle of the side. Spinous dorsal, in the male, dark greyish, with small light spots with darker centres and a small blackish spot on the margin of the membrane between the third and fourth spines; in the female, pale in front of the third spine, black behind it. Soft dorsal greyish with several series of oval light spots with darker centres, which are smaller and better defined above, and with 1 or 2 series of small blackish spots. Caudal with numerous round or oval black spots intermixed with light ones. Anal pale. Pectoral pale, obscurely spotted in its upper part. Ventral usually with a blackish bar near its outer margin in the male, but not in the female.

Four males and three females, 98–174 mm. in total length.

22. *Callionymus lunatus*, Schleg.

The species figured by Messrs. Jordan and Snyder under this name is certainly not Schlegel's species, but appears to be the *Callionymus inframundus* of Gill. There are considerable discrepancies between Messrs. Jordan and Snyder's description and their figure, and it is possible that the former may be in part based on specimens of *C. lunatus*. The male specimen described and figured by Schlegel has the first dorsal spine produced into a long filament, reaching beyond

the end of the soft dorsal when laid back; the last dorsal ray, when laid back, reaches the caudal, which is $\frac{2}{3}$ the length of the fish (without caudal); there is a lunate blackish spot on the upper part of the membrane behind the fourth dorsal spine. Three female examples from the Inland Sea of Japan have the first dorsal spine slightly produced, reaching the first or second soft ray when laid back; the last dorsal ray, when laid back, does not reach the caudal, which is $\frac{2}{7}$ the length of the fish; the spinous dorsal is pale, with some darker spots and with a large blackish spot on the upper half of the fin between the third and fourth spines.

23. *Pseudorhombus ocellifer*, sp. n.

Depth of body $2-2\frac{1}{2}$ in the length, length of head $3\frac{2}{5}$. Snout shorter than eye, the diameter of which is $3\frac{1}{2}-3\frac{2}{3}$ in the length of head. Eyes separated by a ridge. Maxillary extending to below middle of eye or beyond. Gill-rakers longer than gill-fringes, 17 or 18 on the lower part of anterior arch. Scales ctenoid on the ocular side, cycloid on the blind side, 64-72 in a longitudinal series, 11-13 in a transverse series from dorsal fin to curve of lateral line. Dorsal 68-73. Anal 53-57. Pectoral of the ocular side $\frac{2}{3}-\frac{3}{4}$, of the blind side nearly $\frac{1}{2}$ the length of head. Caudal with the middle rays the longest, $\frac{1}{4}$ the length of the fish (the caudal not included). Caudal peduncle $\frac{1}{3}-\frac{1}{2}$ as long as deep. Brownish, with darker spots and markings, of which 5 ocelli arranged thus ::· are most prominent; fins with small dark spots.

Total length 125 mm.

Five specimens, including two from the 'Challenger' collection, referred by Dr. Günther to *P. pentophthalmus*, an allied species especially distinguished by the smaller eye.

24. *Pseudorhombus dupliciocellatus*, sp. n.

Depth of body $2\frac{2}{7}$ in the length, length of head 4. Snout a little shorter than eye, the diameter of which is $4\frac{3}{4}$ in the length of head. Eyes separated by a ridge. Maxillary extending to below middle of eye. Gill-rakers short and stout, 8 or 9 on the lower part of anterior arch. Scales ctenoid on the ocular side, cycloid on the blind side, 98 in a longitudinal series, 18 in a transverse series between dorsal fin and curve of lateral line. Dorsal 74. Anal 56. Pectoral of the ocular side $\frac{2}{3}$, of the blind side $\frac{2}{3}$ the length of head. Caudal with the middle rays the longest, $\frac{2}{3}$ the length of the fish (the caudal not included). Caudal peduncle $\frac{1}{2}$ as long as deep.

Olivaceous, with darker spots and markings, and with 5 conspicuous ocelli or double ocelli, arranged as in the preceding species; fins with small dark spots.

A single specimen, 380 mm. in total length.

25. *Cynoglossus purpureomaculatus*, sp. n.

Depth of body $4\frac{1}{4}$ in the length, length of head $5\frac{3}{4}$. Snout a little more than $\frac{1}{3}$ the length of head. Diameter of eye 8 in the length of head and twice the interocular width. Two nostrils on the left side, one between the anterior parts of the eyes, the other in front of the lower eye. Maxillary extending to below the middle of eye; rostral hook extending a little beyond the mandibular symphysis. Three lateral lines on the left side. 120 scales in a longitudinal series, 18 between upper and middle lateral lines. Dorsal 128. Anal 104. Brownish, with numerous irregular purplish spots.

A single specimen, 215 mm. in total length.

26. *Cynoglossus brunneus*, sp. n.

Depth of body 4 in the length, length of head $4\frac{2}{3}$. Snout $2\frac{3}{5}$ in the length of head. Diameter of eye $7\frac{1}{2}$ in the length of head and 3 times the interocular width. Two nostrils on the left side, one between the anterior parts of the eyes, the other in front of the lower eye. Maxillary extending beyond posterior margin of eye; rostral hook extending to below mandibular symphysis. Two lateral lines on the left side. 74 scales in a longitudinal series, 9 between the two lateral lines. Dorsal 129. Anal 104. Uniformly brownish.

A single specimen, 200 mm. in total length.

III.—Notes on some Oriental Geckos in the Indian Museum, Calcutta, with Descriptions of new Forms. By NELSON ANNANDALE, B.A., Deputy Superintendent of the Indian Museum.

Gymnodactylus Fedtschenkoi, Strauch.

Gymnodactylus caspius, Stoliezka, Proc. Asiat. Soc. Bengal, xxii. 1853, p. 410.

Gymnodactylus Fedtschenkoi, Strauch, Mém. Acad. St. Pétersb. xxxv. 1887, p. 46; Boulenger, Faun. Ind., Rept. 1890, pp. 61, 62, and P. Z. S. 1891, p. 630; Nikolsky, Herpet. Turan. in Fedtschenko, Reise in Turkestan, p. 13, pl. iv. figs. 1, 1a (Russian).

There are five specimens from the Punjab Salt Range in the Indian Museum. They are in bad condition, but agree sufficiently well with Strauch's description of *G. Fedtschenkoi*. The space between the eyes is broader and the head is less depressed than in Nikolsky's figures; also the chin-shields are larger, the middle pair meeting to form a suture, not a mere point of contact, behind the mental. A male has 32 pores.

Gymnodactylus Feæ, Blgr.

Gymnodactylus Feæ, Boulenger, Ann. Mus. Genova, (2) xxiii. 1893, pp. 306, 313, 314, pl. vii. figs. 1, 1 A, 1 B, 1 C.

The only previous record of this species, so far as I am aware, is that of the type from the Karim Hills in Lower Burma. There are three female specimens from Sinkip Island, East Sumatra, in the Indian Museum, presented by the late Professor Wood-Mason. Two of them agree with the type in size and coloration, the third is larger and has 8 white bands instead of 9 on the tail. The dorsal tubercles in this adult specimen have a more distinctive character than in the young, the keel being very clearly defined and running along a more or less flattened base.

The dimensions of the large specimen are:—

	mm.
Total length.....	138
Snout to vent	60
Fore limb.....	22
Hind limb	32
Length of head	21
Breadth „	11

Gonatodes marmoratus (Bedd.).

We have a specimen of this species from Tinnevely, presented by Colonel Beddome. To the same species I refer with a little doubt (but to the genus with certainty) two very young specimens from the Andamans. I am not aware that the genus has been recorded previously from these islands. The specimens were in a bottle containing a large number of examples of *Gymnodactylus rubidus* of different sizes.

Gonatodes affinis (Stol.).

Gymnodactylus affinis, Boulenger, Cat. Liz. Brit. Mus. vol. i. p. 42.

Gonatodes penangensis, S. Flower, P. Z. S. 1896, p. 863, pl. xlv. figs. 1, 1 a, 1 b, 1 c.

Gonatodes affinis, S. Flower, P. Z. S. 1898, p. 455, and 1899, p. 627; Laidlaw, *ibid.* 1901, (i.) p. 304; Boulenger, Fascic. Malay., Zool. vol. i. p. 148; Annandale, *ibid.* pp. 148, 149 (note).

This species has not been recorded from the Empire of India or Ceylon, but probably it occurs in Tenasserim. It is by no means rare in the hill-jungles of the northern part of the Malay Peninsula south of the isthmus of Kra; and the greater number of the geckos known from this district have already been recorded from Lower Burma also. Stoliczka's type, from Penang, is in the Indian Museum; it is in bad condition.

Gonatodes affinis is the only gecko which is known to enter water. Laidlaw has taken it on rocks in a jungle-stream, and I have frequently observed it slip beneath the surface of water collected in hollows in a tree-trunk and remain submerged for some minutes. When in water the skin of the back has a silvery appearance, owing to the retention of a film of air by the enlarged tubercles. Formerly I regarded this as fortuitous; but an examination of the tubercles has made me doubt whether I was right. As Boulenger has noted, they are not merely keeled, but also grooved. Possibly this peculiarity in their structure may assist in the retention of the air-film. The air so retained could not be used in respiration, but it might well protect the organism from a too rapid lowering of temperature, for water in a shady place in the Malayan jungle may be cold.

Phyllodactylus siamensis, Blgr.

Phyllodactylus siamensis, Boulenger, P. Z. S. 1898, p. 918, pl. iv. fig. 1; S. Flower, *ibid.* 1899, p. 627.

A specimen of this interesting form has lately been presented to the Indian Museum by H. W. Biggie, Esq. It is from Pitsanuloke in Northern Siam. An adult male, it has 7 preanal pores, arranged in a curved line and not interrupted mesially. Its size is considerably greater than that of the type. The following are its dimensions:—

	mm.
Snout to vent	45
Head	15
Body	30
Fore limb	15
Hind limb	19
Breadth of head	10

Phyllodactylus burmanicus, sp. n.

Allied to *Phyllodactylus siamensis*, Blgr. Head longer

than broad, not depressed. Snout short, rounded, shorter than distance between orbit and ear-opening. Body slender; limbs short. Granules on snout and on vertex approximately equal; only a few enlarged scales on the latter. Dorsal keeled tubercles in 12 rows, smaller than in *P. siamensis*, farther apart. Ear-opening smaller than half the diameter of the eye, subcircular. Nostril between rostral, first labial, and three small scales; 6 upper and the same number of lower labials. There are 7 præanal pores, arranged as in the preceding species. Colour dark brown above, slightly marbled with paler; labials marked with pale brown; throat shaded with dark brown; ventral surface pale brown.

	mm.
Total length	78
Head	12
Body	23
Tail	43
Fore limb	11
Hind limb	15
Breadth of head	7

Hab. Tavoy.

Both this and the preceding species differ from Boulenger's definition of the genus in the 'Catalogue of Lizards' in that the male is provided with præanal pores.

The species is founded on a single specimen obtained by one of the collectors of the Indian Museum.

Hemidactylus subtriedroides, sp. n.

Hemidactylus maculatus, D. & B., Anderson, Res. Yunnan Exped. p. 800.

Closely allied to *Hemidactylus triedrus* (Daud.), but resembling *H. subtriedrus*, Jerdon, superficially. Lepidosis as in *H. triedrus*, except that the dorsal tubercles are smaller, less prominent and farther apart, and that the enlarged scales on the proximal part of the tail are longer and more spine-like. In the male there are 14 to 16 pores, widely separated mesially; 5 or 6 lamellæ under inner, 8 under median digits. Distance from orbit to snout approximately equal to that from ear-opening to orbit. Head and body depressed; tail depressed, flat above, tapering to a point, broad at the base, flatter and broader at the base than that of *H. Brookii*, Gray. The colour has completely faded (see Anderson, *loc. cit.*).

	mm.
Total length.....	132
Body.....	41
Head.....	21
Tail.....	70
Fore limb.....	20
Hind limb.....	25
Breadth of head.....	13

Hab. Tsagain, Upper Burma.

The species is founded on two male specimens obtained by one of the Yunnan Expeditions under the late Dr. J. Anderson, F.R.S. It agrees sufficiently well with Jerdon's* description of *H. subtridrus*, which is probably confined to certain districts of S. India; but this description is too vague to be definitive. From Boulenger's† description of this species *H. subtridroides* differs in the number of digital lamellæ and in other important points. The bulk is greater than that of *H. Brookii*, Gray, the dorsal tubercles are larger, and the whole animal is more depressed. The proportions also are different. Anderson identified the specimens as *H. maculatus*, D. & B.

Hemidactylus Garnotii, D. & B.

Hemidactylus Garnotii, Boulenger, Faun. Ind., Rept. p. 94.

Hemidactylus Mortoni, Theobald, Journ. Linn. Soc. x. p. 32; Boulenger, Faun. Ind., Rept. p. 95.

In the 'Fauna of India' Boulenger points out that Theobald's description of *Hemidactylus Mortoni* is insufficient to ensure its recognition. He states his belief that this species is either identical with or closely allied to either *H. Bowringii*, *H. karenorum*, or *H. Garnotii*. After comparing two specimens labelled *H. Mortoni* (one of them presented by Theobald) in the Indian Museum with a considerable number belonging to the three species referred to, I can see no essential difference between these two specimens and typical ones of *H. Garnotii*, D. & B., a species which is easily recognized.

Ptychozoon homalocephalum (Crev.).

Ptychozoon homalocephalum, Boulenger, Faun. Ind., Rept. p. 104, fig. 13; Ann. Mus. Genova, (2) xxiii. 1893, p. 316; Fascic. Malay., Zool. vol. i. 1903, pp. 150, 173; F. Müller, Festschr. nat. Ges. Basel, 1892, p. 209, pl. iv.; Gadow, Amphib. Rept. 1901, p. 512; Annandale, Fascic. Malay., Zool. vol. i. p. 150 (note).

* Journ. Asiat. Soc. Bengal, xxii. 1853, p. 467; see also Stoliczka, *ibid.* xli. (2) 1872, p. 93, pl. ii. figs. 1, 1 a; and Theobald, Cat. Rept. Brit. Ind. 1876, p. 75.

† Cat. Liz. Brit. Mus. vol. i. 1876, p. 75.

Var. nov. *lionotum*.

Müller, in pointing out that *Ptychozoon Horsfieldii* was really a good species, gave as one of the diagnostic characters of *P. homalocephalum* that there are enlarged tubercles among the scales of the back. Boulenger has recorded a specimen, obtained in Pegu by the late Signor Fea, which agrees with the latter species in the more important specific characters, but lacks these enlarged tubercles. Along with several typical specimens of *P. homalocephalum* from the Andamans and Nicobars we have in the Museum two from Pegu which agree with Fea's specimen from the same district. The occurrence of three examples from Pegu agreeing thus in lepidosis seems to justify the creation of a new variety for their reception. *P. homalocephalum* var. *lionotum* may be defined as agreeing with the typical form of the species in all respects except in having no enlarged tubercles among the scales of the back.

The name of the "flying" gecko enshrines a belief that the loose fold of integument and muscular tissue along the sides in this species has a similar function to the "alar" membrane of *Draco*, enabling the lizard to take long leaps through the air, and supporting it in that element. That *Ptychozoon* does take long leaps is very possible. So do *Gehyra mutilata* and *Hemidactylus flaviviridis*—forms in which there is nothing of the nature of an aeroplane. A comparison of the "alar" membrane of *Draco* with the fold of soft tissue in *Ptychozoon* shows a very important difference—the latter structure has no skeletal support. Moreover, unlike the membrane of the flying squirrels and phalangers and of *Galeopithecus*, it is not fastened to the limbs, but has three free edges. It is not even supported by scales below, and although there are muscles at its base—that is to say, on the side on which it is continuous with the body-wall—they do not extend to the free edges. Even if they did, they could hardly keep it taut without direct or indirect support on more than one side from some rigid structure. I have never seen an adult living specimen of *Ptychozoon*; but a young one, in which the lateral fold was perfectly developed, was kept under observation by Mr. Herbert C. Robinson and myself for a fortnight. We never saw it stretch out the fold, which lay curved round the side so as to be practically invisible. I have not the slightest doubt that the use of the structure is not to support the lizard in the air, but to assist it in concealing itself by causing it to fit better into its surroundings and be less conspicuous than it would be if its body cast a distinct shadow immediately beneath it. The

dorsal surface has a very close resemblance to lichen-covered bark, and this resemblance is much increased by the lappet-like outgrowths on the tail and head. *Hemidactylus platyurus* is certainly less conspicuous on a stone wall when its lateral fold (which is not so very much less developed than in *Ptychozoon*, though this species does not "fly") is spread out on each side of it, as it commonly is. The same is probably the case with *Mimetozoon*. It is possible also that the folds in these forms have an adhesive function, as outgrowths on the tail have in some geckos; but of this I have no proof. On the whole, the attribution of powers of "flight" to *Ptychozoon* would seem to be parallel to Cantor's statement that *Liolepis Bellii*, a sand-loving, burrowing Agamid which very rarely climbs a tree, is in the habit of "leaping from bough to bough." The foundation of this statement was a real anatomical resemblance in certain respects between *Liolepis* and *Draco*; but the loose rib-supported membrane in the former has a totally different function from that of the latter, being used (partly, at any rate) as a means of sexual display*. Similarity of structure, even when it is pretty close, does not always argue similarity of function.

NOTE.

While on the subject of "flying" quadrupeds, I take the opportunity to restate in a clearer manner a remark recently made about the "flying frog" (*Rhacophorus nigropalmatus*, Blgr.). In a note added to Mr. Boulenger's "Report on the Batrachians and Reptiles" in 'Fasciculi Malayensis,' Zoology, vol. i. p. 138, I said:—"Beyond the statement of the Chinaman who procured Wallace his specimen, there appears to be no evidence to prove that the 'flying frog' does use its enormous feet to support it in the air, and, so far as we could see, it did not appear likely, from the condition of the web in the living animal, that their purpose was that assigned to them by the discoverer of the species." By the condition of the web I meant its flabbiness. It did not seem possible that it could be rendered sufficiently rigid, and the frog made no attempt to tauten it. Here we have a membrane provided with skeletal supports, but probably only used as an organ of adhesion. Gadow has pointed out how greatly the area of the web was exaggerated in Wallace's figure (Gadow, Amphib. Rept. p. 246, fig. 48; compare Boulenger, Fascie. Malay., Zool. vol. i. pl. vi. fig. 1).

* Annandale, P. Z. S. 1900, pp. 857, 858, and Fascie. Malay., Zool. vol. i. p. 156.

IV.—Notes from the Gatty Marine Laboratory, St. Andrews.
No. XXVI. By Prof. M'INTOSH, M.D., LL.D., F.R.S., &c.

[Plate IV.]

1. On the Pacific, Atlantic, and Japanese "Palolo."
2. On the British *Goniadidae*, *Glyceridae*, and *Ariciidae*.
3. On the same Groups found in the 'Porcupine' Expeditions of 1869 and 1870.
4. On the same Forms dredged by Dr. Whiteaves, of Canada, in 1872 and 1873.
5. On the same Groups procured by Canon Norman in Norway and Finmark.
6. On some Japanese *Glyceridae*.
7. On the Form described as *Hemipodus* (?) *magellanicus* in the 'Challenger' Annelida.

1. On the Pacific, Atlantic, and Japanese "Palolo" *.

In connexion with the interesting observations on the "Palolo" of Samoa (*Eunice viridis*, Gray) by Mr. McM. Woodworth in the 'American Naturalist' for December, 1903, a somewhat imperfect digest of which appeared in 'Nature' of March 31st, 1904 †, it is well to remember that previous observers had filled in much of the gap. Thus, even in the case of the first examples as described by Dr. Gray ‡, the discoverer, Mr. Stair, stated that the worm came from the coral-reefs. Subsequent observers knew that they dwelt in fissures and crevices of the rocks at and near low water, and that the swarming of the headless portions was connected with reproduction. The first head was described and figured by Dr. J. D. Macdonald §, one of those able naval surgeons, like Huxley and Moss, who have—when on duty on board ship—largely contributed to our knowledge of marine animals. Euniceids are very abundant in cracks and fissures of rocks everywhere, and especially in coral-reefs; but it has yet to be proved that they bore in the latter. Moreover, epitokous annelids have been familiar to zoologists for a long time, and the step to link on the "Palolo" of Samoa therewith was brief, for it was evidently the posterior region distended

* Communicated to the Cambridge Meeting of the British Association, Aug. 1904.

† Since this date a long discussion as to priority in finding that "Palolo" was *Eunice viridis* has taken place between Benedict Friedlander and Krämer (cf. Zool. Anzeiger, July 12, 1904).

‡ Ann. Nat. Hist. xix. p. 409 (1847).

§ Trans. Linn. Soc. Lond. xxi. p. 237, pl. xli. (1858). It is possible this author found a head of *Lysidice* amongst the others.

by the reproductive elements. The main point in Mr. Woodworth's observations was the demonstration of the atokous and epitokous regions of the body *in situ*, and as obtained by splitting the edges of the honeycombed coral-rocks. The author attaches much importance to what he calls the thermotropic or heliotropic reaction of the pigment-specks borne on the best-developed central segments of the epitokous region—in connexion with swarming. Further observations are necessary on this head, since similar features are observed in other forms without such pigment-specks.

In the Atlantic "Palolo" (*Eunice fucata*, Ehlers) from the Dry Tortugas and Porto Rico, a careful account of which was given in 1892 by A. G. Mayer*, a very similar condition prevails, the posterior epitokous or sexual region being thrown off by the annelids which live in canals and crevices of the dead and disintegrating coral-rock or corroded "coquina," sometimes along with the commensalistic *Polynoë granulata*, Ehlers. These sexual posterior regions are broader than in the Pacific "Palolo," and present no pigment-spots, but swim freely away in the same manner—constituting the swarming, which occurs within three days of the moon's last quarter, June 29th to July 28th.

In Britain a condition closely approaching that seen in the foregoing "Palolo" occurs in various forms, *e. g.* in *Nereis Dumerilii*, Aud. & Ed., swarms of which are seen in various bays. Thus they were in vast numbers in Castlebay, Barra, in May, and were captured by Dr. Thomas Scott, of the staff of the Fishery Board for Scotland. "Millions" of *Nereis longissima* were also found by Mr. Hearder swimming at the surface in Plymouth Sound in 1865. Like other Nereids this is likewise a favourite bait. An allied condition, that is free-swimming sexual forms, occurs in the Syllideans, the Cirratulids (*Dodecaceria*), and many other annelids.

Amongst others Verrill † mentions *Nectonereis megalops* as a form which "swims actively at the surface both in the evening and in the brightest sunshine in the middle of the day, from July 3rd to August 11th. In this species the palpi appear to be much diminished in the *Heteronereis* condition (unless it has some connexion with *Ceratonereis*). The males and females of *Nereis irritabilis*, Webster, when mature, also take to swimming on the surface in the beginning of August. The immature examples live near low-water mark in sand and mud on the Virginian coast.

* Brooklyn Inst. of Arts & Sc., Sc. Bullet. vol. i. no. 3, pp. 93-103, 1 plate, Dec. 1902.

† "Invert. An. Vin. Sound," U.S. Comm. F. & F. 1873, p. 592.

But one of the most interesting Nereids in this connexion is the Japanese "Palolo" (*Ceratocephale osawai*), as recently described and figured in a noteworthy paper by Mr. Akira Izuka*, Assistant Professor of Zoology in the Imperial University, Tokyo. The species is much used by the Japanese fishermen as bait, and occurs abundantly in the littoral region, as well as extends into estuaries, tributaries, canals, and ditches—burrowing in mud to the depth of a foot or more, like *Nereis diversicolor* of our own shores. The species thus approaches the fresh- and brackish-water Nereids from the Pacific coast and Hawaii, as recently described by Mr. H. Parlin Johnson †, and extends the list of such forms, which includes Sabellids and others.

The Japanese "Palolo," which has a dark brownish colour, leaves its burrows in the mud with the flood-tide and creeps about in search of food. It reaches the length of 200–250 mm and is 4 mm. in breadth, and may have as many as 300 segments. In this condition it resembles the ordinary type. Early in September, however, the change to the epitokous form takes place, and the sexes differ in colour, the male being more dusky (brownish) than the female, which is for the most part bright red. The body in both sexes considerably increases in breadth. Then the posterior region, comprising about two thirds of the total number of segments, begins to be differentiated—being narrower than the anterior region and of a different colour, dull brownish with a pale streak in the middle. Specimens in this condition are found by digging in the mud about a week before swarming—just as Mr. Woodworth procured his in the coral-blocks. The narrowed posterior region, however, is not utilized for the spreading of the eggs or spermatozoa, but degenerates and is cast off, apparently in many cases even before swarming, though a few are found swimming with the shrivelled posterior end attached. Shortly after the change just alluded to, the annelids leave their burrows and become pelagic—swarming near the surface of the water to a depth of several feet, and discharging ova and sperms from the aperture at the end of the anterior region (where the separation of the shrivelled posterior region took place). They are captured at night in great numbers by boats provided with a light, which attracts the annelids, and various nets, and they are much esteemed as bait. The swarming annelids appear to be carried by the tide seawards, though many perish previously by rupture of the body-wall or otherwise.

* Journ. Coll. Sc. Imp. Univ. Tokyo, Japan, vol. xvii. ii. p. 1, pl. i.

† Mark Anniversary Volume, art. x. p. 205, pls. xvi. & xvii. (1903).

The swarming takes place during the months of October and November, usually at four different periods, each lasting a few days; the periods falling on nights close to the appearance of the new and the full moon and just after flood-tide.

The Japanese "Palolo" therefore differs from both the Pacific and the Atlantic forms not only in regard to the family, but in the nature of the reproductive process, since in both of the latter a specially modified posterior region—bearing the sexual elements—is separated and swims freely, whereas in the Japanese species the specially modified posterior region degenerates and is shed—the enlarged anterior region swimming actively, discharging its sexual products and then perishing.

Mr. Akira Izuka's paper is illustrated by woodcuts and a coloured plate, the finish of which is in keeping with the excellent illustrations in the 'Economic Fishes of Japan,' by Otaki, Fujita, and Higurashi.

It is probable that the number of forms exhibiting similar features to the "Palolo" will be increased as observations extend.

All the foregoing belong to the temporarily pelagic group, which may be divided into two sections: (1) those which, as larvæ of reptant or fixed forms, rise to the surface and by-and-by return to the bottom; and (2) those which may come from the shore or the bottom (*e.g.* epigamous forms) and do not return thereto. Under the latter "Palolo" and the allied forms fall.

2. *On the British Goniadidæ, Glyceridæ, and Ariciidæ.*

The British Goniadidæ in Dr. Johnston's 'Catalogue' of the British Museum included but a single species, though a second was known shortly after its publication. The view of Ehlers that *Goniada* and *Glycinde* (*Eone*) should form one genus has certain recommendations, but it should be remembered that the structure of the dorsal division of the foot, both in soft parts and in bristles, shows a decided divergence, and the same may be said of the teeth. Moreover, Ehlers does not mention that between the body-wall of each of the common forms (*Goniada maculata* and *Glycinde Nordmanni*) there is this difference, *viz.*, that in the latter the dorsal longitudinal muscles have a well-marked fold inferiorly, whilst in the former such is absent. Ehlers, in 1868, grouped them under his *Glycera polygnatha* and separated them by the condition of the teeth.

In considering the species of Glyceridæ mentioned in the

Catalogue of the British Museum, it would seem that Dr. Johnston's example of *Glycera milis* resembled (in 1872) *G. dubia* in the collection, that is *Glycera siphonostoma*, Delle Chiaje (*G. tessellata*, Grube), and had apparently lost its teeth. Two species are thus accounted for. An example of the same species (also labelled *G. Rouxii*) from South Devon bears out the foregoing diagnosis; yet another specimen labelled *G. Rouxii* seems to be *Glycera lapidum*. *Glycera nigripes* appears to be a variety of *Glycera siphonostoma* procured in Scotland by Lieut. Thomas, R.N. Few examples of *Glycera lapidum* occur in Dr. Johnston's series, and one or two are in bottles with other species, such as *Glycera alba*. One example, however, labelled by Dr. Johnston "*Glycera capitata*," comes from Holy Island. Another is "*Nereis sorex*," of Montagu, from South Devon (Mus. Leach). The additions made to the Catalogue by Dr. Baird consist of the epitokous form of *Glycera capitata* ("*Glycera setosa*") and *Glycera alba*, O. F. M. It is, however, clear that the former is the epitokous condition of *Glycera lapidum*, a form closely approaching *Glycera capitata* and for a long time confounded with it.

The first form, *Goniada maculata*, Erst., is abundant in the stomachs of haddock in St. Andrews Bay, and ranges from Shetland to the south in fairly deep water. It occurs also in sand at low water. The elongated and tapered snout of eight segments, its pinkish or scarlet colour, greenish eggs, and active habits are conspicuous. The broad region of the proboscis in extrusion is densely papillose and armed on each side by a row of about ten dark brown V-shaped denticles. Distally are the circle of papillæ and the denticles of the region. The first foot has two somewhat elongated lower lobes (the inferior being the cirrus), with bristles between and above, and superiorly a flattened process representing the upper division. The tenth foot is characteristically trifid, the setigerous region having a single spine and a tuft of bristles superiorly and inferiorly. At the 50th foot the dorsal lobe (cirrus) is elongated and tapered, with the dorsal bristles and their spine. The inferior division has a rounded setigerous region with its spine and two long papillæ projecting externally. A ventral cirrus occurs inferiorly. The foot remains of similar structure till near the tip of the tail (with its two cirri), the lobes and the bristles increasing in length. The bristles of the ventral lobe considerably exceed the others, their very long terminal pieces projecting far outward.

In glancing at examples of *Goniada* from various parts of the world two types of foot are apparent. The first conforms

to the description already given, and which is observed in those from the Outer Haaf and Skerries, Shetland, St. Andrews, Norway, and Canada. The foot is therefore, both anteriorly and posteriorly, the least complex. A tendency, however, to the enlargement of the lobe beneath the dorsal cirrus occurs in females with large ova from Canada.

The second type is represented by examples from Cape Finisterre and Cape Sagres, in which the anterior feet have five processes, viz. a dorsal and a ventral cirrus (the former being near the base of the foot), a long and large posterior lobe, and two smaller anterior. The dorsal lobe is long and narrow and has a slight constriction at its base. In this type the posterior feet have broadly lanceolate dorsal lamellæ, and three long digit-like papillæ inferiorly, above the elongate ventral cirrus.

From the foregoing *Glycinde* is readily distinguished by its tapering snout of ten segments, its eyes, the two divisions of the body, the structure of the proboscis, and the structure of the feet. The sole British representative, so far as known, is *Glycinde Nordmanni*, Malmgren, which Dr. Gwyn Jeffreys first procured in various Zetlandic waters. It ranges to several parts of Ireland, to the Atlantic, and elsewhere—generally in somewhat deep water. The proboscis is distinguished from that of the foregoing form by the absence of the lateral V-shaped denticles. The arrangement of the denticles at the termination of the first region of the proboscis seems to differ from Malmgren's figure, which shows a decreasing series of four teeth in lateral view, whereas in some this is not evident. The smaller denticles appear to be from 22 to 24 in number. The first feet are simple and short, bifid and afterwards trifid as they increase in length.

The 10th foot has three lanceolate lobes. The same number characterizes the 30th foot, but they are more massive and considerably flattened. Between the 30th and 50th feet the appendages attain greater complexity, the latter having a dorsal division of two lobes (or a cirrus and a lobe), a spine, and a few bristles, though the latter are often included in the tissues. This is evidently due to the growth of a dorsal lobe on the upper process of the trifid foot. The lower division consists of an upper long, bluntly conical, setigerous region, with fan-like groups of bristles which are arranged in three divisions, and a ventral cirrus beneath.

A great increase in the lamella of the inferior setigerous lobe occurs at the 70th foot, so that in outline the parts are broadly lanceolate; the bristles are also longer and more slender. Further changes appear in the 100th foot, for the

lower lobe now far exceeds the superior in bulk, the broadly lanceolate outline being due to the approximation of the two flaps. The ventral cirrus is proportionally smaller. In the superior division again the setigerous lobe forms a short and broad cone with the lanceolate cirrus superiorly. With slight modifications this structure continues to the posterior end.

Advanced ova occur in specimens from Ireland and Shetland in July.

Grube and Ehlers have each given classifications of the Glyceridæ, the former basing his main groups on the presence or absence of branchiæ, the latter using the armature of the proboscis and the nature of the feet to form his chief divisions. Ehlers's first group, the "*Glycera tetragnatha*," however, includes both of Grube's; the second, the "*Glycera polygnatha*," comprising *Goniada* and *Glycinde*, being treated separately by Grube. Arwidsson* retains, after Malmgren, the Glyceridæ and Goniadidæ as separate families, and his paper, illustrated by outline-figures, forms an important contribution to the subject.

The teeth in the Glyceridæ are arranged in pairs, their disposition, however, being such that they divide the circumference of the extruded proboscis into four nearly equal parts; the larger space, however, often occurring between the two pairs, not between the individuals composing a pair. The pairs of teeth are recognized by the direction of the spurs, which are symmetrically arranged on each side—spur pointing to spur—whether it is simple as in *Glycerella* or bifid as in the common *Glycera lapidum*. The single process, however, appears always to be longer than the bifid, and in either case the spur forms a large angle with the tooth which is obliquely inclined to the process.

The first and most abundant British form is *Glycera lapidum*, De Quatrefages, which stretches along both coasts from north to south, is a common European form, and ranges to the South Atlantic. In its epitokous form (like "*Glycera setosa*") it is found swimming at the surface of the sea from Shetland to the Channel Islands, though it is not common in this condition. This species has the body-segment three-ringed, the papillæ of the proboscis are filiform and crenate, and the foot has a single spine in front. At the 35th foot, however, the dorsal lobe, instead of being folded

* "Studien über d. Fam. Glyceridæ &c.," Bergens Museum Aarbog, 1898.

backwards, projects straight outward, and dorsal bristles are present, though the second spine only appears about the 45th foot. The typical foot presents three pointed lobes and a small dorsal cirrus above it, the third or inferior being the conical ventral cirrus, the hind lip being broad and rounded. The ventral bristles are in two fan-like groups, the extreme dorsal and ventral bristles being stronger than the central in the posterior region of the body. This important feature seems to have escaped the patient and persevering labours of Arwidsson, though it is also slightly indicated in *G. capitata*, Erst. In the epitokous condition the body is longer, the feet longer and more prominent, and the spines and bristles longer and more attenuate. Moreover, simple bristles occur amongst the compound in the ventral series. In contrasting this form with the northern *Glycera capitata* in its epitokous condition the greater length and slenderness of the bristles is apparent, as well as the less pronounced increase in the thickness of the upper and lower groups of the strong compound bristles.

It was *Glycera lapidum* which was dredged in the 'Challenger'* off Fayal in the Azores, not *G. capitata*, and it was the latter species (as the original labelling of the slides as well as the remarks of Ehlers now indicate) which was procured at Kerguelen, but such differed from the ordinary type in the great length of the tips of the compound bristles and in the stoutness of the shafts of the upper and lower series of the same bristles, a feature approaching the condition in *G. lapidum*. The differences in transverse section between the ordinary form (*G. lapidum*) and the Kerguelen type, especially in regard to the nerve-cords, were described in the 'Challenger' volume.

De Quatrefages first applied the term *Glycera lapidum* to the species described by Dr. G. Johnston as *Glycera alba*, O. F. M.†, and with it he associated Keferstein's *Glycera capitata*, Erst. In his description of the species, however, there is little that is definite, for he does not mention whether the segments are two- or three-ringed, though he states that the body is attenuate at both extremities, is devoid of branchiæ, that the head has 8-9 rings and is very elongate, the feet are short, biramous, have 2 or 3 groups of bristles, and that the superior cirrus is very small, whilst the ventral is large and conical. A perusal of Dr. Johnston's description and an examination of specimens in the British Museum show

* Annelids of the 'Challenger,' p. 344.

† Ann. & Mag. Nat. Hist. ser. 1, vol. xv. p. 147, pl. ix. figs. 1-10.

that he refers to the common British species (*G. lapidum*) hitherto termed *Glycera capitata*, a species in which the segments are three-ringed. The *G. capitata* of Keferstein is described by the author as two-ringed, so that Ehlers and Arwidsson must have satisfied themselves that this is a misapprehension before grouping it with the British form, which is three-ringed.

It is seldom that two forms so closely approach each other as *Glycera capitata*, Örst., and *Glycera lapidum*, De Quatrefages, for the differences in the comparative length of the foot in spirit-preparations are not noteworthy, and the other characters require minute investigation. *G. capitata*, however, is a purely northern form, characteristic of the waters of Greenland, and not passing farther south than the North Atlantic according to Arwidsson, whilst *G. lapidum* ranges far southwards. The latter is distinguished from *G. capitata* by having an eleven-ringed cephalic region, pointed foot-lobes, first three feet small and devoid of a dorsal cirrus, ventral cirrus pointed, and dorsal cirrus larger. The papillæ of the proboscis are long and subulate, situated on eighteen longitudinal muscular areas, between which are short ovoid papillæ. The spur of the teeth forms a wide V, whereas in *Glycera capitata*, Örst., there is but one limb and a truncated surface (Arwidsson, chiefly). How far future observations may indicate a closer relationship between the two forms is an open question. The differences in structure and distribution are, meanwhile, noteworthy.

Another abundant species is *Glycera siphonostoma*, Delle Chiaje (*G. tessellata*, Grube), which has an extensive range from the north of Scotland to the Cape. In this large form the segments are two-ringed and the massive proboscis has lanceolate papillæ each streaked like a leaf. The foot is comparatively short, with an ovoid dorsal cirrus on the body at the base, two long, anterior, broadly lanceolate lobes, about equal in length, and two short, blunt, posterior lobes besides the ventral cirrus, which is of considerable length, though it does not extend so far outward as the anterior lobes. The spur of the teeth in the proboscis resembles that of *Glycera capitata*, Örst., in having a single process and a flat edge at its base. The body is upwards of a foot in length and nearly half an inch in diameter.

Glycera Ehlersi, Arwidsson?

A species from 80 fathoms in St. Magnus Bay, 1867; 9 miles off Balta, in 80 fathoms, in 1868; and in 53 fathoms on 3rd and 1th August, 1880, in the 'Knight Errant.'

This differs from any other British form in the structure of the foot and in the greatly elongated snout.

The cephalic cone is much elongated and shows about twenty-two rings with the tentacles at the tip. The papillæ of the proboscis are elongate and conical, whilst here and there are a few with broader tips, so as to be somewhat lanceolate. The teeth present only a single spur of considerable length with a shoulder or flange at the base.

The segments of the body, where most distinct, appear to be three-ringed.

The typical foot has a comparatively large rounded dorsal cirrus with a broad base, two elongated conical lobes anteriorly, and a single median lobe of considerable size—with a rounded edge posteriorly. The ventral cirrus is conical and extends beyond the tip of the latter.

This characteristic form has been in the meantime associated with a species described by Ehlers as *Glycera lapidum* *, but which differs from that which has a better title to the name, and therefore Arwidsson has termed it *Glycera Ehlersi* †. It is true it differs from the species described by Ehlers in having apparently three rings to each segment, but in small specimens it is often difficult to apply this character. The structure of the foot of the two forms is the same, though Ehlers has given no figure. Both have a single spur to the teeth—with a flange at its base—and the papillæ of the proboscis are similar. Ehlers considered that the *Glycera capitata* of Keferstein ‡ was his form, but I agree with Arwidsson in referring Keferstein's form to *Glycera lapidum*.

Amongst those with branchiæ is the almost cosmopolitan *Glycera alba*, II. Rathke, which ranges from Britain to Japan and is equally at home in the west of Shetland as on the shores of Devon and Cornwall. The body is of considerable length (6–8 inches) and the segments are two-ringed. The proboscis is short and clavate and the papillæ small and clavate. The teeth have a long external and a shorter internal spur, both arising from a broad base. The foot is somewhat short anteriorly, longer posteriorly. Branchiæ are present on all the feet except the first and the last (about twelve at each end) and arise from the dorsal edge of the foot towards the tip. The dorsal cirrus is short, with a constriction at the base. The foot soon shows two spines, two

* Borstenw. ii. p. 652.

† *Op. cit.* p. 19.

‡ *Zeit. f. w. Zool.* Bd. xii. p. 105, Taf. ix. figs. 17–27 (1862).

flattened lanceolate lobes anteriorly, and behind a shorter conical lobe, whilst a blunt lobe occurs inferiorly. The ventral cirrus is bluntly lanceolate and reaches only to the tip of the truncate lobe just mentioned. The branchia becomes very distinct at the 20th foot, and it diminishes towards the tip of the tail to a small process at the base of the dorsal lobe.

Though it is doubtful whether an accurate diagnosis can be made concerning the *Glycera unicornis* of Savigny *, yet the descriptions of subsequent authors, more especially those of Malmgren (his *G. Goësi* †) and Ehlers ‡ (who, however, gives it bifid branchiæ in certain instances), would appear to separate this form. Such branchiæ have not been seen in Britain, and it may yet be necessary to distinguish it from the *Glycera Goësi*, Malmgren. In Britain it has hitherto been chiefly found in deep water in Shetland, in the Minch, and off the south-west of Ireland. The head is typical, the body about 5 or 6 inches in length, and the segments two-ringed. The proboscis has conical papillæ interspersed with globular ones. The inner spur of each tooth takes the form of that of *G. capitata*, viz. a ridge which comes near the surface in position and a long bar below. In all the fang has a denticle about the point of origin of the inner spur, and the base of the tooth is set obliquely in the proboscis, so that the distance between the extreme points is considerable. The branchiæ commence on the 32nd foot and continue nearly to the posterior end (examples incomplete). The typical foot has considerable depth, with the comparatively large dorsal cirrus at the base. The branchia is on the anterior surface of the foot and is directed forward and slightly upward. Two long lobes occur at the tip of the foot anteriorly and two shorter flattened conical lobes posteriorly, besides a short ventral cirrus with an oblique and rather blunt tip. The *Glycera decipiens* of Marenzeller §, from the Bay of Miya in Japan, appears to resemble this species very closely both in regard to the position of the branchiæ and the structure of the foot; Arwidsson is of the same opinion.

No representative of the family Ariciidæ is entered in Dr. Johnston's 'Catalogue of the Annelids in the British Museum,' though under this head he gives several examples of the Spionidæ. The work, however, was only published after his death, and omissions probably occurred, for in an

* Syst. des Ann. p. 37.

† Ann. Polych. p. 71, tab. xv. fig. 81.

‡ Borstenw. ii. p. 666, Taf. xxiv. fig. 35.

§ Süd-jap. Annel. p. 140, Taf. vi. fig. 3.

illustrated MS. of his which came into my hands in 1872—after the death of Dr. Baird—a figure of "*Aricia Mülleri*" from H. Rathke's 'Beiträge zur Fauna Norwegens' (1813) is given, as if he had been studying the species.

Several examples of the family have long been known in Britain, the first (*Aricia Cuvieri*, Aud. & Ed.) being perhaps the most common. Its head is a pointed cone without trace of rings or eyes. A transverse line separates it from the peristomial segment ventrally, whilst dorsally a crescent is cut from the latter at the base. The body is from 8 to 10 inches in length, with narrow segments. The peristomial segment is narrow dorsally, but broad ventrally, and the proboscis forms a frilled rosette in extrusion. Posteriorly the body tapers to a blunt point, with the anus at the tip dorsally and with two very long and slender cirri. The first region of the body comprises 21 feet, but these vary considerably amongst themselves, commencing with rudimentary feet anteriorly and ending in modified feet towards the 21st. From the 6th foot backward the posterior of the three rows of ventral bristles is darker and is composed of spines increasing in strength, so that they form a conspicuous series of brown dots. The foot becomes more free and the posterior row of papillæ more conspicuous, extending ventrally beyond the bristles of the 17th foot. From the 19th to the 24th foot these papillæ go to the mid-ventral line. The rows of ventral bristles attain their maximum about the 15th or 16th foot. The dorsal cirrus increases in size in its progress backward and has an enlargement at the base. The branchiæ commence at the 5th foot and are of a rich red colour in life. In the succeeding region of the body (at and after the 22nd foot) the dorsal division has in front a long tuft of serrated or articulo-serrate bristles and behind is a large dorsal cirrus with blood-vessels. Below, after an interval, is a smaller cirrus, also with a blood-vessel. The ventral division consists of a setigerous process with a long papilla (ventral cirrus?) and a few very slender bristles of the same type as the dorsal. The peculiarly serrated bristles disappear posteriorly, long simple tapering bristles taking their places in both divisions of the foot. The majority of the specimens consist only of the anterior region, the posterior having been left in the sand or other ground frequented by them as the edge of the dredge severed them.

Aricia norvegica, Sars, again, was found in Shetland by Dr. Gwyn Jeffreys, and extends to Norway and Greenland (*Sars and Norman*). The head in this species is typical and the anterior region has fifteen bristled segments. The

branchiæ commence on the fifth. The dorsal cirrus is flattened, with a filiform process at its outer edge. The anterior rows of ventral bristles are pale, the last three or four with dark brown hastate spines. The rows of papillæ behind the foot are more acutely pointed than in the previous species and are from 8 to 12 in number. At the 23rd foot the dorsal division has 4 or 5 spines and a long tuft of slender bristles with finely tapered serrated tips. The cirrus is narrow and has a tapered extremity. A single spine occurs in the ventral division and a small group of slender bristles, the tips of which are serrated. The blunt setigerous region has a conical lobe to its outer side, whilst at the base externally is a conical ventral cirrus nearly equal in size.

Another of the series is the widely distributed *Scoloplos Mülleri*, De St. Joseph, which ranges from the tidal region to 50 or more fathoms, according to the locality. It extends to Northern Europe and the Siberian coast. The acutely pointed head rests on the truncated cone of the peristomial segment. The body is flattened and widened anteriorly, then rounded ventrally and flattened dorsally in its progress to the tail, which has four papillæ at the vent and a pair of long slender cirri. The anterior region has eighteen segments, bearing shorter, stouter, serrated bristles. The shorter curved bristles with blunt tips serrated on the convex side are modifications of the longer series, apparently due to special influences of habitat, and varying much among themselves. They can scarcely be regarded as a separate and distinctive series. The 15th foot has a conical dorsal cirrus or lobe, with a tuft of rather long bristles in front of it, the shafts of which are smooth. The tapering tips are peculiarly spiked, and end in smooth hair-like points. The ventral division has two short conical papillæ, one of which is below the bristle-tuft and probably represents the ventral cirrus; the other is below the dense, deep row of bristles which are shorter than the dorsal, but of the same type. The branchiæ commence as small papillæ on the 17th bristled foot, attain considerable size at the 20th foot, and almost reach the tip of the tail. Below the foot from the 18th to the 30th bristled segment (fewer in some) a papilla occurs on the side of the body.

To Baron de St. Joseph*, who has done such excellent work amongst the annelids of the French shores, belongs the credit of pointing out the differences between the northern species—the typical *Scoloplos armiger* of O. F. Müller—

* Ann. Sci. Nat. 8^e sér. v. p. 356, pl. xx. fig. 167 (1898).

and the southern, which he terms *Aricia Mülleri*, H. Ratlike. He finds this distinction mainly on the tapering or subulate condition of all the bristles (dorsal and ventral) in the anterior region of *Scoloplos armiger*, O. F. M., whereas in what he calls *Aricia Mülleri* such are accompanied by shorter blunt forms, and, moreover, in the first six segments of the posterior region of the body the ventral division has two protuberances below it, with a minute elevation near them, and a conical papilla on the body below. It is not explained, however, that a similar papilla occurs in the typical *Scoloplos armiger* from Greenland and the northern waters. The two forms very closely resemble each other, the main features which differentiate them being the somewhat longer rows of ventral bristles in the southern, and the better developed fleshy ridge behind them with its flattened conical elevation in the ventral division, and the two papillæ just below it; whilst the ventral row of bristles has a variable number of short and somewhat truncate forms, which must not, however, be regarded as specific. They are simply modified forms of the ordinary tapering serrate kind belonging to the division, and probably are due to the circumstances of habitat, and are perhaps more abundantly present in those from the Channel Islands than in the more northern examples. In this form a papilla appears in the middle of the fillet behind the ventral bristles of the anterior region about the 5th foot, and is very conspicuous from the 10th to the 13th. At the 17th foot two papillæ occur, by the addition of one below the median, whilst at the 18th there are three, the bristles being somewhat above (dorsal to) the upper. At the 19th foot the lateral ridge ends dorsally in three conical processes, with a thick papilla beneath. In very fine examples from Lochmaddy the papilla below the foot commenced on the 15th and continued to the 22nd foot.

The minute differences alluded to in the foregoing paragraphs show the slender grounds on which specific differentiation may be founded. The divergent surroundings may be accountable for some of these, and certainly many examples of *Scoloplos Mülleri* show the effects of abrasion in the anterior bristles of the ventral rows in the first region of the body.

In the typical *Scoloplos armiger*, O. F. M., from Greenland, the first fifteen anterior feet have somewhat shorter (*i. e.* from above downwards) ventral rows of bristles. The dorsal cirrus is a well-marked conical process which gradually increases in length posteriorly. The fillet behind the

ventral row of bristles forms a convex flap—highest in the middle—and without any evident differentiation till the 15th foot, when a papilla projects from its median convexity (one or two of the preceding feet showing a slight thickening at the same part). The row of ventral bristles is shorter. Though the bristles are longer, the row is still shorter at the 16th foot, and a papilla occurs on each side behind it. The 17th foot has three papillæ, whilst the 18th has the enlarged lateral fillet with an isolated papilla below it, and this for three or more segments.

A form like *Scoloplos* *, dredged at Station 6, 1100 fathoms, in the 'Valorous' Expedition of 1875, differs from *S. armiger* and *S. Mülleri* so distinctly that its features may be mentioned. The snout forms a short cone in front of the large peristomial segment which has the triradiate mouth inferiorly. The snout in *Scoloplos armiger* is considerably longer and the peristomial segment smaller. The body is rounded anteriorly, and indeed—so far as the fragmentary specimen goes—throughout, and is thus in contrast with the flattened anterior region of *S. armiger* and *S. Mülleri*. The dorsal surface of each segment is marked by a narrow ridge round the borders with a depressed area in the middle. Ventrally each segment of the first fifteen has a slight elevation in the middle. The great length and curvature of the dorsal bristles anteriorly is noteworthy. The foot in the anterior region is characterized by the tapering condition of all the bristles, both dorsal and ventral, and in the absence of the marked differentiation between them. Almost from the 1st foot a minute dorsal and ventral papilla are present, and they increase in the subsequent feet. These processes in the anterior region form a prominent pair of cirri, which are nearer each other than in the ordinary form. It is difficult to say where the change in the anterior feet occurs, but apparently the first nine are thus differentiated, though it is at the 12th foot that another flattened and broader process appears above the subulate ventral process or cirrus. The yellowish dorsal bristles have smooth shafts with long, curved, and minutely serrated tips, which vary in appearance according to position, giving a camerated aspect in whole or in part, from the peculiar arrangement of the spinous rows. The dorsal cirrus is in the typical foot a long flat cone. The ventral cirrus is a short conical papilla. The ventral bristles are shorter, with tapering and finely serrated tips which project only a short distance beyond the

* Should this prove to be new, the specific name *Jeffreyi* would be appropriate.

cirrus. Amongst these are slender, elongate forms which taper to a fine point and do not appear to be serrated. It would seem that the habits of this deep-water form differ from those of *S. armiger*, in which the anterior ventral bristles are much worn.

The processes of the foot become more distinct and gradually pass upward (dorsally), and they are joined by the branchia on the 20th foot. About the 30th foot the segments increase in antero-posterior diameter, and show a deep furrow laterally and dorsally at the segment-junction, whilst a prominent flap or ridge on the dorsum slopes backward with the various processes, which consist from within outwards of a somewhat short branchia, then of a lanceolate dorsal cirrus with a constriction at the base and the small tuft of long slender bristles, and, lastly, of a larger and a smaller process, the latter probably representing the cirrus—besides a few slender bristles.

The foot thus differs from the ordinary type (*S. armiger*) in the less elongate dorsal and ventral cirri.

Canadian examples are characterized by the small size and filiform condition of the dorsal cirras, and also by the somewhat reduced size of the ventral processes. In *Scoloplos armiger* procured by the 'Valorous' in the same expedition the processes are also more elongate.

A species of *Theodisea*, viz. *T. mammillata*, Claparède, has been described by Cunningham and Ramage* from Granton Quarry in the Forth. The details given of this species do not render its exact structure quite clear, and it certainly differs from the Mediterranean fragment procured by the 'Porcupine.'

Naidonereis quadricuspida, Fabr., was procured in considerable abundance between tide-marks at Lochmaddy, North Uist, in 1865. The head forms a round button-shaped process, the peristomial segment being notched at each side. The body is about 3 inches in length, slightly tapered in front, and considerably diminishing towards the tail, which ends in two rounded dorsal papillæ and two short ventral cirri. The anterior region has thirteen bristled segments. The branchiæ commence on the 6th foot, are of comparatively large size, and continue to the 8th or 10th segment from the tip of the tail. At the 10th foot the branchia is flattened and acutely lanceolate, and it is separated by a space from the dorsal division of the foot, which bears a fan-like tuft of tapering bristles with smooth shafts

* Trans. R. S. E. vol. xxxiii. p. 642, pl. xxxviii. fig. 8, & pl. xl. fig. 8.

and spinose tips. The dorsal cirrus behind has an enlarged base and gently tapered tip. After an interval the slightly convex and long inferior division occurs, with a prominent blunt lobe or papilla rather below its middle posteriorly, and directed inward and backward. A dense series of the strong and slightly brownish curved (club-shaped) bristles occupies the whole length of the division, with a few tapering, serrated forms amongst them. Most of the short strong forms show distinct serrations towards the curve. The ventral division ends in a notch ventrally. After the change in the structure of the foot occurs, as at the 23rd, the slightly tapered dorsal cirrus has in front of it a group of long tapering bristles with smooth shafts and serrated tips, which are supported by four spines. A low rounded papilla closely adjoining the foregoing represents the inferior division, with two spines and a few slender serrated bristles. Posteriorly a ventral cirrus appears beneath the division.

3. *On the Goniadidæ, Glyceridæ, and Ariciidæ of the 'Porcupine' Expeditions of 1869 and 1870.*

Goniada pallida, Arwidsson.

In a large but fragmentary example from 81 fathoms, off Cape Finisterre, dredged by the 'Porcupine' in 1870, the processes of the feet are proportionally long. A similar form comes from Cape Sagres in the same expedition. In both the ventral bristles are long and strong. The examples are the largest of the series. The head appears to be typical. The body is massive, glistening, and characterized by the elongate feet. It is incomplete posteriorly. The proboscis has two larger teeth, which are somewhat irregular in outline, and more numerous smaller denticles than in *G. maculata*.

The V-shaped denticles are more numerous than in the common species, viz. 12-13 in number. It is the apex of these which acts on the food. The larger denticles (Pl. IV. fig. 3) are less regular in outline than those of *G. maculata*, and the teeth are not in a uniform series. One, indeed, has only a median large and two smaller curved teeth without the lesser processes.

The individuals in the row of smaller denticles varied considerably among themselves, but they did not seem to diverge much from the type seen in the ordinary form. They were, however, much more numerous—smaller being intermingled with the larger. The papilla observed did not differ from those of the ordinary form (Pl. IV. fig. 5).

Arwidsson does not show a posterior foot (*e.g.* about 100th), so that there is doubt, but, so far as observed (Pl. IV. fig. 1), it bears a close resemblance to his *G. pallida*. The compound bristles have the form shown in the same plate (fig. 2).

In the 'Porcupine' Expedition of 1869, *Glycera lapidum*, De Quatref., was dredged off Bundoran in Donegal Bay, on muddy sand, in 20-30 fathoms.

Glycera siphonostoma, Delle Chiaje, occurred off Cape Guardia in 1870.

Glycera alba, H. Rathke, in 1869, was found on muddy sand, in 105 fathoms, off Ireland; on muddy sand in Donegal Bay, off Bundoran, in 20-40 fathoms; and in 30-40 fathoms, Dingle Bay, amidst stones and mud. In 1870 it was dredged in 45 fathoms off Cape Sagres, as well as off Cape Guardia.

Aricia Cuvieri was dredged in 164 fathoms in greyish sand and gravel in the expedition of 1869.

The second species is *Aricia Kupfferi*, Ehlers*, which was dredged in the 'Porcupine' Expeditions of 1869 and 1870, and which likewise extends to Norway and Greenland. The head in this form is typical. The anterior region has fifteen bristled segments. Each foot has a dense tuft of spinose bristles finely tapered, with a stout dorsal cirrus posteriorly. An interval separates it from the ventral division, which has a series of similar but shorter bristles, many of which have shafts with rounded tips. The last three feet of the region have dark brownish spines with long hastate tips. The rows of papillæ posteriorly are separated by a space from the bristles. These papillæ occur in rows on the ventral surface of bristled segments 13, 14, 15, and 16, and, it may be, on one or two of the succeeding segments. The 23rd foot has the broadly lanceolate branchia internally on the dorsum, then the elongated dorsal cirrus shaped like a pointed shoe, and a tuft of long serrated bristles, amongst which are some simple forms. There are four spines. In the interval between this and the ventral division is a short and rather broad conical papilla. The ventral division presents a somewhat clavate setigerous region supported by two spines and a prominent lanceolate lobe (cirrus) in front of it. The bristles are long and translucent, with smooth shafts and tapering, curved, and closely serrate tips.

* Tauber seems to be somewhat doubtful if this is other than a var. of *A. noveboracensis*, but no papilla exists in the latter, so that this differs.

4. *On the Goniadidæ, Glyceridæ, and Ariciidæ procured by Dr. Whiteaves in the Gulf of St. Lawrence in 1872 and 1873.*

Goniada maculata, \O Ersted.

In the Canadian examples the V-shaped denticles at the sides of the proboscis ranged from eight upwards. The larger jaws guarded the lateral regions of the organ, their tips pointing dorsally, three bifid denticles occurring ventrally and two V-shaped ones dorsally. When the basal region is fully extended the papillæ form a frill at the tip, the teeth of the larger jaws point inwards and backwards, those of the bifid denticles and the tips of the V-shaped forms having a similar direction. Three small separate denticles appeared outside this circle dorsally. The opening of the proboscis in this condition is oblique, pointing upwards and backwards.

Goniada norvegica, \O Ersted.

Dredged at A, no. 4, 1872, in 150 fathoms, between Griffin's Cove and Cape Rosier, Gulf of St. Lawrence.

The head is proportionally massive and appears to consist of eight rings in front of the large basal (peristomial) segment. The terminal region has four short cirri, the distal being shorter than the terminal pair. A lateral line or groove on each side dorsally and ventrally cuts off a lateral fillet. The peristomial segment has a slight imprint of the lateral grooves in front dorsally, while ventrally it is split by a wide longitudinal fissure with a flap at each side, forming the lips. No trace of eyes exists in the preparation. The body is about 8 inches in length, though incomplete, and at its widest part is fully 10 mm. across the feet and bristles. It is slightly rounded dorsally, flattened ventrally, with a shallow but broad median groove along the latter. The first segment is connected by a broad median neck with the peristomial, and from this point backward the segments dorsally have a distinct pattern, viz. a broad prominent fillet at each side continuous with a narrower median region, and a narrow fusiform central region clasped by the former in front and behind. By-and-by proceeding backward this pattern becomes less marked, the lateral fillets being broader, whilst the median lozenge now extends to the fillet on each side, making, with the former connecting region, two belts between the fillets in each segment. The projecting fillets also show furrows (longitudinal). About the

middle of the body considerable flattening occurs and the markings just described fuse and disappear, the segment, with the foot on each side, being only variegated by pigment; and this continues to the posterior end of the fragmentary specimen, in which reproduction of the caudal region had commenced in the form of a short median papilla with two proportionally large caudal cirri. On the ventral surface the segments are simple in front, then show a tendency to two lateral fillets and two median parts—an anterior broader and a posterior narrower. Posteriorly the segments become simple, as on the dorsal surface, a dimple marking the median region and then disappearing.

The proboscis is a long, tough, and muscular organ, having at the base of its first region two long rows of V-shaped denticles, eighteen in number, with a speck in addition beyond them. At the distal end of this region (in extrusion) are a pair of jaws, near each other, with a dense series of denticles between them, whilst the longer ventral space has a linear series of upwards of twenty in number behind the papillæ. The latter are about seventeen or eighteen in number, blunt and flattened. One of the larger jaws has three prominent teeth, the other three. They lie just within the ring of bluntly conical papillæ.

The first segment bears at each side a small lanceolate lobe on the anterior edge, and on the posterior a foot of three lobes, the ventral being the larger and the dorsal next. No bristles were present in the example. The succeeding feet have four or five lobes, and they increase in size.

Five lobes exist on the 10th foot (Pl. IV. fig. 5), the dorsal being large and lanceolate, with an indentation on the dorsal edge, so that the lobe has the aspect of a foot, the three middle digit-like, and the ventral being a long lanceolate process. The dorsal, ventral, and the posterior lobes reach to the same vertical plane, whilst the two shorter anterior lobes fall considerably within it. Of the two latter (anterior) the upper is the longer.

The 20th foot has the same number of lobes, the large dorsal and ventral, two anterior in front of the bristles, and a much larger lobe behind the bristles.

Only compound bristles are present.

About the 35th foot a small lobe appears in front of the flattened dorsal lobe or cirrus, with a spine and a series of dorsal bristles, thus completing the bifid condition of the foot.

At the 40th foot is a superior division with a second spine and a group of simple dorsal bristles, the dorsal cirrus or lobe

being somewhat shorter than in front, whilst beneath it is a smaller lanceolate lobe.

The inferior division consists of the three lobes (two anterior and one posterior) and the ventral cirrus. The compound bristles have the same structure.

At the 60th foot a decided increase in the size of all these flattened lobes is observable, especially in the inferior division, and when the 100th foot is reached all may be called foliaceous. The lower dorsal far exceeds the upper in size. The anterior lobes of the inferior division form thin but broadly lanceolate flaps, whilst the posterior is as broad as both and of an ovato-lanceolate outline. The ventral cirrus, again, is shorter than in front, but still broad and thin.

At the change from the more rounded form to the flattened condition of the body the whole of the processes of the foot become enlarged and flattened. Thus the secondary dorsal lobe in front of the superior tuft of bristles has become a double flap with the bristles between. The two anterior and the posterior lobes are also flattened out, whilst the ventral lobe is proportionally less than in front.

Posteriorly the feet diminish in size, but they retain a similar character, the lobes, however, being much less, the largest in proportion being the dorsal (Pl. IV. fig. 6, 90th foot).

The example is a female laden with large ova.

In considering the relationship of this to the widely distributed *Goniada maculata* two factors have to be weighed, viz. the effects of environment in causing variation of the several parts of the foot and the influence of sexual conditions.

The addition of two lobes to the foot in the anterior region of the body is perhaps the most marked divergence between this and the ordinary type; but as there is variability in the latter on this head, too much reliance need not be placed on it.

There is less difficulty with the posterior feet, which diverge from the ordinary form only by the foliaceous expansion of the identical lobes of the feet, both dorsally and ventrally.

Glycera capitata, (Erst.), was dredged at Station 54, 1873, off Prince Edward Island, from St. Jaques to Sea-Cow Head.

Glycera siphonostoma, Delle Chiaje, occurred in 1872, locality not stated.

Glycera dibranchiata, Ehlers.

1868. *Glycera dibranchiata*, Ehlers, Bersteu. ii. p. 670, Taf. xxiv. figs. 1, 3-8, & 19-28.

From Station no. 7, 1873, viz. between Anticosti and the Gaspé Peninsula, in 100-220 fathoms, come one or two examples of a species which most nearly approaches the *Glycera dibranchiata* of Ehlers. The form is comparatively small, none apparently exceeding 3 or 4 inches in length. The head appears to be typical, with numerous closely arranged rings. The proboscis forms a boldly clavate organ in extrusion, and the teeth at the end of the first region can readily cross each other, dorsally and ventrally. The papillæ are elongate, and, by a constriction at the base, somewhat elliptical. At the 10th foot, two long and somewhat lanceolate lobes occur in front, a short upper one posteriorly, and below it a longer conical lobe. The ventral cirrus is short and conical. The dorsal cirrus is above the base of the foot and of same size. At the 20th foot the chief change is the increase of the upper posterior lobe, which is a flattened conical plate. The 30th foot presents both a dorsal and a ventral branchia, and these are found as far back as the 90th (Pl. IV. fig. 7), and probably behind it in perfect examples. The size of the somewhat ovoid dorsal cirrus remains considerable throughout.

The only example of the Ariciidæ is *Scoloplos armiger*, O. F. Müller, which was dredged at various stations in 1873, viz., no. 15, in August, in the Baie des Chaleurs, between Capes Despair and Grand; off Pabore, in 70 fathoms; off Cape Hood, Cape Breton, in 45 fathoms, between Bradelle Bank and Miscou Island.

5. *On the same Groups procured by Canon Norman, D.C.L., F.R.S., in Norway and Finmark.*

Of the Goniadidæ, *Goniada maculata*, CErst., and *G. norvegica*, CErst., were obtained, and three of the Glyceridæ, viz.: *Glycera capitata*, CErst., *Glycera unicornis*, Savigny (= *G. Göesi*, Malmgren), and *Glycera alba*, H. Rathke. Amongst the Ariciidæ are *Aricia Cuvieri*, Aud. & Ed., *Aricia norvegica*, Sars, and a form near *Aricia Kupfferi*, Ehlers, from Norway, and *Scoloplos armiger*, O. F. M., from Finmark.

6. *On some Japanese Glyceridæ.*

Four species of *Glycera* have recently been described

from Japanese waters by Mr. J. Percy Moore *, viz. : *Glycera Gössi*, Malmgren, *G. tessellata*, Grube, *G. alba*, Erst., and *G. robusta*, Ehlers.

It is difficult to diagnose the species mentioned by Schmarda from Chili, as the figures and descriptions of the feet are too indefinite. In his first species, *Glycera micrognatha*, he describes the branchia on the foot as terminal, but whether the description applies to the terminal papilla of the foot or a branchia is doubtful. The dorsal cirrus is also situated above the foot. In *G. macrorhiza* the terminal papilla of the foot appears to be his branchia, and the dorsal cirrus is neither shown in the figure nor referred to in the text; yet the form of the foot closely approaches that in the Japanese species. *Glycera monodon*, Schmarda, again has only a single tooth (?), the same kind of branchia (the terminal papilla), and a short ventral and a dorsal cirrus. The form of the tooth approaches that of the Japanese example. His *G. didon* is described as having no branchiæ, two processes to the teeth, and conical, dorsal, and ventral cirri. The setigerous lobe has a clavate papilla at the tip. It is possible that all the foregoing species and the *Hemipoda patagonica* of Kinberg may be identical with the Japanese form, as Ehlers thinks, and all appear to belong to the genus *Hemipodus*, De Quatrefages.

Hemipodus simplex, Grube, var.

Procured at Koba, Japan, lat. 31° 27' N., long. 156° 50' E., by Capt. St. John, in 1874.

Externally this form differs from *Glycera* in the somewhat more elongate condition of the body, which appeared to be about 3 or 4 inches in length, and by the wide spaces between the feet. The latter, however, were closer anteriorly and posteriorly than they were in the middle of the body. The head was absent, having been detached after rupture by the proboscis. Posteriorly the body gradually tapered to a tail, which ended in two short cirri.

The first region of the proboscis was longitudinally streaked. The teeth are rather short, with a single slightly curved spur (Pl. IV. fig. 4), which is situated near the basal part or socket of the tooth.

The papillæ of the proboscis are simple and filiform throughout (Pl. IV. fig. 4), tapering gently from the base to the tip, finely streaked longitudinally and with minute

* Contrib. Zool. Lab. Univ. Pennsylvania, x. p. 464 (1904).

granules. They arise from a translucent basement-membrane. They are often curved, but whether this condition has given rise to De Quatrefages's description of falcate is a question. No other form of papilla is present, and hence the surface differs from the figure and description of Ehlers in regard to *H. simplex*, which has clavate or slightly globular forms amongst the filiform. Much depends on the state of the preparation, for a softened one might assume the condition in Ehlers's figure.

The anterior feet are moderately elongate, the dorsal cirrus being above the base of the foot. The setigerous region is bluntly rounded at the tip, which is pierced by the spines, and from the anterior border projects a long digit-like papilla with a constriction at the base. The bristles are placed symmetrically above and below the spine. They all have the same structure, with pale translucent shafts, dilated and split at the end for the insertion of the base of the terminal piece, which is of moderate length with a thick back piece and a thin edge minutely serrated, the whole being finely tapered to a sharp point. None are seen to be bevelled in lateral view—apparently because they differ in this respect from those of such as *Nereis*. The ventral cirrus is situated at the base of the foot and is somewhat ovoid with a blunt tip—its outline resembling that of the dorsal cirrus.

The posterior feet differ from the anterior in so far as the dorsal cirrus with its constricted base is now situated on the foot, whilst the ventral cirrus has moved outwards to the middle of the foot, is much longer and more pointed. The terminal anterior papilla is also somewhat longer. The bristles do not materially differ: they show a gradation in each bundle, those nearest the spine being more slender than those dorsally and ventrally.

This form has considerably longer feet than that shown by Ehlers, and the ventral cirrus is longer and more pointed posteriorly—in this respect agreeing with De Quatrefages's description of his *Hemipodus roseus*.

Glycera alba, H. R.

This form (not to be distinguished from *Glycera alba*, H. Rathke) comes from a depth of 30 fathoms in the Japan Sea. The papillæ of the proboscis are lanceolate.

A specimen of *Glycera siphonostoma*, 6-7 inches in length, was found by Captain St. John at low water, Tukura, Japan,

in 1874. A comparison with specimens of the species from various localities shows that it is only a variety of this widely distributed form.

7. *On the Form described as Hemipodus (?) magellanicus in the Annelids of the 'Challenger'**.

This remarkable type of the Glyceridae requires, as indicated by the query in the 'Challenger' volume, a new generic name, since it so materially diverges from *Hemipodus*, De Quatrefages, and also from the types of Kinberg and Schmarda. It is difficult to see why Ehlers † has grouped these different forms under his *Hemipodia magellanica*, Kinberg; for Kinberg's type, like that of De Quatrefages, whom he followed, had essentially a simple foot (Schmarda's *Monosticha*) with a single spine and one kind of bristles, whereas the form described in the 'Challenger,' whilst having a simple foot in front, had a bifid one throughout the rest of the body, and two kinds of bristles. The structure of the head of the 'Challenger' species also diverges from that of the types of De Quatrefages and Kinberg. The term *Breviglycera magellanica* was therefore suggested as more appropriate. Now, however, Arwidsson's paper ‡ has priority, and his generic name of *Glycerella* may be accepted for this peculiar type, all the features of which were duly pointed out in the 'Challenger' volume.

EXPLANATION OF PLATE IV.

- Fig. 1.* Posterior foot of *Goniada pallida*, Arwidsson. Magnified about 50 diam.
Fig. 2. Two compound bristles of the same species. Magnified, Zeiss oc. 2, obj. D.
Fig. 3. One of the denticles of the foregoing. Magnified.
Fig. 4. Papille of the proboscis of *Hemipodus simplex*, Grube. Magnified.
Fig. 5. Tenth foot of *Goniada norvegica*, Erst., from the St. Lawrence. Magnified.
Fig. 6. Ninetieth foot of the foregoing. Similarly magnified.
Fig. 7. Ninetieth foot of *Glycera dibranchiata*, Ehlers. Magnified.

* *Op. cit.* p. 349, pl. xlii. figs. 11-15, pl. xxii. A. figs. 12-15, pl. xxxv. A. figs. 5-7.

† Hamburger Magalhaensischen Sammelreise, Polychaeten, p. 81 (1897).

‡ Bergens Mus. Aarbog, 1898, xi. p. 26, figs. 22 & 57.

V.—*Rhynchotal Notes*.—XXIX. By W. L. DISTANT.Subfam. *CICADINÆ* (continued from vol. xiv. p. 430).

Division DUNDUBIARIA.

This division is composed almost entirely of Oriental, Malayan, and Australasian species, save a few derived from the extreme east of the Palearctic Region, which, as well known, possesses a strong Oriental affinity.

The lateral margins of the pronotum are distinctly angulated or toothed; the tegmina and wings hyaline, sometimes spotted, but never opaque; the opercula vary much in length and shape, and in some genera reach the maximum of development.

This division is a very homogeneous one, but at the same time one of the most difficult to readily analyze. It is hoped that the following proposed generic revision will considerably assist specific determination.

Synopsis of Genera.

- I. Second and third ventral segments in ♂ with distinct lateral tubercles; opercula short.
- A. Head (including eyes) considerably narrower than base of mesonotum *Leptopsaltria*.
- B. Head (including eyes) as wide as base of mesonotum.
- a. Head as long as space between eyes.
- b. Tympanal coverings in ♂ broader at base than long.
- c. Abdomen moderately conical, gradually attenuated posteriorly, in ♂ considerably longer than space between apex of head and base of cruciform elevation *Purana*.
- aa. Head as long or a little longer than space between eyes.
- bb. Tympanal coverings in ♂ as long as breadth at base, or sometimes broader than long.
- cc. Abdomen broad, about as broad at apex as at base; in ♂ not longer than space between apex of head and base of cruciform elevation *Maua*.
- II. Second ventral segment in ♂ alone provided with lateral tubercles; opercula short. *Tanna*.
- III. Ventral segments without tubercles; opercula short or sometimes very long, and very variable in shape.
- C. Head with the front large and convex, about twice as broad at its base as the anterior margins of the lobes of vertex; rostrum scarcely reaching the posterior coxæ *Dundubia*.

- D. Head with the front not twice as broad at base as anterior margins of the lobes of vertex; rostrum reaching, sometimes passing, the posterior coxæ; opercula long, at least reaching centre, and sometimes apex, of abdomen.
- d. Abdomen short, about as long as space between apex of head and base of cruciform elevation.
- e. Head as long as breadth between eyes.
- f. Lateral margins of head obliquely continuous to front or very slightly sinuate.
- g. Head (including eyes) as wide as base of mesonotum.
- h. Opercula in ♂ broad, either just or longly passing middle of abdomen, well separated, and not overlapping, more or less concavely sinuate on each side at basal area, their apices rounded or obliquely truncate.
- i. Greatest breadth of tegmina about a third of length *Cosmopsaltria.*
- ff. Anterior margins of vertex of head almost at right angles to front.
- ii. Greatest breadth of tegmina more than one third of length *Fatima.*
- gg. Head (including eyes) only about two thirds the breadth of base of mesonotum *Sawda.*
- ee. Head much shorter than breadth between eyes.
- hh. Opercula in ♂ about twice as broad at apex than at base, their inner margins concave, widening to basal area, outer margins sinuate near centre, their apices broad and overlapping . . . *Ayesha.*
- hhh. Opercula in ♂ broad, their inner margins contiguous, nearly equally broad throughout, their apices broad, the outer margins very obsoletely sinuate. *Haphsa.*
- dd. Abdomen considerably longer than space between apex of head and base of cruciform elevation.
- i. Head (including eyes) about as wide or a little wider than base of mesonotum.
- j. Head about as long as breadth between eyes.
- k. Pronotum measured centrally almost as long as mesonotum excluding cruciform elevation, its lateral margins always distinctly, strongly, and generally acutely toothed.
- l. Opercula elongate, concavely sinuate on each side near base, their apices rounded or obtusely acute, occupying lateral abdominal areas, and always well separated at their inner margins. *Platylomia.*
- jj. Head distinctly shorter than breadth between eyes.
- kk. Pronotum measured centrally distinctly

- shorter than mesonotum, its lateral margins moderately dentate.
- II. Opercula elongate, broad, nearly meeting at their inner margins, sinuate at their basal areas.
- m. Anal abdominal segment in ♂ apically acutely dentate* or with a broad obtuse process † on each side. *Diceropyga.*
- III. Opercula obliquely divergent, sometimes very short.
- mm. Anal abdominal segment in ♂ apically unarmed *Meimuna.*
- III. Opercula short and transverse.
- n. Head (including eyes) about as wide as base of mesonotum, its length about or nearly equal to space between eyes.
- o. Abdomen in ♂ longer than space between apex of head and base of cruciform elevation.
- p. Tympanal coverings of normal shape and size *Pomponia.*
- pp. Tympanal coverings very large, nearly meeting inwardly *Dokuma.*
- oo. Abdomen in ♂ short, about as long as space between apex of head and base of cruciform elevation.
- ppp. Tympanal coverings of normal shape and size *Aola.*
- pppp. Tympanal coverings very globose and projecting beyond the lateral margins of the abdomen. *Oncotympana.*
- nn. Head (including eyes) considerably wider than base of mesonotum; abdomen long; length of head equal to space between eyes *Champaka.*

Genus LEPTOPSALTRIA.

Leptopsaltria, Stål, Hem. Afr. iv. p. 5 (1866); Berl. ent. Zeit. x. p. 170 (1866).

Type, *L. tuberosa*, Sign. (*Cicada*).

PURANA, gen. nov.

Head (including eyes) as wide as base of mesonotum and as long as space between eyes; face prominent and convex, its base almost at right angles to the anterior lateral angles of vertex; pronotum narrowed anteriorly, its lateral margins angulated or toothed; mesonotum much longer than pronotum; abdomen moderately conical above, gradually attenuated posteriorly, in male considerably longer than the space

* As in type, *D. obtecta*, Fabr.

† As in *D. chlorogaster*, Boisd.

between the apex of head and base of cruciform elevation, tubercles on the second and third ventral segments large and prominent; opercula small; tympanal coverings in male broader at base than long; rostrum reaching or a little passing posterior coxæ; tegmina and wings hyaline.

Type, *P. tigrina*, Walk. (*Dundubia*).

MAUA, gen. nov.

Head (including eyes) as wide as base of mesonotum and as long or a little longer than space between eyes; face prominent and elongately convex, not in a line with vertex; pronotum narrowed anteriorly, its lateral margins angulated or toothed; mesonotum much longer than pronotum; abdomen broad, its apex about or almost as broad as base, in male not or scarcely longer than space between apex of head and base of cruciform elevation, tubercles on the second and third ventral segments very large and prominent, opercula small; tympanal coverings in male sometimes as long as, sometimes shorter than, breadth at base; rostrum reaching, generally considerably passing, the posterior coxæ; tegmina and wings hyaline.

Type, *M. quadrituberculata*, Sign. (*Cicada*).

Maua affinis, sp. n.

Closely allied to *M. quadrituberculata*, Sign., from which it differs by having the outer margins of the opercula almost straight and not convexly sinuate, and by the tegmina, which have the transverse veins at the bases of the second, third, and fourth apical areas infuscated, and also having a small fuscous spot at the apex of each longitudinal vein to the apical areas.

Long., excl. tegm., ♂ 35-39 mm.; exp. tegm. 101-123 mm.

Hab. Borneo (Paris and Stockh. Muss.).

TANNA, gen. nov.

Closely allied to *Leptopsaltria*, from which it differs by only having a lateral tubercle on the second and not on the third ventral segment, in other respects resembling the genus *Pomponia*.

Head (including eyes) narrower than base of mesonotum and about as long as space between eyes; lateral margins of pronotum angularly sinuate, but not prominently toothed;

abdomen much longer than space between apex of head and base of cruciform elevation; tympana covered; opercula small, not or scarcely extending beyond base of abdomen; rostrum reaching the posterior coxæ; tegmina and wings hyaline.

Type, *T. japonensis*, Dist. (*Pomponia*).

Genus DUNDUBIA.

Dundubia, Amy. & Serv. Hist. des Hém. p. 470 (1843).

Type, *D. mannifera*, Linn. (*Cicada*).

Genus COSMOPSALTRIA.

Cosmopsaltria, Stål, Mem. Afr. iv. p. 5 (1866); Berl. ent. Zeit. x. p. 170 (1866).

Type, *C. doryca*, Boisd. (*Cicada*).

FATIMA, gen. nov.

Head (including eyes) about equal in breadth to base of mesonotum, as long as breadth between eyes, its lateral margins very irregular, the anterior lateral margins of the vertex being almost at right angles to the face; pronotum little more than half the length of mesonotum; abdomen above as long as space between apex of head and base of cruciform elevation; anal abdominal segment in male apically acutely dentate on each side; tympana covered, the tympanal coverings in male projecting a little beyond the lateral abdominal margins; rostrum passing the posterior coxæ; opercula in male broad, just or longly passing the middle of the abdomen, either concavely sinuate on each side or slightly and obsoletely sinuate, their apices rounded or obliquely truncate; tegmina and wings subhyaline, the first broad, their greatest breadth more than one third of their length.

Type, *F. capitata*, Dist. (*Cosmopsaltria*).

SAWDA, gen. nov.

Head (including eyes) about two thirds the breadth of base of mesonotum, and very slightly longer than breadth between eyes, its lateral margins discontinuous, the anterior margins of vertex being almost at right angles to front; mesonotum only slightly longer than pronotum; abdomen short, about as long as space between apex of head and base of cruciform elevation; tympana covered, the flaps a little

broader than long; rostrum just passing the posterior coxæ; opercula long, their apices broad; tegmina and wings hyaline, their greatest width more than one third of their length; anterior femora tuberculously spined beneath; anal abdominal segment in male apically acutely dentate on each side.

Type, *S. mimica*, Dist. (*Cosmopsaltria*).

Sawda Gestræi, sp. n.

Head, pronotum, and scutellum olivaceous; area of the ocelli, two central fasciæ to pronotum (between which the colour is ochraceous), a central lanceolate spot to mesonotum, on each side of which is a posteriorly angulated spot (marginated with ochraceous), and a spot in front of each anterior angle of the cruciform elevation, black; there is also a sub-lateral fuscous streak on each side of the mesonotum; abdomen purplish brown; body beneath, rostrum, and legs very pale olivaceous; undersides of femora and the tarsi black; tegmina and wings hyaline, the venation pale fuscous; tegmina with the transverse veins at the bases of the apical areas broadly infuscated and a fuscous spot at the apex of each longitudinal vein to the apical areas; the venation at apex of radial area ochraceous; opercula broad, their margins narrowly black and greyishly tomentose, their apices reaching the base of fourth abdominal segment, their outer margins sinuate, but only slightly concave.

Long., excl. tegm., ♂ 45 mm.; exp. tegm. 140 mm.

Hab. New Guinea: Haveri (*Loria*, Genoa Mus.).

AYESHA, gen. nov.

Head (including eyes) as wide or a little wider than base of mesonotum, much shorter than breadth between eyes, lateral margins obliquely continuous to face or very slightly sinuate, eyes large and oblique; pronotum shorter than mesonotum, its lateral margins angulated anteriorly; mesonotum moderately convexly tumid; abdomen short, not longer than space between apex of head and base of cruciform elevation; tympanal coverings about as long as broad; rostrum reaching the intermediate coxæ; opercula in male long, about twice as broad at apex as at base, inner margin concave, widening to basal area, outer margins sinuate near centre, their apices broad and overlapping; tegmina and wings hyaline, greatest width of tegmina about one third their length.

Type, *A. spathulata*, Stål (*Cosmopsaltria*).

HAPHSA, gen. nov.

Head (including eyes) about as broad as mesonotum, considerably shorter than breadth between eyes, lateral margins obliquely sinuate from eyes to apex; pronotum distinctly shorter than mesonotum, subacutely toothed before middle of lateral margins; abdomen short, not longer than space between head and base of cruciform elevation; tympana covered, tympanal flaps about as long as broad; rostrum reaching or passing the posterior coxæ; opercula in male broad, their inner margins contiguous, nearly equally broad throughout, their apices convex, their outer margins very obsoletely sinuate; tegmina and wings hyaline.

Type, *H. nicomache*, Walk. (*Dundubia*).

Haphsa crassa, sp. n.

Body stout, broad, piceous; head with spots at apex of front and the lateral margins of vertex and two spots at base pale ochraceous; pronotum with a central longitudinal fascia, on each side of which are curved discal fasciæ, anterior narrow margin (broken centrally), and the lateral and posterior margins ochraceous (the posterior margin contains a black spot on each side); mesonotum with two long branching discal fasciæ, commencing at the anterior angles of the cruciform elevation, two short central anterior lines, and the lateral margins ochraceous; cruciform elevation ochraceous, centrally black, and with a black spot on each of the anterior prolongations; abdomen above black, more or less ochraceously tomentose; head beneath, sternum, and opercula very pale testaceous and shortly pilose; abdomen beneath piceous, more or less ochraceously pilose, with a central pale, macular, ochraceous fascia; legs black, the tibiæ (excluding bases and apices) castaneous; coxæ, trochanters, and femora streaked and spotted with pale ochraceous; face black, a basal spot and the transverse striations ochraceous; tegmina and wings hyaline, the venation fuscous, the first with the transverse veins at the bases of the second, third, fifth, and seventh apical areas infuscated (sometimes only the second and third infuscated); in one specimen there are minute fuscous spots at the apices of the longitudinal veins to apical areas, but in others these are obsolete. Abdomen short and broad, in male about as long as space between apex of head and base of cruciform elevation; length of head considerably shorter than space between eyes; opercula broad, their inner margins contiguous, nearly equally broad throughout, their

apices broadly subtruncate and reaching the penultimate abdominal segment; rostrum ochraceous, its apex black, and reaching the posterior coxæ.

Long., excl. tegm., ♂ 34-38 mm.; exp. tegm. 97-110 mm.

Hab. Yun-nan (Paris and Brit. Mus.).

Genus PLATYLOMIA.

Platylomia, Stål (nom., nec descrip.), Cefv. Vet.-Ak. Förh. 1870, p. 708, note.

Head (including eyes) about as wide or a little wider than base of mesonotum, about or almost as long as breadth between eyes; pronotum centrally about or almost as long as mesonotum (excluding basal cruciform elevation), its lateral margins always distinctly, sometimes strongly, and generally acutely toothed; abdomen considerably longer than space between apex of head and base of cruciform elevation; tympana completely covered; rostrum reaching or passing the posterior coxæ; opercula more or less elongate, concavely sinuate on each side of basal area, their apices rounded or subacute, occupying lateral abdominal areas, always well separated and seldom reaching disk; tegmina and wings hyaline, the venation sometimes fuscously spotted.

Type, *P. spinosa*, Fabr. (*Tettigonia*).

I use Stål's name for this genus, as the type he proposed (*Cic. flavida*, Guér.) is included in it. His description, however, cannot be accepted, as, evidently referring to Guérin's figure only, he states, "ramo venæ ulnaris interioris recto vel leviter curvato," a character given by the artist and not found in the species.

Platylomia assamensis, sp. n.

Allied to *P. umbrata*, Dist. (Mon. Orient. Cicad. tab. v. figs. 11 *a*, *b*), and differing principally by the size and shape of the opercula, which just pass the posterior margin of the penultimate abdominal segment, with their apices suddenly obtusely angulate; the tegmina are shorter, and thus apparently broader, and are without the marginal spots at the apices of the longitudinal veins to the apical areas and the infuscated transverse veins at the bases of fifth and seventh apical areas; the markings of the mesonotum are similar to those of *P. umbrata*, but there is also a distinct black elongate spot on each lateral area.

Long., excl. tegm., ♂ 40 mm.; exp. tegm. 111 mm.

Hab. Assam (*Atkinson Coll.*, Brit. Mus.).

* *Platylomia virescens*, sp. n.

Body above shining piceous, more or less greyishly pubescent; anterior margin of pronotum and posterior segmental margins pale castaneous; posterior margin of pronotum greenish or ochraceous; mesonotum with traces of two sub-obsolete basal obconical spots; abdomen beneath and legs castaneous, anterior and intermediate tibiae and tarsi piceous; sternum ochraceously tomentose; opercula ochraceous, finely greyishly tomentose; tegmina and wings hyaline, the venation castaneous, basal streaks to both bright, shining green; tegmina with the transverse veins at the apices of the upper two ulnar areas broadly infuscated, and a small fuscous spot at the apices of the longitudinal veins to apical areas. Body long and slender; opercula in ♂ terminating in a long slender outwardly curved prolongation reaching the base of the sixth abdominal segment, moderately concavely sinuate on each side near base; rostrum just passing the posterior coxæ.

Long., excl. tegm., ♂ 55, ♀ 46 mm.; exp. tegm., ♂ ♀ 122-140 mm.

Hab. Borneo: Sarawak (A. Everitt, Brit. Mus.); Philip-pines (Paris & Brit. Mus.).

In general appearance this species much resembles, or, to use a somewhat loose term, "mimics," *Champaka viridimaculata*, Dist.

Platylomia albomaculata, sp. n.

♂. Body and legs very dark piceous brown; abdomen above with a double series of cretaceous spots on each lateral area, the innermost very small, the outer marginal series much larger, a large cretaceous spot on each side of the last abdominal segment; eyes, apices of intermediate and posterior femora, and the posterior tarsi flavescent, posterior tibiae (excluding bases and apices) castaneous; tegmina and wings transparent tale-like, the venation fuscous, extreme bases of both virescent; tegmina with the transverse veins at the bases of the second and third apical areas distinctly infuscated, and with a series of small marginal spots at the apices of the longitudinal veins to apical areas. Opercula somewhat narrow, convexly sinuate on each side near base, the inner and apical margins moderately convexly rounded, their apices reaching the middle of the fourth abdominal segment; rostrum reaching the posterior coxæ; face strongly tumid, centrally longitudinally sulcate, and strongly transversely striate.

Long., excl. tegm., ♂ 40 mm.; exp. tegm. 102 mm.

Hab. Philippines (Brit. Mus.).

Genus DICEROPYGA.

Diceropyga, Stål, Cefv. Vet.-Ak. Förh. 1870, p. 708, note.

Type, *D. obtecta*, Fabr. (*Tettigonia*).

Diceropyga boninensis, sp. n.

Head, pronotum, and mesonotum greenish, or, in faded specimens, ochraceous; head with transverse striations to front, a spot at anterior angles of vertex, area of the ocelli continued obliquely to lateral margins, and a spot at inner margins of eyes black; pronotum with a central black longitudinal fascia, widened anteriorly and posteriorly, and centrally longitudinally pale ochraceous, the incisures, some spots on lateral marginal areas, and the extreme lateral and posterior margins black; mesonotum with two obconical pale ochraceous spots, the inner margins and lateral areas of which are black, connected with a black spot extending from their apices to cruciform elevation, an irregular black longitudinal fascia on each lateral area, broken anteriorly with pale ochraceous; a small black spot on the anterior and posterior margins of the cruciform elevation; abdomen above black, posterior segmental margins greenish or ochraceous, with macular ochraceous markings which do not extend to the apical third; head beneath, sternum, legs, and opercula pale greenish or ochraceous, the last narrowly margined with black and more or less cretaceously tomentose; abdomen beneath brownish ochraceous; face blackly transversely striate on basal and apical areas, the central sulcation black, with an ochraceous spot at base and apex; tegmina and wings hyaline, venation mostly fuscous brown; tegmina with the costal membrane and area greenish or ochraceous, the transverse veins at the apices of the two upper ulnar areas infuscated. Opercula reaching the apex of the third ventral segment, their apices a little narrowed and rounded, concavely sinuate at outer margins on basal area, convexly oblique at inner margins; anal abdominal segment in male obscurely apically dentate; rostrum reaching the posterior coxæ.

Long., excl. tegm., ♂ ♀ 26-33 mm.; exp. tegm. 86-92 mm.

Hab. Bonin Islands and Aluman? (*Holst*, Brit. Mus.).

MEIMUNA, gen. nov.

Head (including eyes) about as broad as base of mesonotum, shorter than breadth between eyes, lateral margins obliquely

continuous to face or very slightly sinuate; pronotum distinctly shorter than mesonotum, its lateral margins distinctly and generally acutely toothed before middle; abdomen considerably longer than space between apex of head and base of cruciform elevation; tympana covered, tympanal flaps about as long as broad; rostrum reaching the posterior coxæ; opercula obliquely divergent, sometimes very short; tegmina and wings hyaline.

Type, *M. tripurasura*, Dist. (*Dundubia*).

Genus POMPONIA.

Pomponia, Stål, Hem. Afr. iv. p. 6 (1866); Berl. ent. Zeit. x. p. 171 (1866).

Type, *P. fusca*, Oliv. (*Cicada*).

Pomponia merula, sp. n.

♂. Body dark castaneous; posterior and lateral margins of pronotum and the sternum more or less dull ochraceous; striations to front and face, and a central spot to first, area of the ocelli and a spot between them and eyes black; black markings on pro- and mesonota generally as in *P. imperatoria*, but posterior margin of pronotum immaculate; a spot between face and eyes, coxæ and femora beneath, tibiæ, more or less, and the opercula black; tegmina and wings pale smoky hyaline, the venation brownish ochraceous; tegmina with the base, costal membrane and area, and spots on transverse veins at apices of first, second, third, and fourth ulnar areas, and near the apex of each longitudinal vein to apical areas, fuscous brown; wings with extreme base and two narrow longitudinal basal streaks fuscous brown.

Allied to *P. imperatoria*, Westw., from which it differs principally by the black, more transverse, and a little shorter opercula, darker colour of the body above and beneath, distinctly narrower and more spotted tegmina, &c.

Long., excl. tegm., 67-72 mm.; exp. tegm. 188-194 mm.

Hab. Borneo, 4 ♂ specs. (*Sir H. Brooke, Lowe, Hose, & Everitt*, Brit. Mus.). North Borneo: Sandakan (*Pryer*, Coll. Dist.).

Pomponia intermedia, sp. n.

Allied to *P. imperatoria*, Westw., in colour and markings, but differing by the length of the third apical area to the tegmina, which is shorter than the fourth, while those areas are about equal in length in Westwood's species; the greatest

width of the tegmina is scarcely more than a third of their length; opercula ochraceous, narrowly margined with black and obliquely black at base, in shape and length resembling those of *D. imperatoria*. Allied to *P. merula* by the relative breadth and length of tegmina, and by having the third apical area to the same shorter than the fourth, but differing by the shape and length of the opercula.

Long., excl. tegm., ♂ 64 mm.; exp. tegm. 176 mm.

Hab. Tenasserim: Thaungyang Valley (*Col. Bingham*, Brit. Mus.).

The structural differences of the three species are expressed in the following synopsis:—

- A. Opercula about as long as broad.
- a. Greatest width of tegmina much more than a third of their length.
 - b. Third apical area to tegmina about as long as fourth *P. imperatoria*.
 - aa. Greatest width of tegmina about or little more than a third of their length.
 - bb. Third apical area to tegmina shorter than fourth. *P. intermedia*.
- B. Opercula broader than long *P. merula*.

DOKUMA, gen. nov.

Head (including eyes) as wide as base of mesonotum, its length about equal to breadth between eyes; pronotum considerably shorter than mesonotum, its lateral margin distinctly angularly toothed; mesonotum with a transverse tumidity at and extending beyond the cruciform elevation; abdomen in male considerably longer than space between apex of head and base of cruciform elevation; tympana very large, a little convex, nearly meeting inwardly, and between them the prolonged metanotum appears as a longitudinal subconical process; opercula small, between their inner margins a short subglobose metasternal process; rostrum reaching the posterior coxæ; tegmina and wings hyaline; tegmina with eight apical areas, the basal cell longer than broad.

Type, *D. nigristigma*, Walk. (*Dundubia*).

AOLA, gen. nov.

Head (including eyes) about as wide as base of mesonotum, its length about equal to breadth between eyes; front prominent, its lateral margins more or less continuous with those of vertex; pronotum distinctly shorter than mesonotum, its lateral margins prominently toothed; abdomen short, about as long as space between apex of front and base of cruciform elevation; tympana entirely covered, the flaps broader than

long; opercula short, just reaching the first abdominal segment, and not covering the lateral margins of the tympanal flaps; rostrum reaching the posterior coxæ; tegmina and wings hyaline, the first with eight apical areas and the basal cell longer than broad.

Type, *A. bindusara*, Dist. (*Pomponia*).

Genus ONCOTYMPANA.

Oncotympana, Stål, *Œfv. Vet.-Ak. Förh.* 1870, p. 710.

Type, *O. pallidiventris*, Stål.

CHAMPAKA, gen. nov.

Head (including eyes) considerably broader than base of mesonotum, its length about equal to breadth between eyes, lateral margins of front and vertex almost obliquely in line; pronotum about as long as head, its lateral margins armed with a distinct medial spine; mesonotum moderately tumid; abdomen considerably longer than space between apex of head and base of cruciform elevation; tympana covered, tympanal coverings broader than long; opercula short, just reaching basal abdominal segment, laterally oblique and thus exposing the marginal areas of the cavities; rostrum reaching the posterior coxæ; anterior femora strongly spined beneath; tegmina and wings hyaline, the first considerably longer than the body and with its greatest breadth considerably less than a third of its length; apical areas eight; basal cell longer than broad.

Type, *C. viridimaculata*, Dist. (*Pomponia*).

VI.—Further Descriptions of new *Rhinolophi* from Africa.

By KNUD ANDERSEN.

Rhinolophus Darlingi, sp. n.

Diagnosis.—Differs from all other South-African *Rhinolophi* by the combination of these two characters: cingula of the upper canine and p^1 in immediate contact with each other; forearm 46·7–47·7 mm.

Nose-leaves.—Extreme length 14–14·5 mm. Horseshoe covering almost the whole of the muzzle; no tooth-like projection on either side of the median notch; greatest width 8·1–8·5 mm. Sella naked, slightly constricted below the middle, broadly rounded off at summit; vertical height 4 mm.; breadth at base, at constriction, and at summit

2.1, 1.5, and 1.7 mm. Posterior connecting-process very short, rounded, in side view very nearly semicircular, scarcely projecting beyond the summit of the sella (this kept in vertical position). Lancet very long, scarcely constricted, its lateral margins evenly converging towards the tip; distance from the posterior transverse bridge to the tip of the lancet 4.2 mm.

Ears.—Reaching tip of muzzle, when laid forward: not attenuated below the tip; this latter blunt. Width of ear about equal to its length from notch on outer margin to tip.

Wings.—5th metacarpal equal to (or only a mere trifle longer than) 4th. 1st phalanx of 4th finger about $\frac{2}{3}$ the length of 2nd phalanx. Plagiopatagium inserted on tarsus.

Tail.—Much longer than the tibia, about the same length as the 3rd metacarpal. Hinder margin of interfemoral triangular.

Colour.—General colour of adult individuals (2 skins) rather dark brownish drab above, "drab-grey" beneath. Base of hairs on back of the same colour as the underside. Length of fur on middle of back about 10 mm.—Immature specimens (2 skins) have a more greyish tinge on the back, but the difference from adult examples is very slight (but may perhaps be more pronounced in still younger individuals).

Skull.—Hinder border of palatal bridge opposite (or very slightly behind) the middle of m^3 .

Dentition.—Cingula of the upper canine and p^4 so closely approximated as to completely touch each other. Upper p^2 quite on the external side of the tooth-row; in one skull (♀ ad.) with unworn teeth it is as high as the cingula of the adjacent teeth; in two other skulls with slightly worn teeth it is hair-fine, hardly perceptible without a lens (therefore presumably lost in still older individuals). Lower p_3 , when present, external to the tooth-row, not reaching the upper margin of the cingula of p_2 and p_4 ; in a little more advanced age p_3 is lost.

Type.—Ad. (skin). Mazoe, Mashonaland, 4000 ft., June 13th, 1895; collected by J. ff. Darling, Esq. B. M. no. 95. 8. 27. 1. Original no. 35. "Taken in mining adit." Five paratypes (three skins, two in alcohol) are in the British Museum.

Distribution.—A young *Rhinolophus* from Angola (B. M. no. 64. 8. 16. 3*) is indistinguishable from the species here

* *Rh. atthiops*, specimen "e," in Dobson's Cat. Chir. Brit. Mus. (1878) p. 122.

described, in external characters as well as in skull and dentition. Its geographical distribution therefore, probably, is from Angola across South Africa, eastwards at least to Mazoe.

Remarks.—The short diagnosis given above will, in every case, prevent confusion of the present species with any other hitherto known South-African *Rhinolophus*. *Rh. Landeri*, *lobatus*, *simulator*, and *Denti* differ, *altogether*, in having the upper p^2 placed in the tooth-row, separating the canine and p^1 by a distinctly perceptible interspace. *Rh. Landeri* is much smaller (forearm about 43 mm.), with much shorter ears, much narrower sella, higher connecting-process, much shorter tail (18–21 mm.), and with the 1st phalanx of the 4th finger peculiarly shortened (less than, or equal to, half the length of the 2nd phalanx). *Rh. lobatus*, which is of about the same size as *Rh. Darlingi*, may at once be separated by having the posterior connecting-process long, pointed, projecting like a small “horn” far beyond the summit of the sella. *Rh. simulator* is smaller (forearm 43·5–45 mm.); the front face of the sella is “rough,” owing to the presence of very short hairs (most easily to be observed under a lens). *Rh. Denti* is much smaller (forearm 41–43 mm.); front face of sella as in *Rh. simulator*.

The species is named in honour of Mr. J. folliott Darling, to whom the British Museum is indebted for so many valuable accessions to its collection of South-African mammals.

Measurements.

	Type. Ad.	3 adult spems., 3 skulls.	
		Min.	Max.
	m.	mm.	mm.
Forearm	46·7	46·7	47·7
3rd metacarpal	28·5	28·5	30·2
4th metacarpal	34	34	35·7
5th metacarpal	34·2	34·2	35·7
Tail, from anus	(28·5)	28·5	32
Skull, extreme length	20·2	20	20·2
„ zygomatic width	10	10	10·3
Mandible, condylus to front of incisors..	13·3	13·1	13·3
Front of upper canine to back of m^3 . . .	7·4	7·2	7·4
„ lower canine to back of m_3	8	7·8	8

Rhinolophus acrotis brachygnathus, subsp. n.

Diagnosis.—Like *Rh. acrotis Andersoni*, but upper and lower tooth-rows, as well as mandible, distinctly shorter.

Skull and dentition (two skulls examined).—Although being apparently, on an average, larger than *Rh. a. Andersoni*, the present form has a smaller skull, smaller teeth, shorter tooth-rows and mandible (conf. measurements).

Colour.—The general colour of the single skin at my disposal (♀ imm.) is much darker than in the type of *Rh. a. Andersoni* (♂ imm.): greyish “drab” on the upper-side, tinged with “mouse-grey” on the hinder back; “ecru-drab” on the underside; base of hairs on the back of the same colour as the underside.

Type.—♂ ad. (in alcohol). Ghizeh, Lower Egypt, Dec. 16th, 1891; collected and presented by Dr. J. Anderson. B. M. no. 92. 9. 9. 7. There is a second specimen (♀ imm., skin) in the Museum from the same locality.

Distribution.—Known only from Ghizeh.

Remarks.—The absence, even in immature individuals, of the lower p_3 and upper p^2 distinguishes this form sufficiently from the only species with which it could possibly be confounded, viz. *Rh. euryale* and *Rh. clivosus*.

Up to the present time three forms of *Rh. acrotis* have been described: *Rh. acrotis* (typicus) from Keren, Erytrea; *Rh. a. Andersoni* from the Eastern Egyptian Desert, about 22° N., 35° E.; and *Rh. a. brachygnathus* from the environs of Cairo.

Measurements of Rh. acrotis brachygnathus and Andersoni.

	<i>Rh. a. brachygnathus.</i>	<i>Rh. a. Andersoni</i> *,	
	Type. ♂ ad.	4 immature spems, 5 skulls.	
		Max.	Min.
	mm.	mm.	mm.
Forearm	47·5	46·8	44·2
3rd metacarpal	32	29·5	27
4th metacarpal	33·7	31·2	29·7
5th metacarpal	33·8	32·2	30
Mandible, condylus to front of incisors..	12·6	13·5	13
Front of upper canine to back of m^3	7	7·8	7·5
„ lower canine to back of m_3	7·6	8·5	8·2

* It may well be noticed that all the (4) specimens, including the

Rhinolophus fumigatus exsul, subsp. n.

Diagnosis.—Apparently similar in all essential characters to *Rh. fumigatus* (= *Andersoni*), but decidedly smaller. Forearm 49.5 mm.

External characters.—To judge from a dried skin, the shape of the nose-leaves and ears is the same as in *Rh. fumigatus*. The lateral margins of the sella bear the dense clothing of long hairs characteristic of the *fumigatus*-group of species; the hairing on the front face of the sella seems to be sparser and shorter than in the typical form. General colour above dark greyish "drab," darkest on the hinder part of the back, brighter drab on the underside of the body; base of hairs, throughout, dark smoke-grey.

Measurements.—Under the next form.

Type.—Ad. (skin). Kitui, British East Africa, 3500 ft., Jan. 3rd, 1901; collected and presented by Mrs. H. Hinde. B. M. no. 1.5.6.3. Original no. 68. The type is the only specimen known to me.

Distribution.—Probably the whole of the Ukamba district.

Remarks.—This is evidently a southern offshoot of *Rh. fumigatus*, cut off from the (Abyssinian) main stem of the species, and developed into a distinct race. From *Rh. Deckeni*, an inhabitant of nearly the same regions, it is easily distinguished by the longer and differently shaped nose-leaves, by having the margins of the sella clothed with long straight hairs, by the much smaller size (forearm in *Rh. Deckeni* 54.7 mm.), by having the 4th metacarpal only about 2 mm. longer than the 3rd (in *Rh. Deckeni* 5 mm. longer), by the comparatively very short 2nd phalanx of the 5th finger, &c. I have not seen a skull of this form; it will, no doubt, be found to have lost both the lower p_3 and the upper p^2 , agreeing in this respect with *Rh. fumigatus* and differing from *Rh. Deckeni*.

Rhinolophus Hildebrandti eloquens, subsp. n.

Diagnosis.—A small race of *Rh. Hildebrandti*. Forearm 57.7–60.5 mm.

Wings.—*Rh. Hildebrandti* is among the largest species of

type, of *Rh. a. Andersoni* are immature (though apparently full-grown or very nearly full-grown) individuals, as proved by the still not ankylosed epiphyses of the metacarpals and phalanges. This must be borne in mind when comparing their measurements with those of the adult *Rh. a. brachygnathus*. It will be seen that, notwithstanding their smaller size (and immature size), the specimens of *Rh. a. Andersoni* have markedly larger skulls and teeth than those of *Rh. a. brachygnathus*.

its genus; *Rh. H. eloquens* barely surpasses *Rh. ferrum-equinum*. The reduction in size affects mainly the forearm and metacarpals, far less the phalanges. In the length of the forearm the *largest* specimens of *Rh. H. eloquens* fall short of the *smallest* individuals of the typical form; this character, therefore, evidently affords a most reliable mark of distinction between the two races. As to the metacarpals, maximum measurements of *Rh. H. eloquens* approach, very closely, minimum measurements of *Rh. H. typicus*.

Colour.—*Rh. Hildebrandti* (4 skins) is dark greyish "drab" on the upperside, bright drab beneath. *Rh. H. eloquens* (3 skins) is tinged with "wood-brown" above, next to "broccoli-brown" beneath. Base of the hairs, on the upper and under sides, dark smoke-grey. Immature individuals (1 skin) are slightly duller in colour than adults.

Skull and dentition.—All the measurements markedly smaller than in typical *Rh. Hildebrandti*. The length of the upper and lower tooth-rows, as being almost quite independent of the individual variation, is the best character by which to distinguish between the skulls of the two forms (conf. measurements below). In *Rh. Hildebrandti* (6 skulls) the upper p^2 is nearly always present and easily perceptible; the lower p_3 very minute, but generally not completely wanting. In *Rh. H. eloquens* p^2 is exceedingly small, hair-fine, even under a strong lens; p_3 (as it appears from examination of four skulls) almost always wanting, even in immature specimens.

Type.—Ad. (sk.), unsexed. Entebbi, Uganda; collected and presented by F. J. Jackson, Esq. B. M. no. 99. 8. 4. 4. Three other specimens, from the same locality, are preserved in the Museum.

Distribution.—Probably the whole of the district surrounding Albert, Albert Edward, and Victoria Nyanza.

Remarks.—The present form is of great interest from a phylogenetic no less than from a zoogeographical point of view. *Rh. Hildebrandti* and *Rh. fumigatus* (= *Antinorii*)* form a well-defined group of species, agreeing in the general form of the ears, in the size and shape of the horseshoe, the sella, and the posterior connecting-process, in having the margins and front face of the sella clothed with long hairs, in the general form of the wings, the comparative shortness of the tail, and the more essential characters of the skull

* Together with *Rh. aethiops*; but this species, although extremely interesting as the hitherto only known West-African representative of the group, has a more isolate position, differing much more from the two other species than these latter *inter se*.

and dentition. Until now, however, the very large *Rh. Hildebrandti* and its small counterpart, *Rh. fumigatus*, have been without any intermediate link, widely separated in size as well as in geographical distribution. *Rh. H. eloquens* greatly reduces the gap between the two species; in all the points in which *Rh. H. eloquens* differs from *Rh. Hildebrandti typicus*, it approaches *Rh. fumigatus*—in size, in colour, in dentition. *Rh. Hildebrandti* is decidedly the most primitive form: the upper p^2 is distinctly perceptible, the lower p_3 only occasionally wanting; in the Uganda race p^2 is markedly reduced in size, p_3 almost always completely lost; in the northern *Rh. fumigatus* p^2 is but very rarely present, p_3 never. Uganda, the typical locality of *Rh. H. eloquens*, is, so to speak, "on the way" between the areas of *Rh. Hildebrandti* (from Mazoe to Mombasa) and *Rh. fumigatus* (S. Somali and Abyssinia). It is not improbable that, when the region between Uganda and Abyssinia is better explored, we shall have to regard *Rh. Hildebrandti* and *Rh. fumigatus* no longer as distinct "species," but rather as *peripheral forms* of one species, bound together by races intermediate in characters and in geographical distribution.

The subjoined table of measurements gives the difference in size, from the smallest form of *Rh. fumigatus* to the largest form of *Rh. Hildebrandti*. If I had been arranging the forms from a phylogenetic point of view, the order would have been just the reverse (the names of the races read from right to left).

	<i>Rh. fumigatus.</i>				<i>Rh. Hildebrandti.</i>			
	<i>ersul.</i> Type. Ad.	<i>f. typica.</i> 7 ad. spems., 1 skull.		<i>eloquens.</i> 3 ad. spems., 4 skulls.		<i>f. typica.</i> 11 ad. spems., 6 skulls.		
		Min. mm.	Max. mm.	Min. mm.	Max. mm.	Min. mm.	Max. mm.	
Forearm	49.5	51	54	57.7	60.5	62	67	
3rd metacarpal	35	36	38	39.8	42	42.3	46	
4th metacarpal	36.8	37	41	42.5	44	44.2	47.8	
5th metacarpal	38	39	41.8	44	45.2	45.3	48	
Mandible, condylus to front of incisors ..	..	..	15.8	17.2	17.5	18.8	19.8
Front of upper canine to back of m^3 ....	..	..	8.1	9	9.2	10	10.2
„ lower canine to back of m_3 ....	..	..	8.5	9.6	10	10.8	11

VII.—*New African Mammals of the Genera Glauconycteris, Lutra, Funisciurus, Arvicanthus, Lophiomys, and Procavia.*
By OLDFIELD THOMAS.

Glauconycteris papilio, sp. n.

Allied to *G. variegatus*, Tomes, with which it has hitherto been confounded; but the acquisition by the British Museum of the co-types of that species in the Tomes collection enables me to clear up the confusion.

Size smaller than in *variegatus* (forearm 41 instead of 45). General colour of the ends of the hairs above uniform clay-colour from head to rump, exactly matching the posterior back of *variegatus*, but in the latter the head and shoulders are whitish, the clay-colour being only present posteriorly. Individually the hairs are pale slaty basally, then silvery cream-colour, the tips being pale brownish clay-colour. Under surface uniform cream-buff from chin to anus, the corresponding part of *C. variegatus* being white. Wings and interfemoral membrane variegated as in the allied species. Inner basal lobe of ear rounded.

Skull as in *G. variegatus*, but shorter, while nearly as broad. Inner upper incisors similarly unicuspid; outer minute.

Dimensions of the type (measured in skin):—

Forearm 41 mm.

Third finger, metacarpus 40, first phalanx 15, second phalanx 27; fifth finger, metacarpus 38, first phalanx 9, second phalanx 9; lower leg and foot (c. u.) 27.

Skull: greatest length 13·2; median basal length 10·2; breadth of brain-case 8·2; front of canine to back of m^3 5.

Hab. (of type). Entebbi, Uganda. Other specimens from Gambaga, Gold Coast (*Giffard*), and Tette, Zambesi (*Boyd Alexander*).

Type. B.M. no. 99. 8. 4. 14. Collected 10th April, 1895, and presented by F. J. Jackson, Esq.

Mr. Tomes's collection contains six specimens of "*Scotophilus variegatus*," among which two labelled in his handwriting can be identified as those of which he gave the dimensions in his original description*. Dobson's statement that the type of this species was in the Berlin Museum was therefore erroneous.

The beautiful "butterfly-bat" now described has been

* P. Z. S. 1861, p. 36.

hitherto considered by de Winton * and myself as *G. variegatus*, but it may be readily distinguished by the characters above described.

Lutra capensis Hindei, subsp. n.

Two years ago I described the Abyssinian representative of the large Cape clawless otter (*Lutra capensis*) as a special subspecies under the name of *Lutra c. Meneleki* †.

The British Museum has now received from Dr. S. L. Hinde the skin and skull of an old male otter of this group from Fort Hall, British East Africa, where it had been found drowned in a native fish-net. The specimen was skinned and prepared by Mrs. Hinde, whose scientific enthusiasm in performing so serious a task is worthy of much admiration. The only other East-African otter that I have seen is the skin mentioned by W. L. Sclater ‡, which was taken in the Victoria Nyanza and sent home by Col. Delmé-Rudelffe; but that having no skull is of little help for purposes of comparison.

In external characters the Fort Hall otter agrees more closely with South-African specimens than with that from Abyssinia, as it has the wool-hairs of the body broadly tipped with brown as in the former animal, while in the latter they are nearly wholly white. Throughout it is a dark form, the throat less white than in most members of the group, and the dark patches at the bases of the whiskers unusually well marked. Ears entirely brown, without white edging.

The skull is remarkably small as compared with that of either the Abyssinian or Cape forms, and on this account I think it necessary to give a special name to the animal, calling it *Lutra capensis Hindei*. The difference may be seen on a comparison of the measurements now given with those of the type of *L. c. Meneleki*.

The forehead is narrow, the postorbital processes little developed, although the individual is an old one with much worn teeth, and the cranial ridges comparatively low. Nasal opening shaped as in *Meneleki*, but much smaller. The teeth are of the usual character, but the upper molar is not so large in area or so produced postero-internally as it is in *Meneleki*.

The following are the dimensions of the skull:—

Basal length 118 mm.; zygomatic breadth 94; mastoid breadth 80; breadth of nasal opening 18; interorbital

* Ann. & Mag. N. H. (6) xx. p. 317 (1897), and (7) iv. p. 354 (1899).

† P. Z. S. 1902, ii. p. 309.

‡ P. Z. S. 1903, i. p. 191.

breadth 29.5; tip to tip of interorbital processes 31.5; interorbital breadth 26.5; palate length (exclusive of median spine) 62.5; breadth of posterior palate 16; antero-posterior diameter of p^1 12.9; greatest diameter of m^1 17.5, antero-posterior diameter of its inner lobe 12.1.

The length of the hind foot (s. u.) is 134 mm.; ear 21.

Hab. Fort Hall, Kenya District, British East Africa.

Type. Old male, B.M. no. 4. 12. 6. 8. Presented by Mrs. S. L. Hinde.

Since the above was written, Mr. F. J. Jackson has presented to the Museum another specimen of this otter, also a male, obtained some years ago on Lake Naivasha. It agrees very closely with Mrs. Hinde's example in colour and size, the basal length of the skull being 116 mm. The nasal opening, however, is narrower and higher, its shape being therefore less constant than might have been expected.

Funisciurus pyrrhopus leonis, subsp. n.

Closely allied to the Gold-Coast *F. p. leucostigma*, Temm., but with the following differences:—Middle of crown and top of muzzle dark olivaceous like the back, the rufous or yellowish which surrounds the eyes not extending across the muzzle as it does in *leucostigma*. Ears larger, conspicuously white behind, the white forming also a prominent postauricular patch behind their posterior bases; in *leucostigma*, although there is some white behind the ears, it is much less conspicuous and less extended. Light lateral band narrower. Flanks a richer rufous than in *leucostigma*; the outer sides of the hips especially rich rufous; in *leucostigma* the sides of the hips are only a dull suffused fulvous. Middle of underside of tail dull and inconspicuous rufous, instead of bright and prominent fulvous or rufous.

Dimensions of the type (measured in the flesh):—

Head and body 200 mm.; tail 150; hind foot (s. u.) 44; ear 12.5.

Skull: greatest length 49; length of upper tooth-series 9.5.

Hab. Bo, Sierra Leone. Altitude 120 m.

Type. Female. B.M. no. 4. 11. 1. 5. Collected 20th January, 1904, by Mr. Robin Kemp. Two specimens.

It is to be noticed that while the flanks and sides of hips are more rufous than in *leucostigma*, the muzzle and the underside of the tail are less so. The white on and behind the ears is also noticeably more conspicuous.

Arvicanthis setosus, sp. n.

A pale-coloured species without dorsal stripes.

Size medium. Fur long, the ordinary hairs of the back about 11–12 mm. in length, profusely mixed with much longer bristly hairs, averaging 20–22 mm. in length on the rump. General colour pale yellowish grey, the hairs each with a broad buffy yellow subterminal ring, the whole very heavily lined with the black tips to the ordinary hairs. Tips of long setæ of rump buffy yellowish. Under surface greyish white, the bases of the hairs slaty, their tips white; no sharp line of demarcation on sides. Sides of muzzle and orbital rings yellow. Ears yellowish brown. Outer side of limbs like body; inner side thinly haired, but not naked, whitish; upper surface of hands and feet dull buffy white. Tail black above, dull whitish below and on the sides.

Skull of normal size and proportions, the incisors not unusually large. Palatal foramina narrow, little open, reaching just behind the anterior point of m^1 .

Dimensions of the type (measured by the collector):—

Head and body "110" mm. (probably more); tail 112; hind foot 29; ear 17.

Skull: greatest length 32; basilar length 26.3; zygomatic breadth 17; length of nasals 11; interorbital breadth 4.5; breadth of brain-case 14; palate length 14.5; diastema 8; palatal foramina 6.1×1.8 ; length of upper molar series 6.8; breadth of m^1 2.1.

Hab. Fra-Fra Country, Gold Coast Hinterland. Alt. 150 m.

Type. Male. B.M. no. 99. 6. 15. 13. Collected 7th February, 1899, and presented by Capt. W. Giffard.

This species is much paler and yellower than *A. rufinus*, the only other W.-African species without dorsal lineation.

Lophiomys testudo, sp. n.

As long ago as 1898 Mr. F. J. Jackson made the first discovery of the remarkable genus *Lophiomys* in East Africa, and presented the specimen which he had captured at the Ravine Station to the National Museum. Being in doubt as to its relationship with the Somali *Lophiomys Smithi*, Rhoads, Mr. de Winton, when working out Mr. Jackson's collection, made no reference to the *Lophiomys*, but afterwards incidentally mentioned it in Anderson's 'Mammals of Egypt' *.

In 1902 Mr. C. S. Betton presented to the Museum two further specimens, which had been captured, the one by himself and the other by Mr. S. Couper, in very much the same region.

A comparison of this material with an Abyssinian example

* P. 291 (1902).

of *L. Imhausi*, and with Mr. Rhoads's description* of *L. Smithii*, convinces me that the E.-African form is quite distinct from the others, and I would propose to call it *Lophiomys testudo*.

Size smaller than in *L. Imhausi*, larger than in *L. Smithii*. Long hairs of back about 65 mm. in length, broadly tipped with white on body, limbs, and tail. Underfur about 45-50 mm. long, as compared to 20 in *L. Smithii*, the length to the base of the black terminal band about 27 mm. Basal third of the underfur dark brown, middle third white, tip black, the contrast between the colours more marked than in *L. Imhausi*. Suborbital white spot well marked. Dark band dividing the frontal from the auricular white patch scarcely perceptible. Inner aspect of ears broadly margined above with white, but the lower half is dark brown, including the base of the outer margin. Hairs of lateral line olive. Under surface hoary grey, not darker along the median line. Upper surface of hands and feet blackish. Tail with its underfur mixed whitish and black, the tip for a length of about half an inch sharply contrasted white.

Skull larger and, especially, markedly broader than in *L. Smithii*. Nasals narrower behind than in front. Interorbital more than half the total frontal breadth. Small keystone portion of squamosals separating the frontals from the rugose wing of the molars long antero-posteriorly (4.5 mm.), narrow (2 mm.) transversely. A marked angular concavity on the outer side of the maxillary zygomatic process just in front of the anterior angle of the malar. Palatal foramina comparatively short, ending just anterior to the front edge of m^1 .

Dimensions of the type (measured in the flesh):—

Head and body 296 mm.; tail 176; hind foot 44; ear 29.

Skull: greatest length 58.2; basilar length 47.4; greatest breadth 37.5; nasals, length 20.5, anterior breadth 8.8, posterior breadth 7.5; interorbital breadth 13.5; greatest frontal breadth 24.2; palate length 2.7; diastema 15.1; palatal foramina 9.3 × 4.3; length of upper molar series 12.6.

Hab. (of type). Ravine Station, British East Africa. Mr. Betton's specimens from El Burgon Station and Mile 513 of the Uganda Railway.

Type. Female. B.M. no. 99. 8. 4. 97. Collected 15th March, 1898, and presented by Mr. F. J. Jackson.

This East-African representative of the genus *Lophiomys* differs from its nearest ally, *L. Smithii*, Rhoads, by its longer

* Pr. Ac. Philad. 1896, p. 524.

underfur, much broader skull (37.5 mm. as compared with 31), and shorter palatal foramina, which do not penetrate between the molars.

There is a certain amount of difference between the typical skull obtained by Mr. Jackson and that presented by Mr. Betton in the detailed proportions of the parietals and squamosals and in the form of the anteorbital foramina; but without further specimens it is impossible to express any opinion as to the cause or value of these differences.

Since the above was written Mr. S. L. Hinde has presented to the Museum another specimen of this animal obtained by him on the Abudau Range at an altitude of 10,000 feet. It agrees with the type in all important respects.

Procavia Goslingi, sp. n.

A hypsodont species with an elongate orange-coloured dorsal spot.

Fur rather short, though not harsh; hairs of back about 16–17 mm. in length. General colour above from nape to rump dull sandy yellowish, something between Ridgway's "isabella" and "clay-colour," slightly speckled with black on the posterior back. Basal half of the hairs dark chocolate-brown. Under surface and inner side of limbs dark buffy, the line of demarcation on sides not sharply defined. Head greyish brown ("hair-brown") without yellowish suffusion, conspicuously different from the rest of the upper surface; top of muzzle darker. Ears of medium size, rounded, their outer surface yellowish grey, inconspicuously edged with black anteriorly; inner surface glossy yellowish. Outer side of limbs and upper surface of hands and feet to the hoofs greyish fawn, less suffused with yellow than the back. Dorsal spot narrow, elongate (40×7 mm.), its hairs uniformly deep orange from base to tip.

Skull as usual in this group, its general proportions as shown by the measurements.

Dimensions of the type (measured in skin):—

Head and body 450 mm.; hind foot 67.

Skull (stage iii.): basal length 72; greatest breadth 48; nasals 19×21.5 ; diastema 11; breadth of m^1 7.5; height of m^1 7.1.

Hab. Nertang, Yerghum Country, Northern Nigeria. Alt. 360 m.

Type. Immature male. Original number 24. Collected 29th June, 1904, and presented by Capt. G. B. Gosling.

Native names: in Yerghum "Chium"; in Hausa, "Rema."
—*G. B. Gosling.*

This remarkably coloured dassy is quite unlike any species known to me. Its nearest ally is probably *P. Kerstingi*, Matschie*, from E. Togoland, but that has wholly black backs to its ears, and the hairs of its dorsal spot are dark for their basal halves.

VIII.—*Eocene Shells from Nigeria.*

By R. BULLEN NEWTON, F.G.S.

[Plate V.]

THE names of the shells about to be described in this paper have already been published in list-form by the present writer † in 'The Geographical Journal' for November 1904, accompanied by a digest of the literature bearing upon the palæontology of Nigeria and adjacent territories.

The specimens were collected by Colonel G. S. McD. Elliot, R.E., and Captain Lelean, R.A.M.C., of the Anglo-French Niger-Chad Boundary Commission, at Kalfu-Tamaskie and Garadimi, in Northern Nigeria, and subsequently presented to the Geological Department of the British Museum by those officers.

A few general points of interest connected with these shell-remains are referred to in the following quotation, from the article in 'The Geographical Journal':—

"Some of these specimens are preserved as limestone-casts, among them being several *Lucina*, which I have called *L. cf. Menardi* and *L. cf. pharaonis*, and which represent most probably the forms referred to in Lapparent's papers as *L. cf. gigantea*. All three species, however, are typically Eocene, and have mostly been recorded from Egypt or Southern European countries. The specimens of *Alectryonia cf. Martinsi*, originally described from India by J. de C. Sowerby under the name of *Ostrea orbicularis*, help to support the theory that this ancient sea had an extensive eastward direction in Eocene times. The peculiar Ostreiform genus *Vulsella*

* SB. Ges. Nat. Berl. 1899, p. 59.

† R. Bullen Newton, "A Notice of some Marine Tertiary Fossils from Northern Nigeria, collected by Colonel G. S. McD. Elliot, R.E., and Captain Lelean, R.A.M.C., of the Anglo-French Boundary Commission," *The Geographical Journal*, 1904, vol. xxiv. pp. 522-524.

may also be referred to as characteristically Eocene, whilst among the Gastropods *Volutilithes cithara* is important from the distribution point of view, being known from the Eocene areas of England, Europe, Egypt, and India."

Moreover, everything seems to prove that this fauna is of Middle Eocene or Lutetian age, thus confirming the opinion of Professor A. de Lapparent*, who first made us acquainted with the presence of rocks of that horizon in the Soudan area of Africa, from an examination of fossils obtained by Captain Gaden at the same locality as yielded those collected by the British officers, viz. Tamaskie, which is said to be 400 kilometres west of Zinder. These fossils comprised the following Mollusca and Echinoids, the latter having been determined by M. Victor Gauthier:—

MOLLUSCA.	{ <i>Nautilus</i> cf. <i>Lamarcki</i> , Deshayes. <i>Nerita</i> (<i>Velates</i>) <i>Schmideliana</i> , Chemnitz. <i>Lucina</i> cf. <i>gigantea</i> , Deshayes.
ECHINOIDEA.	{ <i>Plesiolampas</i> , sp. n. <i>Linthia</i> cf. <i>Ducroequi</i> , Cotteau. <i>Rhabdocidaris</i> (<i>Leiocidaris</i>).

The distribution of Eocene rocks in African territory north of the Equator appears to be very considerable, since fossils have been recorded of that age from the Cameroons by Dr. Paul Oppenheim †, which were obtained by Dr. Esch, the same palaeontologist having also evidence of the Eocene formation at Dahomey from a shell submitted to him by Dr. Joh. Boehm; and, again, Prof. G. Vasseur ‡ has reported the occurrence of Eocene Foraminifera found at a depth of 230 metres in the kingdom of Senegal. In the more northern and eastern parts of Africa these rocks are again largely developed (including Morocco, Algeria, Egypt, Somaliland, &c.), so that it is quite certain that the Eocene sea must have covered an extensive area of that continent in ancient Tertiary times.

* A. de Lapparent, "Sur les traces de la Mer Lutétienne au Soudan," and "Sur de nouveaux fossiles du Soudan," *Comptes Rendus*, 1903, vol. cxxxvi. pp. 1118 & 1297.

† Paul Oppenheim, "Vorläufige Mittheilung über des auftreten von Eocän in Kamerun," *Centralblatt Mineralogie, Geol. u. Pal.* (Stuttgart) 1903, no. 12, pp. 373, 374; "Ueber Tertiärfossilien wahrscheinlich Eozänen alters, von Kamerun," *Beiträge Geologie von Kamerun*, by Dr. Ernst Esch, &c., 1904, pp. 243-285, pls. vi.-ix.

‡ S. Vasseur, "Sur la découverte du terrain nummulitique dans un sondage exécuté à Saint-Louis du Sénégal," *Comptes Rendus*, 1892, vol. cxxxiv. pp. 60-63.

DESCRIPTION OF THE SPECIMENS.

LAMELLIBRANCHIA.

Ostrea varilamella?, Deshayes.

Ostrea varilamella, Deshayes, Desc. Anim. sans Vert. 1861, vol. i. pls. lxxxii., lxxxiii., & vol. ii. p. 109; Archiac, in Tchihatcheff's 'Asie Mineure,' Paléontologie, 1866-1869, pl. x. & pl. xi. fig. 1, p. 135; Zittel, Palaeontographica [Libyschen Wüste], 1883, vol. xxx. p. cxi.

The specimen, referred doubtfully to this species, consists of a fragment of an upper valve without, however, its hinge-area. It shows great thickness of shell-structure (= 13 millimetres), somewhat distant lamellæ of growth, and a portion of an extensive scar-impression. Beyond the scar-margin the surface of the valve is rounded, smooth, slightly undulating, and dipping towards the outer edge. In the absence of more perfect material, a closer determination is scarcely possible, although the general facies of the specimen compares favourably with the figures and descriptions of this species.

Loc. Kalfu-Tamaskie.

Collector. Colonel Elliot.

Alectryonia cf. *Martinsi*, Archiac.

Ostrea orbicularis, J. de C. Sowerby, Trans. Geol. Soc. London, 1840, ser. 2, vol. v. pt. 2, pl. xxiv. fig. 8, non Linnæus.

Ostrea Martinsi, Archiac, Mém. Soc. Géol. France, 1850, sér. 2, vol. iii. pt. 2, pl. xiii. fig. 25, p. 438.

This form is represented by two fragments of a small, depressed, suborbicular, and ostreiform shell having both its valves plicated, and therefore a true *Alectryonia*. Its shape and the bifurcation of the strong, prominent, and rounded costæ suggest affinities with *A. Martinsi*, from the Eocene beds of Cutch and Biarritz, though probably the valves of that shell are rather more convex.

Loc. Kalfu-Tamaskie.

Collector. Colonel Elliot.

Vulsella nigeriensis, sp. n. (Pl. V. figs. 4, 5.)

The collection contains a small subcircular form of *Vulsella* of greater horizontal than vertical measurement. The umbones are nearly central, divergent, and acute, whereas the sides of the valves are furnished with about nine convex radial costæ separated by shallow grooves, which proceed

from just below the umbonal area. Where the original shell is preserved, it is seen to be ornamented with very fine concentric striations originating from the summits, having the tendency of rendering the radial costæ somewhat indistinct. The specimen likewise possesses a well-sculptured triangular chondrophore (fig. 5), so characteristic of the genus, the outer posterior sides of which form a pseudo-alation extending from the divergent summits.

Both valves of the specimen are in the closed condition.

Vulsella is a characteristic genus of Eocene rocks, the present species mainly differing from other described forms in its rounder and more depressed valves.

Dimensions. Umbono-ventral 27 mm.; antero-posterior 30; diameter 11.

Loc. Kalfu-Tamaskie.

Collector. Colonel Elliot.

Spondylus cf. subspinosus, Archiac. (Pl. V. figs. 6, 7.)

Spondylus subspinosus, Archiac, Mém. Soc. Géol. France, 1850, sér. 2, vol. iii. pt. 2, pl. xiii. fig. 1, p. 437 (Biarritz); and in Tchihatcheff's 'Asie Mineure,' 1866-1869, Paléontologie by Archiac, pl. xi. figs. 2, 3, p. 149; R. B. Newton, Quart. Journ. Geol. Soc. 1904, vol. lx. pl. xxiv. figs. 24 & 25, p. 289 (Turkey).

This form of *Spondylus*, although related to *S. subspinosus*, a species found in the Eocene rocks of Biarritz, Turkey, and Asia Minor, is slightly more convex, and has a greater number of costæ, and consequently narrower longitudinal grooves. The sculpture-striations (fig. 7) are, however, very similar, being close together and nearly horizontal. The only example found was the larger or lower valve.

Dimensions. Umbono-ventral 48 mm.; antero-posterior 40; diameter 20.

Loc. Kalfu-Tamaskie.

Collector. Colonel Elliot.

Cardium sp.

This specimen consists of a rough cast showing no sculpture characters, but possessing closed valves with a greater height (= umbono-ventral measurement) than length (= antero-posterior measurement), and showing subcentral and rather convex umbones, the hinge-area being somewhat shortened. It is almost impossible from its condition of preservation to suggest any species with which this specimen might be related, although its oblong and subglobose form resembles *Cardium gratum* of Deshayes, a European Eocene species,

which has recently been recorded by Oppenheim from Egyptian rocks of similar age ('Palæontographica,' 1903, vol. xxx. part 3, p. 153).

Dimensions. Umbono-ventral 40 mm.; antero-posterior (approximate) 37; diameter 24.

Loc. Kalfu-Tamaskie.

Collector. Colonel Elliot.

The following casts of *Lucina* probably comprise what Prof. de Lapparent has referred to under the designation of *Lucina* cf. *gigantea*:—

Lucina cf. *Menardi*, Deshayes. (Pl. V. fig. 8.)

Lucina Menardi, Deshayes, Desc. Coq. Foss. Paris, 1825, vol. i. pl. xvi. figs. 13 & 14, p. 94.

Lucina Menardi?, Bellardi, Mem. R. Accad. Sci. Torino, 1854, ser. 2, vol. xv. p. 188.

This form is represented by three limestone-casts with closed valves in very fair condition of preservation. It is of larger size than *L. pharaonis*, and showing coarser radial striations. It differs also from *L. gigantea* in possessing more ventricose valves.

One of the specimens (fig. 8) from Kalfu-Tamaskie exhibits the long, narrow, anterior adductor scar lying slightly above the pallial line. The size of the same specimen agrees with the published figures of Deshayes, which are said to be of natural size, a statement which, however, does not agree with the text, where greater dimensions are given.

Dimensions (the Garadimi specimen). Umbono-ventral 56 mm.; antero-posterior 58; diameter 26.

It is interesting to note in connexion with this determination that Bellardi doubtfully referred an Egyptian fossil to this species.

Locs. Kalfu-Tamaskie and Garadimi.

Collectors. Colonel Elliot and Captain Lelean.

Lucina cf. *pharaonis*, Bellardi. (Pl. V. fig. 9.)

Lucina pharaonis, Bellardi, Mem. R. Accad. Sci. Torino, 1854, ser. 2, vol. xv. p. 190, pl. ii. fig. 12; Oppenheim, Palæontographica, 1903, vol. xxx. pt. 3, pl. xiii. figs. 1 & 2, and pl. xv. fig. 6, p. 124.

Represented by natural casts with closed valves of various sizes, agreeing in its nearly circular shape and diameter with the same form from Egypt, as figured quite recently by Dr. Oppenheim and previously by Bellardi and others. The Nigerian casts exhibit numerous fine longitudinal striations

radiating from the umbonal area which are so characteristic of the internal surface-structure of Luciniform shells.

Dimensions. Umbono-ventral, largest 52 mm., medium 46; antero-posterior, largest 59, medium 47; diameter, largest 23, medium 20.

Locs. Kalfu-Tamaskie and Garadimi (fig. 9).

Collectors. Colonel Elliot and Captain Lelean.

Lucina sp. indet.

Specimen consisting of a natural cast of a Luciniform shell with closed valves possessing nearly central umbones and exhibiting rather wide concentric sulcations. There are also obscure indications of an angulated posterior area. It is of oval shape, somewhat resembling *Fimbria lamellosa*; but as that species has a more complicated sculpture, and is, moreover, without an angulated area, it need not be confused with the present specimen.

Dimensions. Umbono-ventral 40 mm.; antero-posterior 58; diameter 26.

Loc. Kalfu-Tamaskie.

Collector. Colonel Elliot.

Panopæa sahariensis, sp. n. (Pl. V. fig. 10.)

Shell of transversely oval shape, of greater length than height, with anterior umbones and straight hinge-line. Valves inflated in the umbonal region, depressed posteriorly, and with nearly parallel dorsal and ventral margins. Sculpture consisting of rounded, equidistant costæ, separated by fairly wide and shallow grooves.

Dimensions. Umbono-ventral 26 mm.; antero-posterior (approximate) 50 mm.; diameter 27.

Shell related to *Mya intermedia* of James Sowerby, occurring in the Eocene deposits of Britain and Europe, but appearing to differ chiefly in its lesser umbono-ventral measurement, and the possession of nearly parallel dorsal and ventral margins. The sculpture is very similar, the broad equidistant sulcations being clearly expressed. The dorso-posterior part of the valve shows an oblique depression extending from the umbonal region to the outer margin, whilst a second specimen proves that the anterior region was very short.

Two fragmentary natural casts with closed valves represent this form; that figured and described is imperfect anteriorly.

Loc. Kalfu-Tamaskie.

Collector. Colonel Elliot.

GASTROPODA.

Calyptræa nigeriensis, sp. n. (Pl. V. fig. 3.)

This form of *Calyptræa* is represented by a natural limestone-cast exhibiting fairly good external characters. It is a subglobular form, and possesses four slightly rounded, depressed whorls, the penultimate being of considerable depth (17 mm.) in front, the whilst the last is fractured and imperfect. The surface of the later whorls is ornamented with numerous straight, longitudinal, radial riblets, which are fine at first, but which afterwards become coarser, being thickest near the slightly impressed suture. These radial lines show certain obscure asperities which indicate the former presence of minute spines. The apical surface is apparently smooth.

Dimensions. Summit to margin of basal fracture 44 mm.; transverse diameter 50 mm.

This species appears to show a relationship to *C. aperta* of Solander, from the European Eocenes. It is, however, of less conical form, more spreading and depressed in its volutions, and with a more regular and generally coarser sculpture; the sculpture of *C. aperta* being of a vermicular character, and considerably more minute in the disposition of its spines. On the matrix of this specimen occurs the remnant of an Echinoid plate, with some prominent tubercles which may represent the genus *Rhabdocidaris* referred to in De Laparent's account of fossils from this area of Africa.

Loc. Kalfu-Tamaskie.

Collector. Colonel Elliot.

Volutilithes cithara, Lamarck. (Pl. V. fig. 2.)

Voluta cithara, Lamarck, Hist. Nat. Anim. sans Vert. 1822, vol. vii. p. 348; Deshayes, Desc. Coq. Foss. Paris, 1835, vol. ii. pl. xc. figs. 11, 12, p. 681; J. de C. Sowerby, Mineral Conchology, 1843, vol. vii. pl. 625, figs. 1, 2, 3; id. Dixon's 'Sussex,' 1850, pl. v. fig. 17, p. 106; F. E. Edwards, Mon. Pal. Soc. 1854, pl. xxiii. fig. 6, p. 176; Archiac, Desc. Anim. Foss. Nummulitique l'Inde, 1854, pl. xxxii. figs. 4, 5. p. 325; Zittel, "Libyschen Wüste," Palæontographica, 1883, vol. xxx. p. cviii.

Volutilithes cithara, Cossmann, Ann. Soc. R. Mal. Belgique, 1889, vol. xxiv. p. 195.

Consists of a limestone-cast of a small compressed example of a Volutiform shell, resembling in every way the *V. cithara* figured by Archiac from India, especially his figure 4, which is likewise a cast. It exhibits the distant longitudinal costæ with the smooth concave interspaces so characteristic of the species. The specimen is very much worn, so that no oblique spiral lines are observable at the anterior end. This

is a frequently found Eocene shell of England, Europe, Egypt, and India.

Dimensions. Length 35 mm.; max. diameter 19.

Loc. Garadimi.

Collector. Captain Lelean.

Rostellaria cf. *goniophora*, Bellardi. (Pl. V. fig. 1.)

Fusus goniophorus, Bellardi, Mem. R. Accad. Sci. Torino, 1854, ser. 2, vol. xv. pl. i. fig. 8, p. 181.

Rostellaria goniophora, Blanckenhorn, Zeitsch. Deutsch. geol. Ges. 1900, vol. lii. p. 446.

A rather compressed limestone-cast of what appears to be an example of Bellardi's *Fusus goniophorus*, from the Nummulitic rocks of Egypt. It comprises three whorls, the earlier part of the spire being absent, on two at least of which can be traced an obtuse posterior angulation beneath the suture. The front or apertural view exhibits the presence of a sharp carination extending from the posterior corner of the mouth, beneath which on the base of the shell occur rather distant, elevated spiral lines. No anterior canal is preserved, the specimen showing a fractured surface where that would originally have been situated. The dorsal aspect closely resembles Bellardi's figure; and it is interesting, further, to note that Dr. Blanckenhorn records the species from the *Alcetryonia Clot-Beji* beds (= Lutetian) of the Fajum district of Egypt.

Dimensions. Maximum diameter 25 mm.

Loc. Garadimi.

Collector. Captain Lelean.

Turritella cf. *egyptiaca*, Mayer-Eymar.

Turritella egyptiaca, Mayer-Eymar, Journ. Conchyl. [Paris] 1895, pl. ii. fig. 2, p. 41.

Two fragmentary specimens most probably related to this species. The best preserved exhibits the basal whorl and part of the penultimate separated by a fairly deep suture. This last whorl bears three equidistant carinations and a more obtuse one on the anterior margin formed of two spiral lines very close to each other. Obscure spiral lines are also present on the areas between the carinae. According to Mayer-Eymar, *T. egyptiaca* ranges from Upper Cretaceous rocks (Garumnian) to Lower Tertiary (Londonian).

Dimensions of last whorl. Height 19 mm.; width 13 mm.

Loc. Garadimi.

Collector. Captain Lelean.

Conus sp.

This specimen consists of a very rough natural cast of a *Conus* probably related to *C. deperditus* of Bruguière, which is found in Eocene areas. It is of broadly conical form, exhibiting the last three volutions, and furnished with a suture which, in the cast, is deeply canaliculated or concave. There are no sculpture-markings of any kind preserved, nor is the anterior end complete, although its general contour and facies would suggest its connection with a form like *C. deperditus*.

Dimensions. Maximum diameter 35 mm.

Loc. Garadimi.

Collector. Captain Lelean.

EXPLANATION OF PLATE V.

With the exception of figure 7, all the figures are drawn of the natural size.

Fig. 1. *Rostellaria* cf. *goniophora*, Bellardi, sp.

Fig. 2. *Volutilithes cithara*, Lamarek, sp.

Fig. 3. *Calyptrea nigeriensis*, sp. n.

Figs. 4, 5. *Vulsella nigeriensis*, sp. n. *Fig. 5* shows the chondrophore.

Figs. 6, 7. *Spondylus* cf. *subspinosus*, Archiac. *Fig. 7* shows the striated sculpture, magnified.

Fig. 8. *Lucina* cf. *Menardi*, Deshayes.

Fig. 9. *Lucina* cf. *pharaonis*, Bellardi.

Fig. 10. *Panopæa sahariensis*, sp. n.

IX.—On new Species of Helicarion, Ariophanta, Eulota, Cyclotus (Eucyclotus), Lagochilus, and Diplomatina (Gastroptychia). By HUGH FULTON.

Helicarion rugosa, sp. n.

Shell globosely depressed, thin, subtransparent, almost imperforate, light brown or horn-colour; whorls 4, slightly convex, upper whorls smooth, the lower covered with rugose spiral striae, underside of last whorl getting smoother towards the umbilicus, carinated at the periphery; aperture suboval; peristome simple.

Maj. diam. 40; alt. 23 mm.

Aperture: maj. diam. 23; alt. 20 mm.

Hab. N. Borneo (*Waterstradt*).

This large and striking form is quite distinct from any other species known to me.

Ariophanta innata, sp. n.

Shell sinistral, depressed, broadly and deeply umbilicated, dark brown above, rather light yellowish brown below, with a dark spiral band about 2 mm. wide at the periphery of last whorl, apex smooth, other whorls with somewhat distant arcuate rugose striae, underside of shell polished and smoother than upper part; whorls $5\frac{1}{2}$, slightly convex, last rather sharply descending at about 3 mm. from the edge of the peristome; aperture suboval, whitish within, the colour-band showing through; peristome slightly thickened, basal portion narrowly expanded and triangularly dilated at point of insertion, middle of upper margin slightly bent downwards, margins joined by a thin transparent callus.

Maj. diam. 42; alt. 18 mm.

Hab. Yunnan.

In form and coloration this species bears a superficial resemblance to the Javan species *A. Rumphii*, Busch, but is readily distinguished by its coarser sculpture and broadly open umbilicus.

Eulota flexibilis, sp. n.

Shell subglobular, moderately umbilicated, very thin, dark green below, lighter with brownish tint on earlier whorls, with numerous oblique, somewhat conspicuous folds, traces of spiral lines under the lens; whorls barely 5, moderately convex; aperture rather dark within; peristome flexible, very thin and acute, owing to which it bends inwards, triangularly expanded at point of insertion.

Maj. diam. 31; alt. 24 mm.

Hab.? Probably Saghalien Island (*Keppel Coll.*).

Very near *E. lata*, Gould, var. *Gudeana*, Pils., but has half a whorl less, is somewhat more depressed in form, and has less shelly matter in its composition, in fact hardly any; the whorls also increase more rapidly in size.

Eulota (Euhadra) fuscina, sp. n.

Shell subglobular, moderately but deeply umbilicated, of a rather thin substance, light golden straw-colour, apical whorls darker, last whorl encircled at the periphery by a dark brown band, which is continued at the suture of the middle whorls, getting narrower as it ascends, covered with close, conspicuous, raised, oblique striae, with numerous oblique folds on the last whorl, the place of a former peristome marked by a broad brown stripe, ornamented above and below with very

numerous impressed spiral lines, which can easily be seen without a lens; whorls $6\frac{1}{2}$, moderately convex, slightly depressed at suture of lower whorls, last descending; aperture subcircular, almost white within, outer band showing clearly through; peristome moderately expanded, margins brown.

Maj. diam. 34; alt. 27 mm.

Hab.? Probably Saghalien Island (*Keppel Coll.*).

In form and coloration somewhat similar to *E. miranda*, Smith, but more globose, and readily separated by its spiral sculpture. I had thought that it might possibly be a large form of *E. serotina*, Ad.; but Mr. G. K. Gude, who possesses a co-type of that species, kindly informs me that *E. serotina*, besides being smaller, is much smoother, its spiral sculpture is much weaker and the lines closer together.

Cyclotus (Eucyclotus) amabilis, sp. n.

Shell broadly umbilicated, depressed, solid, finely obliquely striated, some of the striae very conspicuous on underside of last half-whorl, yellowish brown, ornamented with short and rather distant narrow stripes (sometimes zigzag) of darker brown, these becoming obsolete on the last half-whorl; spire slightly raised; whorls 5, convex, regularly increasing; aperture circular, whitish; peristome double at outer, single at columellar portion, the outer peristome being expanded at the upper part and forming a short canal at its termination; operculum shelly, slightly concave, having 12 whorls.

Maj. diam. 26; alt. 12 mm.

Hab. N. Borneo (*Waterstradt*).

Chiefly distinguished from other species known to me by its large oblique aperture and well-produced *Pterocyclus*-like channel at upper junction of the peristome.

Lagochilus proprium, sp. n.

Shell moderately umbilicated, globosely turbinate, yellowish brown, ornamented on last two whorls with narrow, oblique, yellowish stripes; whorls $5\frac{1}{2}$, very convex, finely striated, with four spiral threads or lirae on last whorl, the upper one ascending the penultimate whorl; aperture circular; peristome narrowly expanded, operculum normal.

Maj. diam. $6\frac{3}{4}$; alt. 7 mm.

Hab. Borneo (*Keppel Coll.*).

At first I thought that this characteristic *Lagochilus* might be *L. Keppeli*, Godw.-Aust., but that species has more spiral threads and the peristome is more expanded. Some specimens are of a uniform rather light yellowish-brown colour, the stripes being absent.

Diplommatina (Gastroptychia) electa, sp. n.

Shell sinistral, oblong-conic, greyish brown, moderately solid, ornamented by fine and close-set oblique striæ; whorls 8, distinctly convex, regularly increasing; aperture subovate, orange within; peristome double, the inner part exerted forward and the outer expanded, orange-colour; columella tortuous, expanded at point of insertion, bearing a distinct plait on the lower part, which is continued within the aperture; two interior plaits or callosities are seen from the exterior, more plainly if the shell be wetted, the first appears as a perpendicular orange-coloured line commencing just above the point of insertion of columella and directed upwards, the other runs near to and parallel with the suture, and is situated just to the right of the aperture.

Maj. diam. $3\frac{1}{2}$; alt. $6\frac{1}{2}$ mm.

Hab. N. Borneo (*Waterstradt*).

This distinct species can easily be separated from *D. adversus*, Ad., by its more regular form, stronger sculpture, and more numerous whorls.

X.—On Chelonethi, chiefly from the Australian Region, in the Collection of the British Museum, with Observations on the "Coxal Sac" and on some Cases of Abnormal Segmentation. By C. J. WITH, Copenhagen.

[Plates VI.-X.]

THE observations included in this paper were all made on material belonging to the British Museum (Natural History). For the liberality with which the collections of Chelonethi were handed over to me I tender to the Director, Professor E. Ray Lankester, my best thanks. I am also grateful to Dr. W. T. Calman, because he assisted me with his extensive knowledge of literature, as well as to several members of the entomological staff, especially Col. Bingham, by whose kindness it became possible for me to investigate some specimens of Hymenoptera which were remarkable on account of their abnormal segmentation.

In the following pages I have first given a revision of the Australian species of *Chelifer*, because I had occasion to examine a good many of the described species, and among them several typical specimens. In addition to these, I have

described or redescribed several species from other parts of the world, which seemed to me of special interest. Owing to the fact that I have taken characters from several organs—for instance, the legs and antennæ—hitherto more or less ignored by students of this group, it has been necessary to give rather long descriptions. In this paper I have no occasion to discuss the generic value of several of these characters, but refer to another paper which I hope to publish shortly. The same is the case with my studies on the coxal sac of *Ch. socotrensis*, sp. n., of which I have given a short description without comparison with the corresponding organ in other nearly related forms. With regard to the ecdysis, about which scarcely anything is found in the literature, I refer to the description of *Ch. sculpturatus*, Lewis (p. 122).

Some cases of abnormal segmentation in *Ch. sculpturatus*, Lewis, and *Ch. javanus*, Thor., described in the third part of this paper, and compared with similar cases in other Arthropods and Annelids, are, perhaps, of more general interest.

I.—SYSTEMATIC PART.

The following synopsis of the species of the genus *Chelifer* from the Australian Region, as well as of those from other parts of the world described in this paper, has been difficult to get into proper shape on account of the very incomplete descriptions of many species; but, nevertheless, I hope that it will be fairly easy to identify most of the species by its help:—

- a. Femora and tibiæ of the palps beset with large subconical tubercles. *sculpturatus*, Lewis.
- b. Femora and tibiæ of the palps without any tubercles.
 - a¹. Femora of the palps at least three times longer than broad. Fingers shorter than hand.
 - a². Trochanter of the palps distinctly broader than the femur.
 - a³. Eyes distinct. Abdominal and tarsal "tactile" hairs present.
 - a⁴. Hairs partly clavate; skin shagreened *laysanensis*, Sim.*
 - b⁴. Hairs pointed; skin almost smooth; tarsus iv. with median "tactile" hair and only 1·5 times longer than femur iv. is high. Claws with

* *Ch. laysanensis*, Sim., and *Ch. megasoma*, Dad., each occur twice in this synoptic key, because the characters used under a¹-b⁴ and a²-b² are not mentioned in the original descriptions.

- anterior tooth; fingers without accessory teeth *bifissus*, Sim.
- b*³. Eyes or ocular spots not present. Abdominal and tarsal "tactile" hairs wanting; tarsus iv. at least twice longer than the femur is high; claws without teeth; fingers with accessory teeth.
- a*⁵. Femora of the palps without stalk, gradually widened out towards the extremity, four times longer than broad; inner margin of hand only slightly convex *hawaiiensis*, Sim.
- b*⁵. Femora of the palps without stalk, not gradually but rather abruptly widened out and broadest in the middle, less than four times longer than broad; inner margin of hand distinctly convex. *pacificus*, sp. n.
- b*². Trochanter of the palps not broader than femur. Femora stalked and not gradually widened out distally.
- a*⁶. Eyes distinct; hairs of tergites clavate, not pointed; two transverse grooves; abdominal "tactile" hairs present.
- a*⁷. Skin shagreened; hand a little longer than fingers *laysanensis*, Sim.*
- b*⁷. Skin with low granules; hand much longer than fingers; tarsus iv. with terminal tactile hair and twice longer than the femur is high; claws with anterior tooth *socotrensis*, sp. n.
- b*⁶. Eyes wanting; hairs pointed; no transverse grooves (?); hand much longer than fingers *meGasoma*, Daday.*
- b*¹. Femora of the palps not three times longer than broad; eyes wanting.
- a*⁸. Hairs of palps not always pointed, partly clavate or obtuse.
- a*⁹. Hairs of palps partly clavate. Femur not longer than tibia.
- a*¹⁰. Hand distinctly (1.5) longer than fingers; inner margin of hand convex, not semicircular *aequatorialis*, Daday.
- b*¹⁰. Hand not or only slightly (1.2) longer than fingers.
- a*¹¹. Finger longer than the hand is high; inner margin of hand not semicircular *scorpioides*, Herm. (?).
- b*¹¹. Finger as long as the hand is high; inner margin of hand semicircular; tarsus iv. without tactile hair and 2.5 longer than the femur is high; fingers with accessory teeth; lower tubercle of the trochanter rounded, not subconical *australiensis*, sp. n.

- b*⁹. Hairs of palps not clavate, but obtuse; femur distinctly longer than tibia; fingers a little shorter than hand and longer than the hand is high; tarsus iv. with median "tactile" hair; fingers with accessory teeth; lower tubercle of trochanter subconical *brevispinosus*, Keys.
- b*⁸. Hairs of palps pointed.
- a*¹². Tubercles of the trochanter exceedingly long, at least one subconical; ocular spots; no transverse grooves; tarsus iv. with basal "tactile" hair and only 1·3 longer than the femur is high *equester*, sp. n.
- b*¹². Tubercles of the trochanter moderate or wanting.
- a*¹³. At least one transverse groove.
- a*¹⁴. Fingers much shorter than hand, not longer than the hand is high; ocular spots *pallipes*, White.
- b*¹⁴. Fingers almost as long as hand.
- a*¹⁵. Ocular spots wanting; fingers scarcely shorter than hand, with accessory teeth; tarsus iv. with median "tactile" hair *pygmæus*, Keys.
- b*¹⁵. Ocular spots present; fingers distinctly shorter than hand *ramosus*, Keys.
- b*¹³. No transverse grooves; fingers distinctly shorter than hand.
- a*¹⁶. Femora more than twice longer than broad; no ocular spots *me gasoma*, Daday.*
- b*¹⁶. Femora of the palps only twice longer than broad.
- a*¹⁷. Hairs of the tergites within a distinct white spot *punctatus*, Keys.
- b*¹⁷. Hairs not situated in distinct white spots; hand higher than broad, distinctly longer than fingers *brevidigitatus*, Keys.

Geographical Distribution.

The following species of Pseudoscorpiones are known from the Australian Region:—

From the Australian continent: *Chelifer australiensis*, sp. n.; *Ch. brevidigitatus*, Keys.; *Ch. brevispinosus*, Keys.; *Ch. punctatus*, Keys.; *Ch. pygmæus*, Keys.; *Ch. ramosus*, Keys.; *Olpium longiventer*, Keys.

From New Guinea: *Chelifer æquatorialis*, Dad.; *Ch. me gasoma*, Dad.; *Ch. scorpioides*, Herm.; *Chthonius Wlassicsi*, Dad.; *Ideobisium bipectinatum*, Dad.

From New Zealand: *Chelifer pallipes*, White.

From New Caledonia: *Obisium antipodum*, Sim.

From Funafuti: *Garypus longidigitatus*, Rainbow; *Obisium antipodum*, Sim. (?).

From Sandwich Islands: *Ch. bifissus*, Sim. (?); *Ch. hawaiiensis*, Sim.; *Ch. pacificus*, sp. n.; *Garypus personatus*, Sim.

From Laysan: *Ch. laysanensis*, Sim.

I will prove later on (p. 100) that it is doubtful if the specimens of *Ch. bifissus*, Sim., from Sumatra and Hawaii really are the same species. The occurrence of *Ch. scorpioides*, Herm. (Daday, 4, p. 477), in New Guinea and *Obisium antipodum*, Sim. (Rainbow, 5, p. 108), at Funafuti cannot be accepted without further investigation. *Olpium* (*Ampliolpium*) *longiventer*, Keys., has been found on Hawaii and Funafuti according to Simon (9, p. 519) and Pocock (6, p. 321). I have examined the original specimens determined by these two naturalists, and a detailed investigation has convinced me that they are different from each other as well as from *Olpium longiventer*, Keys., and are most naturally referred to the genus *Garypinus*, Daday.

Description of Species.

Under the heading "Measurements" in the following descriptions the first figure in each case gives the greatest length of the organ referred to. The figures within brackets give, in the case of the body, antennæ, and palps, the breadth, or, when there are two figures, the greatest and least breadth. In the case of the legs the figures within brackets refer to the height of the joints.

Chelifer bifissus, Sim. (Pl. VI. figs 1 a-f.)

1899. E. Simon, (8) p. 121.

1900. E. Simon, (9) p. 517.

Cephalothorax.—The *eyes* are indistinct. The cephalothorax, which is slightly longer than broad, possesses two rather indistinct transverse *grooves*, which are almost straight. The second thoracic tergite has an indistinct longitudinal line. The smooth and brilliant skin bears short and dentated hairs.

Abdomen.—The abdomen, which is longer than broad, has the tergites of almost equal length as well as breadth, with the exception of the first three, which are shorter. The second to the tenth sclerites are divided by an indistinct longitudinal line; the sclerites are almost smooth and with a hindmost marginal row of rather long hairs, with some distal teeth; the median segments possess at least one lateral hair

in front of the row on each side; the eleventh tergite bears one pair of "tactile" hairs in addition to the usual, which are long and placed without order. The lateral membranes are provided with densely placed longitudinal wrinkles or ridges. The fourth to the eleventh sternites are scarcely different from the corresponding tergites.

Antennæ (fig. 1 a).—The *flagellum* seems to consist of three almost simple hairs. The immovable finger bears on the inner dorsal margin some few minute teeth just behind the tip and farther backwards three larger. The *galea* (fig. 1 a), which is scarcely longer than the distal curved hair, has at least six distal teeth. The *serrula* is composed of about 25 rather high teeth, of which the basal one has the usual wide flap.

Maxillæ.—The maxillæ, especially their distal portion, which is surrounded by a broad, exteriorly dentated lamina, are provided with many hairs.

Palps (fig. 1 b).—The palps are smooth, with the exception of the exterior surface of the trochanter. The hairs are rather scarce, slender, broken, and distally provided with a tooth; they appear rather long, especially on the inner side. The fingers possess several tactile hairs. The *trochanter*, which has a rather long stalk, is distinctly longer than broad; its inner outline is evenly convex, its outer more abruptly so; a slightly marked upper protuberance is present. The *femur*, which has a short rather distinct stalk, is not so broad as the trochanter; the inner surface is in the proximal half slightly convex and in the distal slightly concave; the outer side is evenly convex. The *tibia*, which has a moderately short but distinct stalk, is shorter than the femur and a little broader; the inner surface is beyond the notch, which marks off the stalk, moderately convex; the stalk has exteriorly a basal prominence, which forms part of the articulation, and a distal low elevation separated from the former by a little notch; the joint proper is at first almost straight and then distinctly convex. The *hand*, which is almost as long as but broader than the tibia, is evenly convex both inwards and outwards; it is broader than high and distinctly longer than the fingers, which scarcely gape when closed.

Coxæ.—The third and the second pairs of coxæ are of almost equal breadth and widened out distally; the fourth pair, which is almost as broad basally as distally, is as broad as the third is at the end; the hinder margin is almost straight and forms an obtuse rounded angle with the inner.

Legs (figs. 1 c-f).—The scarce hairs of the legs are almost all provided with one or two minute teeth distally, and

broken; the hairs of the ventral side are the longer; near the tip of the tarsus some simple hairs are found. The dorsal "tactile" hair of the fourth tarsi is nearer to the base than to the tip and scarcely shorter than the tarsus; dorsally near to the base of the claws there is a pair of curious hairs. The posterior hair of tarsus iv. (fig. 1*f*) is rather slender, and becomes suddenly thinner near the tip, where it is bifurcate; the lower branch is very slender, much the longest, and almost straight, while the upper is very short, most similar to a tooth (fig. 1*f*). The anterior hair is distinctly curved, rather suddenly pointed, and with a little dorsal tooth near the tip; the shape of this hair is consequently very similar to that found in *Chelifer javanus*, Thor., &c. The posterior hair of the first pair of tarsi is comparatively shorter than that of the fourth pair, and has the lower branch slightly curved downwards (fig. 1*e*) as in *Ch. socotrensis*. The anterior hair is moderately long and thick, and its distal enlarged portion bears at least three teeth. The claws possess a well-developed anterior tooth near the tip. The areola is shorter than the claws. The legs are short and rather stout; the trochantin of the first pair is very long. The tibia, which is moderately enlarged distally, is distinctly longer than the slightly pointed tarsus; the tarsus of the fourth pairs is comparatively much longer than the tarsus of the first.

Colour.—The palps are reddish brown; the cephalothorax is brilliant dark brown; the abdominal tergites are lighter brown and not brilliant. The coxæ and the maxillæ are reddish brown, lighter than the palps; the legs are yellowish brown.

Measurements.—Cephalothorax 0.560 (0.520); abdomen 1.300 (0.896) mm.

Palps: trochanter 0.308 (0.175); femur 0.550 (0.153); tibia 0.513 (0.189); hand 0.495 (0.257), height 0.225; fingers 0.380 mm.

Leg i.: femur 0.220 (0.120), trochantin 0.180; tibia 0.216 (0.081); tarsus 0.171 (0.053) mm.

Leg iv.: femur 0.405 (0.153), trochantin 0.171; tibia 0.315 (0.099); tarsus 0.216 (0.063) mm.

Material, Remarks.—I have examined Simon's specimen from Olan Hawaii. Mons. Simon writes:—"Le *Ch. bifissus* de Hawaii ne diffère en rien de celui de Sumatra." I have not had occasion to examine specimens from India, but, to judge from the description (8, p. 121), there are some differences not quite without importance. I hope my description will make it possible for those who have specimens from the latter region to settle the question whether the Pacific and

Indian specimens belong to the same species. The characters in which the Hawaii specimen differs seem to be the following:—The femur has a distinct stalk and is not so broad as the tibia; the hand is distinctly broader than the tibia and longer than the fingers; the galearia is not simple.

Chelifer australiensis, sp. n. (Pl. VI. figs. 2 a-g.)

Cephalothorax.—The *eyes* or ocular spots are missing. The cephalothorax, which is as broad behind as it is long, becomes gradually narrow in front; the sides are straight or almost so, passing gradually into the front margin through a moderate convexity. Two dark rather distinct *grooves* or lines are present; the first is nearly straight, while the second is moderately curved forwards in the middle; both grooves are, as usual, widened out laterally, showing that they represent the interarticular membrane between the convex anterior and posterior margins of the adjacent somites. The *skin* is minutely granular and provided with moderately short clavate hairs, of which the most prominent are set in transverse rows along the front margin of the head and the hindmost margins of the two tergites.

Abdomen.—The abdomen, which is almost as broad as long, is broadest just behind the middle. The sclerites of the tergites are of almost equal breadth, but the first three are, as usual, the shortest; the hinder margin of each sclerite covers the front margin of the following. There seem to be traces of lateral projections or keels on the tergites. The sclerites, with the exception of the eleventh, are divided by a longitudinal line. Their granulation is better marked than that of the cephalothorax. About thirty rather short but distinctly clavate hairs are placed along the hinder margin of the sclerites; besides, a single hair is placed laterally in front of the row on all the tergites with the exception of the first three; the last ones have, in addition, a median pair in front of the row. The hairs of the eleventh tergite are more irregularly arranged, and there seem to be no long, slender, pointed "tactile" hairs.

The lateral membranes possess densely placed undulated ridges. The fourth to the tenth sternites are, like the tergites, longitudinally divided; there is an increase in their length as well as in breadth from before backwards; the fourth is only half as broad and two thirds as long as the tenth sternite. The sclerites bear hairs along their hinder margins, which are less distinctly clavate, especially those of the front sternites, where they are almost simple.

The sexual area consists of a semilunar hairy plate behind the genital opening; in front and between the coxæ there is a long and broad plate, which has the hindmost margin slightly concave in the middle and is provided with many hairs; laterally this plate is nearly connected with the corners of the posterior plate. In the area between the two plates several minute internal organs are seen through the integument (fig. 2 a).

Antennæ (figs. 2 b-c).—The *flagellum* (fig. 2 b) is composed of four hairs, of which the foremost is the longest and the hindmost the shortest; they are all, especially the first and fourth, provided with a few teeth along the front margin. The four hairs are so closely connected at the base that probably they can only be moved together. The immovable finger bears about five teeth on the inner dorsal margin. A well-developed *lamina exterior* is present, as well as a *lamina interior*; the latter has a strongly folded plate-shaped portion which, when seen from below, covers the proximal dentated lobes. These lobes are placed obliquely to the longitudinal axis of the finger and directed forwards and downwards, each covering the hinder or basal margin of the following when seen in ventral view. The terminal spine, which seems to be placed on a slightly higher level than the lobes, has four teeth. The *galea* (fig. 2 c) is moderately long and slender and distally provided with five teeth of different sizes. The *serrula exterior* consists of about twenty-nine teeth, of which the median ones are the shortest and almost squarely truncate; the basal tooth is distinctly longer than the following, but only slightly enlarged distally; the last one is, again, a little more pointed and longer than the preceding.

Maxillæ (fig. 2 a).—The maxillæ are granular and densely covered with rather long, slender, and distally dentated hairs. The *lamina maxillaris* is rather short.

Palps (figs. 2 d-e).—The palps are indistinctly granular and everywhere beset with rather long, more or less clavate hairs; those of the fingers are pointed and amongst them are some tactile hairs. The *trochanter*, which is longer than broad, has a distinct stalk; the inner side has an almost semicircular outline from the stalk to near the tip; the outer side bears two blunt prominences, of which the ventral and proximal is the longer, while the more dorsal is less marked. The *femur*, which is twice as long as broad and broader than the trochanter, has a distinct stalk; this is most marked when seen from the side, because the upper surface is much more distinctly and suddenly raised than the exterior; the

inner side beyond the stalk is first moderately convex, and thereafter concave, while the outer side is regularly convex from the base to the tip. The *tibia* is as long as and distinctly broader than the femur, with a rather long and well-marked stalk; the inner side has first a deep notch to mark off the stalk, but is thereafter distinctly convex to near the tip, where a gentle concavity is found. The outer side, beyond the low basal protuberance which forms part of the articulation and the following low concavity of the stalk, is convex to near the tip, where a short low concavity is found. The *hand* (figs. 2 *d-e*), which is a little shorter than the tibia, but 1.4 times broader, is higher than broad, almost as high as long, and as high as the fingers are long. The curvature of the upper and inner surfaces, which are almost semicircular, is more marked than that of the lower and outer. The fingers, which gape slightly when closed, are provided with the usual row of triangular teeth; the immovable finger bears also on the inner side four accessory teeth behind the distinctly hooked tip, and at some distance from these four others near the middle; on the outer side there are about nine of these teeth distally. The movable finger also bears a few on the inner and outer side near the tip.

Coxæ (fig. 2 *a*).—The first pair of coxæ are almost trapezoid; the two following pairs are nearly triangular, as the inner margin is very short; the fourth pair have a similar shape, but the inner side is broader and the intero-posterior angle is obtuse and rounded.

Legs (figs. 2 *f-g*).—The legs are moderately long and slender; the hairs, especially the dorsal, are more or less enlarged distally, with a number of minute spines in all directions; this kind of hair is called clavate. The hairs on the ventral surface of the tarsi are almost simple; on each side of the claw there is a strongly curved hair corresponding to the bifurcated one found in *Ch. cancroides*, L. (*cf.* p. 120). The tarsus of the fourth pair of legs has some longer pointed hairs near the claws, but does not bear an inner "tactile" hair, in contrast to most other species with the exception of *Ch. cimicoides*, F. The trochantin of the first pair with a well-marked stalk. The tibia, which is distinctly longer than the tarsus, is, like the latter, enlarged distally; this difference in length between the two segments is, as usual, yet more marked on the fourth pair of legs.

Colour.—The maxillæ, palps, and cephalothorax are bright reddish brown (the two black transverse grooves excepted); the coxæ and legs are lighter; the sclerites of the abdomen

are yellowish brown, but sometimes with a blackish shade; longitudinal line white.

Measurements.—Cephalothorax 1.54 (1.54); abdomen 3.0 (2.38) mm.

Palps: trochanter 0.738 (0.590); femur 1.40 (0.644); tibia 1.484 (0.728); hand 1.372 (1.092), height 1.222; finger 1.232 mm.

Leg i.: femur 1.12 (0.308), trochantin 0.504; tibia 0.810 (0.196); tarsus 0.728 (0.144) mm.

Leg iv.: femur 1.484 (0.392), trochantin 0.476; tibia 1.26 (0.224); tarsus 0.868 (0.171) mm.

Material &c.—Two males of this species, which seem to be related to *Ch. cimicoides*, F., were collected by Mr. W. W. Froggart in Queensland.

Chelifer hawaiiensis, E. S.

(Pl. VI. fig. 3 a; Pl. VII. figs. 1 a-f.)

1900. E. Simon, (9) p. 518.

Cephalothorax.—No eyes or ocular spots are visible. The cephalothorax, which is a little longer than broad behind, is provided with two transverse grooves; these are slightly curved forwards, but the hinder is very indistinct. The skin is minutely granular; short, distally enlarged, and dentated hairs are abundant.

Abdomen.—The abdomen, which is distinctly longer than broad, has its tergites of almost equal breadth, with the exception of the first three, which are a little shorter; the front as well as the hinder margins of all the tergites are almost straight. The sclerites are indistinctly developed, as in so many forms of *Garypus*, minutely granular, and provided with a row of short hairs along the hindmost margin. The sternites (iv.-xi.) are similar to the tergites. The genital area is rather indistinct in the type specimen, but seems to be similar to that of the other female. In this we observe a plate, the hindmost margin of which is strongly chitinized and with a row of hairs. Between this plate and the coxæ we find a number of rather stout pointed hairs, articulated in deep and wide cavities.

Antennæ.—The galea is broken distally, but seems rather stout and with a short branch near the base.

Maxilla.—The maxillæ are short and broad; they are shagreened laterally, but smooth in the middle, and provided with a few short pointed hairs.

Palps (fig. 1 a).—Only the exterior surface of the tro-

chanter and the interior of the femur and tibia are minutely shagreened; the low flat granules of the hand are very indistinct. Rather short and more or less dentated hairs are abundant everywhere; those of the fingers, which, besides, bear tactile hairs, are more slender and simpler. The arrangement of the tactile hairs (Pl. VI. fig. 3 *a*) seems to be similar in the two specimens: most conspicuous are two placed very near to each other at the base of both fingers exteriorly; two others are placed more distally on each finger. Interiorly there are two close to each other near the base and a single one distally; dorsally there are a few. The *trochanter*, which has a long stalk, is distinctly longer than broad; its inner surface is evenly convex to near the tip; the outer is suddenly convex, almost similar to a protuberance; under this and separated from it by a longitudinal depression there is a less-marked more even convexity, which is, perhaps, the real exterior outline of the joint. The *femur* has no marked stalk, is narrower than the trochanter, and about 4.5 times longer than broad distally; it is gradually enlarged distally; the inner surface is, after a shallow notch and low elevation, almost straight; the outer is, beyond a basal short concavity, almost straight proximally, but distinctly convex distally. The *tibia*, which has a rather short and not very well-marked stalk, is a little shorter and broader than the femur; the inner surface, beyond the distinct basal notch, is almost straight; the outer has a well-marked basal prominence and a low elevation where the stalk passes into the joint proper; between these two there is a shallow notch; the outline, beyond the above-mentioned elevation, is almost straight and at last convex. The *hand*, which is as long as but only 1.46 broader than the tibia, is slightly convex interiorly, but almost straight exteriorly; it is 2.5 longer than broad, a little broader than it is high, and a trifle longer than the fingers, which gape slightly when closed. Besides the usual marginal row of teeth, which are rounded basally and conical distally, the fingers bear accessory teeth, the number and position of which differ in the two specimens examined. The one (Pl. VI. fig. 3 *a*, *a*) had along the inner side of the immovable finger eight teeth, of which the first three near the middle were divided distally; the movable finger possesses four inside. Exteriorly the immovable finger bears about nine accessory teeth and the movable four; all these are placed more or less near to the middle. In addition to these teeth we find a number of organs (fig. 3 *a*, *a*) which seem to bear some similarity to those described by Hausen (15, p. 217). The other specimen differs from that described

in minor details with regard to the number and arrangement of these teeth.

Coxæ.—The coxæ are very similar to those of *Ch. australiensis*, sp. n. (Pl. VI. fig. 2 a), but are more slender; the third is not so broad distally as the second, and the fourth pair not enlarged towards the extremity.

Legs (figs. 1 b-d).—The rather short hairs of the first pair of legs are almost simple ventrally, but with a distal tooth, or broken dorsally; the hairs of the fourth pair of legs, at least along the dorsal side of the femur and tibia, are distinctly enlarged distally and provided with a distal and some lateral spines. The dorsal "tactile" hair of the fourth tarsus is wanting, unless a rather short, pointed, and simple one near the base of the claws represents it; I was not able to make out whether this hair was paired or single. The hairs which are found on each side near the base of the claws are moderately curved and without a distinct tooth distally (fig. 1 d). The claws are very slender and longer than the areola. The legs are exceedingly long and slender. The trochantin of the first pair of legs (fig. 1 b) is rather short; the femur is much longer (5·3) than high; the tibia, which is moderately enlarged distally, is a trifle longer than the tarsus. The trochanter of the fourth pair of legs (fig. 1 c) is almost twice as long as high; the femur is much (4·3) longer than high, and only 1·7 times longer than the tarsus; the tibia is distinctly longer than the tarsus, which is 2·6 longer than the femur is high.

Colour.—The palps, maxillæ, and cephalothorax are pale yellowish brown; the femur and tibia are lighter than the other joints of the palps. The abdomen is brownish in the one specimen with indistinct darker spots, in the other more yellowish with more distinct dark sclerites. The coxæ and legs are yellowish.

Measurements.—Cephalothorax 1·4 (1·3); abdomen 3·6 (2·0) mm.

Palps: trochanter 0·700 (0·420); femur 1·624 (0·344); tibia 1·316 (0·364); hand 1·344 (0·532), height 0·504; fingers 1·092 mm.

Leg i.: femur 0·960 (0·180), trochantin 0·356 (0·204); tibia 0·616 (0·130); tarsus 0·588 (0·100) mm.

Leg iv.: femur 1·134 (0·252), trochantin 0·392; tibia 0·840 (0·150); tarsus 0·672 (0·120) mm.

Material.—I have examined two females: the one, which is probably Simon's androtype, is dilated by eggs; the other, which has a small bundle of eggs attached to the genital area,

has a smaller abdomen, with more distinct colours and slightly longer palps.

Variety.

Cephalothorax.—The transverse grooves are very indistinct, but the granulation much better marked.

Abdomen.—The first three very short tergites have the hindmost margin distinctly convex and the foremost concave; the median tergites have both margins more or less straight, while the last ones have the anterior margin convex and the posterior concave. The sclerites are well developed and divided by a broad longitudinal line where the skin is distinctly reticulated. The hairs are evidently clavate; the eleventh tergite possesses a number of very small round spots similar to those found in *Ch. equester*, sp. n. (cf. p. 124). The genital area seems to be different from that found in the typical specimen.

Antennæ (Pl. VII. fig. 1 e).—The *flagellum* is composed of four hairs, of which the anterior longer one bears many marginal teeth, while the second has only a few. The *lamina interior* has at least three distal lobes with very long teeth; the terminal spine is shorter, distinctly hooked, and provided with six long teeth. The *galca* (fig. 1 e) has some few teeth distally and is a little longer than the hair at its base. The teeth of the *serrula* (fig. 1 e) are high, the terminal is pointed, and the basal is only slightly enlarged distally.

Maxillæ.—The maxillæ are not only beset with granules laterally, but bear also some larger protuberances.

Palps.—The granulation, especially that of the hand, is more pronounced, and the hairs, especially those from the inner surface of the femur, are distinctly clavate. The tactile hairs of the fingers seem to be arranged as described (p. 105). The joints are comparatively shorter and broader; this difference is especially marked on the *hand*, which is 1·6 times broader than the tibia and only 2·1 times longer than broad; the margins, especially the inner, are a little more convex; the number of secondary teeth of the fingers is very different; interiorly I was not able to discover any, but exteriorly the immovable finger bears at least six and the movable four.

Legs.—The hairs of the legs are more distinctly clavate; the lateral hairs near the base of the claws are more curved (fig. 1 f). The legs are comparatively shorter and higher—for instance, the femur of the first pair of legs is only 4·4 longer than high.

Colour.—The palps and maxillæ are reddish brown; the

cephalothorax is a little paler; the abdominal sclerites are brown, with a white and a black spot and divided by a broad, white longitudinal line.

Measurements.—Cephalothorax 1.344 (1.12); abdomen 2.128 (1.820) mm.

Palps: trochanter 0.616 (0.392); femur 1.344 (0.300); tibia 1.176 (0.320); hand 1.092 (0.504), height 0.476; fingers 0.980 mm.

Leg i.: femur 0.786 (0.178), trochantin 0.308; tibia 0.532 (0.130); tarsus 0.476 (0.084) mm.

Leg iv.: femur 0.972 (0.252), trochantin 0.364; tibia 0.756 (0.140); tarsus 0.616 (0.112) mm.

Material.—I have examined one specimen (♀) of the variety from Kauai, one of the most western islands of the Sandwich Archipelago.

Remarks.—As I have only seen three specimens of this species, I have not thought it advisable to establish the variety as a new species; but, on the other hand, as the differences seem to be well marked and as the specimen is from another locality, I think that the description of the differences will be of value to future workers. It would be interesting to investigate the relation between the geographical distribution and the variations.

Chelifera pacificus, sp. n. (Pl. VII. fig. 2 a.)

Cephalothorax.—No eyes or ocular spots are present. The cephalothorax is a little longer than broad; it is more distinctly produced in front and with a better-marked median incision than *Ch. hawaiiensis*; the almost straight transverse grooves are indistinct; the skin is distinctly but minutely granular and the distinctly clavate hairs are almost as long as broad.

Abdomen.—The abdomen is distinctly longer than broad; the tergites have their sclerites poorly developed, and the first three are only in a slight degree shorter than the other; both the anterior and the posterior margins are almost straight. The whole surface of the tergites, including the indistinct longitudinal line in the middle, is shagreened. Eight transverse rows of clavate hairs are present as well as some few hairs (lateral) in front of the row on the median segments. Genital area scarcely different from that found in *Ch. hawaiiensis*, Sim.

Antennæ.—The *flagellum* consists of four hairs. The *lamina interior* possesses three or four lobes, the teeth of which are comparatively short; the terminal spine, which is

rather thick and suddenly pointed, is not crooked and is provided with five teeth. The *galea*, which is rather slender and a little longer than the hair at its base, is provided with five teeth distally. The 21 teeth of the *serrula* are moderately long; the basal one is longer and is slightly and evenly enlarged towards the extremity.

Maxillæ.—The maxillæ are shagreened laterally.

Palps (fig. 2 a).—The palps are minutely granular, especially the inner surface of the joints, with the exception of the trochanter, which is shagreened posteriorly. The hairs are rather short, widened out and spinous distally. The number and the arrangement of the tactile hairs of the fingers are as in *Ch. hawaiiensis*, Sim. The *trochanter*, which is longer than broad and distinctly stalked, is strongly but evenly convex interiorly; the exterior outline is more abruptly convex, and the distinction between the upper prominence and the lower, which passes into the stalk, is well marked. The *femur*, which has a short stalk and is narrower than the trochanter, is 3.6 times longer than broad; it is not gradually and distinctly widened out towards the extremity; the inner outline is almost straight; the convexity of the outer side begins just beyond the notch which marks off the stalk. The *tibia*, which has a short, not very well-marked stalk, is distinctly shorter and a little broader than the femur; both the inner and the outer margins are slightly convex. The *hand*, which is as long as, but 1.6 times broader than, the tibia, is distinctly convex both interiorly and exteriorly; it is 1.9 times longer than broad, a little broader than high, and scarcely longer than the fingers, which do not gap when closed. In position and number the accessory teeth differ from those described under *Ch. hawaiiensis* (p. 105); the immovable finger has along the inner margin at least three distally, and the movable one; the former has at least five exteriorly.

Legs.—The hairs of the ventral side are pointed, long, and more or less simple, while those of the dorsal side are shorter, widened out, and provided with teeth. The dorsal "tactile" hair of the fourth pair of tarsi is wanting. The lateral hairs near the base of the claws are slightly curved, very similar to those of *Ch. hawaiiensis*, Sim. (Pl. VII. fig. 1 d). The legs are moderately long; the trochanter of the fourth pair of legs is only 1.5 longer than high. The femora of the first as well as of the fourth pair are only four times longer than high; the tibiæ are distinctly longer than the tarsi.

Colour.—The maxillæ and palps are brown, the former more brilliant; the cephalothorax and abdomen are brownish,

the latter more pale with darker spots; the coxæ and legs are yellowish brown.

Measurements.—Cephalothorax 1.036 (0.980); abdomen 2.10 (1.316) mm.

Palps: trochanter 0.532 (0.336); femur 0.924 (0.260); tibia 0.832 (0.280); hand 0.840 (0.448), height 0.392; fingers 0.820 mm.

Leg i.: femur 0.626 (0.155), trochantin 0.280 (0.175); tibia 0.420 (0.112); tarsus 0.392 (0.084) mm.

Leg iv.: femur 0.840 (0.210), trochantin 0.300; tibia 0.616 (0.120); tarsus 0.524 (0.110) mm.

Material.—I have examined a single female, probably from Hawaii; it was mounted with Simon's original specimens of *Ch. hawaiiensis*, but evidently had not been examined by him.

Chelifera brevispinosus, Keys.

1885. Keyserling, (3) pp. 45-46, tab. iv. figs. 3-3 c.

♂.—The hand is scarcely as high as broad; the fingers gape distinctly when closed, especially distally, on account of a notch just behind the tip of the immovable finger; the inner margin at least of the fingers with a number of accessory teeth. The trochanter has posteriorly a lower, almost subconical projection and an upper, bigger and more rounded one. The legs are moderately short; the femur of the fourth pair is about 2.5 longer than high, and the tibia is much longer than the tarsus, which bears a tactile hair near the middle; the lateral hairs, near the base of the simple claws, are slightly curved and simple.

♀.—The fingers of the palps gape slightly.

I have examined Keyserling's original specimens.

Chelifera pygmaeus, Keys.

1885. Keyserling, (3) pp. 49-50, tab. vi. figs. 8-8 b.

The last abdominal segment bears some "tactile" hairs. Trochanter with well-marked exterior tubercles. The fingers are almost as long as the broad hand, and bear a few accessory teeth on the distal half. The first pair of legs, the femur of which is 2.5 times longer than high, have the femur proper, tibia, and tarsus of almost equal length; the tarsus of the fourth pair of legs with a dorsal "tactile" hair in the basal half near the middle.

I have examined Keyserling's original specimens.

Chelifer pallipes, White*. (Pl. VII. figs. 3 a-b.)

1849. A. White, (1) p. 6.

Cephalothorax.—Two distinct eyes or ocular spots are present. The cephalothorax seems to be longer than broad behind, and becomes rather suddenly narrow in the anterior third. The head slopes towards the front margin; a distinct transverse groove, which is curved backwards in its whole length, is found near the middle; a second groove near the hindmost margin is indistinct and straight, as far as I could make out. The cephalothorax is everywhere distinctly granular.

Abdomen.—The granulation is less distinct and there seems to be a broad longitudinal line.

Antennæ.—The moderately long galea possesses at least four distal branches.

Palps (figs. 3 a-b).—The palps appear quite polished; but are nevertheless granular, the granules being so low and so near to each other that the whole surface appears to be covered with a minute mosaic. The hairs, especially those of the inner surface of the femur and tibia, are exceedingly long and pointed; at least most of the hairs bear one terminal tooth; the hand has also tactile hairs in addition to the ordinary kinds. The palps are rather long and slender. The *trochanter*, which has a long stalk, is distinctly longer than broad; the inner side is evenly convex, while the outer side is abruptly convex, but not so marked that we can speak of a lower posterior tubercle; the dorsal surface posteriorly and near the tip is slightly prominent like an upper tubercle. The *femur*, which has a short distinct stalk, is slightly broader than the trochanter and almost three times as long as broad; the inner side beyond the moderately concave stalk is slightly convex for a very short distance, but thereafter almost straight; the outer side just beyond the stalk is rather suddenly, but more distally evenly convex. The *tibia*, which is both shorter and broader than the femur, has a long, well-marked stalk; the inner side, after the deep notch of the stalk, is distinctly convex; the outer side has a well-marked basal prominence and a rather low elevation separated from the former by a shallow notch before the moderate convexity of the joint proper. The *hand*, which is almost as long as, but distinctly broader than, the tibia, is distinctly longer than, and as high as, the finger.

* The name of *Ch. pallipes*, Bks., from America (Canad. Entomologist, vol. xxv. 1893, p. 64), must be changed.

Coxæ.—The fourth pair of coxæ is broad and widened out distally.

Legs.—The trochantin of the first pair of legs is short and its tibia is distinctly longer than the tarsus. The femur of the fourth pair seems to be exceedingly long and compressed; there does not appear to be any "tactile" hair at the base of the tarsus.

Colour.—The cephalothorax, palps, and abdomen (according to White's description) are deep brown; the legs are pale. "The claws with a greenish hue . . . ; abdominal segments edged with palish" (White, *op. cit.* p. 6).

Measurements.—Cephalothorax about 1 mm. long.

Palps: trochanter 0.600 (0.392); femur 1.176 (0.420); tibia 1.092 (0.476); hand 1.064 (0.588), height 0.824; finger 0.784 mm.

Material.—I have examined White's typical specimen from New Zealand; it was dried and badly damaged. I hope it will be possible to recognize it from my description; it would probably have been impossible to do so from the very short description given by White.

Chelifera brevidigitatus, Keys.

1885. Keyserling, (3) pp. 48-49, tab. iv. figs. 6-6 c.

The tubercles of the trochanter of the palps are slightly marked; the femur is twice as long as broad; the hand is higher than broad and 1.4 longer than the fingers. The tarsi of the legs are much shorter than the tibiae; the fourth pair has a dorsal "tactile" hair at the base; the lateral hairs near the base of the claws are strongly curved. The genital area is similar to that of *Ch. birmanicus*, Thor. The abdomen of the female is exceedingly long and slender.

I have examined Keyserling's original specimens.

Chelifera socotrensis, sp. n. (Pl. VII. figs. 4 a-h.)

♂. *Cephalothorax*.—Two distinct eyes are present. The cephalothorax, which is slightly longer than broad, becomes gradually narrower towards the front margin, which is bordered with a clear membrane. The anterior transverse groove is always straight in the middle, while the second is moderately curved forwards; the second tergite with a more or less indistinct longitudinal groove. The skin is everywhere granular, with rather large and low granules, which are always well separated from each other. The short clavate hairs of the head and first tergite are placed without order

everywhere, while a row of eighteen are placed along the hinder margin of the second tergite.

Abdomen.—The abdomen is rather slender, with all the dorsal sclerites of almost equal breadth and length, with the exception of the first three, which are shorter; the tergites show scarcely any trace of lateral keels. All the tergites are, with the exception of the hindmost portion of the eleventh, divided by a distinct longitudinal line. The granules are perhaps lower than those of the cephalothorax and arranged in circles around the smooth spots which surround the lyriform fissures and the articulation of the more or less short, distally dentated hairs. These are situated in the following order:—the first two tergites bear only a row of about eighteen hairs along the hindmost margin of the sclerite; this row is at the third tergite not quite straight, and each half has at least an inner and an outer hair in front of the row: the fourth to the eighth have, in addition to the hindmost marginal row, five hairs on each side in front of the row, placed in an irregular transverse row; the order of these hairs is not quite symmetrical right and left; the right half of the sixth tergite possessed, for instance, in one specimen only four hairs. In the ninth and tenth sternites the two rows were not well marked off from each other; the light spots which surround the hairs are better marked in the anterior than in the posterior row; the hairs of the hindmost tergites are longer, and the eleventh bears a pair of tactile hairs.

Sternites.—The fifth to the eleventh sternites are similar to the tergites and longitudinally divided like these; but the granulation is more obsolete, and the hairs, of which there is only one row along the hinder margin, are longer and more slender; those of the anterior sternites are almost simple. The twelfth sternite seems to be missing, or, more correctly, it is fused with the eleventh; for the latter has in the middle, just in front of the hindmost margin, a short transverse groove, partly cutting off its hindmost median portion. The fourth sternite has the anterior margin curved inwards. The genital area is composed of a rather short anterior plate and a longer posterior one; the former has many long slender hairs in the middle, while the latter has short hairs everywhere and covers a pair of “ram’s-horn”-shaped organs (cf. *Ch. cancroides*, L.).

Antennæ.—The *flagellum* seems to consist of only three hairs, of which the anterior longest one is armed with about nine teeth along the front margin, thus having similarity to a feather. The dorsal margin of the immovable finger possesses some tiny teeth just behind the tip, and thereafter five

larger ones; the first is the largest and the second is smaller than the third. The serruliform portion of the *lamina interior* consists of four dentated lobes and a terminal spine with six teeth. The *galea* was broken. The *serrula exterior* is composed of about 30 teeth, of which the basal one has a large distal flap.

Maxille.—The maxillæ are of the usual triangular shape, with a broad lamina dentated externally; they are granular along the sides, and hairy with short dentated hairs.

Palps (fig. 4*a*).—The palps are minutely granular everywhere above, with the exception of the hand, fingers, and stalks; the granulation is very indistinct beneath. Short, rather thick, distally dentated hairs are abundant at all the joints, with the exception of the fingers, which bear rather long and slender hairs, besides the tactile hairs. There is no difference in length between the hairs on the inner and outer sides of the proximal joints. The *trochanter*, which is distinctly longer than broad, has a well-marked stalk; the inner margin is gradually convex, and so is the hinder; the upper surface is posteriorly raised to a blunt tubercle. The *femur*, which is almost four times longer than broad and distinctly broader than the trochanter, has no well-marked stalk; its inner side is almost straight beyond a low short convexity near the base, while the hinder is moderately convex. The tibia, which is as long as but broader than the femur, has a rather short but distinct stalk; its inner side is moderately convex after the deep notch of the stalk; the basal exterior prominence which forms part of the articulation is well marked, as well as the distal elevation of the stalk and the rather shallow notch between; the outline of the proper joint, which passes gradually into this elevation, is first straight and terminally convex. The *hand*, which is twice as long as broad and broader than the tibia, is 1.78 longer than the fingers; it is slightly longer than the cephalothorax and evenly convex both interiorly and exteriorly. The fingers do not gape when closed and are only 1.25 longer than the hand is broad.

Coxæ (fig. 4*b*).—The coxæ are scarcely different from those of *Ch. australiensis*, with the exception of the fourth pair, which is much broader than the third and only slightly widened out distally; the inner side is straight and makes an obtuse angle with the hinder margin, which is slightly concave and almost parallel with the convex front margin.

Coxal sac (figs. 4*c-f*).—Compare p. 135.

Legs (fig. 4*g*).—The legs are comparatively long and slender. The hairs, which are found in numbers, are rather

short, thick, and provided with spines distally; those which are placed on the ventral surfaces of the tarsi are long, slender, and almost or completely simple; the trochanter bears also some longer and pointed hairs beneath. The dorsal "tactile" hair of the fourth pair of legs is placed near the tip. All the tarsi bear at least one hair, which is rather long and slender, on each side just above the base of the claws; besides these hairs there is on each side a differently shaped bifurcated hair. The posterior of these hairs, which seems to be alike on all the tarsi, is moderately long and divided near the tip into two branches, of which the lower and longer one is directed upwards and curved downwards, while the upper one is short and similar to a short tooth. The anterior hair has the lower branch short and straight on at least the fourth pair; that of the first pair of legs seems to bear several tiny teeth distally. The two long claws of the fourth pair of legs are as long as the areola and are armed with an anterior strong tooth. The anterior claw of the first pair is rather long and slender without any tooth, while the posterior is exceedingly long and slender, bearing an insignificant tooth inside. The claws of the second pair of legs bear comparatively well-developed teeth. The tibia of the first pair is only a trifle longer than the tarsus, which is broadest in the middle (fig. 4 *g*), while the tibia of the fourth pair is considerably longer than the corresponding tarsus.

Colour.—The hand is reddish brown, the other joints, including the maxillæ, are lighter, and so is the head; the thorax and abdominal tergites are yellowish brown with the less chitinized portions paler; the ventral side and legs are yellowish.

Measurements.—Cephalothorax 1.26 (1.134); abdomen 2.156 (1.372) mm.

Palps: trochanter 0.730 (0.418); femur 1.556 (0.448); tibia 1.540 (0.476); hand 1.10 (0.630); fingers 0.790 mm.

Leg i.: femur 0.765 (0.252), trochantin 0.420 (0.270); tibia 0.565 (0.207); tarsus 0.495 (0.140) mm.

Leg iv.: femur 1.232 (0.420), trochantin 0.40; tibia 0.952 (0.252); tarsus 0.616 mm.

♀. *Cephalothorax*.—The cephalothorax is as broad behind as it is long. The eyes and transverse grooves seem to be more distinct.

Abdomen.—The sclerites of the fourth sternite are short and widely separated from each other; many short pointed hairs along the hindmost margin of the sternite; the third sternite bears a similar row of hairs, and in front of the

genital opening there are a number of irregularly placed hairs.

Palps.—The palps are shorter and less powerful and there are small differences in the relative measurements. The dorsal prominence of the *trochanter* seems to be smaller, but more marked off; the hand is, compared with the tibia, both longer and broader than in the male; it is as high as broad.

Coxæ.—The fourth pair of coxæ has the hindmost margin straight and does not possess any coxal sac.

Legs.—The claws of the first (and probably also the second) pair of legs are different from those of the male; both claws bear teeth, but that of the posterior claw is placed under the summit, not anteriorly as usual. The first pair of legs differs from those of the male by the greater slenderness of the tibia and tarsus (fig. 4*h*), as well as by the shape of the latter, which is of equal breadth throughout.

Colour.—The palps and maxillæ are dark reddish brown, with the hands darker; the head and last abdominal tergites dark, more blackish brown, while the thoracic and first three abdominal tergites are lighter, the latter with white inter-articulate membranes. The coxæ and foremost part of the abdomen below are yellowish, while the hindmost portion is brownish.

Measurements.—Cephalothorax 1.232 (1.260); abdomen 2.20 (1.596) mm.

Palps: trochanter 0.660 (0.361); femur 1.350 (0.40); tibia 1.354 (0.455); hand 1.326 (0.675), height 0.672; fingers 0.765 mm.

Leg i.: femur 0.765 (0.243), trochantin 0.405 (0.265); tibia 0.600 (0.168); tarsus 0.532 (0.112) mm.

Material.—I have examined two males and one female, which are perhaps not quite full-grown, from Socotra.

Remarks.—This species is very similar to *Ch. Simoni*, Bal. from Sierra Leone (II, p. 529). The following are my reasons for establishing a new species:—*Ch. Simoni*, of which Balzan has examined full-grown specimens, is a much smaller species; its cephalothorax is distinctly longer than broad, both in male and female; the median abdominal tergites have only three hairs in front of the row along the hindmost margin of the sclerite; the fingers are distinctly longer than the hand is broad; the hand is shorter than the cephalothorax; the hairs along the inner side of the palps are distinctly longer than those along the outer.

Chelifer sculpturatus, Lewis. (Pl. VIII. figs. 2 a-h.)

1903. Lewis, (16) pp. 497-498, pl. xxv.

♀. *Cephalothorax*.—The two rather indistinct *eyes* or ocular spots are removed from the front margin a distance equal to their diameter. The cephalothorax, which is as broad behind as it is long, is only one-fourth as broad anteriorly as posteriorly; the front margin possesses a slight median incision. The foremost of the two rather shallow transverse *grooves* is straight or moderately curved backwards, while the hinder is distinctly curved forwards, and so is also the hindmost margin of the second tergite, which is so similar to an abdominal tergite that Lewis counted it amongst them.

The skin of the head, the first and in a less degree the second thoracic tergite are everywhere beset with very minute granules. The first thoracic tergite and at least the hindmost part of the head bear besides a number of low, round, and rather large granules and tubercles; the tergite possesses about fifty, while the head has comparatively few, which decrease in number as well as in size anteriorly. The cephalothorax bears some few rather slender, but blunt hairs, which, at least posteriorly, are placed each on its own tubercle. The granulation of the second tergite is so similar to that of the abdominal tergites that I can refer to the description of these.

Abdomen (fig. 2 a).—The abdomen, which is broader in the middle than it is long, is shaped similarly to that in *Chiridium*; it slopes gradually from the middle towards the sides, and from the seventh tergite both forwards and backwards; the lateral outline is distinctly convex. The tergites slightly increase in length from the first towards the ninth, but much more in breadth towards the seventh. The second thoracic as well as the first ten abdominal tergites bear a pair of lateral, more or less marked projections.

Each abdominal tergite, with the exception of the eleventh, is divided into a posterior and an anterior portion by a transverse raised band or line, which is more zigzag than straight. These two portions are again subdivided into more or less round areas by short ridges, neither so raised nor so broad as the transverse band, between which and the margins they extend. The depressed spots thus formed bear each a median knob, on which, at least sometimes, a short clavate hair is articulated: in each row about twenty of these areas are present; but they are sometimes rather indistinct, especially those of the anterior row, which are often covered

by the hindmost margin of the preceding tergite. The depressions described are minutely granular in a similar manner as is the head. The eleventh tergite is smooth.

Sternites.—The fifth to the eleventh sternites increase both in length and in breadth towards the middle. Both the fourth and the third sternites are more or less covered by the fourth pair of coxæ. The sclerites of the former are distinctly narrower and only half as long as those of the fifth; the sclerite of the third sternite is almost a mere line. The sclerites of the sternites seem to be smooth, are provided with a hinder row of numerous, short, and almost simple hairs, and are divided by a narrow longitudinal line.

Antenna.—The minute organs of the small antennæ were so badly preserved on the dried specimen at my disposal that I could not examine their structure in detail. The *flagellum* is composed of three (?) moderately long, curved, and slender hairs, of which the anterior one is provided with about five distal and marginal teeth. The margin of the immovable finger is provided with two minute dorsal teeth just behind the tip and more proximally five larger but of unequal size. A distinct but narrow *lamina exterior* is present as well as a *lamina interior*, the serruliform distal portion of which seems to differ from that usually found in *Chelifer*. The *galea* is rather long and slender, distally provided with about seven short, blunt, and slightly curved teeth. The *serrula exterior* is similar to that found in *Ch. claviger*, Thor.; it consists of about thirty, almost completely fused teeth, of which the basal one is the longest and widened out distally; the terminal tooth is also comparatively long and slender.

Maxille.—The maxillæ are placed on a level with the coxæ; they are strongly raised in the middle, pointed in the front, and, at least in some specimens, with large granules laterally.

Palps (figs. 2 *d-e*).—A minute granulation, similar to that of the head, seems to be wanting, but the whole surface is thickly studded with subconical tubercles; these tubercles are comparatively low on the trochanter, and almost wanting on the ventral side of the femur and tibia; some few low ones are found at the basal portion of the hand. Each tubercle bears a moderately long, stiff, and clavate hair near the tip; the hairs of the hands, especially those of the inner side, are more slender, not clavate, but only provided with some few distal spines. This kind of hair is gradually merging into the simple and pointed hairs of the fingers, and is not to be confounded with tactile hairs. On the fingers of a cast skin (fig. 2 *e*) I observed in number a kind of organs

identical with or similar to those described by H. J. Hansen in *Ch. cimicoides* (15, p. 218, pl. v. fig. 14 a). Each organ consists apparently of a more or less irregularly shaped area with a marked round spot; they are either apart or more or less fused; the area itself is in reality placed under the skin as a kind of chitinous sac. The immovable finger has inwards two tactile hairs and about eight of these organs, placed in the proximal portion; the movable has none; the immovable as well as the movable possess outwards three tactile hairs and twelve organs. The *trochanter*, which is distinctly longer than broad, has a distinct stalk, which is enlarged basally; the interior margin is first suddenly and then gradually convex; the exterior surface bears an upper and a lower projection, the latter is the longer, but neither the one nor the other is much more marked than one of the femoral tubercles. The *femur*, which is a little more than twice as long as broad, and distinctly broader than the trochanter, is provided with an exceedingly short stalk; the tubercles make it difficult to realize its shape, but the interior side seems to be almost straight, while the exterior is slightly convex. The *tibia*, which is slightly shorter but broader than the femur, has a moderately long, well-marked stalk, the axis of which forms an obtuse angle with the proper joint, and accordingly gives the tibia an inward direction. The interior side is moderately convex after the deep notch which marks it off from the stalk; the exterior side is almost straight beyond a sudden elevation which follows the stalk. The *hand*, which is slightly shorter and a little broader than the tibia, is as high as broad and longer than the fingers. The inner curvature is more marked than the outer. The *fingers* (fig. 2 e) gape widely when closed, because the lower margin of the immovable finger is not straight, but with a distinct bend upwards behind the tip. The proximal teeth of the immovable finger are small and more or less rounded; those of the notch are extremely small, but they are followed by large and pointed ones; the teeth of the movable finger are all more or less minute.

Coxæ (fig. 2 f).—The coxæ are on a level with the maxillæ; the first pair is the shortest and trapezoid in shape; the second and third pairs are longer and enlarged distally, so that they become nearly triangular. The fourth pair is both broader and longer than the preceding ones (fig. 2 f); they are much longer in front than behind; the hindmost shorter portion is distinguished from the anterior portion by a shallow groove; both the interior and posterior margins with low concavities. While the hairs of the first three pairs of

the coxæ are short and spined, those of the fourth pair are longer and more slender.

Legs.—The ordinary hairs of the legs are rather short, stiff, and clavate; they are enlarged terminally and there provided with short branches in all directions. The ventral hairs of the tarsus are much longer and more slender than the dorsal ones; they are not simple, but spined distally. The claws seem never to bear teeth, but have an inner and outer bifurcated hair near the base as in *Ch. cancroides*, L. (Pl. VIII. fig. 2 *g*); this structure I have observed only in tarsi of a cast skin. The first legs have a very well-developed trochantin; the tibia is distinctly enlarged distally and as long as the tarsus. The fourth legs have the tarsus enlarged distally and shorter than the tibia.

Colour.—The palps, maxillæ, head, and coxæ are reddish brown, with a more or less pronounced purple shade. The raised band of the tergites is bright brown, while the depressed spots are more yellowish brown; sternites yellowish brown with a blackish shade. The whole dorsal surface is, when lighted, more or less metallic.

Measurements.—Cephalothorax 1·4 (0·42–1·68); abdomen 2·1 (2·492) mm.

Palps: trochanter 0·644 (0·448); femur 1·260 (0·540); tibia 1·148 (0·540); hand 0·982 (0·576), height 0·550; fingers 0·812 mm.

Leg i.: femur 0·840 (0·308); trochantin 0·392; tibia 0·560 (0·210); tarsus 0·560 mm.

Leg iv.: femur 1·094 (0·415); trochantin 0·336; tibia 0·728 (0·250); tarsus 0·600.

♂. *Cephalothorax.*—The anterior groove is distinctly curved backwards. The granulations are less marked than in the female.

Abdomen.—The lateral projections of the tergites are much better marked than in the female. That of the second thoracic tergite is comparatively insignificant; those of the abdominal tergites attain their highest development in the sixth and seventh segments, and are there long, free, and similar to a keel, directed obliquely upwards, outwards, and backwards. The raised transverse bands, and especially the hindmost row of depressed spots, seem less marked than in the females.

The fourth sternite differs from the corresponding one in the female by being half as long and almost as broad as the fifth.

Genital area (fig. 2 *b*).—The genital area is most similar to that found in *Chelifer cancroides*, L., and the species which are

nearly related to it. The *anterior genital plate* (fig. 2 *b, a*), which is hairy in the middle, is situated between the coxæ and the posterior plate; it is well raised in the middle, prolonged backwards with a low concavity in the posterior margin; the lateral part gets rather suddenly and most distinctly shorter. The *posterior genital plate*, which is broad and long, is distinctly wider than long; its hinder margin is moderately raised backwards, the lateral margin, after a shallow concavity in which the first pair of stigmata (*s.*) is partly placed, is suddenly bent inwards, merging into the anterior margin. This is distinctly curved forwards on each side, and in the middle provided with a well-marked curvature, which fits into the convexity of the anterior plate. The median and anterior portion of this system is more raised than the lateral and posterior region when seen from below. From the front margin to the middle a longitudinal shallow depression extends, having a moderate elevation on each side, which cover the usual ram's-horn-shaped organs. The posterior part of this plate is distinguished from the anterior plate by an indistinct transverse groove (fig. 2 *b, g*). Hairs are found at least along the front margin.

Palps (fig. 2 *d*).—The conical tubercles are larger than in the female. The palps are both longer and stronger. The *trochanter* has the interior margin more strongly curved and the stalk more distinct. The *femur* is very clumsy and scarcely twice as long as broad. The hand is comparatively broader and the fingers shorter than in the female.

Coxæ (fig. 2 *b*).—The first three pairs of the coxæ are shaped as in the female, but the fourth is very different. It is most narrow in the middle and enlarged towards both ends, slightly so inwards, but most distinctly outwards. The posterior side is distinctly concave, the anterior moderately convex, with a low median concavity. Near the interior posterior corner the entrance-opening (fig. 2 *b, c*) of the coxal sac is seen. This sac (comp. p. 135) is almost as long as the coxa, which it almost fills, and is enlarged distally; the inner wall is provided with many subconical elevations or tubercles, each bearing one or several hairs, which most often are bifurcated from the base or middle, but sometimes divided into several branches. Near the opening these eminences are arranged in a kind of half-funnel.

Colour.—The colour is perhaps more bright, especially the purple of the anterior portion of body.

Measurements.—Cephalothorax 1·4 (0·42–1·68); abdomen 2·24 (2·52) mm.

Palps: trochanter 0·812 (0·560); femur 1·51 (0·800);

tibia 1.4 (0.7); hand 1.12 (0.775), height 0.730; finger 0.870 mm.

Young animal.—I have not had any opportunity of examining young animals, but only cast skins. The abdominal tergites of these had neither raised bands nor depressed areas. The fourth pair of coxæ is neither similar to those of female nor male.

Locality, Material.—I have examined five females and two males, besides a number of silk-cocoons containing animals in process of moulting or cast skins. They were all taken in Natal from the interior of bee-hives.

Remarks.—This animal, in spite of some peculiarities, is most naturally referred to a group of species which are nearly related to *Ch. cancrroides*, L. The following characters of the males are common to these species:—lateral tergal keels, shape of genital area with ram's-horn-shaped organs, shape of fourth coxæ with coxal sac, and bifurcated terminal tarsal hair. It is remarkable for the shape and granulations of body and palps, the broad coxæ of the female, and the shape of the posterior genital plate of the male.

Ecdysis.—Besides the animals which have been described, I have examined seven slightly curved circular silk-cocoons, which were sometimes placed two together. As they all contained animals in course of moulting, or cast skins, we must conclude that their purpose is to protect the animal during the dangerous process of ecdysis. These nidi show on microscopic examination a surprising structure, for the different threads are not independent and free, but are more or less fused, so that a complicated system or meshwork of thinner and thicker threads is formed (Pl. VIII. fig. 2 h). The density of the meshwork varies considerably in the different cocoons, and is not the same everywhere in each cocoon. The area between the threads is sometimes many times, sometimes scarcely broader than the threads. This structure is difficult to explain; the newly-formed threads have perhaps fused before drying.

I found only a single cast skin (palps and legs not attached) in a cocoon without any animal. This skin was closed, with the exception of a very wide aperture in front; this opening was formed by the bursting of the membrane between the head and first tergite dorsally, and antennæ and maxillæ ventrally. The articular membrane is strongly dilated just behind this opening. The tergites are separated from the cephalothorax by a deep groove, and so strongly curved (downwards) that the last abdominal tergites almost reach and cover the coxæ. The sternites are placed so closely to

the tergites that no room is left between; they are very difficult to distinguish from each other. The concavity of the sternites is consistently equal to the convexity of the tergites. The last two pairs of coxæ are, on account of the curvature, covered by the first two pairs, and not visible unless the whole animal be stretched out. The antennæ are without any connection whatever with the head, and fastened to the hindmost part of the maxillæ by a thin membrane. Other specimens were examined, which were killed during the moult. One, for instance, had the whole cephalothorax, front portion of abdomen, and femur of the palps free. The cast skin of the cephalothorax was placed as a cap on the top of its abdomen.

Chelifer equester, sp. n.

(Pl. VIII. figs. 3 a-d, Pl. IX. figs. 1 a-f.)

♂. *Cephalothorax*.—Two indistinct white *ocular spots* present. The cephalothorax, which is as broad behind as it is long, has the sides slightly curved outwards; in front they approach each other, so that the front is much shorter than the hinder margin. There are no transverse *grooves*, but the head is nevertheless very well marked off from the thorax by being darker and more raised. The skin is minutely dotted, and bears a few moderately slender and clavate hairs in front as well as along the hinder margin of the thorax.

Abdomen.—The abdomen is distinctly longer than broad, and its dorsal sclerites are of almost equal breadth, but the first three are much shorter than the following, which increase slightly in length towards the tenth tergite. The hinder margin of the sclerites of at least the first two tergites is raised. All the tergites from the fourth (third) to the tenth are divided by a longitudinal line, which is rather imperfect in the middle of each sclerite. The granulation is indistinct; each sclerite possesses a hinder row of twelve long, slender, and dentate hairs, each placed in the middle of a yellow spot; laterally at least one pair of hairs in front of the row on the hindmost segments; the hairs of eleventh tergite placed without order. Tenth and eleventh tergites with two pairs of exceedingly long and pointed "tactile" hairs. The fourth to the eleventh sternites are similar to the tergites, and, like them, longitudinally divided; but the fourth is much narrower than the others; the twenty-four hairs of each sternite, which are placed in transverse rows, are moderately slender and almost simple; the eleventh sternite bears at least three pairs of tactile hairs in addition

to the usual hairs, arranged without order. Besides, the eleventh sternite possesses a great many (about 200) round spots, each with a median fissure, much smaller than the usual "lyriform" fissures; the corresponding tergite bears a smaller number, and the tenth sternite about 70.

The genital area (Pl. VIII. fig. 3 *d*) is similar to that of *Chelifer birmanicus*, Thor., with a short backwardly curved third (?) sternite, and a long and broad anterior plate, between which is the opening; under the front plate several internal chitinous organs are seen.

Antenna (fig. 3 *c*).—The *flagellum* probably consists of four hairs, like that of the female. The immovable finger bears three low blunt teeth just behind the tip, and thereafter five larger, decreasing in size backwards. The *lamina exterior* is well marked, and so is the *lamina interior*, the serruliform portion of which consists of six dentated lobes; the terminal spine bears many teeth internally. The short galea is provided with a few teeth (Pl. VIII. fig. 3 *c*): the serrula exterior (fig. 3 *c*) is very long and consists of 37 teeth, which are almost completely fused; the basal tooth is a good deal longer, enlarged distally, and provided with a membranous plate.

Maxilla.—The pointed distal portion of the maxillæ is well marked and provided with a broad lamina.

Palps (Pl. IX. figs. 1 *a-d*).—The palps are everywhere, with the exception of the stalks and partly of the fingers, provided with low granules; short and slender, but not quite simple, hairs are abundant; the tibia bears on the outer side near the base a pair of longer pointed hairs, and the fingers some tactile hairs. The *trochanter*, which is somewhat longer than broad, is provided with a distinct stalk. The inner margin is strongly convex; the outer surface possesses a high tubercle; the upper a similar one near exterior margin; there is a deep cleft between them. The upper tubercle (figs. 1 *a-b*), which is directed upwards and slightly outwards, is triangular and as high as trochanter is long, if measured from lower margin of segment to its top. The outer and lower tubercle is shorter, and its broad triangular base merges into a rather slender but blunt terminal projection (fig. 1 *a*). The *femur*, which is twice as long and somewhat higher than broad, is wider than the trochanter and provided with a distinct stalk; the latter merges gradually into the moderate convexity of the inner margin, which is followed by a slight concavity; the outer surface is regularly convex from the base to the tip. The upper side is much more suddenly and strongly convex than the outer,

while the lower surface is only slightly curved. The *tibia* (fig. 1 *c*) is as long as, but broader than, the femur, with a very long stalk. The inner side has first a very deep notch to mark off the stalk, and is then irregularly and strongly convex; near the tip there is a low concavity. The outer side is almost straight from the base to the middle, because both the basal projection and the elevation beyond it, which bears a rather long pointed hair (fig. 1 *a*), are low as well as the concavity between; from the middle to the tip the outline is distinctly convex. In lateral view both outlines are regularly convex, almost semicircular. The hand, which is as long as the tibia, but broader, is higher than broad, 1.6 times longer than broad, and 1.5 times longer than the fingers. It is moderately convex inwards, and strongly so outwards, as well as above and below.

Coxæ.—The coxæ are very similar to those of *C. australiensis* (fig. 2 *a*), but those of the second pair are broader than those of the third more triangular pair; the fourth pair (fig. 3 *d*) are broader, with the hinder margin, which is longer than the inner, slightly convex on the middle.

Legs (figs. 1 *e-f*).—The legs are rather short and clumsy. Their hairs are long, stiff, pointed, and almost simple. Near the base of claws a pair of simple strongly curved hairs, and near the base of the tarsus of fourth legs the usual interior and dorsal "tactile" hair. The long areola is shorter than the long claws. Both the tibia and tarsus of the first legs widened out distally, the former being much the longer; the tarsus of the fourth leg is comparatively much shorter than that of first pair, and scarcely longer than its femur is high.

Colour.—The palps and head have the surface polished, and are dark brown in colour, sometimes almost blackish, sometimes rather reddish; the maxillæ and the thoracic tergites are light reddish brown, with the posterior margin of the second tergite black. The abdominal tergites of a dull blackish-brown colour with white longitudinal line; the sternites are more yellowish brown, and so are the coxæ and legs, but lighter.

Measurements.—Cephalothorax 1.75 (1.75); abdomen 3.75 (2.5) mm.

Palps: trochanter 1.26 (0.98); femur 2.38 (1.224), height 1.40; tibia 2.42 (1.316); hand 2.38 (1.42), height 1.54; fingers 1.596 mm.

Leg i.: femur 1.56 (0.448); trochantin 0.728 (0.560); tibia 1.232 (0.308); tarsus 0.898 mm.

Leg iv. : femur 2.0 (0.849) ; trochantin 0.742 ; tibia 1.596 (0.42) ; tarsus 1.064 mm.

♀. *Abdomen*.—The genital area, which is covered by the fourth pair of coxæ, differs from that of the male.

Antennæ (Pl. VIII. figs. 3 a-c).—The flagellum (fig. 3 a) is composed of four hairs, of which the three posterior are simple and decreasing backwards, while the anterior is bifurcated and very much widened out in the middle, where about five larger and smaller pointed teeth are found. The serruliform part of lamina interior with five dentated lobes (fig. 3 b, s). The moderately long galca (fig. 3 c ♀) possesses about three rather long terminal branches, as well as some few distal, short, blunt teeth. The serrula exterior is composed of about 40 teeth.

Palps (Pl. IX. figs. 1 a-d).—The palps are much shorter than those of the males. The inner margin of the *trochanter* is gradually curved (fig. 1 b) ; the posterior and superior tubercles are comparatively lower than in the male. The posterior and inferior tubercle is rather low and blunt, while the superior is high and, in bearing a tooth-like projection, resembles the lower of the two prominences in the male. The *femur*, which is more than twice as long as broad, has the inferior and superior outlines much less convex than in the male. The upper and lower convexities of the tibia (fig. 1 c) more even than in the male. The hand is much broader than the tibia (1.35) and 1.4 times longer than broad.

Coxæ (Pl. VIII. fig. 3 d ♀).—The fourth pair is scarcely widened out distally and has the inner margin as long as the hinder.

Colour.—The colour is much lighter, especially on the palps, which are light reddish ; the head is scarcely darker than the thorax. The ventral surface, including the maxillæ, is yellowish brown. There is great difference between the specimens, as the darkest amongst them are scarcely lighter than the males.

Measurements.—Cephalothorax 2.0 (2.0) ; abdomen 3.0 (2.5) mm.

Palps : trochanter 1.12 (0.728) ; femur 1.96 (0.84) ; tibia 1.932 (0.952) ; hand 1.876 (1.316), height 1.46 ; fingers 1.35 mm.

Leg i. : femur 1.4 (0.42), trochantin 0.616 (0.504) ; tibia 1.134 (0.308) ; tarsus 0.84 mm.

Leg iv. : femur 1.976 (0.817), trochantin 0.74 ; tibia 1.540 (0.364) ; tarsus 1.064 mm.

Material.—Mr. F. J. Jackson collected 8 ♀ and 13 ♂ beneath the elytron of a beetle at Taveta, Kilimanjaro.

Remarks.—This species, which seems to be related to *Ch. javanus*, Thor., is especially remarkable for the pronounced sexual difference in the structure of the palps. In spite of these differences, I have referred the males and the females to the same species on account of the great number in which they occur together, and the similarity in the rest of their structure.

Ideoroncus mexicanus, Bks. (Pl. IX. figs. 2 *a-d*,
Pl. X. figs. 1 *a-f*.)

1898. N. Banks, (14) p. 289.

Cephalothorax (fig. 2 *a*).—Two well-developed *eyes*, placed at the lateral margin, and as far removed from the front margin as length of their diameter. The cephalothorax, which is distinctly longer than broad posteriorly, has parallel sides and is of almost equal breadth behind the eyes, but much narrower in front of them. Anterior margin is marked off from posterior part of head by a line; it is prolonged into a blunt “*epistoma*” and bordered with a thin membrane. The *skin* is smooth and provided with moderately long, pointed, simple hairs.

Abdomen.—The abdomen is distinctly longer than broad in the middle, where it is broadest, very narrow anteriorly, and thereafter almost oval with regularly curved sides. The tergal sclerites are in this specimen, which is dilated with eggs, much shorter than the thinly chitinized membranes between. The sclerites, especially of the anterior and posterior tergites, are indistinctly marked off, and the hindmost row of hairs is placed behind their posterior margin. There is a shallow longitudinal depression through the middle of each sclerite; the tergites seem to be smooth. Each tergite bears about four pairs of hairs, which are longer on the posterior tergites than on the anterior ones; the tenth and eleventh tergites each bear, in addition to these, two pairs of “*tactile*” hairs.

The sternites are scarcely different from the tergites, with the exception of the third and fourth, which are very narrow, indistinct, and divided in the middle.

The sides have well-marked grooves between the segments and possess densely placed, narrow, parallel and longitudinal ridges.

Antennæ (Pl. IX. figs. 2 *b-d*).—The fingers gape slightly when closed (fig. 2 *d*). The *flagellum* is composed of three short hairs, which are placed rather apart from each other and provided with some few tiny spines (fig. 2 *b*). The tip

of immovable finger long, slender, and moderately curved; behind the tip, and well removed from it, is situated a strong, conical, dorsal, marginal tooth, followed by about five more or less distinct low and rounded teeth (fig. 2 *d*).

Serrula interior (fig. 2 *b*) consists of eighteen teeth, of which the proximal are more or less squarely truncate and almost completely fused—four basal ones excepted, — while the distal are much more free, pointed, and minutely spined along posterior margin. No independent terminal spine placed on a lower level than the teeth of the serrula proper is present, as is the case in *Ideobisium Balzanii* and *crassimanum*, Bal. (comp. Hansen, 15, pl. v. fig. 6 *b*), as well as in two undescribed Indian species examined by me—unless the last tooth of the serrula should correspond to it.

The *galea* (fig. 2 *c*) is slender, moderately long, curved, and blunt; a few minute teeth are noticed near the tip. The terminal point of the movable finger is distinctly longer and more curved than that of the other finger; above its terminal hook we find a much shorter and stouter one. The tip of the immovable finger is placed between these two when the hand is closed. Behind the described dorsal tooth a long and broad marginal projection is placed, which on the right antenna has the margin slightly folded (fig. 2 *d*), and on the left (fig. 2 *c*) is broken up into blunt teeth.

The *serrula exterior*, of which a distal third portion is free, consists of about twenty teeth, which are squarely truncate and touching each other in almost their whole length (fig. 2 *c*).

Maxille (Pl. X. fig. 1 *a*).—The labrum is well developed and widened out distally. The median triangular portion of the maxillæ, seen from below, appears strongly raised and falls steeply laterally. In front we find, as usual, an interior marginal lyriform organ, consisting of a single semicircular fissure (fig. 1 *a*, *i*), and more behind a median lateral one, consisting of several more or less curved fissures (fig. 1 *a*, *n*). The terminal portion is thinly chitinized, placed on a higher level than the basal region, and is provided with two pointed hairs; at its base a single very long and slender one is situated. Along the terminal portion a narrow *lamina inferior* (?) is placed, and in addition to this a broader and longer *lamina superior*.

Palps (Pl. X. figs. 1 *b-c*).—The palps seem to be smooth, with the exception of the exterior basal elevation of the femur, which is granular. Longer or shorter, pointed and simple hairs are abundant everywhere. The hand bears

besides a single tactile hair near the inner margin and nearer to the middle than to the base (fig. 1 *b*, 1); the immovable finger possesses on the outer surface three tactile hairs near the base and two more distally (fig. 1 *c*, 4-8); the dorsal surface with two distal hairs (fig. 1 *b-c*, 2-3), and the inner without any. The movable finger has four tactile hairs on the outer surface (fig. 1 *c*). Outside, near the base of the fingers, we find a peculiar organ, shaped like a compressed horseshoe (fig. 1 *c*, *h*) and with a clear spot inside. Four similar ones are found interiorly near the upper margin at the base of the finger, the one placed above the other, each consisting of a low elevation with almost oval outline, and provided with a round clear spot at the top in the middle; each of the spots seems to possess a median dot (comp. 15, p. 201).

The *trochanter*, which is twice as long as broad, is distinctly stalked and gradually widened out distally; the inner side is, with the exception of a low basal concavity, regularly convex from the base to the tip; the outer side is slightly curved inwards. The *femur*, which is 3.5 times longer than broad, is provided with a distinct but short stalk; the interior side is slightly and almost regularly convex from the base to the tip; the outer side has, after the shallow notch which marks off the stalk, a low elevation; beyond this there is first a low concavity and then a moderate convexity. The *tibia*, which is slightly shorter and broader than the femur, is distinctly stalked and gradually enlarged distally; the inner side, beyond the concavity which marks off the stalk and the following low elevation, is slightly convex or, more correctly, shaped as a very open obtuse angle; the outer side is almost straight both before and beyond the scarcely visible elevation of the stalk and at last slightly convex. The *hand*, which is a little shorter than the tibia, but nearly twice as broad as the femur, is higher than broad and shorter than the fingers. The convexities of the superior and especially of the interior surfaces are much more marked than those of the inferior and exterior ones. Both fingers bear obtuse, squarely truncate, densely placed teeth; the tip of the immovable finger is much more hooked than that of the movable one.

Coxæ (Pl. X. fig. 1 *a*).—The *coxæ* are all placed on the same level, but on a lower level than the maxillæ. The first pair is almost as broad as long and scarcely enlarged towards the extremities; the second pair is of almost equal breadth, but distinctly enlarged distally; the third pair is so much enlarged distally that it becomes almost triangular, but much less marked than the corresponding pair in

Ideobisium Balzani. The fourth pair is broader again, enlarged distally, with the posterior corner smoothly rounded like the postero-exterior, which is produced backwards.

Legs (Pl. X. figs. 1 *d-f*).—The skin of the legs, especially that of the femora and tibiæ, seems to be minutely shagreened; we find more or less long, pointed, and simple hairs everywhere. An exceedingly long "tactile" hair is placed dorsally near the base of first tarsus of the last two pairs of legs. On each side near the base of the claws is placed a rather short hair with some few teeth distally along its upper margin (fig. 1 *f*). The areola is shorter than the slender claws. The legs are long and slender. The basal femoral part of the first pair of legs (fig. 1 *d*) is three times as long as high and twice as long as the distal part. The tibia is slightly shorter than the basal femoral part and a little longer than the second tarsus, which is about 2.5 times longer than the first. The femur of the fourth pair (fig. 1 *e*) is rather slender and three times longer than high; the articular membrane of the rather short trochantin is not straight as usual in *Ideobisium* (cf. p. 134), but oblique as in *Olpium*. The tibia is distinctly longer than tarsus ii., which is more than twice as long as tarsus i., but shorter than both tarsi together. The trochanter of the first pair of legs is enlarged distally and only a little longer than high; that of the fourth pair is much more slender and almost twice longer than high.

Colour.—The palps and maxillæ are yellowish brown with darker fingers; the cephalothorax is brown; the abdominal tergites are lighter with yellowish interarticular membrane; white spots, placed under the skin, are seen everywhere. The coxæ are brownish and the legs yellowish, both with a greenish shade.

Measurements.—Cephalothorax 0.720 (0.588); abdomen 1.820 (1.036) mm.

Palps: trochanter 0.392 (0.196); femur 0.784 (0.214); tibia 0.728 (0.245); hand 0.700 (0.388), height 0.420; finger 0.800 mm.

Leg i.: femur i. 0.396 (0.105); femur ii. 0.198 (0.100); tibia 0.315 (0.081); tarsus i. 0.125, tarsus ii. 0.305 mm.

Leg iv.: femur 0.675 (0.225), trochantin 0.235; tibia 0.495 (0.108); tarsus i. 0.162, tarsus ii. 0.360 mm.

Material.—Mr. H. H. Smith collected a single female near Chandilly (Windward Islands) at a height of 800 feet, March 14th, in fermenting cocoa-husks (shady place).

Remarks.—I have referred the above-described species to

Id. mexicanus, Bks. : the minor points in which this species differs from Banks's description seem not to be sufficient for establishing a new species ; but, on the other hand, we must admit that the description mentioned is too insufficient and lacking in important details for settling the question definitely.

The differences are the following :—The cephalothorax is only 1.2, not 1.5, longer than broad ; the trochanter of the palps can scarcely be called swollen behind ; the tibia is almost as long as the femur, not one fourth shorter ; the tibia can scarcely be called "short pedicellate" and is slightly broader than femur, not merely as broad.

This species is most easily distinguished from *Ideoroncus pallidus*, Balz. (10, p. 444), as well as from two undescribed species from Siam, which I have examined, by the flagellum, which consists of three short hairs, but especially by the tactile hairs of the hand ; *Id. mexicanus* bears only a single dorsal one, while the others bear four, placed in a trapezoid. On account of its slender palps and the arrangement of tactile hairs, it presents no similarity to *Id. gracilis*, Balz. (11, p. 540). From *Id. obscurus*, Bks. (12, p. 66), it differs by the simple undivided galea, by the palps, which are longer than the body, femur of the palps longer than the cephalothorax, and fingers distinctly longer than hand.

Ideobisium Balzani, sp. n. (Pl. X. figs. 2 a-h.)

♂. *Cephalothorax* (fig. 2 a).—The comparatively large eyes are placed near to each other at the lateral margin, removed from the front margin a distance about as long as their diameter (fig. 2 a). The cephalothorax, which is a little longer than broad posteriorly, has almost parallel sides, and is of nearly equal breadth behind the eyes, but slightly narrower in front of them. The front margin passes into a rather broad, rounded, median "epistoma." There are no transverse grooves. The skin seems to be smooth, and is provided with moderately long, slender, and pointed hairs everywhere.

Abdomen.—The abdomen is distinctly longer than broad and broadest in the middle. The sclerites of the tergites are, with the exception of the eleventh, of almost equal breadth and length (the second and third are a little shorter), and well separated from each other by long thin-skinned membranes. The sclerites seem to be smooth and bear some few simple pointed hairs along the hinder margin ; those in the middle are rather short, but the more lateral

ones are long and slender. The tenth and eleventh tergites bear a pair of "tactile" hairs each. The sides of the abdomen are minutely shagreened. The fifth to the eleventh sternal sclerites are similar to the tergal, but they are rather short in the middle and widened out laterally; the hairs, which are long and slender, are not placed along the hinder margin, but behind. The sclerite of the fourth sternite is divided into two well-separated triangular portions. The sclerite of the third sternite is better marked and provided with short hairs along hindmost margin and with the front margin curved inwards in the middle. In front of this sternite, which constitutes the hindmost genital plate, and between the fourth pair of coxæ, a complicated system of inner organs belonging to the male system are visible.

Antennæ (figs. 2 *a-b*).—The antennæ are large and gape distinctly when closed. The *flagellum* consists of at least six long slender hairs, provided with densely placed tiny teeth along the front margin; the hindmost hair is considerably shorter than the others. This flagellum presents great similarity to that of *I. crassimanum*, Balz. (cf. H. J. Hansen's figure, 15, tab. v. fig. 6 *f*). The immovable finger possesses along its inner margin a dorsal row of many tiny teeth, which vary in number and size in the different specimens.

The *serrula interior* is very similar to that described by Hansen in *Id. crassimanum*, Bal. (fig. 6 *b*); the basal teeth are placed near to each other and are very short compared with the distal ones, which are almost completely free, slightly curved, pointed, and with the hinder margin serrated; this serrula seems to be fused with the finger in its whole length to base of terminal tooth. Independent of this serrula, and placed on a lower level, there is a very long, slender, and curved spine, slightly dentated along its hinder margin; we find a similar one in *I. crassimanum*, but less curved.

The *galea* is rather long, slender, and blunt; its root is well removed from the tip of the finger. The end of the movable finger is moderately curved (fig. 2 *a*); behind the tip the dorsal margin possesses six to ten teeth, which are of unequal size in the different specimens, and even in the two antennæ of the same specimen.

The *serrula exterior* is very similar to that drawn by Hansen for *I. crassimanum* (fig. 7); its distal portion is free; there are about 30 teeth, which are larger distally and are more or less fused. When the serrula is observed

from the edge (fig. 2 *b, s*), it will be seen that the proximal portion is directed more downwards, the distal more upwards. If we examine the antennæ in their natural position, we will see the immovable from the edge with the serrula interior directed downwards and outwards, working against the serrula exterior (fig. 2 *a*).

Maxillæ (fig. 2 *c*).—The maxillæ, the hindmost portion of which is covered by the first pair of coxæ, appear more trapezoid than triangular; the terminal portion is moderately pointed, only this bears a long slender hair at the base and several shorter ones distally; a distinct long lamina maxillaris is present.

Palps (figs. 2 *d-e*).—The palps seem to be smooth with the exception of the inner surface of the hand. More or less long and slender hairs are found everywhere; those of the inner side are the longer; the inner surface of the hand bears two very long hairs; the hairs of the fingers are placed more densely. The hand bears exteriorly three tactile hairs (fig. 2 *e*, 6-8), one more forwards and two a little more backwards, the one above the other. The immovable finger possesses on the outer surface two tactile hairs (figs. 2 *e*, 4-5), and on the dorsal surface three (fig. 2 *d*, 1-3). The movable finger has one tactile hair at the base and three, one above the other, in the middle (fig. 2 *e*).

The *trochanter* is distinctly stalked and longer than broad; the inner side is marked off from the stalk by a moderate convexity, and is beyond almost straight to the end; the outer side is extremely short and concave. The *femur*, which is 2.5 times longer than broad, has a very short stalk; the inner surface has first a moderate convexity and thereafter a slightly pronounced concavity; the exterior side is first provided with a short and low elevation just beyond the stalk, and is then almost straight. The *tibia*, which is slightly shorter and broader than the femur, is distinctly and shortly stalked; the inner outline is almost semicircular beyond the deep notch which marks off the stalk; the exterior side is proximally almost straight, but for a very low elevation near the base, and distally very strongly convex. The *hand*, which is as long as femur and 1.8 times broader, is almost 1.5 times longer than broad and as high as broad; it is only a trifle longer than fingers, which are distinctly longer than the hand is broad. Both interior and exterior surfaces are much more strongly convex than the superior and inferior. The marginal teeth of the fingers are placed near to each other and squarely truncated.

Coxæ (fig. 2 *c*).—The coxæ are not placed completely on the same level; the first pair covers the hindmost portion of the maxillæ. The first pair is almost as broad as long; the second pair is a little longer and slightly enlarged distally; the third pair, the front margin of which is covered by the second, is widened out distally so considerably that its shape becomes almost triangular. The fourth is as broad as the third is distally and is almost trapezoid; the postero-interior corner is obtuse, and the postero-exterior is rounded but scarcely produced backwards as in *Ideoroncus mexicanus*, Bks. (Pl. X. fig. 1 *a*).

Legs (figs. 2 *f-h*).—The skin of the legs seems to be smooth. We find more or less long, pointed, and simple hairs everywhere; a dorsal "tactile" one is placed near the base of the first tarsus of the fourth pair of legs. A long pointed hair, which is provided with many teeth, especially downwards, on each side near base of the claws (fig. 2 *h*). The claws are strongly curved and longer than the areola. The legs are less long and slender than in *I. mexicanus*; the basal femoral part of the first pair of legs (fig. 1 *f*) is three times longer than high and 1.4 as long as the distal part. The tibia is as long as the basal femoral part, distinctly longer than the second tarsus, and only a little shorter than the two tarsi together; the distal portion of the tarsi is twice as long as the basal. The femur of the fourth pair (fig. 2 *g*) is about twice as high as long; the trochantin is almost half as long as the whole femur, with straight articular membrane. The tibia is a little longer than the two tarsi, of which the distal is almost twice as long as the basal.

Colour.—The hand and the tibia of the palps are reddish brown; the basal joints, maxillæ, and coxæ are darker or paler yellowish brown; the legs are very pale. The cephalothorax is brownish; the abdominal sclerites are lighter and more brilliant. Some of the specimens are paler, while others are darker.

Measurements.—Comparatively small specimen from St. Vincent. Cephalothorax 0.513 (0.450); abdomen 0.990 (0.540) mm.

Palps: trochanter 0.224 (0.144); femur 0.425 (0.162); tibia 0.378 (0.207); hand 0.410 (0.288), height 0.288; finger 0.360 mm.

Leg i.: femur i. 0.207 (0.099); femur ii. 0.152 (0.099); tibia 0.207 (0.063); tarsus i. 0.090; tarsus ii. 0.170 mm.

Leg iv.: femur 0.468 (0.207); trochantin 0.225; tibia 0.360 (0.095); tarsus i. 0.126; tarsus ii. 0.225 mm.

♀.—A much darker specimen from Upper Richmond Valley is probably a female; as the following dimensions make evident, neither the absolute nor the relative proportions are quite alike; but in all other respects it seems to be similar to the above-described male, which is perhaps a young one.

Cephalothorax 0·588 (0·532); abdomen 1·260 (0·700) mm.

Palps: trochantin 0·280 (0·168); femur 0·564 (0·210); tibia 0·476 (0·252); hand 0·560 (0·392); finger 0·448 mm.

Material, &c.—This species seems to be very common in the West Indies. I have examined specimens from several localities at St. Vincent, collected partly by Mons. E. Simon and partly by Mr. H. H. Smith; the latter seems to have taken most of his specimens under rubbish or rotten leaves in mountainous forests (1200–3000 feet) during the months from January to March.

Remarks.—This species seems to be nearly related to *Id. crassimanum*, Bal. (II, p. 542), from which it differs in the following characters:—The abdominal sclerites seem to be smooth, not granular; the epistoma is rounded, not subconical; the immovable finger of the palp has three, not two, tactile hairs; the hand is not 1·7 times longer and not 1·3 times broader than fingers are long, but longer than hand is broad.

II.—COXAL SAC. (Pl. VII. figs. 4 b–f.)

If we carefully examine the fourth pair of coxæ in the male of *Chelifer sacotrensis*, sp. n., we shall find a remarkable organ which I propose to call the coxal sac. This organ is only slightly developed in this species compared with many others more or less nearly related to *Ch. caneroides*, L., for instance, *Ch. sculpturatus*, Lewis (p. 121); in this paper I shall give only the description of its structure in *Ch. sacotrensis*. My investigations on its modifications and fuller development in other forms I hope to get finished in a not too distant future. The coxal sac is situated in the inner and hinder part of the coxæ, and directed towards the postero-interior corner (Pl. VII. fig. 4 b), where probably an opening is found through which the hairs of the funnel are directed. The sac, which is rounded and elongated, consists of two portions which are well marked off from each other dorsally and laterally. I was not able to settle the question whether the sides which I have called dorsal and ventral really are so or not. I use these terms because the position of this organ in one of the specimens I examined seems to

bear out this opinion. The two parts into which the coxal sac is divided are of very unequal size; the basal, which is nearest to the postero-interior corner, is only half as spacious as the distal part. The two portions are dorsally and laterally separated from each other by a rather deep groove as well as a chitinous ring (figs. 4 *e-f*), but ventrally there is no such distinction (figs. 4 *c-e*). Not only the outer surfaces, but also the inner cavities, are well marked off from each other except ventrally. Just between the two portions, and, as it seems, fastened to the above-mentioned ring, we find a "funnel" of hairs, which is open below (figs. 4 *e-f*, *b-f*). There is consequently no direct communication between the two cavities except ventrally. The units which build up the funnel are of two kinds; its wider basal portion is more solid and seems to have been formed by the fusing of elongated tubercles like those with which the inner walls of the distal sac are beset. These tubercles are not in every case all fastened behind to the above-mentioned ring, because at least some are seen to be free posteriorly and project into the distal cavity (fig. 4 *e*). The more narrow distal part of this funnel is composed of a number of long, slender, and pointed hairs which converge towards each other and are directed through the round entrance-opening (*o*) of the sac (*l*). This entrance opening, which is found just at the end of the organ, is, at least in other species, connected with an opening in the ventral wall of the coxæ, and the above-mentioned hairs project through this opening. The dorsal and partly the lateral walls of the distal cavities are provided with subconical tubercles which project into the lumen (figs. 4 *c-f*, *h*); each tubercle bears at least one terminal pointed hair. These tubercles are sometimes supported by chitinous ridges. The skin of the coxal sac is everywhere minutely granular.

III.—ABNORMAL SEGMENTATION.

Chelifera sculpturatus, Lewis. (Pl. VIII. fig. 2 *a*.)

One of the dried females of this species which I examined showed some abnormalities in the segmentation. The first abdominal tergite is normal (Pl. VIII. fig. 2 *a*); all the following are, as usual, divided into a right and a left portion by a longitudinal line. The left portions of the second and third tergites are well separated laterally, but fused in the middle, because the groove between them has been gradually abolished. The depressed areas and the ridges between show

also some irregularities. The other half part (the right) of the second tergite is rather short, but otherwise of usual shape; it is separated in its whole length from the right portion of the third segment, which is distinctly widened out towards the middle. If we regard the two segments as a whole, it will easily be seen by looking at the figure that the two half parts are of almost equal length laterally, but that the right half is distinctly longer than the left in the middle. The longitudinal line between the two is not parallel to the longitudinal axis of the body, but forms an acute angle with it. The left portion of the fourth tergite is rather long and well separated from both the third and fifth, especially towards the middle, where it becomes narrower. The right half is exceedingly narrow and rather short; the space between the two portions is very well marked, being twice as broad as the right half and more than half as broad as the left half. The wide open area thus formed is limited behind by the convex margin of the right half of the otherwise regular fourth tergite; it is like an attempt at lessening the unprotected wide space. The ventral side shows no trace of these irregularities.

Chelifer javanus, Thor., ♂. (Pl. VIII. fig. 1 a.)

As I looked over the collections of *Chelonethi* from India I discovered a specimen (♂ from Tharravadi, Burma) which was remarkable for its abnormal segmentation. The first and second abdominal tergites are normal, but the two following show a peculiar structure. The left half of the third tergite is fused with the right half of the fourth. I have not been able to distinguish the longitudinal line which elsewhere divides the sclerites, and it is consequently impossible to tell where the one begins and the other ends. The right half of the sclerite thus formed is much longer and somewhat narrower than the left. The right half of the third tergite is without connexion with the corresponding left half; its sclerite is triangular and rather short. The left portion of the fourth tergite passes into the right, but its sclerite has no connexion with the sclerite of the right side. The positions of the hairs are as usual, and, as seen in the figure, not the same in the third and the fourth tergites. The right side of the latter shows some irregularities, as the hindmost row of hairs are placed behind the hinder margin of the sclerite. The ventral side shows no trace of the described abnormalities.

In the following I enumerate a few similar cases of

abnormal segmentation found in Arachnids, Insects, and Annelids :—

Arachnids.—In Hansen and Sørensen's paper (24, p. 97, pl. ii. fig. 2 a) I came across a figure of *Stylocellus sumatranus*, Westw., one of the Cyphophthalmi, which shows that the groove between the fifth and the sixth tergite on the left side is incomplete; a kind of split segment is thus formed. If the right half of the sixth tergite is fused with and undistinguishable from the right part of the fifth the abnormality is of another nature than that found in *Ch. javanus*; but if it is connected with the right half of the seventh tergite the similarity to the above-described case is unmistakable.

Insects.—In the collections of the British Museum I found some specimens of Hymenoptera showing abnormalities in the segmentation. By the kind assistance of Col. Bingham I am able to give the names of the insects in question. In Trans. Ent. Soc. (23) I found a short note about one of these animals by the Rev. F. D. Morice, who had collected the specimens. He exhibited to the Society a specimen of "*Gorytes quinquecinctus (fossor)* with the abdominal segments twisted out of their proper shape and place." The animal so named is, according to Col. Bingham, not a *Gorytes*, but *Cerceris quinquefasciata*. The cases are the following :—

1. *Polistes* sp.—The first and the second segments are normal, the latter being provided with the usual yellow spots and marginal band, but the two following tergites are irregular. The left side of the third passes without any limitation whatever into the right side of the fourth, and so does the yellow band along the hindmost margin, which is directed obliquely backwards. The right portion of the third tergite, which is bordered with yellow, is well separated from the left and is short and narrow. The left portion of the fourth is even less marked, almost triangular, bordered with yellow, and without communication with its right part or with the fifth tergite. The latter is almost normal if the irregularly shaped anterior and posterior margins be excepted. Ventrally and laterally the segmentation appears normal.

2. *Megachile* sp.—The dorsal side shows the following abnormalities :—The hindmost margin of the third segment is not quite transverse, but slightly oblique, so that its right side becomes longer than its left. The left halves of the fourth and the fifth segments, which are well separated by a

groove bordered with thin yellow hairs, are both fused with the right half of the fourth tergite, which is rather short, especially laterally. The right half of the fifth tergite is consequently without connexion with its corresponding half; it is short, almost triangular, and bears the usual marginal row of yellow hairs.

3. *Cerceris quinquefasciata*.—The segmentation shows dorsally very remarkable variation. The first segment is normal; the left half of the second tergite, which bears a moderately large yellow spot, merges into the right half of the third, being rather short and almost yellow, on account of its prominent spot. The right portion of the second segment, which is very small and with a tiny yellow spot, is well limited from the tergite thus established. The left half of the third tergite, which is almost yellow, is well separated by a groove from the left part of the fourth, but passes into its right half without any limitation. The fourth segment, together with the one half of the third, becomes thus a split segment (*cf.* Morgan, 19, p. 245).

Many cases of a similar kind of abnormality or variation in the segmentation have been described in different forms of Annelids (compare the literature, 18–21). In outer appearance many of these abnormalities (Cori, 18, Taf. xxv. figs. 5 *a*, *b*) are very like those described here, especially in *Megachile* (segments iv. and v.) and *Cerceris* (segments iii. and iv.), and also in *Chelifer javanus*, Thor. (Pl. VIII. fig. 1 *a*). Cori (18, p. 576) characterizes the abnormality in the following manner:—“Dass die äusseren Segmentgrenzen der betreffenden Körperabschnitte nicht die Form von Kreistouren haben, sondern Schraubenlinien beschreiben.” It has also been called “spiral segmentation” (Bateson, 21).

Even if there is great similarity between the more simple cases of “spiral segmentation” in the Annelids and the abnormalities found in the segmentation of the above-described Articulata, it remains to be proved that the similarity is more than superficial. The number of the segments is not so constant in the Annelids as in most Arthropods, and the individuality of each segment, especially in the inner structure, is more pronounced in the former than in the latter group. The distinction between dorsal, ventral, and lateral parts within each sternite is better marked in the Arthropods. All these are reasons to be careful in comparing and identifying similar phenomena of this kind in the two groups. Different authors have tried to explain the

spiral segmentation, but in different ways. In the Arthropods there are at least two modifications, viz.: "the split segment," in which the one half of a segment is fused with its fellow half as well as with that of another segment; and the modification in which the one half of one segment is fused with the opposite half of the following, without having any connexion with its own corresponding half. Both modifications are found in *Cerceris* and an intermediate link in *Chelifer javanus* (Pl. VIII. fig. 1 a). The abnormality of *Ch. sculpturatus* (Pl. VIII. fig. 2 a) seems to be somewhat different. Whether the abnormalities mentioned are due to injuries in the embryos or later on in life or to quite different causes cannot be decided until a larger number of forms, especially of Myriopods, have been examined.

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EXPLANATION OF THE PLATES.

PLATE VI.

Chelifer bifissus, Sim., ♀.

- Fig. 1 a.* Left galea, × 335.
Fig. 1 b. Left palp, × 37.
Fig. 1 c. Left leg i., × 65.
Fig. 1 d. Left leg iv., × 65. *t*, "tactile" hair.
Fig. 1 e. Tip of left tarsus i., × 335.
Fig. 1 f. Tip of left tarsus iv., × 335.

Chelifer australiensis, sp. n.

- Fig. 2 a.* Ventral view of cephalothorax, × 24. *a*, anterior genital plate; *p*, posterior.

Fig. 2 b. Flagellum of left antenna, $\times 217$.

Fig. 2 c. Left antenna, $\times 139$.

Fig. 2 d. Left palp, $\times 15$.

Fig. 2 e. Hand of right palp, $\times 23$.

Fig. 2 f. Left leg i., $\times 18$.

Fig. 2 g. Left leg iv., $\times 18$.

Chelifer hawaiiensis, Sim.

Fig. 3 a. Hand of right palp, $\times 59$. *a*, accessory teeth; *s*, sense-organs.

PLATE VII.

Chelifer hawaiiensis, Sim., ♀.

Fig. 1 a. Left palp, $\times 20$.

Fig. 1 b. Left leg i., $\times 31$.

Fig. 1 c. Left leg iv., $\times 31$.

Fig. 1 d. Lateral tarsal hair of left tarsus (anterior), $\times 205$.

Fig. 1 e. Lateral tarsal hair of left tarsus (posterior), $\times 205$. (Variation.)

Fig. 1 f. Left antenna, $\times 190$. (Variation.)

Chelifer pacificus, sp. n., ♀.

Fig. 2 a. Left palp, $\times 20$.

Chelifer pallipes, White.

Fig. 3 a. Right palp, $\times 22$.

Fig. 3 b. Hand, $\times 21$.

Chelifer socotrensis, sp. n.

Fig. 4 a. Left palp, ♂, $\times 12$.

Fig. 4 b. Right coxæ iii.-iv., $\times 50$. *c*, coxal sac.

Fig. 4 c. Left coxal sac, almost seen from the basal end, \times about 300. *f*, funnel of hair; *b*, base of funnel.

Fig. 4 d. Left coxal sac in almost ventral view, \times about 300. *f*, as in 4 c; *o*, basal opening; *h*, tubercles with hairs.

Fig. 4 e. Left coxal sac in almost posterior view. Letters as in 4 c-d; *t*, free hairs of funnel.

Fig. 4 f. Left coxal sac, almost in dorsal view, \times about 300. Letters as in previous figures.

Fig. 4 g. Tarsus i. of left leg, ♂, $\times 62$. *li*, lateral hair, inner; *le*, outer.

Fig. 4 h. Tarsus i. of left leg, ♀, $\times 62$. Letters as in 4 g.

PLATE VIII.

Chelifer javanus, Thor., ♂.

Fig. 1 a. Abdominal tergites i.-v., $\times 30$. i-v, number of segments.

Chelifer sculpturatus, Lew.

Fig. 2 a. ♀ in dorsal view, showing the abnormal segmentation, $\times 17$. i-v, corresponding abdominal segments.

Fig. 2 b. ♂. Coxæ iv. and genital area, $\times 30$. *e*, opening of coxal sac; *a*, anterior plate; *s*, stigma i. within a concavity of posterior plate; *g*, line dividing off hinder part of posterior plate; *rv*, sternite iv.

Fig. 2 c. ♂. Right palp, $\times 16$.

Fig. 2 d. ♀. Right palp, $\times 16$.

- Fig. 2 e.* From cast skin, right palp, $\times 55$. *s*, sense-organs; *t*, tactile hairs.
Fig. 2 f ♀. Left coxæ iii.-iv., $\times 30$.
Fig. 2 g. Claw with lateral hair, $\times 145$.
Fig. 2 h. Cobweb of cocoon, $\times 550$.

Chelifer equester, sp. n.

- Fig. 3 a* ♀. Flagellum of left antenna, $\times 151$.
Fig. 3 b ♀. Tip of immovable finger of left antenna in ventral view, $\times 151$.
l, lamina exterior; *t*, terminal spine; *s*, five dentated lobes of the lamina interior.
Fig. 3 c ♀. Left galea, $\times 115$.
Fig. 3 e ♂. Left movable finger of antenna, $\times 100$.
Fig. 3 d ♀. Coxæ iii.-iv., $\times 34$.
Fig. 3 d ♂. Coxæ iii.-iv. with genital area, $\times 34$.

PLATE IX.

Chelifer equester, sp. n.

- Fig. 1 a* ♂. Left palp, $\times 10$.
Fig. 1 a ♀. Left palp, $\times 10$.
Fig. 1 b ♂. Femur of right palp, $\times 15$.
Fig. 1 b ♀. Femur of right palp, $\times 15$.
Fig. 1 c ♂. Tibia of right palp, $\times 18$.
Fig. 1 c ♀. Tibia of right palp, $\times 18$.
Fig. 1 d ♂. Hand of right palp, $\times 10$.
Fig. 1 d ♀. Hand of right palp, $\times 10$.
Fig. 1 e ♂. Left leg i., $\times 18$.
Fig. 1 f ♂. Left leg ii., $\times 18$.

Ideoroncus mexicanus, Bks., ♀.

- Fig. 2 a.* Front part of cephalothorax, $\times 91$.
Fig. 2 b. Serrula interior and flagellum of left antenna, $\times 249$.
Fig. 2 c. Serrula exterior and galea of left antenna, $\times 249$.
Fig. 2 d. Right antenna in dorsal view, $\times 125$.

PLATE X.

Ideoroncus mexicanus, Bks.

- Fig. 1 a.* Cephalothorax in ventral view, $\times 50$. *i*, interior marginal fissure; *m*, median exterior lyriform organ.
Fig. 1 b. Left palp, $\times 30$. 1-8, tactile hairs of hand and immovable finger.
Fig. 1 c. Hand of right palp, $\times 35$. Numerals as in 1 *b*.
Fig. 1 d. Left leg i., $\times 50$.
Fig. 1 e. Left leg iv., $\times 50$.
Fig. 1 f. Inner lateral hair of left tarsus iv.

Ideobisium Balzanii, sp. n., ♂.

- Fig. 2 a* ♂. Antenna and eyes in dorsal view, $\times 130$.
Fig. 2 b ♀. Left immovable finger, $\times 216$. *s*, serrula, seen from edge.
Fig. 2 c ♂. Cephalothorax in ventral view, $\times 52$.
Fig. 2 d ♂. Left palp, $\times 37$. 1-8, tactile hairs.
Fig. 2 e ♂. Right hand, $\times 37$. 4-8, tactile hairs.
Fig. 2 f ♂. Left leg i., $\times 65$.
Fig. 2 g ♂. Left leg iv., $\times 65$. *t*, tarsal "tactile" hair.
Fig. 2 h ♂. Inner lateral hair of left tarsus iv.

BIBLIOGRAPHICAL NOTICES.

Birds by Land and Sea. By JOHN MACLAIR BORASTON.
London: John Lane, 1905.

"HEAVENS! *Another* bird-book!" was the first exclamation which escaped us on unpacking this volume. But a glance at the beautiful illustrations which are copiously distributed throughout its pages soon convinced us that the book had at least one redeeming feature. Later, when we came to play the critic, we discovered that this was a work of real excellence, a perfectly charming series of essays, one for each month of the year.

The author seems to have written out of sheer love of his subject, rather than with a view of writing a book which, perchance, might "sell." His enthusiasm is infectious!

Possessing an unusual facility of expression the author is able to make even the most everyday fact of his subject interesting. Keen insight and power of interpretation are everywhere apparent in these essays, while here and there he is able to show his less fortunate brother naturalists something of the mysteries of the inner life of birds which are but rarely to be encountered. His observations, for example, respecting the migration of the starlings and his notes on their "pairing flights" are new to us.

The author's comments on the evils unfortunately inflicted on our native avifauna by the game-preserver are peculiarly to the point and have our most cordial sympathy. Never has the case been stated more clearly or more forcibly. He also inflicts a well-merited castigation on a certain Field "Naturalists'" (!) Club, whose conduct at Puffin Island ill-agreed with their title to the claim of "Naturalists."

Valuable hints on the methods of one of the most difficult branches of photography—the photography of living birds—are dropped incidentally by the author, and for these many who read this book will be grateful.

Books by what we may call camera-naturalists are legion, but this is one of the very best that has yet appeared.

W. P. PYCRAFT.

Our Country's Animals, and how to know them. By W. J. GORDON.
London: Simpkin, Marshall, & Co. (n. d.).

This volume is the last of the series which have appeared under the above title. We suppose it will be useful to some people, and, so far as we have examined it, it appears to be fairly accurate; but we would point out that the metapterygoid has nothing to do with the quadrato bone, the astragalus and calcaneum are not metatarsal

bones, the Microchoridae do not belong to the Insectivora but to the Lemurs; *Hyrachtherium* was not Tapir-like, and *Ornilhostoma* was not a Crocodile.

We note, as in former volumes, too many instances of loose writing, such as "The land Carnivores can be sorted out on their hind toes"

The long lists of names of fossil species serve to fill out the book, but it is doubtful whether they fulfil any other useful end whatever.

MISCELLANEOUS.

The Echinoid Name Discoidea subucula.

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

A FRIENDLY criticism of the labels attached to specimens of this Cretaceous Echinoid in the Geological Department of the British Museum has caused me to look the matter up. There is nothing very novel in the conclusions to which I have been led; indeed the tangle was almost entirely unravelled by Mr. J. Lambert twelve years ago*. But there are four reasons for reopening the question: first, Mr. Lambert's views appear to have passed unnoticed by British authors, in spite of the 'Zoological Record'; secondly, his conclusions are vitiated in the eyes of most zoologists by his acceptance of the pre-Linnean and uninominal writer Klein; thirdly, a further erroneous alteration of the nomenclature recently appeared in a book for which I was largely responsible; and, lastly, after lying *perdu* for just a century, another use of the name *Discoidea* claims attention. It may therefore be well to defend the name at the head of this note.

The name *Discoidea* was invented by Klein† for a genus of his section *Fibula*, he saying in explanation:—"Discoidea appellamus mutato nomine a figura *Disci* veterum (ff) qui cum vase ligneo

"(ff) *Lucerna prægrandis &c. cœnarumque reliquiis discus &c.*, Apul. 2, Miles, p. 125."

tornato convexo-concavo, quo nos reliquias ex mensa reponimus, comparari potest. Tischkorb, Tellerschussel." The sole species mentioned under this name was called by him *Discoidea subucula*.

Several of Klein's names were legitimized in 1778 by Leske in

* "Recherches sur les Échinides de l'Aptien de Grandpré," Bull. Soc. Géol. France, (3) xx. p. 77 *et seq.*; Nov. 1892. See further, Lambert, "Étude . . . Échinides crétacés dans l'Yonne," Bull. Soc. Sci. Yonne, xlviii. pp. 58, 59; 1894.

† Nat. Disp. Echinodermatum, p. 26; 1734.

his 'Additamenta ad . . . Klein &c.'; but the name *Discoïdes* was not so endorsed. On the contrary, Leske threw *Conulus* and *Discoïdes*, Klein's two "genera" of *Fibula*, into a single genus, for which he proposed the name *Echinites* *. The sixth species of this was *Echinites subuculus* Leske ex Klein.

The first writer to resuscitate *Discoïdes* appears to have been James Parkinson, who in vol. iii. of 'Organic Remains' (1811) gave a good account of fossil Echinoids, based upon, but not blindly following, that of Leske. On p. 20 he says, "The second genus of this section is *Discoïdes*, the only species of which is *subuculus*."

Parkinson has been strangely overlooked, and most writers have taken J. E. Gray † as the authority for the genus, and have supposed themselves to be following him in spelling the name "*Discoïdea*." In Gray's paper, however, the spelling is "*Discodea*," which may be a misprint for *Discoïdea*, or, as Mr. Alexander Agassiz has supposed, for *Discoïdes*, since anything is possible in a paper so full of misprints. As type, Gray quoted *Galerites rotularis*, Lamarek's name for *Discoïdes subuculus*. The spelling *Discoïdea* seems to have been first used in 1836 by L. Agassiz ‡, who, under the heading "*Discoïdea macropyga* Agass." (p. 137), wrote:—"M. Gray a judicieusement distingué de nouveau les Galérites à ambulacres étroits, que Klein désignait sous le nom de *Conulus*, et dont le *G. vulgaris* Lam. est le type, de celles dont les aires ambulacraires sont sensiblement plus larges, et que Klein appelait *Discoïdea* [sic], pour en faire un genre dont le *G. rotularis* Lam. est le type." In his systematic summary of slightly later date (p. 186), under "*Les Clypéastres*," he placed [Genus] "4. DISCOÏDEA Kl. et Gr. (*Conulus* Leske.—*Echinodiscites* V. Ph.—*Galerites* Lam.)"; then follows the diagnosis and list of species, including "*D. rotularis* Kl. [sic] (*Galerites rotul.* Lam.)." Therefore those who, for good or bad reason, prefer the form "*Discoïdea*," should write "*Discoïdea* Agassiz (emend. *Discodea* Gray, err. typ.)."

But *Discoïdes* Parkinson could be rejected only if the name were preoccupied for some other genus. This proves to be the case. L. Agassiz, in his 'Nomenclator,' under Mollusca, quoted "*Discoïdes*, Reu., = *Pleurobranchus*," giving no reference. Writers on

* *Op. cit.* p. 171 of original edition, p. 107 of reissue in same year. In Leske's synopsis of his own species and genera, on p. xviii, this is introduced as "Genus III. *Conulus* Klein. *Echinites* mihi." This and the fact that *Echinites* had already been used by Gesner ('Tract. phys. de Petrif.' p. 34; 1758) warrant the adoption of *Conulus*. The genotype is *Conulus*, vel *Echinites, albo-galerus* Leske ex Klein; but this is congeneric with *Echinites vulgaris*, the genotype of *Galerites* Lamarek ('Anim. sans Vertèbres,' p. 346; 1801), which therefore is a synonym of *Conulus*. *Echinocomus* A. d'Orbigny ex Breynius, is another synonym.

† "An Attempt to divide the Echinida &c.," Ann. Philos. xxvi. p. 429; Dec. 1825. Many writers quote "Gray, 1834," but no such paper can be found; probably they are misled by the words "de nouveau," in the paper by Agassiz quoted below.

‡ Mém. Soc. Neuchâtel, i. pp. 137 & 186.

Mollusca seem to have ignored this, with the exception of Herrmannsen †, who has this entry: “*Discoïdes Renieri* (? 1807. Tavol. classif.* [*=not seen]) teste Agass. Nom. . . . = *Pleurobranchus* Cuvier.”

After much trouble on the part of many friends, I have at last received, through the most kind exertions of Professor Dante Pantanelli of Modena, a clear and almost complete account of the work referred to. The author's name was Stefano Andrea REXNER, of Chioggia. The title of the pamphlet in question is ‘Tavola alfabetica | delle conchiglie adriatiche.’ The copy in the library of Padua University—the only copy that could be seen—has lost the full titlepage; according to Carus and Engelmann (*Bibliogr. Zool.* p. 831) it continued “nominata dietro il sistema di Linneo, edizione di Gmelin. s.l. 1788.” Professor Pantanelli, however, asserts that the date is indubitably 1804. The date 1807, given by Herrmannsen, refers to another pamphlet, No. 1 in Agassiz and Strickland's Bibliography, while the date 1788 may be due to a confusion with No. 5 in that Bibliography. For the present discussion it is enough to admit that any possible date is anterior to 1811.

The book is a folio and comprises two sections: Part I. pp. v–xiii, entitled “Molluschi cioè Lamellibranchi e Gasteropodi compresi quelli terrestri”; Part II. pp. xv–xxvi, “Prospecto delle classe dei vermi ossia Molluschi—Vermi intestinali—Polipi.” At the end are eight large systematic tables, preceded by a titlepage. This copy may possibly be incomplete so far as the number of tables is concerned.

The name *Discoïdes* is found only in Part II., and occurs first in line 5 on p. xvi, being the ninth in a list of genera of Mollusca, thus:—

“IX Discoïde *Discoïdes* Ren. Discoïde Discoïde barcolante
D. natans D. Branlant Renier.”

At the foot of the page are various footnotes; of these (c) gives a description of the genus and (d) an account of the locomotion of the species and of its chief variations. The author promises a more complete description of the species, with anatomical details and a figure, in a future “Saggio”; but this he never published. The descriptions here given are, however, enough to justify the name *Discoïdes*. Whether that name is a synonym of *Pleurobranchus*, established by Cuvier about the same time, must be left to the malacologists to determine.

The Echinoid genus therefore cannot bear the name *Discoïdes* Parkinson 1811, but must accept the modification *Discoïdea*. The American school of purists would enforce the validity of Gray's misprint, while a contrary school would reject both *Discoïdea* and *Discoïda* because of their common etymology with *Discoïdes*. The latter view, which I do not admit, might lead to the acceptance of one of the names next to be considered.

Gradually other species were described as belonging to the genus.

† *Indicis generum malacoz. &c., i. p. 394; 1846.*

and in 1883 Pomel, perhaps following a suggestion by Desor*, thought it necessary to separate these from the true *Discoidea* (*D. subuculus*) as a subgenus *Pithodia*, of which, if it were accepted, the type would be *D. cylindrica* †.

Ignoring this action by Pomel, P. Martin Duncan, on p. 139 of his "Revision of the Echinoidea" ‡, proposed a similar subdivision of the genus on very similar grounds, and erected a subgenus *Echinites*, of which the unique representative was *D. subuculus*. The name, as we have seen, was doubly preoccupied, indeed trebly, for Müller and Troschel had also used it for an Asteroid. The subdivision had been anticipated by Pomel. And Duncan's method of subdivision was impossible, since *D. subuculus* is the genotype of *Discoidea*.

Prof. J. W. Gregory, however, while properly rejecting the name *Echinites*, has gone further, and not merely proposed a new name, *Protocyamus*, "to indicate the affinity of this Echinoid with the *Echinocyamus* series," but has raised the form to the dignity of a genus §.

The name *Protocyamus* cannot stand, and it is very doubtful whether any subdivision is required. Gregory made no attempt to rebut the arguments of Lambert, who (*op. cit.* 1892) pointed out that the chief diagnostic character used by both Pomel and Duncan, namely the distribution of the hydropores on the genital plates, was one that, in some genera at any rate, varied among individuals of a single species.

So far, then, the conclusion is that all the species should be left in one genus under the name *Discoidea* Agassiz.

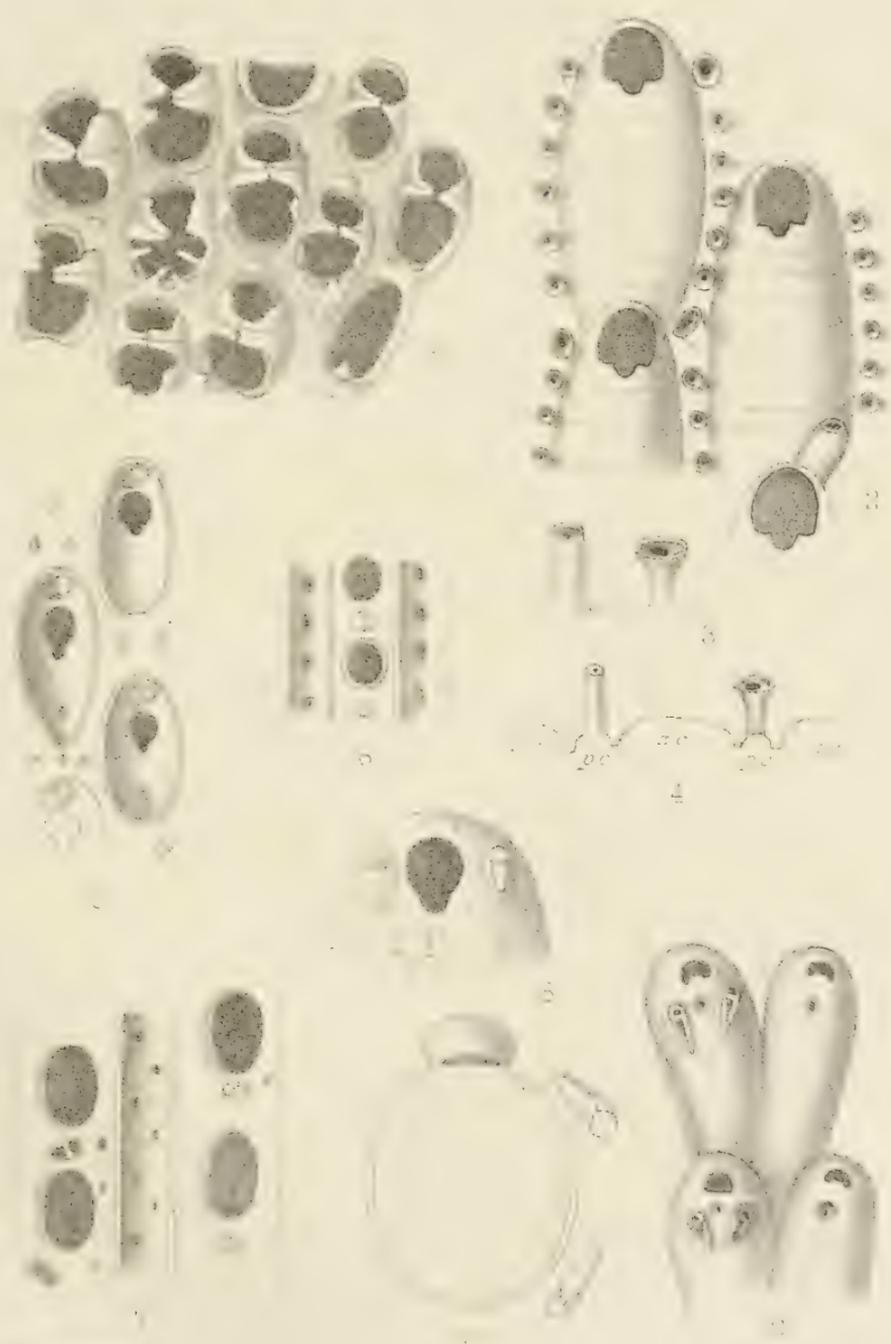
As for the trivial name *subuculus*, the question has been raised whether it should not be *subucula*. Klein, Leske, and, indeed, most authors have written *subuculus*. Klein explains this as "Kamisol-Knopff" (Anglice "shirt-button"), which, however, is not a translation of *subuculus*, but includes the word *Fibula* understood, since the *Conulus* and *Discoidea* of Klein are divisions of his "Sectio I. *Fibula*," which he explains as a *Sphærule vel glomerula vestiaria*. *Subuculus*, then, was Klein's Latin for *Kamisol*; but the Latin word used by Horace and many other authors (see Facciolati and Forcellini's Lexicon) was *subucula*, signifying "a man's shirt," masculine enough in meaning if not in form. If no other authority for *subuculus* can be found, it seems preferable to employ in the Exhibition Galleries of the British Museum the spelling *Discoidea subucula*.

* 'Synopsis des Échinides,' p. 175; 1858.

† Pomel, "Classification méthodique &c.," Doctoral Thesis, Fac. Sci. Paris, Alger, p. 75.

‡ Journ. Linn. Soc., Zool. xxiii.; 31 Dec., 1889.

§ 'Treatise on Zoology,' ed. Lankester, vol. iii. "Echinoderma," p. 316; 1900.



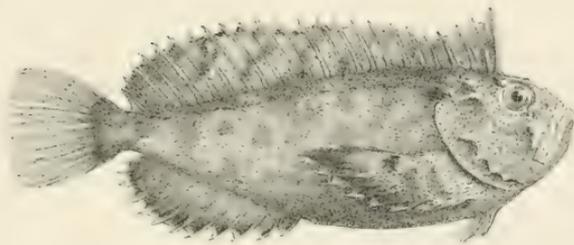
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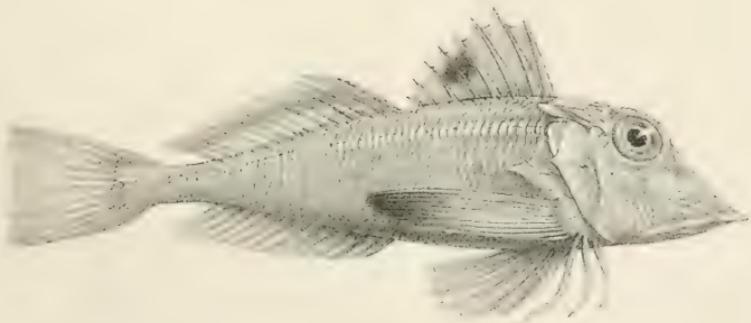
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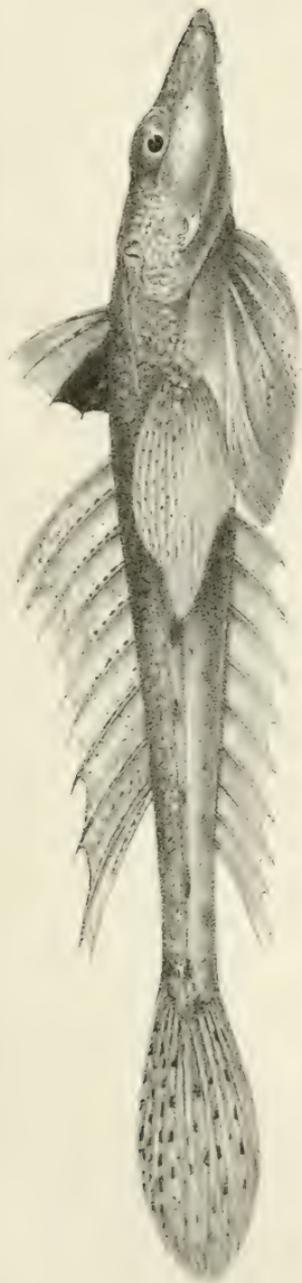
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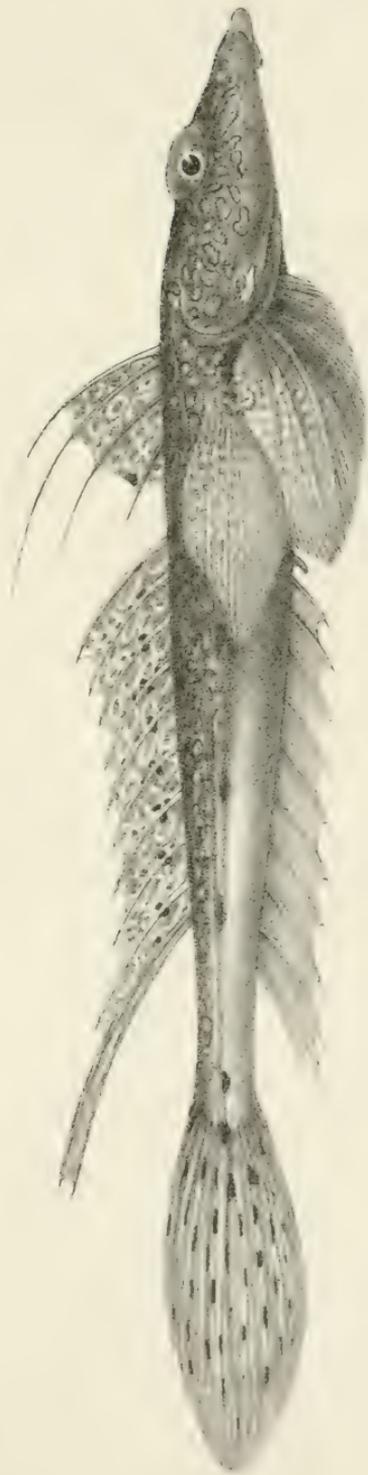
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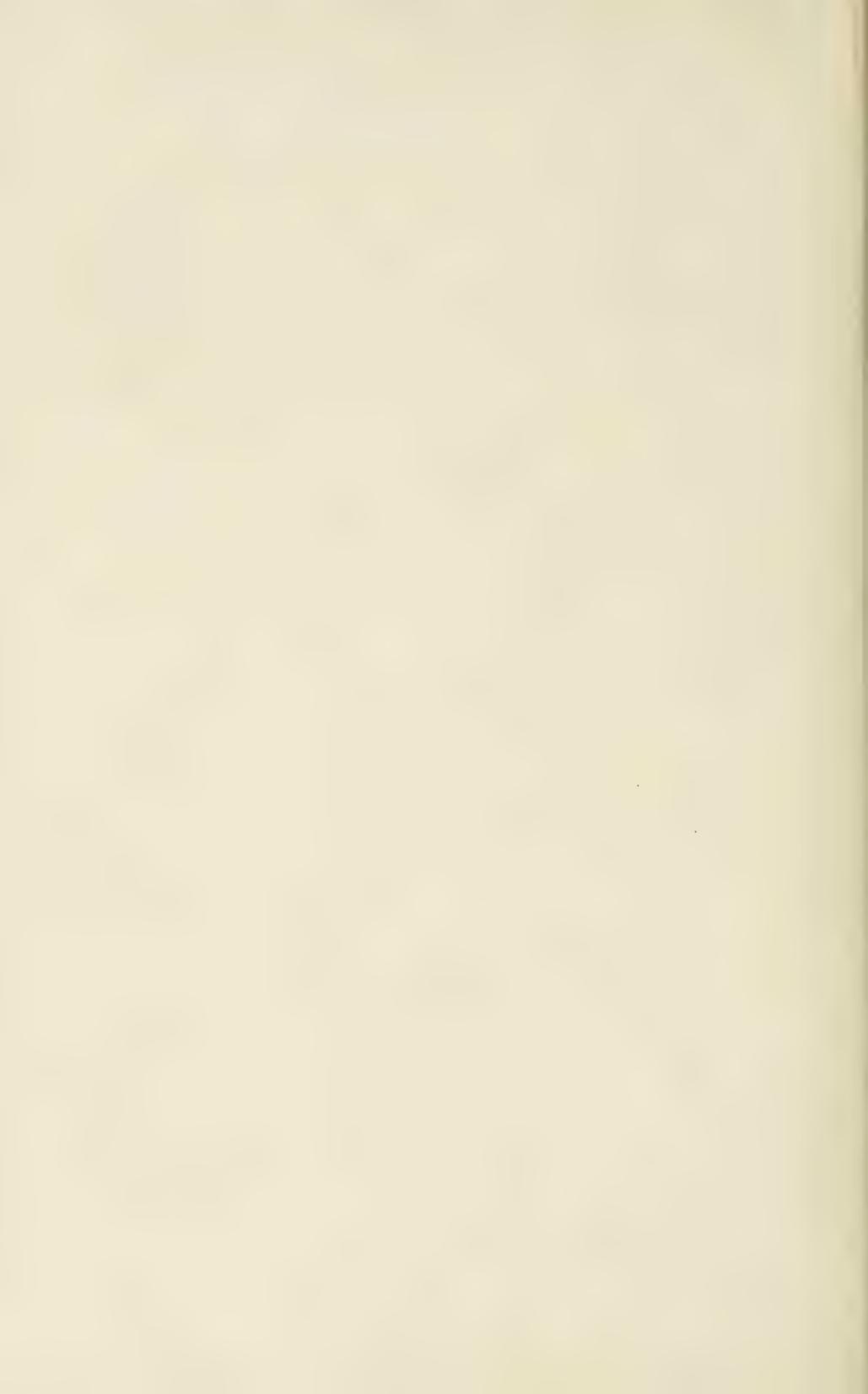
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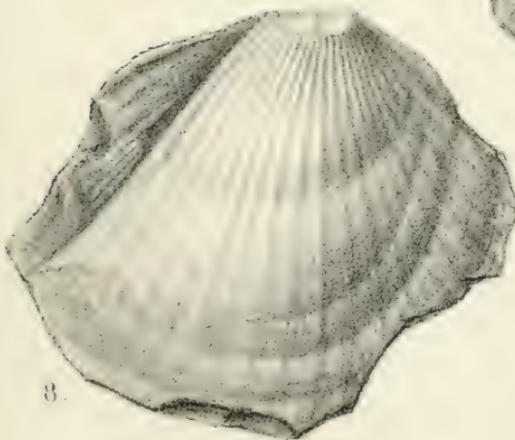
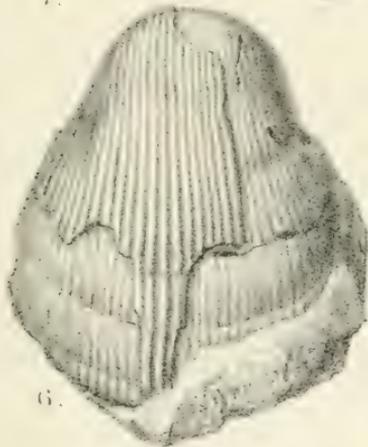
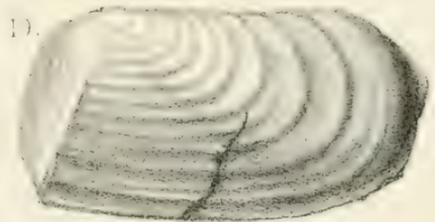
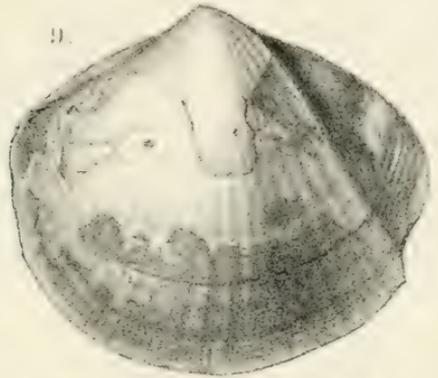
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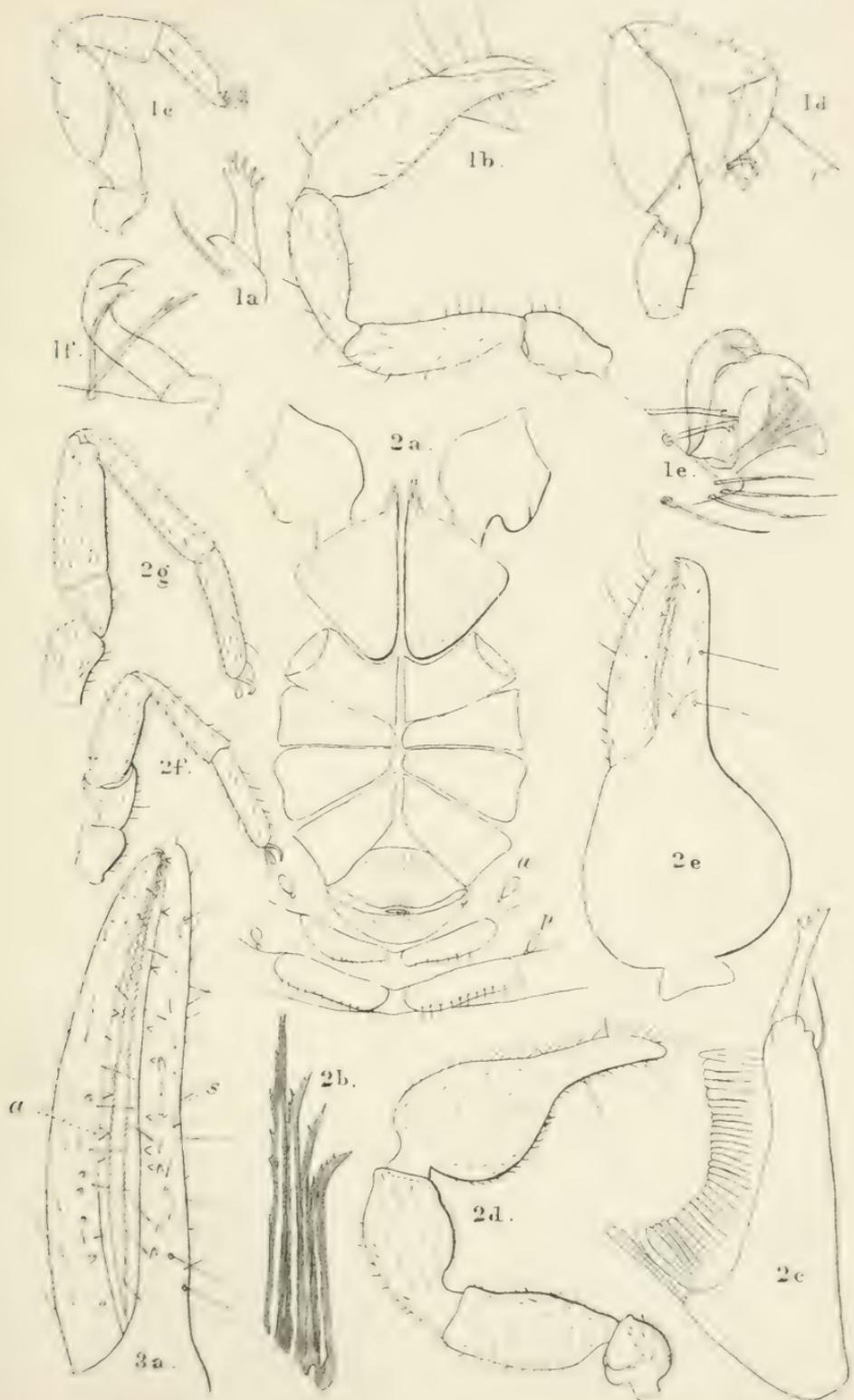




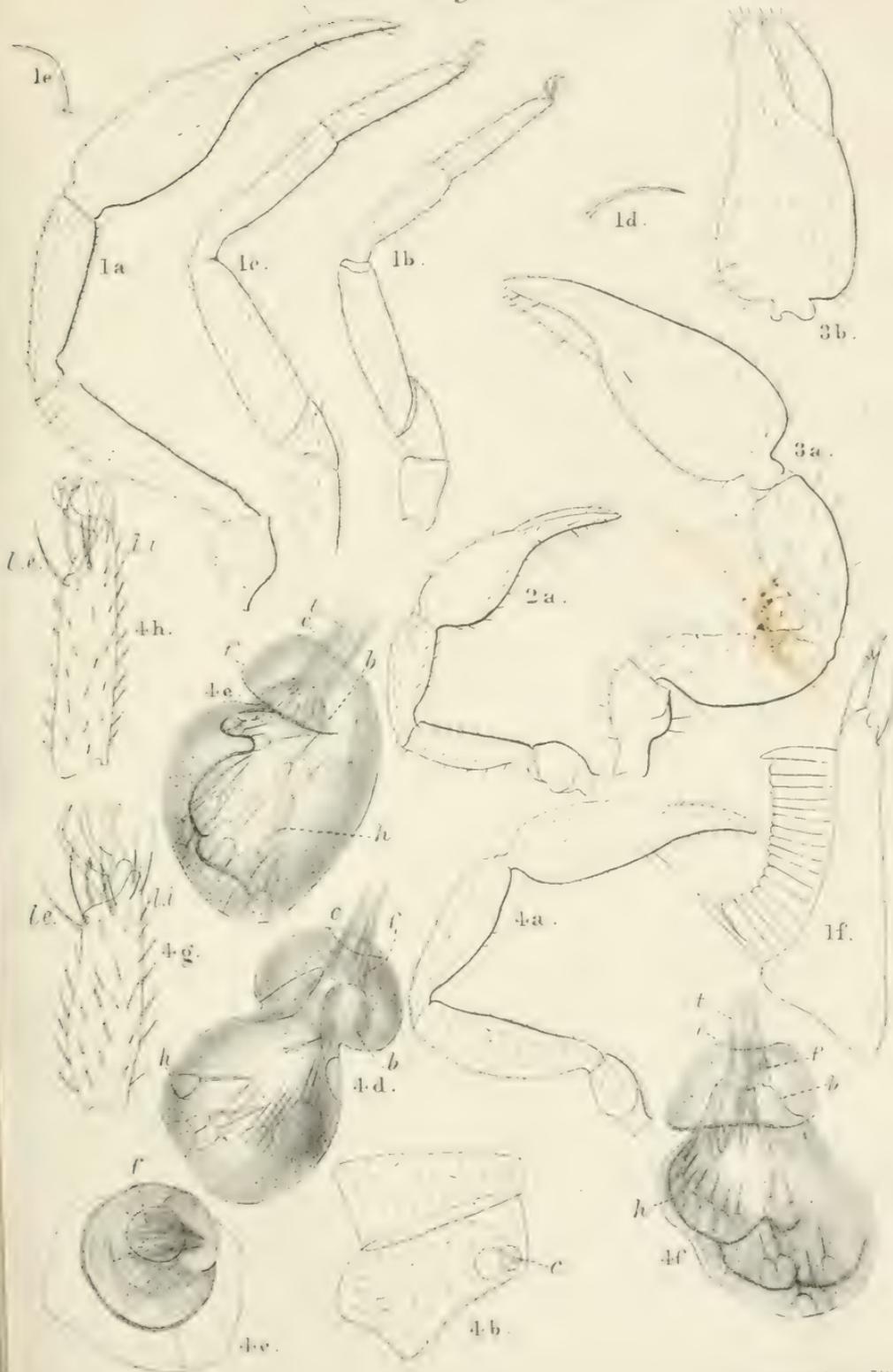


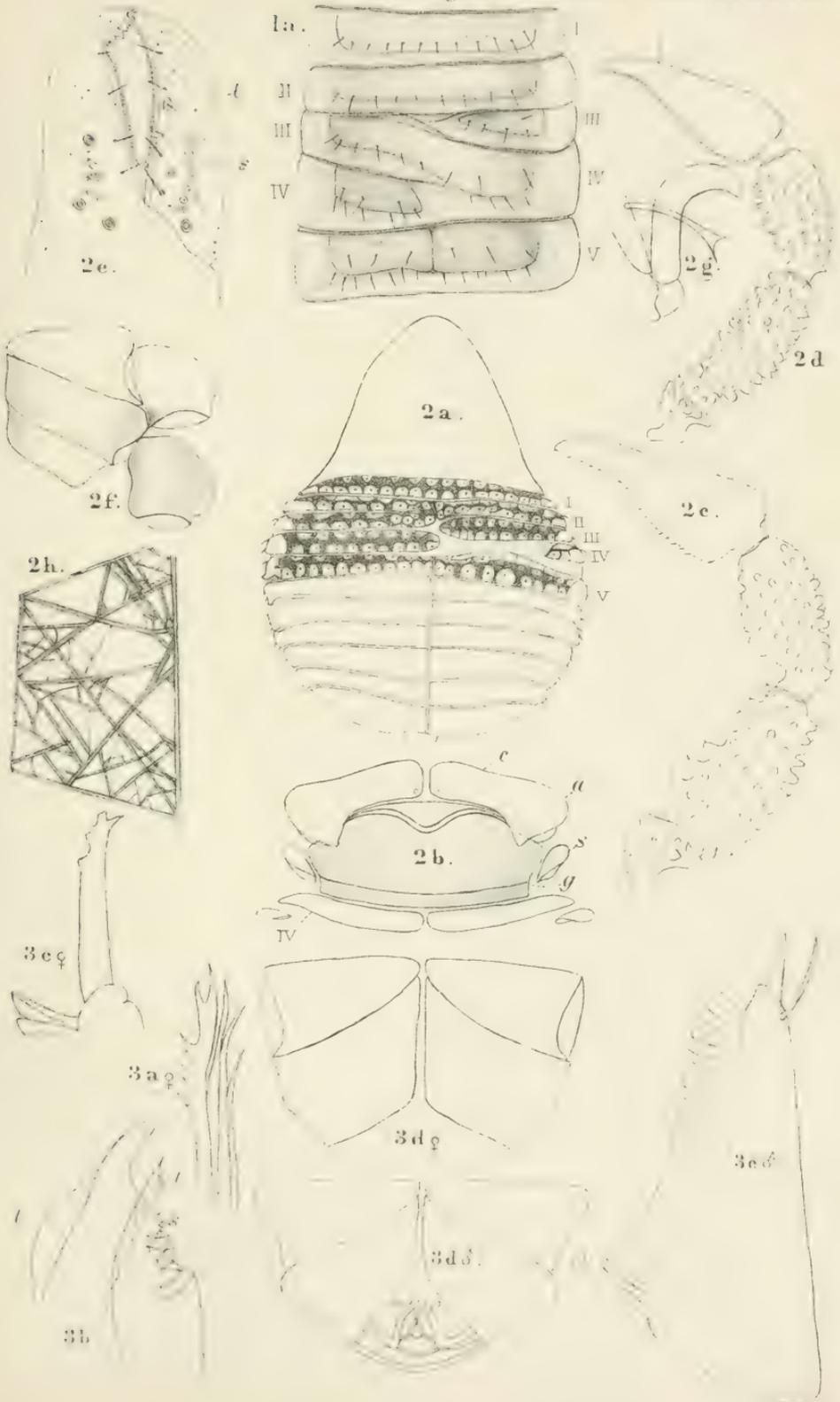
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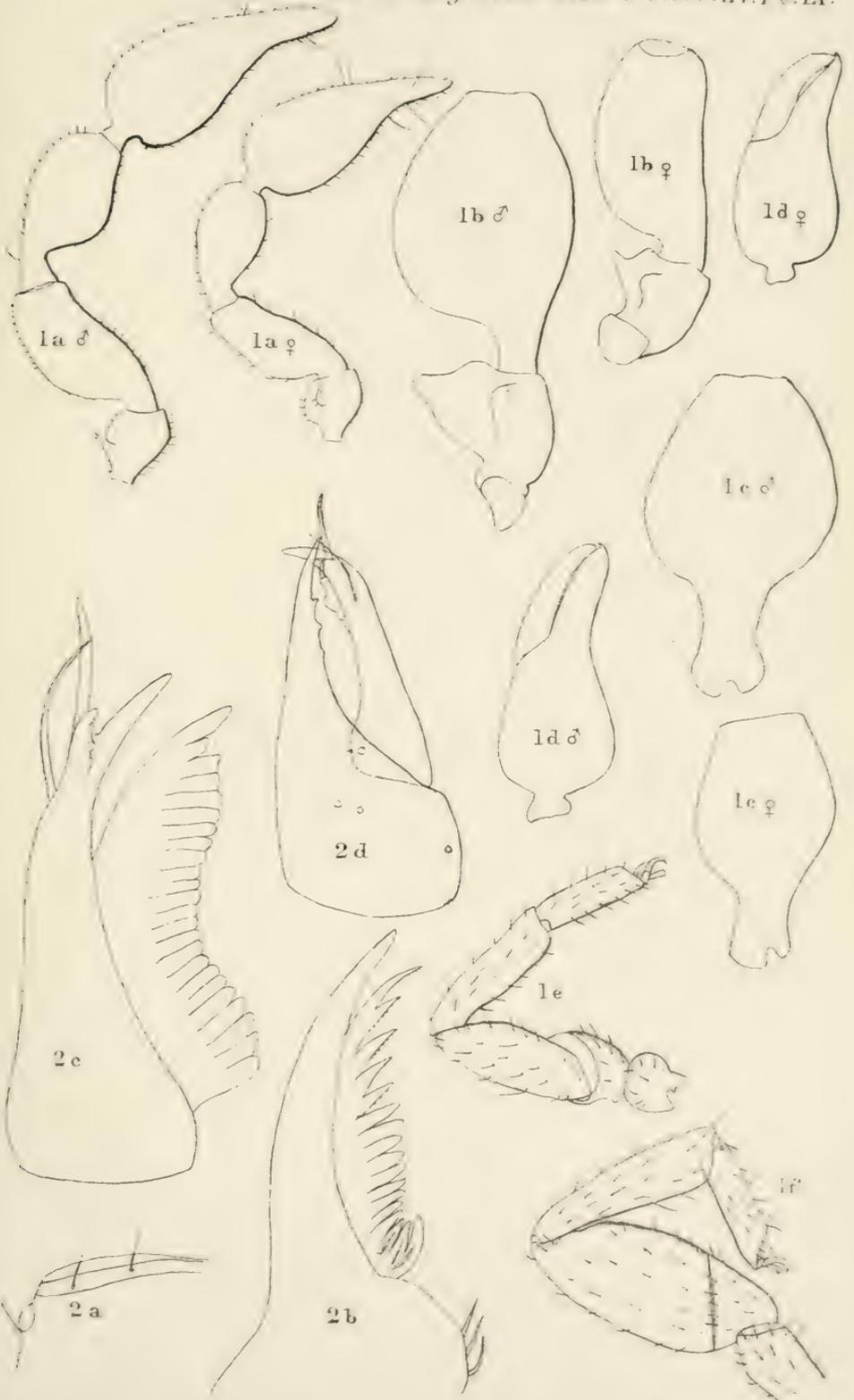




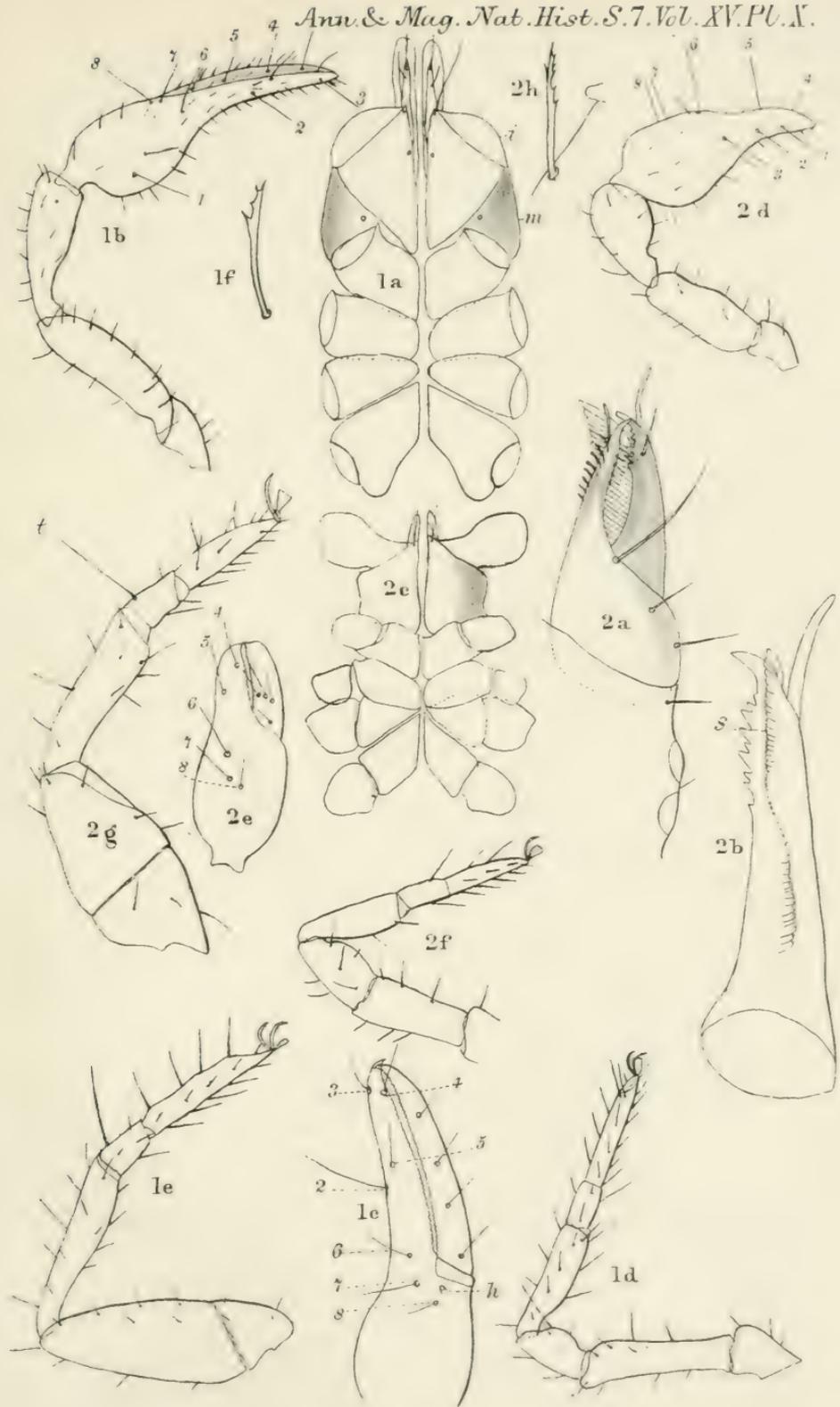














THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 86. FEBRUARY 1905.

XI.—*New Species of Eastern Heterocera in the National Collection.* By Colonel CHARLES SWINHOE, M.A., F.L.S., &c.

Family Chalcosiidæ.

Chalcosia electra, nov.

♂. Frons white, shaft of antennæ metallic blue, pectinations black; head and thorax black, covered with metallic-blue scales; abdomen pale ochreous brown, with white segmental thin bands: fore wings dark greenish black, with a dark dull ochreous subapical band, like two oval spots joined together, extending from close to costa beyond the middle to near outer margin above the middle; a white space on the hinder margin, which in the type specimen is pure white and in the other is white suffused with brown: hind wings white, with a black apical border, broad at the apex and narrowing down the outer margin; in the Santabong example with black streaks below the costa; some metallic-blue scales at the base of the fore wings in the type specimen, on both wings in the other. Underside much as above, but there is much blue scaling on the basal portion of the fore wings and at the apex of both wings: body and legs white.

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

1 ♂, Pewrisoen, Borneo (*Shelford*) (type).

1 ♂, Santabong, Borneo (*Shelford*).

I know of no near ally.

Family Drepanulidæ.

Problepsidis neoma, nov.

♂. White, suffused with pale chestnut-brown irrorations in parts; two nearly straight brown lines from the abdominal margin of the hind wings, the first from one third, the other from the middle, run parallel across both wings and suddenly converge on the middle of vein 5 of fore wings, and run from thence in a single line to the costa near the apex; between these lines on the fore wing is a large hyaline space; the rest of the wing is lightly suffused; on the outer margin there is a fairly broad pale pinkish band, composed of large pale pinkish spots joined together; marginal line brown; cilia pale pinkish, marked with brown: hind wings with the inner area nearly white, the outer area from the outer line to the margin with dark suffusion, and through the middle of the disk a dentated white line; marginal line white; cilia white and brown. Underside white, the hyaline patch on fore wings prominent, bordered outwardly by a dark brown band: hind wings with a broad dark brown band, which covers a third of the wing.

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

Singapore (*Ridley*).

Allied to *carneotincta*, Warren, = *excisa*, Hmps. n.

Problepsidis tristis, nov.

♂. White; pectinations of antennæ ochreous: fore wings with a broad pale brown medial band from the middle of hinder margin to the upper end of the cell; a similar marginal band from the hinder angle to vein 6, through which runs a white dentated line: hind wings with very faint indications of two similar bands; on the medial bands of both wings are some white, iridescent, raised scales. Underside white; fore wings with a brown band from the middle of the hinder margin, which is curved at vein 6 and runs down again to the hinder margin near the angle.

Expanse of wings 1 inch.

Matang, Borneo (*Shelford*).

Has the fore wing somewhat excavated below the apex, and is allied to *carneotincta*, Warren.

Callidrepana pilana, nov.

♀. The upper half of the hind wings, including the entire cell, is whitish; otherwise the entire coloration of body and

wings is very uniform dark ochreous, covered with very minute iridescent white scales, and on the middle of the fore wings a few black atoms; a straight dark orange line runs from below the middle of the abdominal margin of the hind wings to near the falcated apex of the fore wings (obsolete on the whitish portion of the hind wings); an indistinct indication of a dentated orange submarginal line on both wings and dark marginal line and cilia. Underside of a uniform pale orange ochreous, without any markings.

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

Matang, Borneo (*Shelford*).

Antennæ bipectinate, the branches short.

Family Limacodidæ.

Parasa insignis, nov.

♂ ♀. Of a uniform dark bright chocolate-colour; a pale spot on the palpi above near the tip; a green spot behind the base of each antenna; a green antemedial transverse band on the fore wings from before the middle of the hinder margin to the middle of the costa, narrow and broken in the male, broad and unbroken in the female, and somewhat expanded on the costa. Underside of the same uniform dark bright chocolate-colour; a whitish space on the basal half of the hinder margin of fore wings; legs with pale spots. The female is paler chocolate than the male, the hind wings and the underside considerably paler.

Expanse of wings, ♂ $1\frac{2}{10}$, ♀ 2 inches.

♂ ♀, Borneo, 1904 (*Shelford*) (types).

1 ♂, Borneo, 1904 (*Shelford*).

1 ♀, Kuching, Borneo, 1902 (*Shelford*).

Belongs to the *lepida* group.

Family Lymantriidæ.

Euproctis dirtea, nov.

♂. Antennæ, palpi, head, thorax, and fore wings dark dull greyish ochreous; palpi brown above; shaft of antennæ brown, a white spot at the base on each side: fore wings irrorated with black atoms; a prominent black spot at the end of the cell; two dark grey, transverse, even bands, antemedial much outwardly curved, the other discal and very slightly curved; a concolorous cilia with grey patches: hind wings dull yellow; the abdominal area broadly brownish; abdomen brownish black; anal tuft dull yellow. Underside

of a pale dull ochreous, the abdominal area of hind wings brownish; a prominent large black spot at the end of the cell in both wings: body and legs without markings.

Expanse of wings $1\frac{8}{10}$ inch.

Kuching, Borneo, 2 ♂ (*Shelford*).

Belongs to the *plana* group.

Family Hepialidæ.

Palpifer pellicia, nov.

♂ ♀. Of a uniform dull brown colour above and below, a slight red tinge on the hairs of the legs: the fore wings above have a very small white dot in the middle of the cell, which, however, is not visible in all examples; the hind wings have a moderately large yellowish spot on the outer margin below the apex; there are no other markings.

Expanse of wings $1\frac{8}{10}$ - $1\frac{1}{10}$ inch.

Khasia Hills.

Allied to *P. cærulescens*, Swinhoe; paler in colour, the wings more sparsely clothed, and uniformly smaller; *cærulescens* has a prominent large white spot in the middle of the cell of fore wings and no yellow spot on the hind wings. I have five examples of this new form and have examined several others.

Family Trifidæ.

Caradrina pratexta, nov.

♂ ♀. Ochreous brown; palpi with pale hairs in front; thorax with a brownish band in front; abdomen of the male with blackish-brown hairs and luteous anal tuft: fore wings variegated with pale luteous-grey marks; a pale antemedial transverse line, edged on each side with brown, a short outward angle in the middle, and bent inwards shortly on to the costa and on to the hinder margin; a postmedial similar line, which, however, is not bent inwards at its lower end; a submarginal sinuous pale line, edged on its inner side with brown; orbicular a small black spot, pale-ringed; reniform black, large, somewhat ear-shaped, and ringed with a pale line: hind wings pale brown, a brown lunule at the end of the cell; marginal line pale, interrupted on fore wings: cilia of fore wings brown, of hind wings luteous, with a brown basal line. Underside grey; a brown lunule at the

end of each cell; both wings with dark grey discal lines and pale submarginal fascia.

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

Khasia Hills.

There is an example from Darjiling in the B. M., drawer 142.

Euplexia flavistigma.

Xylophasia flavistigma, Moore, P. Z. S. 1867, p. 50; Hmps. no. 1715.

Xylophasia sodalis, Butler, Ann. & Mag. Nat. Hist. (5) i. p. 83; Hmps. no. 1717.

Apamea strigidisca, Moore, P. Z. S. 1881, p. 346, pl. xxxviii. fig. 9.

Apamea basalis, Moore, l. c. p. 346.

Apamea denticulosa, Moore, Lep. Atk. p. 109, pl. iv. fig. 13 (1882).

Apamea obliquiorbis, Moore, l. c. p. 109.

Khasia Hills; common.

The type from Bengal is in Coll. Staudinger, but the description is good, and there can be no mistake about the identification; the type of *sodalis* from Japan is in the B. M., so are also the types of *strigidisca* from Sikkim, *basalis* from Dalhousie, and *obliquiorbis* from Darjiling; the type of *denticulosa* from Darjiling is also in Coll. Staudinger, but the description and figure are good: all the above are undoubtedly one species. Sir George Hampson puts *Halena constellata*, Moore (Lep. Atk. p. 130, pl. iv. fig. 21), from Sikkim, the type of which is also in Coll. Staudinger, as a synonym to *flavistigma*, but neither the description nor the figure corresponds.

Family Acontiidæ.

Agrophila burmana, nov.

♂. Frons with a pale luteous band; thorax and fore wings luteous white; abdomen grey, with white rings: fore wings with a very broad blackish-brown marginal band, occupying nearly half the wing; this band has a clearly cut inner edge, is narrow at the apex, curves round the reniform to the middle of the wing, then almost straight down to the hinder margin; the rest of the wing is luteous white, with a medial double line, nearly erect, and some pale blackish-brown marks on the costa; marginal line whitish; the reniform is a round ringlet, the orbicular is not visible: hind wings brownish, without markings.

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

Beeling, Burma (*Bingham*).

I have several examples, all identical; it appears to be a good and uniform species. There is one in the B. M. from Thyetmyo, Burma, in drawer 195, with *A. basifera*, Walker.

Maliattha stolasa, nov.

♂ ♀. White, minutely irrorated with chestnut-red atoms; palpi, frons, and antennæ chestnut-red: fore wings with the costal border and outer portions suffused with that colour; some white specks on the costa; indications of two outwardly curved white lines before and beyond the middle rather close together; a white transverse streak below the apex close to the outer margin: hind wings grey; marginal line of both wings white; cilia white, interlined with grey.

Expanse of wings $\frac{8}{10}$ inch.

Khasia Hills.

Allied to *M. plumbata*, Butler, from Dharmasala, which I also have from Simla; is common in the Khasia Hills. There is in the B. M. drawer 199, unnamed, one from Arjuno, Java, and one from Sarawak, which appear to me to be identical with the Khasia Hill form.

Cerynea rubra, nov.

♂. Palpi, frons, and head chocolate-brown; body and wings reddish-orange colour: costa of fore wings broadly chocolate-brown; two brown dots at the end of the cell; a pale lunular mark halfway between these and the outer margin: hind wings with a brown mark in the cell, some in the middle, and some in the disk; apparently indications of transverse bands, of which there are also some indications on the fore wings: both wings variegated with marks of darker orange; brown marginal festoon and black spots. Underside smoky grey, the wings crossed by three indistinct grey bands; legs brownish grey.

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

Matang, Borneo (*Shelford*).

Allied to *ustula*, Hmps., from Ceylon, and superficially somewhat resembling it; but that insect has broader wings and two spots at the end of each cell.

Rivula niveipuncta, nov.

♂. Palpi, head, and collar pale ochreous grey; thorax and fore wings dark olive-brown; spots on fore wings pure white, subbasal, ante- and postmedial, and two close to the apex;

two white dots below the second spot, a cluster of many spots and dots below the third, three dots on the costa between the third and fourth, with two or three dots below them; a large white subbasal spot within the wing and two dots in a line beyond: hind wings and abdomen pale brown, without markings. Underside: fore wings grey, with the apical spots and some spots and dots on the outer half of the costa: hind wings whitish, with a grey spot at the end of the cell and a grey discal line.

Expanse of wings $\frac{7}{16}$ inch.

Khasia Hills.

Somewhat resembling *R. niphosticta*, Hmps., from Ceylon, but the spots on the fore wings are differently arranged.

Family Palindidæ.

Homodes irretita, nov.

♂. Of a uniform dull dark fulvous, brighter than *fulva*, Hmps., which I have from Ceylon, but duller than in *crocea*, Guenée, or *vivida*, Guenée, the margins slightly darker than the interior portions of the wings; antemedial and medial slightly waved, dark transverse lines nearly erect on the fore wings, the inner line continued on the hind wings, curving slightly outwards; duplex dentated discal lines across both wings, the inner line having black points on the dentations on the hind wings; the first three lines ending in black dots on the costa of the fore wings; duplex dark red submarginal lines on both wings, enclosing a series of small black lunular marks; black lunules close to the outer marginal black line; all the black points and lunules with minute white points attached to them. Underside of a uniform fulvous-red colour; fore legs with thick whitish hairs.

Expanse of wings $1\frac{2}{16}$ inch.

Khasia Hills (type).

Silchar, Cachar.

There is one example in the B. M. from the Khasia Hills; there are also in the same drawer three from Fergusson Island, three from the Solomons, and three from Singapore which cannot be separated from this form. It is nearest to *bracteigutta*, Walker, from Sarawak, the type of which is in Mus. Oxon.

Family Sarrothripidæ.

Genus NANAGUNA, Walker.

Nanaguna, Walker, xxvii. 85 (1863).

Clettharra, Walker, xxvii. 101.

Orosa, Walker, xxxiv. 1222 (1865).

Nanaguna breviuscula.

Nanaguna breviuscula, Walker, xxvii. 85.

Cettharra valida, Walker, xxvii. 101; Hmps. no. 2237.

Cetthara floccifera, Hmps. Moths India, ii. p. 386 (1894).

Khasia Hills; common.

Also from Nagas, Burma, Ceylon, and Borneo; very variable in shades of colour.

Nanaguna aquisoides, nov.

♂ ♀. Palpi brown, white at the base and tips of the last joint; frons brown; head and thorax white, the latter with brown specks; wings and abdomen dark olive-brown: fore wings with white suffusion, speckled with brown at the base and on the costal and apical areas, forming a circle round the brown portion of the wing; indications of a subbasal brown line, of a discal line outwardly angled at vein 3, and of a submarginal line, but all very indistinct; marginal line dark blackish brown: hind wings slightly pale brown, without markings. Underside dull brown, marginal line pale, no markings; tarsi with pale bands.

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

Khasia Hills.

There is one example in the B. M. Deltoid drawer no. 45, without name, from the Khasia Hills; superficially this insect is much like *Aquis viridisquama*, Walker, xv. 1652, from Sarawak.

Labanda viridalis, nov.

♂ ♀. Frons, head, thorax, and fore wings green (the ground-colour is really white, thickly irrorated with minute green atoms): fore wings with a broad basal black band, some green markings inside it near the base, representing the subbasal transverse line; the discoidal vein thickly black, making a prominent lunule; an antemedial, slightly dentate, black line close to the outer margin of the basal band; an outwardly curved discal similar line, duplex in parts, a submarginal similar broken line outwardly edged with white; a marginal black line; cilia green, with black patches; a black suppressed largish spot on the costa at the middle, another much larger at one third from apex, and two small ones close to the apex, and two more prominent spots below them, the lower one the larger: hind wings brown, unmarked: abdomen brown, with black and green crests. Underside

brown, without markings, except for a few pale spots on the costa of fore wings.

Expanse of wings, ♂ 1, ♀ $1\frac{3}{10}$ inch.

Khasia Hills.

There is an example from the Khasia Hills in the B. M. drawer no. 44.

Blennia fumosa, nov.

♀. Palpi grey, brown-speckled; head, thorax, and fore wings chocolate-brown, with a slight greenish tinge; transverse lines slightly darker than the ground-colour, all very indistinct—first subbasal, sinuous, and double, second just before the middle, also double, bent outwards, third similar and discal, fourth submarginal, single, and marked with white and brown dots; a broad blackish shade or diffused oblique band from the middle of the costa to the hinder margin near the angle, marginal points whitish: hind wings paler and with an ochreous tinge, blackish on the outer margin; indications of a thin, ochreous, waved, discal band; cilia dull ochreous. Underside: body, legs, and inner half of wings pale greyish brown, outer half of wings dull black; some dull ochreous spots on costa of fore wings towards apex; both wings crossed by a thin dull ochreous band, outwardly angled below the middle on the hind wings; cilia of both wings dull ochreous.

Expanse of wings $1\frac{8}{10}$ inch.

Khasia Hills.

Not nearly allied to anything I know of; fore wings narrower and longer than is usual in the genus, outer margin rounded.

Family **Haliadæ**.

Topadesa sanguinea.

Topadesa sanguinea, Moore, Lep. Atk. p. 280 (1882).

Khasia Hills.

Moore described a male from Sikkim, the type of which is in Coll. Staudinger; there is one male from Darjiling in the B. M.; I have now received several pairs from the Khasia Hills.

The female differs from the male in the colour of the fore wings being purple instead of fiery red, the fiery-red colour only showing on the edging of the purple; no cell-spot; the front half of the thorax is also purple and the upper part of the abdomen is smeared with pale purplish grey. The underside is much as in the male, cell-spot and all but the interior of the fore wing is suffused with purple.

Family Stictopteridæ.

Gyrtona niveivitta, nov.

♀. Brown-black; abdomen pale black; the hind wings very slightly paler than the fore wings, the latter with a broad white subcostal stripe from the base to the outer margin a little below the apex; the upper side of the stripe even, the lower side rough; the orbicular invisible, the reniform a black ringlet, within the stripe; two submarginal sinuous white lines, well separated, pale spots on the outer margin and black crenulated line; cilia of both wings with white tips. Underside dull black, without markings.

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

1 ♀, Kuching, Sarawak (type).

1 ♀, Penang.

Family Gonopteridæ.

Cosmophila excavata, nov.

♀. Of a uniform pale greyish chocolate-colour; palpi on the inner sides, head, and collar white, thickly irrorated with ochreous brown: fore wings thickly irrorated with ochreous brown in parts, leaving a more or less clear space before the middle and a space at the apex: hind wings with similar irrorations on the disk, almost forming a band; through this and up the fore wings runs a very acutely dentated submarginal line; some brown marks above the middle of the outer margin of fore wings, one at the angle, and one at the apex; cilia of both wings pale ochreous, with white tips, interlined with brown, the interline macular on the fore wings above the angle.

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

Sadong, Borneo (*Shelford*).

I do not quite know where to put this insect without examining its male; the apex of fore wings is acute, the outer margin is produced at vein 4 and rather deeply excavated between this and the apex; the outer margin of the hind wings is slightly angled at vein 2 and is quite straight between veins 2 and 6, like a Focillid.

Tympanistes flavescens, nov.

♂. Antennæ, palpi, head, body, and fore wings dull pale yellow; head, thorax, and costal and basal portions of fore wings suffused with olive-green; transverse olive-green lines distinct, prominent, highly sinuous, and dentated in parts—

subbasal, antemedial, postmedial, and submarginal, the last broken and irregular; outer margin with black dots between the veins: hind wings white, with pinkish suffusion on the abdominal area. Underside pale yellowish white; costal area of fore wings suffused strongly with pink; a brown subapical spot on the costa and another below it; legs with brownish hairs.

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

Khasia Hills.

Between *T. testacea*, Moore, and *T. rubidorsalis*, Moore, but the lines in these forms are not dentated, are much less sinuous, the coloration is nearly white, and the undersides have no markings whatever.

Carea dione, nov.

♂ ♀. Antennæ, palpi, and frons chestnut-colour; collar and patagia purplish brown, the rest of the thorax, the abdomen, and fore wings pale creamy pink, with minute brown irroration; these are collected densely together in parts and form subbasal, antemedial, postmedial, and submarginal oblique bands, the postmedial being the broadest and darkest, extending from a little beyond the middle of the costa to the hinder angle; there are also two transverse, brown, straight lines, the first oblique, from the middle of the costa, the other nearly erect, from the costal third to the hinder margin near the angle; cilia brown: hind wings pale pinkish, without markings. Underside pale pinkish, without markings.

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

Khasia Hills.

Fore wings with the outer margin rounded. Allied to *fasciata*, Moore, which I have also from the Khasia Hills; but that form is of an almost uniform dark brown-pink, with discal and submarginal highly sinuous transverse lines and shorter wings.

Family Quadrifidæ.

Hypætra ruinosa, nov. ?

♀. Antennæ, palpi, head, thorax, and fore wings dark chocolate-brown; palpi whitish beneath, and speckled with white above: fore wings with the outer third smeared with a glaucous sheen; black patches on the costa; a large oval black patch on the disk, touching the glaucous band, ringed inwardly with deeper black; the black line running partly along the inner limit of the glaucous band; many lunular

and sinuous grey bands across the wing, more or less indistinct; a double black, sinuous, submarginal line: hind wings dark brown, the outer part more or less glaucous; two ochreous marks near anal angle; cilia dark brown, with two subapical white spots and one near anal angle.

Expanse of wings $1\frac{7}{10}$ – $1\frac{9}{10}$ inch.

1 ♀, Singapore (type) (*Ridley*).

2 ♀, Kuching, Borneo (*Shelford*).

1 ♀, Andamans (*Moore Coll.*).

Allied to *inclusens*, Walker.

Hypaetra trifasciata, nov.

♂. Palpi dark chestnut-brown above, white beneath, last joint ochreous grey beneath; head, body, and wings of a uniform pale brownish grey, irrorated and striated in parts with blackish brown: fore wings crossed by three nearly erect blackish fasciæ or bands, rather broad and more or less incomplete, these bands themselves containing in places small darker black patches, marginal festoon grey, points black: hind wings paler on the costal space, where there are no irrorations; indications of a discal transverse line, elbowed outwardly below the middle, where there is a black spot, marginal festoon grey, points grey. Underside ochreous grey, almost whitish, very uniform in colour, no markings; the long hairs on the legs variegated, black and ochreous grey.

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

1 ♂, Kapaur, N. Guinea (type) (*Doherty*).

1 ♂, Fergusson Island (*Meek*).

Hamodes Butleri.

Thermesia (?) *Butleri*, Leech, Trans. Ent. Soc. 1900, p. 570.

Khasia Hills; fairly common.

The type came from Western China; the Khasia Hills examples are paler in colour, but are not separable.

Family Focillidæ.

Zethes pallidiplaga, nov.

♂. Uniform greyish white, slightly tinged with ochreous; palpi brown, with pale tips; a pale chestnut-brown large patch on the thorax: fore wings with a subbasal broad band, a brown dot in the cell, a transverse sinuous line, a large almost square patch, its top touching the costa, its

lower end touching a transverse, outwardly bent, pale line; a large, also nearly square, patch on the outer margin at the apex; a submarginal grey line and brown marginal spots: hind wings with antemedial and submarginal sinuous grey lines, a medial straight pale line, a large chestnut-brown patch at the anal angle.

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

Penang (*Flower*) (type).

Isabel Island, Solomons (*Meek*).

The Isabel example has the patches smaller, but is otherwise very similar to the type specimen.

Zethes enigmaria, nov.

♂ ♀. Dark red-brown, with an ochreous tint and variegated with ochreous patches: fore wings with ochreous dots on costa towards apex; ante- and postmedial outwardly curved sinuous brown lines; a large ochreous spot at the end of the cell, with a thin brown lunular mark inside it; an ochreous spot in the disk in a line with the cell, another near the hinder angle: hind wings with an antemedial line, a medial line, the space between forming an ochreous band; a discal line, the outer portion of the wing mostly ochreous; the ochreous parts mostly dull in colour; a marginal lunular line on both wings and cilia with a basal ochreous line. Under-side pale pinkish grey on fore wings, ochreous on the hind wings, the former with a black subapical lunular spot on the costa; indications of medial and discal lines, the outer portion of the wing suffused with purplish brown: hind wings with an antemedial line; a broad discal black band and both wings with black marginal line; blackish cilia with ochreous basal line.

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

Khasia Hills.

Allied to *Z. perturbans*, Walker.

Family Deltoididæ.

Talapa birihana, nov.

♀. Palpi black, with whitish hairs on the upper side; head, body, and wings of a uniform pale brown, tinged with pink; thorax with a black patch; abdomen with brown segmental lines: fore wings with some short brown marks running along the costa; a black triangular patch before the middle below the cell, its outer side incurved, and edged with white, a black spot just above its outer end; a large black

suffused spot outside the patch nearly even with its upper side, and in this patch is a prominent white spot, with a short streak running from it obliquely upwards, and through it runs a transverse, indistinct, sinuous grey line from costa to hinder margin; a discal sinuous line, which is (except towards the costa) deep black and thick, outwardly edged with whitish, and followed by a whitish line close to it; between this and the outer margin is another sinuous but incomplete whitish line; marginal lunules brown, with whitish points; cilia with pinkish-white streaks opposite the veins: hind wings with indications of a medial pale line and pale marginal line.

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

Khasia Hills.

Allied to *T. albigutta*, Swinh.

Adrapsa curiosalis, nov.

♂ ♀. Dark blackish brown, with a pink tinge: fore wings with a white dot in the cell, a white spot at the end, and a large white square patch near the apex, with a white streak to the costa on its inner side; both wings with a medial, slightly sinuous, transverse, white line, dentated in parts; a discal similar line rather near the margin, indistinct in parts and touching the inner side of the subapical patch; marginal line whitish, lunular in parts. Underside rather variegated in colour; a white spot at the end of each cell; the subapical patch and transverse lines as above; antennæ, body, and legs same colour as the wings, the long hairs on the fore legs of the male pale dirty whitish ochreous.

Expanse of wings, ♂ $1\frac{3}{10}$, ♀ $1\frac{7}{10}$ inch.

Khasia Hills.

The antennæ are somewhat as in *A. albirenalis*, Moore, but there is no hook at the base, as is the case in that species; one male in my collection is almost as much variegated in colour above as it is below, with a pale shade inside the medial line.

Catada sabada, nov.

♂. Antennæ, palpi, head, and body dark olive-brown: fore wings with a broad band of the same colour, which occupies nearly the basal half of the wing, leaving a small basal space and the outer half of the wing dark pinkish grey; the band has on each side slightly sinuous but erect white

edges; a brown semicircular mark near the apex: hind wings and underside of a uniform dull brown, without markings.

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

Goping, Perak (*Kunstler*).

Superficially like *C. bipartita*, but that form has the fore wings angled in the middle of the outer margin; in this form the outer margin is rounded.

Falcimala diacia, nov.

♂ ♀. Palpi brown on the outer side, pale on the inner side, last joint whitish, with a brown ring near the tip; frons whitish; collar brown in the middle, white at the sides; body and wings whitish: fore wings with a black streak on the costa near the base, a large oblique black patch at the middle, the costal space from thence to the apex white; a nearly upright, broad, pale medial band from the patch to the hinder margin, the patch and band edged with white; the colour of the wing inside the band white, on the outer side it is smoky brown; a subbasal line of white specks; the extreme apex pure white; the marginal line with black points joined to very minute white specks: hind wings greyish white. Underside: fore wings pale grey, with white dots on the costa beyond the middle and at the apex: hind wings whitish.

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

Khasia Hills.

Allied to *F. ochrealis*, Hmps., which is pinkish ochreous, has no medial band on fore wings, and has brown hind wings.

Family Hypenidæ.

Hypena regia, nov.

♀. Palpi, head, and body dark greyish-olive colour: fore wings dark olive-brown; a large round prominent white spot in the middle of the cell, a black lunule at the end; a postmedial, nearly straight, black line from the hinder margin at two thirds to the costa near apex; an irregular row of indistinct submarginal dots, the four upper ones white, the remainder black; a pale shade across the disk: hind wings brownish grey, whitish towards base. Underside pale brownish: fore wings with a small cluster of white dots at the apex: hind wings with a brown lunule at the end of the cell; both wings crossed by a medial brown line.

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

Granville, New Guinea.

Allied to nothing I know of.

Hypena tyhstalis, nov.

♀. Olive-brown, with a pink tinge. fore wings with erect transverse lines, antemedial and slightly sinuous, postmedial and quite even, composed of two colours, the inner brown, the outer white; the whole inner space from this to the base darker than the rest of the wing; a sinuous line adjoining, followed by a nearly straight submarginal line: hind wings without markings, marginal line of both wings black; cilia with a white basal line. Underside much paler: fore wings with a white subapical spot: hind wings with a brown spot at the end of the cell and a brown discal line.

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

Granville, New Guinea.

Allied to *H. umbripennis*, Moore, from India, of which I have a good series; but that form has all its lines sinuous.

Hypena phecomalis, nov.

♂. Dark olive-brown; palpi white at the end of the last joint: fore wings with an erect, almost straight, brown line, outwardly edged with whitish beyond the middle, the entire space inside it dark blackish brown, and contains a darker spot at the end of the cell and a darker basal band, with its outside edge acutely dentated outwards, below the middle; a dark brown shade below the apex, leaving a paler space on the costa near the apex; faint indications of a row of submarginal pale dots and white points on the margin: hind wings without markings. Underside pale brown, tinged with pink: fore wings with indications of postmedial and submarginal lines: hind wings with a black spot at the end of the cell, and medial and discal lines.

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

Khasia Hills.

Wings broader than is usual in the genus, the hinder angle more rounded, costa of fore wings rounded near the base. There are two examples from the Khasia Hills in the B. M. with *H. tenebralis*, Moore, of which I have a fine series; but it is quite distinct from that form, being a much broader insect, with the lines erect instead of oblique.

Family Boarmiidae.

Heteromiza obliquaria.

Anzea obliquaria, Leech, Ann. & Mag. Nat. Hist. (6) xix. p. 182 (1897).

Khasia Hills.

Leech's type came from Chang Yang, Central China. I have six from the Khasia Hills, and there is an example in the B. M. marked "India" from Dr. F. Moore's collection; they are absolutely identical with the Chinese examples.

Family Sterrhidæ.

Chrysocraspeda fulviplaga, nov.

♂ ♀. Orange-pink, tinged with purple: fore wings with a prominent black spot at the end of the cell; an antemedial, transverse, yellow line, angled slightly outwards in the cell; a discal similar line, angled outwards at the middle, its lower half obscured in the male by a large patch of purplish suffusion, which extends on the lower half of the wing from the inner line to the outer margin: hind wings with a yellow subbasal line, much angled outwards at its middle; a very large triangular yellow patch, occupying nearly the whole of the disk; a discal yellow line like that on the fore wings, the upper portion of it being only visible, the lower portion being merged in the discal yellow patch; cilia of both wings bright yellow. Underside: fore wings pink-red, with the outer and hinder margins yellow: hind wing with the inner half pink-red, the outer half yellow; frons white; antennæ, body, and legs pink-red; abdomen with the tips and the whole of the underside whitish.

Expanse of wings, ♂ $\frac{9}{10}$, ♀ $1\frac{2}{10}$ inch.

Khasia Hills.

Belongs to Hampson's Section I. B, and is allied to *iole*, Swinhoe; the hind wings resemble those of *dilucida*, Warren, but that form has no transverse lines.

Chrysocraspeda conspicuaria, nov.

♂ ♀. Pale pink, irrorated in parts with brown atoms; costa of fore wings brownish; a large black spot at the end of the cell, three or four black points in a row outside the cell: hind wings with a pure white elongated spot at the end of the cell; a discal row of black points; outer margin of both wings with a conspicuous brown band and bright yellow cilia. Underside of a uniform dark red-pink; cell-spots as above, but less distinct; costa of fore wings blackish brown; no outer marginal band to either wing; cilia yellow; frons white; antennæ and body above pink-brown; body below and legs whitish.

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

Khasia Hills.

Fore wings with the apex produced and acute; hind wings with the outer margin rounded. Belongs to Hampson's Section I. *b*, and is allied to *abhadraca*, Walker; but the markings are much as in *sanguinaria*, Warren.

Family Geometridæ.

Actenochroma ochreipicta, nov.

♂. Frons ochreous, with a green centre; head, body, and wings green, irrorated and striated with olive-green; an indistinct blurred dark spot at the end of each cell: fore wings with indications of antemedial and discal darker bands, the hinder margin with two ochreous spots, ante- and post-medial, and another in the disk above the middle; inside the outer band there is a dentated black line visible in places, but very indistinct: hind wings with a similar line, more distinct, and indications of both bands; an ochreous spot on the abdominal margin at the end of the outer band; marginal lunules black; cilia ochreous in parts. Underside pinkish white; a prominent black spot at the end of each cell and a broad blackish discal band, with some blackish suffusion between it and the outer margin; marginal lunules black.

Expanse of wings $1\frac{8}{10}$ inch.

Khasia Hills.

Of the shape and size of *A. viridaria*, Moore, but the colour is darker, more olive-tinted, and quite different.

Agathia ithearica, nov.

♂. Antennæ, palpi above, head, and body pale chocolate-colour; palpi below white; frons with the lower half white, upper half chocolate; thorax with two large green spots in front: wings green, bands chocolate-colour; fore wings with a band at the base, a narrow costal band, and both wings with a broad marginal band; on the fore wings there is a thin sinuous band from the middle of the costa to the hinder margin, touching the marginal band; within the latter is a large green subapical spot, with a small spot above and two below it: a large green oval spot on the hind wings within the marginal band, touching the outer margin below the apex, and a pale streak which runs downwards a short distance: on both wings the marginal band is lined on both sides with dark chocolate and edged on the inner side with whitish.

Underside greenish white, with a broad, sinuous, discal band of pale chocolate-colour across both wings.

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

Kuching, Borneo (*Shelford*).

Nearest to *carissima*, Butler, from Japan.

Agathia solaria, nov.

♂. Antennæ, upper side of palpi, upper half of frons, thorax above, and bands on both wings chocolate-colour, lower side of palpi and lower half of frons white; a green band behind the base of the antennæ, a broader green collar, a green spot on the hind part of the thorax; abdomen with the apical third pale, nearly white, the tip chocolate: wings green; fore wings with a narrow costal band, very pale chocolate; a sinuous submarginal band, broad and curved and dark chocolate (nearly black at the apex), touching a black spot on the outer margin below the apex, then continued, thin, pale, and sinuous, to the hinder margin near the angle; black elongated spots on the margin at the ends of the veins, followed by chocolate spots on the ochreous-grey cilia; a narrow chocolate band at the base, which does not reach the costa, which here is green; this band is continued thinly down the abdominal margin of the hind wings (with a spot in the middle) until it reaches the broad outer marginal band, which is broad at the anal angle, narrowing upwards, contains a green spot where the abdominal band joins it, and a larger green spot below the apex, which is narrow and runs down the margin a little; this outer band on both wings contains on its inner margin an acutely dentated dark line with the points black and pointing outwards, on the fore wings obsolete on the thin part of the band; marginal line of hind wings chocolate, cilia ochreous grey, with chocolate spots at the vein-ends. Underside greenish white; bands nearly black, on fore wings more or less as above, on the hind wings nearly uniform in breadth.

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

Singapore (*Ridley*).

There are some indistinct chocolate marks in the middle of the wings that look like obsolete bands, but they are not traceable; the insect belongs to the *hemithearia* group.

XII.—*List of the Snakes in the Zoological Museums of Lund and Malmö, with Descriptions of new Species and a new Genus.* By NILS ROSÉN, Zool. Inst. Lund.

[Plates XI. & XII.]

AT the request of the Director of the Zoological Museum of Lund, Prof. D. Bergendal, I have determined and revised the collections of snakes in that Museum. The specimens not determined belong principally to collections made by Dr. Hj. Möller in Java (1897), by Dr. N. Holst in West Australia (1897), and by Bar. Eggers in Ecuador. Through the kindness of Dr. H. Wallengren I have further had the opportunity of examining some snakes in the Museum of Malmö. I have found five species and one genus not previously described. A description of these and notices respecting some specimens which differ from the typical examples form the subject of this paper. As regards the systematic classification and nomenclature, I have followed G. A. Boulenger, 'Catalogue of the Snakes in the British Museum,' vols. i.—iii. (1893-96). Some snakes were presented by private individuals, without any information as to habitats.

Fam. Typhlopidae.

1. *Typhlops braminus*, Daud.
Java.
2. *Typhlops bicolor*, Ptrs.
West Australia.
3. *Typhlops olivaceus*, Gray.
West Australia.

Fam. Boidæ.

4. *Python reticulatus*, Schn.
Java.
5. *Python molurus*, L.
6. *Epicrates cenchris*, L.
14 upper labials.
7. *Epicrates striatus*, Fisch.
8. *Corallus caninus*, L.
Maroni (Surinam).

9. *Trachyboa gularis*, Pters., var. *multimaculata*, nov.

Snout scarcely prominent. Upper head-scales small, convex, keeled. Eye bordered by 2 labials (sixth and seventh) and 11 scales. 25 scales round the upper lip. Four pairs of shields bordering the mental groove. Scales strongly keeled, in 31 rows. Ventrals 146. Anal entire. Subcaudals 29. Brown above, with a dorsal series of large irregular black spots; two series of smaller ones on each side; yellow beneath, with large black spots.

Total length 320 mm.; tail 35.

Ecuador.

A single specimen, belonging to the Museum of Lund, collected by Eggers, 1892, in Balao (Ecuador).

Cf. Proc. Zool. Soc. of London, 1898, p. 115, where Boulenger describes a specimen from Ecuador differing by having the eye completely surrounded with 14 scales, labials being excluded.

10. *Eunectes murinus*, L.

Brazil.

11. *Boa constrictor*, L.

Fam. Ilysiidæ.

12. *Ilysia scytale*, L.13. *Cylindrophis rufus*, Laur.

Java.

Fam. Xenopeltidæ.

14. *Xenopeltis unicolor*, Reinw.

Sumatra.

Fam. Colubridæ.

Series AGLYPHIA.

15. *Acrochordus javanicus*, Hornst.

Java.

16. *Polyodontophis geminatus*, Boie.

Differs from the description in Cat. Snakes in having 8 upper labials, third, fourth, and fifth entering the eye.

Java.

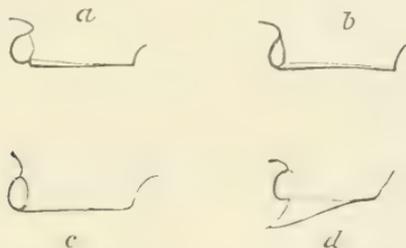
17. *Tropidonotus ordinatus*, L., var. *infernalis*.
Oregon.
18. *Tropidonotus ordinatus*, L., var. *sirtalis*.
Oregon.
19. *Tropidonotus saurita*, L.
Total length of one specimen 970 mm. ; tail 290.
North America.
20. *Tropidonotus natrix*, L.
Sweden.
21. *Tropidonotus trianguligerus*, Boie.
Java, Sumatra.
22. *Tropidonotus piscator*, Schn., type C.
Scales sometimes feebly keeled or nearly smooth, reminding
one of *Tr. Sancti-Johannis* (see Boul. Cat. Snakes, i. p. 230).
Java.
23. *Tropidonotus tessellatus*, Laur.
South Europe.
24. *Tropidonotus viperinus*, Latr.
Algiers.
25. *Tropidonotus Clarkii*, B. & G.
26. *Tropidonotus tigrinus*, Boie.
27. *Tropidonotus vittatus*, L.
Java.
28. *Tropidonotus subminiatus*, Schleg.
Some specimens with third and fourth upper labials entering
the eye.
Java.
29. *Helicops angulatus*, L.
30. *Helicops modestus*, Gthr.
31. *Helicops leopardinus*, Schleg.

The last two species differ from the descriptions by not having any hypapophyses in the posterior region of the dorsal column. In *H. leopardinus*, Schleg. (which is represented in the Lund Museum by a single specimen), the lower surface of the dorsal vertebrae in the posterior region has a lower keel (text-fig. 1, *a*), without any crest or tubercule projecting

below the condyle. In *H. modestus*, Gthr. (two specimens in the collections), the lower surface is smooth (fig. 1, *b*).

In the 'Catalogue of Snakes' Boulenger has laid stress upon the presence or absence of hypapophyses on the posterior dorsal vertebræ, and, so far as I know, he has continued to do so. Among the snakes I have had an opportunity of examining I have, however, found several specimens which differ from species already described only by the presence or absence of the hypapophyses in the posterior region of the dorsal column. That these ought not to be regarded as new species or genera is quite certain, and consequently the hypapophyses are not of such great importance for classification as has been supposed. More extended examination of other species and genera is required.

Fig. 1.



Vertebræ in the posterior region of the dorsal column.

- a. Helicops leopardinus*, Schleg.
b. — modestus, Gthr.
c. Tretanorhinus intermedius, sp. n.
d. Chrysopelea ornata, Shaw, type A.

32. *Tretanorhinus intermedius*, sp. n. (Pl. XII. fig. 2.)

Without any hypapophyses on the posterior dorsal vertebræ (text-fig. 1, *c*).

Nasals separated. Internasals small. Frontal much shorter than the parietals. One loreal, about twice as long as deep. Two præoculars. Two postoculars. Temporals 1+2. Eight upper labials, fourth entering the eye. Five lower labials in contact with the anterior chin-shields. Posterior chin-shields separated from each other by scales. Scales in 21 rows, striated, with short but strong keels. Ventrals 142. Anal divided. Subcaudals 56. Dark brown above, with a dorsal series of irregular black spots, sometimes confluent. An indistinct yellow, dark-edged, lateral streak.

Yellow beneath, with brown dots, anteriorly dark, with an indistinct black median line.

Total length 520 mm. ; tai 120.

Central America.

33. *Elapoides fuscus*, Boie.

Nasal entire.

Java.

34. *Lycodon aulicus*, L.

35. *Lycodon subcinctus*, Boie.

Java.

36. *Zamenis korros*, Schleg.

Java.

37. *Zamenis constrictor*, R.

Eight upper labials, fourth and fifth entering the eye.

North America.

38. *Zamenis flagelliformis*, Laur.

South Carolina.

39. *Zamenis gemonensis*, Laur., var. *asianus*.

Entirely black.

40. *Zamenis algirus*, Jan.

Algiers.

41. *Zamenis hippocrepis*, L.

Algiers.

42. *Drymobius bifossatus*, Raddi.

Loreal longer than deep. Frontal shorter than the parietals. Total length 1720 mm. ; tail 500.

43. *Drymobius Boddaertii*, Sentz.

44. *Coluber fasciatus*, sp. n. (Pl. XI. fig. 2.)

Rostral broader than deep. Internasals much shorter than the prefrontals. Prefrontals large. Frontal once and two thirds as long as broad, much longer than its distance from the end of the snout. Nasal entire. Loreal a little longer than deep. One præocular. Two postoculars. Temporals 2+2. Eight upper labials, third, fourth, and fifth entering the eye. Five lower labials in contact with the anterior chin-shields. Posterior chin-shields in contact anteriorly.

Scales smooth, in 17 rows, with two apical pits. Ventrals without or with a rather indistinct lateral keel, 179. Anal divided. Subcaudals 100, in two rows. Dark brown above, with narrow indistinct white (in spirit) cross-bands, extending on the ventrals. These bands are caused by large white edges to the scales. Lighter beneath. Head with white streaks and spots.

Total length 305 mm.; tail 30.

Ecuador.

A single specimen, belonging to the Museum of Lund, collected by Eggers in Balao (Ecuador), 1892.

45. *Coluber letus*, B. & G.

North America.

46. *Coluber obsoletus*, Say.

Scales rather feebly keeled.

North America.

47. *Coluber oxycephalus*, Boie.

Java.

48. *Coluber melanurus*, Schleg.

Java.

49. *Herpetodryas carinatus*, L.

50. *Dendrophis pictus*, Boie.

Java.

51. *Dendrophis formosus*, Boie.

Java.

52. *Dendrelaphis subocularis*, Blgr.

Java.

A single specimen, ventrals 160.

53. *Dendrelaphis caudolineatus*, Gray.

Java.

Five specimens, collected by Dr. H. J. Möller, 1897. *The genus Dendrelaphis had not previously been found in Java.*

54. *Gastropyxis smaragdina*, Schleg.

55. *Leptophis occidentalis*, Gthr.

56. *Dromicus antillensis*, Schleg.

West Indies.

57. *Dromicus rufiventris*, D. & B.

West Indies.

58. *Liophis albiventris*, Jan, type A.

Ecuador.

59. *Liophis pæcilogyrus*, Wied.

Argentine.

60. *Liophis typhlus*, L.

Brazil.

61. *Liophis epinephelus*, Cope.

62. *Liophis reginæ*, L.

Brazil.

63. *Liophis parvifrons*, Cope.

64. *Xenodon Merremi*, Wagl.

Brazil.

65. *Heterodon platyrhinus*, Latr.

Two specimens have scales very feebly keeled, but do not differ in other structural characters.

United States of America.

66. *Aporophis lineatus*, L.

67. *Rhadinæa anomala*, Gthr.

Argentine.

68. *Rhadinæa cobella*, L.

69. *Rhadinæa fusca*, Cope.

70. *Urotheca lateristriga*, Berth.

Ecuador.

71. *Dimades plicatilis*, L.

72. *Coronella austriaca*, Laur.

Europe.

73. *Coronella triangulum*, Daud., type A.

North America.

74. *Cemophora coccinea*, Blumenb.

The supraoculars fused with the frontal.

75. *Simotes octolineatus*, Schn.

Java.

76. *Contia vernalis*, Harl.

Total length 580 mm.

North America.

77. *Homalosoma lutrix*, L.

78. *Petalognathus nebulatus*, L.

Brazil.

79. *Carphophis amœnus*, Say.

North America.

80. *Calamaria Linnæi*, Boie.

Java.

Series OPISTHOGLYPHA.

81. *Hypsirhina enhydris*, Schn., type A.

East Indies.

82. *Homalopsis buccata*, L.

Java (one specimen with a length of 840 mm. from the snout to the anal; tail stumped); East Indies.

83. *Cerberus rhynchops*, Schn.

84. *Gerardia Prevostiana*, Eyd. & Gerv.

85. *Eteirodipsas colubrina*, Schleg.

Internasals shorter than the præfrontals. Three præoculars, upper largest and reaching the frontal. Three suboculars; three postoculars. Temporals 2+2. Eight upper labials. Scales in 27 rows. Ventrals 213. Anal divided. Subcaudals 80, the anterior single. Brown above, yellow beneath; with irregular black or dark brown spots; the posterior ventrals with dark brown or black dots.

Total length 710 mm.; tail 130.

Madagascar.

A single specimen belonging to the Museum of Lund.

86. *Trimorphodon biscutatus*, D. & B.

87. *Lycognathus cervinus*, Laur.

88. *Dipsadomorphus multimaculatus*, Boie.

Java.

89. *Leptodira personata*, Cope.
 90. *Leptodira albofusca*, Lacép.
 91. *Leptodira annulata*, L.
 92. *Oxyrhopus petolarius*, L.
 93. *Oxyrhopus trigeminus*, D. & B.
 94. *Oxyrhopus clælia*, Daud.
 95. *Thamnodynastes Nattereri*, Mik.
 Subcaudals 80.
 Brazil.
 96. *Thamnodynastes punctatissimus*, Wagl.
 97. *Tomodon ocellatus*, D. & B.
 98. *Philodryas æstivus*, Schleg.
 Total length 1300 mm.
 99. *Philodryas viridissimus*, L.
 100. *Philodryas Olfersii*, Licht.
 101. *Philodryas Schotti*, Schleg.
 102. *Trimerorhinus rhombeatus*, L.
 103. *Cælopeltis monspessulana*, Herm.
 Algiers.

ANISODON, gen. nov.

Hyppapophyses throughout the vertebral column, represented on the posterior dorsal vertebræ by a well-developed crest, projecting below the condyle. Solid maxillary teeth anteriorly small, increasing in size and followed by an interspace, after which the teeth are very small; the last two large and grooved, situated below the posterior border of the eye. Mandibular teeth unequal, the anterior largest and separated from the rest by a short interspace. Head distinct from neck. Snout pointed. Eye rather large. Body cylindrical. Tail moderate. Scales smooth, in 17 rows. Subcaudals in 2 rows.

Java.

104. *Anisodon Lilljeborgi*, sp. n.* (Pl. XI. fig. 3.)

Rostral much broader than deep. Internasals as long as broad, shorter than the præfrontals. Nasal entire. Loreal

* I take the liberty of naming this snake after the celebrated Swedish zoologist Prof. W. Lilljeborg, who has determined the old collections of snakes in the Museum of Lund.

irregular. Frontal nearly twice as long as broad, longer than its distance from the rostral, nearly as long as the parietals. One præocular. Two postoculars. Supraocular large. Temporals 2+2. Eight upper labials; second and third reaching the præocular; third, fourth, and fifth entering the eye. Three lower labials in contact with the anterior chin-shields.

Fig. 2.



Anisodon Lilljeborgi, gen. et sp. n.

- a. Maxillary and anterior part of the mandible.
b. Hypapophysis in the posterior region.

Scales smooth, in 17 rows. Ventrals 156-159. Anal entire. Subcaudals 43-50, in two rows. Greyish brown; a dorsal series of lighter spots, edged with black, indistinct posteriorly. Yellowish beneath, with irregular dark spots. Head with lighter and darker irregular streaks and dots. Along the upper labials a white streak, edged with black.

Total length 490 mm.; tail 95.

Java.

Two specimens, belonging to the Museum of Lund, collected by Dr. Hj. Möller in Tjibodas (Java), 1897.

105. *Macroprotodon cucullatus*, Geoffr.

Algiers.

106. *Dryophis xanthozona*, Boie.

Java.

In the 'Catalogue of Snakes,' vol. iii. (1896), Boulenger says:—"Anal entire (rarely divided)." Of the ten specimens which are preserved in the collections no less than nine have the anal divided.

107. *Dryophis prasinus*, Boie.

Java.

108. *Oxybelis acuminatus*, Wied.

109. *Chrysopelea ornata*, Shaw, type A. (Pl. XI. fig. 1; and text-fig. 1, d, p. 171.)

Hypapophyses present throughout the vertebral column,

represented on the posterior dorsal vertebrae by a well-developed crest, projecting below the condyle. Ventrals 222. Subcaudals 131.

Sumatra.

A single specimen, belonging to the Museum of Malmö, collected by C. Richter, 1895.

110. *Chrysopelea ornata*, Shaw, type D.

111. *Erythrolamprus Æsculapii*, L.

South America.

112. *Homalocranium melanocephalum*, L.

Ecuador.

Series PROTEROGLYPHA.

113. *Hydrus platurus*, L.

Coast of Java.

The two specimens belonging to the Museum of Lund have respectively 51 and 59 scales round the body. In the 'Cat. of Snakes' Boulenger states the scale-rows of this snake to be 45 to 47. The two specimens also differ from the description in 'Cat. Snakes' by having the frontal shorter than the parietals. In coloration they agree with the type E.

114. *Hydrophis gracilis*, Shaw.

115. *Enhydris Hardwickii*, Gray. (Pl. XII. fig. 1.)

One specimen, with six very feebly grooved small maxillary teeth.

116. *Distira longissima*, sp. n.

Head moderate. Body much elongated. Rostral about as broad as deep. Nasals shorter than the frontal, more than twice as long as the suture between the præfrontals. Frontal a little more than twice as long as broad, as long as its distance from the end of the snout, shorter than the parietals. One præocular. Two postoculars. Two anterior temporals. Eight upper labials; third, fourth, and fifth entering the eye, second largest and reaching the præfrontal. Two pairs of chin-shields; posterior a little longer than the anterior, in contact anteriorly. Scales smooth, imbricate, 31 round the neck, 35 round the middle of the body. Ventrals 320, smooth. Greyish green, with dark cross-bands, broadest on the middle, narrowing on the sides.

Total length 1650 mm.; tail 120.

Habitat unknown. A single specimen belonging to the Museum of Lund.

117. *Aipysurus australis*, Sauw.

Australia.

Ventrals 167-168.

118. *Platurus colubrinus*, Schn.119. *Denisonia superba*, Gthr.

Australia.

One specimen differs from the description of the genus *Denisonia* in having the poison-fangs followed by 7 small solid teeth. Boulenger states (Cat. Snakes) the number to be 3 to 5.

120. *Denisonia Gouldi*, Gray.

West Australia.

121. *Denisonia fasciata*, sp. n.

Eye moderate. Rostral broader than deep, visible from above. Internasals shorter than the præfrontals, broader than long. Frontal once and one fourth to once and one third as long as broad, shorter than its distance from the rostral, shorter than the parietals, much broader than the supraoculars. Nasal entire, narrowly in contact with the præocular. Two postoculars, upper in contact with the parietal. Six upper labials, second and third in contact with the præocular, third and fourth entering the eye. Temporals 2+1 or 2, lower anterior wedged in between the fifth and sixth upper labials. Three lower labials in contact with the anterior chin-shields. The posterior chin-shields separated by scales, about as long as the anterior. Scales in 17 rows. Ventrals 153-165. Anal entire. Subcaudals 28-31. Yellow (? in spirit), with large indistinct brown spots or cross-bands.

Total length 410 mm. ; tail 47.

West Australia.

Two specimens, belonging to the Museum of Lund, collected by Dr. N. Holst, 1897.

Seems to be closely allied to *D. maculata*, Stdr.122. *Rhynchelaps Bertholdi*, Jan.

West Australia.

123. *Rhynchelaps fasciolatus*, Gthr.

West Australia.

124. *Bungarus fasciatus*, Schn.

Java.

125. *Bungarus candidus*, L.

Java.

Of the eight specimens in the collections there are seven with dark annuli on the tail (not cross-bands). Frontal shorter than its distance from the rostral. The coloration on the head a little variable.

126. *Naiia melanoleuca*, Hallow., type A.

Gaboon.

Some scales with white dots and edges.

127. *Naiia tripudians*, Merr., var. *leucodira*.

Java.

One black specimen.

128. *Doliophis bivirgatus*, Boie, type C.

Java.

129. *Doliophis intestinalis*, Laur., f. *typica*.

Java.

130. *Elaps fulvius*, L., type A.

North America.

131. *Elaps Spixii*, Wagl.

Brazil.

132. *Elaps frontalis*, D. & B.

Argentine.

133. *Elaps lemniscatus*, L.

Fam. Amblycephalidæ.

134. *Dipsas infrenalis*, sp. n.

Maxillary with 12 teeth. Rostral as deep as broad. Internasals broader than long. Præfrontals much longer than the internasals, entering the eye. Nasal entire. One præocular. Two postoculars. No loreal. Frontal small, broad anteriorly, much shorter than the parietals. Temporals 1+2, very small. Nine upper labials, third, fourth, and fifth entering the eye. First lower labial in contact with its fellow behind the symphysial. Two pairs of chin-shields, the posterior largest. Five lower labials in contact with the anterior chin-shields. Scales smooth, in 15 rows, vertebral row enlarged. Ventrals 193. Anal entire. Subcaudals 99,

in two rows. Colour? (in spirit), with dark cross-bands, extending on the ventrals.

Total length 390 mm. ; tail 100.

A single specimen, belonging to the Museum of Lund. Habitat unknown.

Fam. Viperidæ.

135. *Vipera berus*, L.

Europe.

136. *Cerastes cornutus*, Forsk.

Algiers.

137. *Ancistrodon rhodostoma*, Boie.

Java.

138. *Lachesis lanceolatus*, Lacép.

West Indies.

One specimen with small shields on the anterior part of the head.

139. *Lachesis atrox*, L.

Maroni.

140. *Lachesis alternatus*, D. & B.

One specimen with a $\mathbf{\text{X}}$ -shaped light marking.

141. *Crotalus terrificus*, Laur.

Well-developed shields between the internasals and the præfrontals.

142. *Crotalus horridus*, L.

EXPLANATION OF THE PLATES.

PLATE XI.

Fig. 1. *Chrysopelea ornata*, Shaw, type A.

Fig. 2. *Coluber fasciatus*, sp. n.

Fig. 3. *Anisodon Lilljeborgi*, gen. et sp. n.

PLATE XII.

Fig. 1. *Enhydris Hardwickii*, Gray.

Fig. 2. *Tretanorhinus intermedius*, sp. n.

XIII.—A Synopsis of the Species of the Silurid Genera
Parexostoma, *Chimarrichthys* and *Exostoma*. By C. TATE
 REGAN, B.A.

THE fishes which have usually been placed in the genus
Exostoma of Blyth fall into three very distinct groups, which
 should be regarded as genera, as will be apparent from the
 following synopsis:—

- I. Teeth all pointed, those of the upper jaw forming a band, which is produced backwards at the sides; gill-openings extending on to the lower surface of the body; fold of the lower lip broadly interrupted; pectoral with 11 branched rays [gen. nov.
 PAREXOSTOMA,
- Pectoral extending $\frac{3}{3}-\frac{3}{4}$ of the distance from its base to the base of ventral; caudal peduncle 3 times as long as deep 1. *P. Stoliczka*, Day.
- Pectoral extending $\frac{1}{2}-\frac{3}{5}$ of the distance from its base to the base of ventral; caudal peduncle twice as long as deep [Regan.
 2. *P. maculatum*,
- II. Teeth all pointed, those of the upper jaw forming a band which is not produced backwards at the sides; gill-openings not extending on to the lower surface of the body; fold of the lower lip continuous or not; pectoral with 13-19 branched rays [Sauv.
 CHIMARRICHTHYS,
- A. Lower angle of gill-opening below the middle of the base of pectoral, which fin extends about to the base of ventral; fold of the lower lip not continuous.
- Pectoral with 13 or 14 branched rays; caudal peduncle much longer than deep 1. *C. Davidi*, Sauv.
- Pectoral with 16 or 17 branched rays; caudal peduncle about as long as deep 2. *C. Blythii*, Day.
- B. Lower angle of gill-opening opposite the middle of the base of pectoral.
- Pectoral with 14 or 15 branched rays, not reaching the ventral; fold of the lower lip not continuous 3. *C. Feæ*, Vincig.
- Pectoral with 19 branched rays, extending beyond the base of the ventral; fold of the lower lip continuous [Vincig.
 4. *C. macropterus*,
- III. Each jaw with 2 bands or patches of small pointed teeth, with an enlarged outer series of compressed obtuse teeth; gill-openings not extending on to the lower surface of the body; fold of the lower lip continuous; pectoral with 10-12 branched rays EXOSTOMA, Blyth.

A. Caudal fin truncate or very slightly emarginate.

- Origin of dorsal posterior to the extremity of pectoral; anal with I 5 rays [Regan. 1. *E. Vinciguerra*,
 Origin of dorsal above posterior $\frac{1}{3}$ of pectoral; anal with I 7 rays [Day. 2. *E. Andersoni*,

B. Caudal fin forked or rather deeply emarginate.

- Pectoral with 10 branched rays [Blyth. 3. *E. Berdmorii*,
 Pectoral with 12 branched rays 4. *E. labiatum*, [MacClell.

PAREXOSTOMA.

1. *Parexostoma Stoliczkae*.

Exostoma Stoliczkae, Day, Proc. Zool. Soc. 1876, p. 782; Second Yarkand Mission, Ichthyology, p. 1, pl. i. fig. 1 (1878); Fishes of India, p. 502, pl. cxvii. fig. 3 (1878).

Exostoma Oshaniini, Herzenstein, Bull. Ac. St. Petersburg, xxxiii. 1890, p. 120.

Hab. Eastern Turkestan.

2. *Parexostoma maculatum*, sp. n.

Depth of body about 6 in the length, length of head nearly 4. Head as broad as long. Eyes small. Snout as long as postorbital part of head and $1\frac{1}{2}$ the interocular width. Nasal barbel extending to eye, maxillary barbel to base of pectoral, outer mandibular barbel to gill-opening. Dorsal I 6, commencing slightly in advance of the extremity of pectoral; adipose fin as long as or longer than its distance from the dorsal. Anal I 5. Pectoral with 11 branched rays, extending $\frac{1}{2}$ — $\frac{2}{3}$ of the distance from its base to the base of ventral. Ventral with 5 branched rays. Caudal truncate. Caudal peduncle twice as long as deep. Olivaceous, with numerous irregular dark spots; caudal with a white posterior margin.

Two specimens, 210 and 255 mm. in total length, from Lhasa, Tibet, collected by Capt. H. J. Walton.

CHIMARRHICHTHYS.

Chimarrichthys, Sauvage, Rev. et Mag. Zool. xxv. 1874, p. 332.

1. *Chimarrichthys Davidi*.

Chimarrichthys Davidi, Sauvage, Rev. et Mag. Zool. xxv. 1874, p. 333.

Exostoma Davidi, Günth. in Pratt, Snows of Thibet, Appendix, p. 245 (1892).

Hab. Eastern Tibet.

2. *Chimarrichthys Blythii*.

Exostoma Blythii, Day, Proc. Zool. Soc. 1869, p. 525; Fishes of India, p. 501, pl. cxvii. fig. 2 (1878).

Hab. Northern Bengal.

3. *Chimarrichthys Feca*.

Exostoma Feca, Vincig. Ann. Mus. Genov. xxix. 1890, p. 256, pl. viii. fig. 6.

Hab. Karenni Hills, Upper Burma.

4. *Chimarrichthys macropterus*.

Exostoma macropterus, Vincig. Ann. Mus. Genov. xxix. 1890, p. 253, pl. viii. fig. 5.

Hab. Khakhyen Hills, Upper Burma.

EXOSTOMA.

Exostoma, Blyth, Journ. As. Soc. Bengal, xxix. 1861, p. 155; Günth. Cat. Fish. v. p. 264 (1864).

1. *Exostoma Vinciguerræ*, sp. n.

Exostoma labiatum (non MacClell.), Vincig. Ann. Mus. Genov. xxix. 1890, p. 252.

Depth of body about $7\frac{1}{2}$ in the length, length of head 5. Head as broad as long. Diameter of eye 2 in the interocular width, which is $3\frac{1}{4}$ in the length of head. Snout twice as long as postorbital part of head. Nasal barbel extending to posterior margin of eye, maxillary barbel to anterior $\frac{1}{3}$ of pectoral. Outer mandibular barbel not extending to base of pectoral; inner mandibular barbel very small. Fold of the lower lip continuous. Lower angle of gill-opening at the level of the base of the pectoral spine. Dorsal I 6, commencing behind the extremity of pectoral; adipose fin long and low, extending on to the caudal. Anal I 5. Pectoral with 10 branched rays, extending $\frac{2}{5}$ of the distance from its base to base of ventral. Ventral with 5 branched rays, not reaching the vent. Caudal very slightly emarginate. Caudal peduncle twice as long as deep. Uniformly brownish; fins pale.

A single specimen, 80 mm. in total length, from the Khakhyen Hills, Upper Burma, collected by the late L. Fca.

2. *Exostoma Andersonii*.

Exostoma Andersonii, Day, Proc. Zool. Soc. 1869, p. 524.

Hab. Yunnan.

3. *Exostoma Berdmorii*.

Exostoma Berdmorii, Blyth, Journ. As. Soc. Bengal, xxix. 1861, p. 155; Günth. Cat. Fish. v. p. 265 (1864); Day, Proc. Zool. Soc. 1869, p. 526; Fishes of India, p. 502 (1878).

Hab. Tenasserim.

4. *Exostoma labiatum*.

Glyptosternon labiatum, MacClell. Journ. Nat. Hist. Calcutta, ii. 1842, p. 588.

Exostoma labiatum, Günth. Cat. Fish. v. p. 265 (1864); Day, Proc. Zool. Soc. 1869, p. 526; Fishes of India, p. 502 (1878).

Hab. Assam.

XIV.—*Descriptions of Five new Cyprinid Fishes from Lhasa, Tibet, collected by Captain H. J. Walton, I.M.S.* By C. TATE REGAN, B.A.

DURING the recent expedition to Tibet, Captain H. J. Walton made a small collection of fishes, which he has forwarded to the British Museum. Of seven species represented, six appear to be new to science, the exception being *Nemachilus Stolickæ*, Day. This result is not surprising, for I believe that fishes have not before been described from this part of the Brahmaputra system. Five Cyprinid fishes are described below, whilst a new Silurid, *Parexostoma maculatum*, is described on p. 183.

1. *Schizopygopsis Youngusbandi*.

Pharyngeal teeth 4 : 3—3 : 4, cylindrical, obtusely pointed, those of the outer series slightly curved inwards. Depth of body $4\frac{1}{3}$ — $5\frac{1}{4}$ in the length, length of head 4— $4\frac{1}{2}$. Breadth of head $1\frac{2}{5}$ — $1\frac{4}{5}$ in its length, diameter of eye 4—6, length of snout $3\frac{1}{5}$ —4, interorbital width $2\frac{2}{5}$ — $3\frac{1}{5}$. Snout obtuse; anterior edge of upper jaw slightly below the level of the lower margin of the eye; maxillary extending to below anterior edge of eye; lower jaw shorter than the upper, with a nearly straight transverse anterior edge. Dorsal III 8—9, its origin a little nearer to tip of snout than to base of caudal; third simple ray slender, articulated, not serrated. Anal III 5—7. Pectoral extending $\frac{1}{2}$ — $\frac{2}{3}$ of the distance from its base to the base of ventral. Origin of ventral below or a little behind the middle of dorsal. Caudal forked. Caudal peduncle $2\frac{1}{3}$ — $2\frac{3}{4}$

as long as deep. Greyish above, silvery below; upper part of body with irregular dark spots.

Ten specimens, 110-250 mm. in total length.

2. *Schizothorax dipogon*.

Depth of body about $5\frac{1}{2}$ in the length, length of head $4\frac{1}{2}$. Upper profile of head nearly horizontal to just in front of the nostrils, where it bends abruptly downwards and becomes nearly vertical. Breadth of head $1\frac{3}{4}$ in its length. Snout obtuse, much shorter than postorbital part of head. Diameter of eye 6 in the length of head, interorbital width $3\frac{1}{4}$. Mouth subterminal; lower jaw apparently without horny covering; lips strongly developed, continuous, the upper with median prolongation, the lower notched medianly. No anterior barbel; posterior barbel $1\frac{1}{3}$ the diameter of eye. Scales regularly arranged anteriorly above the lateral line, becoming smaller and irregular on the lower part of the side in the abdominal region; lower part of thorax and abdomen naked; about 90 scales in a longitudinal series. Dorsal III 8, the third simple ray slender, articulated, not serrated; origin of dorsal far in advance of the bases of the ventrals, nearer to tip of snout than to base of caudal. Anal III 6. Pectoral extending a little more than $\frac{1}{2}$ the distance from its base to the base of ventral; ventral extending $\frac{2}{3}$ of the distance from its base to the origin of anal. Caudal forked. Caudal peduncle $2\frac{2}{3}$ as long as deep. Brownish above, lighter below; dark spots on the upper surface of the head and one on each scale of the upper part of the body.

A single specimen, 265 mm. in total length.

In the peculiar shape of the head, the structure of the lips, and in having the third simple ray of the dorsal slender and articulated this species resembles *S. Regelii*, Herz., but differs notably in the absence of the anterior barbels and in having the thorax and abdomen naked.

3. *Schizothorax Waltoni*.

Depth of body $4\frac{1}{3}$ in the length, length of head 4. Upper profile of head descending slightly to above the nostrils and thence more strongly to the tip of snout. Breadth of head twice in its length. Snout pointed, a little shorter than postorbital part of head. Diameter of eye $6\frac{1}{4}$ in the length of head, interorbital width $3\frac{2}{3}$. Mouth subterminal; lower jaw apparently without horny covering; upper lip slightly elevated medianly; lower lip with a small median lobe and a pair of well-developed lateral lobes; 2 barbels on each side,

subequal, nearly $\frac{1}{4}$ the length of head. Scales regularly arranged, 124 in a longitudinal series; thorax and abdomen scaly. Dorsal III 8, the third simple ray a stout coarsely serrated spine, $\frac{2}{3}$ the length of head; origin of dorsal behind the bases of the ventrals, nearer to base of caudal than to tip of snout. Anal II 5. Pectoral extending less than $\frac{2}{3}$ the distance from its base to base of ventral; ventral extending nearly to the vent. Caudal forked. Caudal peduncle $1\frac{1}{3}$ as long as deep. Olivaceous; fins pale.

A single specimen, 160 mm. in total length.

This species is allied to *S. progastus*, MacClell.

4. *Schizothorax macropogon*.

Depth of body about 4 in the length, length of head $4\frac{1}{2}$. Upper profile of head straight, oblique. Breadth of head $1\frac{1}{3}$ in its length. Snout rounded, shorter than postorbital part of head. Diameter of eye $5\frac{1}{3}$ in the length of head, interorbital width $2\frac{2}{3}$. Mouth inferior; lower jaw without horny covering; fold of the lower lip broadly interrupted; 2 barbels on each side, subequal, $\frac{1}{2}$ as long as the head or more. Scales small and irregularly arranged on the anterior part of the body, about 160 in a longitudinal series; lower part of thorax and abdomen naked, except for some rudimentary imbedded scales. Dorsal III 8, the third simple ray a stout coarsely serrated spine, about $\frac{3}{4}$ the length of head; origin of dorsal behind the bases of the ventrals, nearer to base of caudal than to tip of snout. Anal III 5. Pectoral extending $\frac{3}{4}$ of the distance from its base to the base of ventral; ventrals extending nearly to the vent. Caudal forked. Caudal peduncle $1\frac{3}{4}$ as long as deep. Dark greyish, with some darker spots on the upper part of the body; fins dusky.

A single specimen, 230 mm. in total length.

Distinguished from allied species by the long barbels.

5. *Nemachilus tibetanus*.

Depth of body 5 in the length, length of head 4. Snout a little shorter than postorbital part of head, $1\frac{2}{3}$ as long as eye, the diameter of which is 5 in the length of head and $1\frac{1}{2}$ in the interorbital width. Breadth of head $1\frac{5}{6}$ in its length and equal to its depth. Cleft of mouth extending to below the nostrils; lips moderately thick, plicated, the lower interrupted medianly; barbels six; outer rostral barbel reaching the base of the maxillary barbel, which is a little shorter than the eye. Scales entirely wanting. Dorsal II 8, its origin equidistant from anterior margin of eye and base of caudal.

Anal II 6. Pectoral extending $\frac{3}{5}$ of the distance from its base to the base of ventrals. Ventrals 9-rayed, extending to the origin of anal. Caudal emarginate. Caudal peduncle slender, $3\frac{1}{2}$ as long as deep, its length $\frac{2}{3}$ the length of head. Greyish, with irregular dark spots on head, body, and fins.

A single specimen, 125 mm. in total length.

Allied to *N. ladacensis*, Günth.

XV.—*Description of a new Batrachian of the Genus Bombinator from Yunnan.* By G. A. BOULENGER, F.R.S.

[Plate XIII.]

ONLY three species of *Bombinator* were previously known—*B. igneus*, Laur., and *B. pachypus*, Bp., from Europe, and *B. orientalis*, Blgr., from Manchuria, Corea, and Northern China. To my great surprise and gratification a small series of Batrachians collected by Mr. John Graham near Tong Chuan Fu in Yunnan (altitude about 6000 feet), which has just reached the British Museum, contained three examples of a fourth species, remarkable for its large size and as greatly extending the known range of this genus and also of the small family, Discoglossidæ, to which it belongs. For this new species I propose the name

Bombinator maximus. (Pl. XIII.)

Vomerine teeth in two small groups or short transverse series close together behind the level of the choanæ. Tongue large, circular, scarcely free at the sides and behind. Head broader than long; snout rounded, not quite as long as the diameter of the orbit; no canthus rostralis; nostril equally distant from the eye and the tip of the snout; interorbital space narrower than the upper eyelid, nearly equal to the distance between the nostrils. Fingers short, obtusely pointed, first shortest, third longest, fourth a little longer than second; no subarticular tubercles; two round palmar tubercles, inner larger and more prominent. Tibio-tarsal articulation reaching the shoulder, tarso-metatarsal articulation reaching the eye; tibia as long as the femur, the heels meeting when the legs are folded at right angles to the rhachis; foot as long as the tibia; toes short, obtuse, flattened, only half-webbed; no subarticular tubercles; a small, rounded inner metatarsal tubercle. Upper parts covered with small warts intermixed with very large glands studded with pores, similar to the parotoids of toads; the largest are situated behind the eyes (true parotoids), on the tibia, on the tarsus, and on the back, where they form a pair of curved or angular chains behind the head, with

the convexity turned inwards. Lower parts nearly smooth; a more or less distinct gular fold. No horny spines on any part of the body. Blackish olive above, with rather ill-defined black markings forming vertical bars on the upper lip and cross-bars on the limbs; only the inner finger and toe with a light tip; a more or less distinct light transverse spot on the back, just behind the head. Lower parts marbled bright



Female, smaller specimen, upper view of head and anterior part of body, natural size.

orange and black, in about equal proportions, or the black predominating; greater part of palm and sole orange, this colour involving the inner digit; the orange of the lower surface of the arm either extending across the breast, or widely separated from a pair of pectoral spots; plantar, tarsal, and tibial orange spots continuous or interrupted; the orange not extending on the back of the thighs.

	mm.
From snout to vent	68
Length of head	19
Width of head	23
Diameter of eye	6
Interorbital width	3
Fore limb	32
Hind limb	73
Tibia	24
Foot	24

The three specimens here described are females.

EXPLANATION OF PLATE XIII.

- Fig.* 1. Female, largest specimen, upper view, natural size.
Fig. 2. Female, lower view, natural size.

XVI.—*Description of a new Snake of the Genus Atractaspis from Mount Kenya, British East Africa.* By G. A. BOULENGER, F.R.S.

A SMALL collection of reptiles made by Mr. S. L. Hinde at Fort Hall, Mount Kenya, 4400 feet, contains, in addition to specimens of four species previously described by me from East Africa—viz. *Lygosoma clathrotis*, *Chamaleon Jacksoni*, *Chamaleon Roperi*, and *Glauconia Emini*,—an example of the Viperid genus *Atractaspis*, unique in having two postoculars instead of one. It represents a new species, which I propose to name

Atractaspis bipostocularis.

Snout very short, rounded. Portion of rostral visible from above half as long as its distance from the frontal; suture between the internasals as long as that between the præfrontals; frontal a little longer than broad, nearly twice as long as its distance from the end of the snout, as long as the parietals; one præ- and two postoculars; a very large temporal wedged in between the fourth and fifth upper labials and in contact with the lower postocular; five upper labials, third and fourth entering the eye, fourth largest; first lower labial in contact with its fellow behind the symphysial; four or five lower labials in contact with the chin-shields, fourth or fifth very large. Scales in 23 rows. Ventrals 233; anal divided; subcaudals 24 pairs. Dark olive above and beneath, upper surface of head paler.

Total length 240 mm.; tail 16.

A single young specimen.

XVII.—*List of a Collection of Neuroptera Odonata (Dragon-flies) formed by G. A. K. Marshall, Esq., at Salisbury, Mashonaland, with Descriptions of a new Genus and Two new Species.* By W. F. KIRBY, F.L.S., F.E.S.

THIS small collection was recently presented to the Natural History Museum by Mr. Guy Marshall, and is interesting on account of all the specimens being marked with the month of capture. A few notes are also added, chiefly on the colours of the living insects.

Libellulidæ.—LIBELLULINÆ.

- Pantala flavescens*, Fabr.: (no. 29) Nov. 1903.—Four specimens.
- Trithemis arteriosa*, Burm.: (no. 42) October 1903, April 1904.—Seven specimens.
- Trithemis stictica*, Burm.: (no. 53) April 1904.—One specimen.
- Crocothemis erythræa*, Brullé: (no. 25) Oct. 1903, April 1904.—Five specimens.
- Orthetrum chrysostigma*, Burm.: (no. 14) April 1904.—Three specimens.
- Misthotus Marshalli*, sp. n. (*vide infra*): (nos. 6 & 26, immature) Oct. 1903, (no. 5, adult) Nov. and Dec. 1903.—Five specimens.
- Diplacodes exul*, Selys: (nos. 3 & 26) Oct. 1903, (no. 40) Nov. 1903, (no. 11) March 1904.—Four specimens.

Æschnidæ.—ÆSCHNINÆ.

- Hemianax ephippiger*, Burm.: (no. 30) Nov. 1903.—Two specimens.

Agrionidæ.—CÆNAGRIONINÆ.

- Disparoneura glauca*, Burm.: (no. 23) November 1903.—One specimen.
- Micronympha senegalensis*, Ramb.: (nos. 46 & 48) Oct. and Nov. 1903, (no. 46, November). "Sides of thorax and of two basal and two apical segments of abdomen bright blue." (*G. M.*)—Several specimens.
- Pseudagrion punctum*, Ramb.: (no. 41) Oct. and Nov. 1903, "Apex of abdomen pale blue." (*G. M.*); (no. 45) Nov. 1903, "♀ of 24." (*G. M.*)—Nine specimens.
- Pseudagrion Deckeni*, Gerst. (according to the above note = *P. punctum*, ♂): (nos. 24, 41, 43, 44) Oct. and Nov. 1903, (nos. 44 & 46) April 1904.—Fourteen specimens.
- Agrionemis exilis*, Selys: (no. 16) Oct. 1903.—One specimen.
- Lestes obscurus*, Kirb.: (no. 15) Oct. 1903, March and April 1904.—Four specimens.

Genus MISTHOTUS, nov.

Eyes contiguous, scarcely expanded behind, frontal tubercle rounded; abdomen about as long as the fore wings, rather slender, neither thickened nor constricted at the base, with the second and third segments carinated; terminal appendages of male rather short and slender, thickened towards the extremity, scarcely longer than the broad triangular lower appendage: fore wings with 11 or 12 continuous antenodal cross-nervures and 9 to 11 postnodal cross-nervures in the upper space and 7 or 8 in the lower (only 5 in female); pterostigma rather long, with 2 or 3 nervures in the space below it; only 1 nervure in the lower basal cell; no supra-triangular nervures; triangle regular, traversed, followed by 3 rows of post-triangular cells, only increasing towards the extremity, subtriangular space consisting of 3 cells; sectors of the areculus stalked, only slightly waved, lower sector of the triangle rising just beneath the triangle: hind wings with 9 or 10 continuous antenodal cross-nervures (sometimes an accessory one in the upper series), and 11 postnodal upper cross-nervures and 8 lower; triangle untraversed, followed by two rows of cells increasing above the upper sector, which rises close to the lower one.

Differs from *Orthetrum* chiefly by the uninflated and unconstricted abdomen. Several species described under *Orthetrum* (among others *O. flavidulum*, Kirb.) will probably fall into this genus.

Misthotus Marshalli, sp. n.

Exp. al. 58 mm.; long. pter. 3 mm.; long. corp. 34 mm.

Male.—Head black; vertex purple, coarsely punctured; below it a yellow spot on each side, touching the eye; mentum with the sides broadly yellow; outer orbits yellow, spotted with black; thorax and abdomen pruinose blue, with some slight yellow markings at the base of the legs, on the sides of the base of the abdomen beneath, and on the lower abdominal appendage above; thorax very hairy; legs black; wings very clear hyaline, with blackish neuration; stigma dark brown, slightly bordered with smoky yellow on the inner edge; base of wings with a smoky yellow patch, nearly obsolete on the fore wings; membranule of hind wings small, grey.

Salisbury, Nov. and Dec. 1903. Two specimens.

Female (taken in cop. with one of the two males described

above, in Nov. 1903) and *immature male* (Oct. 1903).—Head yellow, antennal tubercles surrounded with purple (vertex wholly purple in male); thorax yellow, a black isosceles triangle above, pointing backwards, and with 5 or 6 more or less confluent oblique stripes on the pleura; interalary space varied with black and yellow; abdomen yellow, with 3 black bands, widening behind, one median, the others lateral; the lateral ones more or less interrupted towards the base; fourth segment with a black transverse line near the base, simulating an imperfect carina (in the pruinose males first described this is hidden). All else as in the adult males previously described.

In a still more immature male, taken in October, which seems to belong to the same species, the neuration is reddish, with the yellow at the base of the wings more extended; the dark median triangle of the thorax and the median abdominal stripe are barely indicated, and the pleura and sides of abdomen at the base are almost white, with oblique black lines.

Misthotus ambiguus, sp. n.

Exp. al. 70 mm.; long. pter. 3 mm.; long. corp. 38 mm.

Male.—Vertex purple, with greenish shades in certain lights; face mostly greenish; rhinarium black, with an orange spot on each side; mentum black, with a broad orange band on each side; outer orbits yellow, spotted with black. Body and wings nearly as in the last species; fore wings with 11 continuous cross-nervures, and sometimes an accessory one on one side, not continued beneath, 10 in the upper postnodal space, and 7 in the lower: hind wings with 7 or 8 continuous antenodal cross-nervures, 10 or 11 in the upper postnodal space, and 7 or 8 in the lower.

Otherwise as in the last species.

Hab. Transvaal (*H. Ross*); Cape Colony.

A larger and stouter insect than *M. Marshalli*. Perhaps allied to *Orthetrum farinosum*, Förster, also from the Transvaal.

This is not one of Mr. Guy Marshall's captures, but I describe it here as an additional species of the new genus *Misthotus*.

XVIII.—*Notes on the Synonymy of Thecla spurina, Hew., and Thecla ericusa, Hew.* By HAMILTON H. DRUCE, F.Z.S., F.E.S.

MUCH confusion has been caused by Hewitson having described the male and female of both these species as distinct, which is the more remarkable as the female only differs on the underside by being paler in colour. Besides the specimens in the National Collection I have examined those in Mr. Godman's collection, amongst which are several co-types of Hewitson's which were formerly in Bates's possession and several of his types.

The first species described by Hewitson is *Thecla spurina**, the type of which (a female) is now in the British Museum; it is in indifferent condition and without locality. There are four females in Mr. Godman's collection (two Tapajos and two Pará) marked by Bates "*spurina*." These differ from the type only by being rather darker and by the orange spot between the tails on the upperside being less apparent, this, however, varying slightly in all four specimens. The specimen referred to by Hewitson as being in Bates's collection, and which is labelled "*spurina*, Hew., type," is, in fact, *T. ericusa*, Hew., of which an excellent figure is given (fig. 162).

We possess a single female from Bartica, British Guiana, obtained by Mr. H. S. Parish, which differs from the Amazon specimens only by being rather richer in colour, doubtless due to its being a fresher specimen, and by the total disappearance of the orange spot between the tails on the upper surface.

A few pages later is described *T. stagira* †, with two vars. (*a* and *b*).

Mr. Godman's collection contains one male from Bates's cabinet labelled "*stagira*" from Tapajos; also one female labelled "*stagira*" from Tapajos which I am quite convinced is *T. pion*, G. & S. ‡, judging from the colour and pattern of the underside, also by the costal margin of the fore wing being much more concave towards its middle than in *T. spurina* ♀.

* *Thecla spurina*, Hew. Ill. Diurn. Lep. p. 102, t. xxxix. figs. 122, 123 (1867).

† *Thecla stagira*, Hew. Ill. Diurn. Lep. p. 113, t. xxxix. figs. 120, 121 (1867).

‡ *Thecla pion*, Godm. & Saly. Biol. Centr.-Am., Rhop. ii. p. 56, pl. liv. figs. 28-30.

The var. *a*, to which Hewitson originally gave the name *erenea*, and subsequently sunk under *stagira*, I do not know, and do not find it in the Hewitson Coll. or the B. M. Coll. According to the figure it has no brown apex and margin on fore wing above.

The var. *b*, mentioned by Hewitson as from Rio, I am also unable to find, but there is a male in Mr. Godman's collection of about the same size from Panama obtained by Mr. Champion.

Again, in the same work Hewitson describes and figures *T. volana** from the collection of the late W. W. Saunders.

In Mr. Godman's possession is a single female labelled "S," and on another ticket "Amazon." I have no doubt that this is Hewitson's type; it formerly belonged to Mr. Herbert Druce, who obtained it from the Saunders Collection at its dispersal. It cannot be separated from *T. spurina*. Messrs. Godman and Salvin, in Biol. Centr.-Americana, Rhop. ii. p. 52, refer to this species as *T. stagira*, probably because no Central-American females were sent to them.

Again, Hewitson describes the female as *Thecla timæa*† from Bates's collection, and the type is now in Mr. Godman's possession. It is slightly smaller than the type *T. volana*, but I can detect no other difference.

From a perusal of the foregoing remarks it will be seen that the synonymy of this species is as follows:—

<i>Thecla spurina</i> ,	Hew.	
„	<i>stagira</i> ,	„
„	<i>volana</i> ,	„
„	<i>timæa</i> ,	„
„	<i>stagira</i> ,	„
		Godm. & Salv.

T. spurina, like many other *Theclas* of which any considerable number of specimens can be got together, proves to have a rather wide range. I have examined specimens from Chiriqui and Panama in Central America, males only, and both sexes from British Guiana; from Manaure, N. Granada; from Tapajos and Pará, on the Amazon; from Paraguay (captured by Perrens) and from Brazil (Chapada), sent by Mr. H. H. Smith.

* *Thecla volana*, Hew. Ill. Diurn. Lep. p. 123, t. xlvi. figs. 225, 226 (1869).

† *Thecla timæa*, Hew. Ill. Diurn. Lep. p. 125, t. li. figs. 268, 269 (1869) (*T. lydia*, Kirby, Cat. p. 393).

The next species here dealt with is *Thecla ericusa**, described by Hewitson from a female Brazilian specimen in the collection of the late W. W. Saunders. I have been unable to trace this type, but the figure is an excellent one, and there should be no difficulty in identifying it. Shortly afterwards Hewitson describes the male under the name *Thecla voconia*† from an unknown locality. This type is now in the British Museum, and without doubt = *T. ericusa*.

There are specimens from Venezuela (one female) and Rio (one male) in Mr. Godman's possession which were formerly in the Kaden Collection, and one female from Minas Geraes (Bates), also two males and two females from Chapada, Brazil, obtained by Mr. H. H. Smith, and two males from Paraguay (Perrens).

T. ericusa, which varies much in size, is at once distinguished in the male from *T. spurina* by possessing a simple brand on the fore wing placed just beyond the end of the cell, whilst that species has a double brand partly placed in the cell and partly beyond. The possession of this simple brand probably points to its near alliance with *Thecla brescia*‡, a well-known Central-American species.

XIX.—*On Two new Leucaniæ from British New Guinea.*

By GEORGE T. BETHUNE-BAKER, F.L.S., F.Z.S.

Leucania leucosphenia, sp. n.

♂. Head and collar ochreous brown, patagiæ and thorax reddish ochreous; abdomen pale ochreous brown, with a large pale yellowish anal tuft; legs pale ochreous brown, with dark reddish femora. Primaries pale ochreous brown, with all the veins palely outlined and a pale dash at the lower angle of the cell; cell filled in with pale reddish, with a like-coloured basal dash on its lower margin; a pale patch below the centre of the cell; a double postmedial row of dark dots; a greyish wedge-shaped mark on the termen below the apex; termen darkly dotted, inner margin pale,

* *Thecla ericusa*, Hew. Ill. Diurn. Lep. p. 113, t. xlii. fig. 162 (1867).

† *Thecla voconia*, Hew. Ill. Diurn. Lep. p. 120, t. xlix. figs. 244, 245 (1869).

‡ *Thecla brescia*, Hew. Desc. Lyc. p. 13 (1868); Ill. Diurn. Lep. p. 119, t. l. figs. 260, 261 (1869).

with a dark dash above it near the base : secondaries pinkish brown, paler towards the base.

♀. Like the male in all respects.

Expanse, ♂ 44, ♀ 46 mm.

The types from Dinawa are in my collection ; the species flies in August.

Leucania cryptargyria, sp. n.

♂. Head pale rufous brown ; collar pale purplish brown, with four dark lines horizontally across ; patagiæ reddish brown, tinged with grey ; abdomen pale ochreous brown ; palpi pale purplish brown, pale ochreous internally ; legs pale ochreous brown, striped with reddish ; spines black at the base ; mid legs with tibiæ fringed with long pale hair ; an abdominal tuft of longish black hair at the base. Primaries pale ochreous brown, tinged with reddish in the cell and up to the apex, to which point the darker area tapers gradually ; costa broadly whitish grey ; a double postmedial row of black points ; termen slightly clouded ; the veins are more or less irrorated with black scales and the inner marginal area has a patch of similar-coloured scales : secondaries warm brown, slightly pinkish, with the costa and inner margin paler. Fringes pale pinkish, outer half white. Under surface : both wings uniform lustrous metallic silver, with a blackish spot on the costa a third from the apex.

Expanse 48 mm.

The type is in my collection from Dinawa.

XX.—On a new Vole from Kashmir.

By J. LEWIS BONHOTE, M.A.

THE collection of voles sent home from Kashmir by Col. A. E. Ward contains three specimens of a most interesting new species allied to *Microtus nivalis*, for which I propose the name

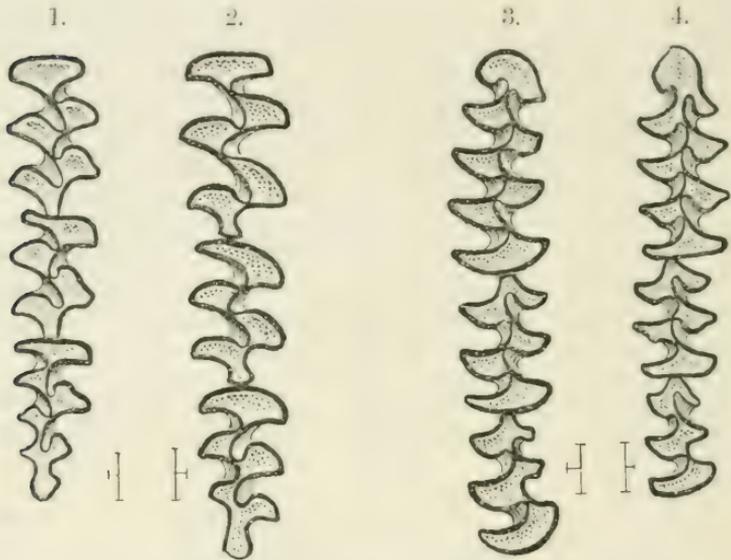
Microtus imitator, sp. n.

Differs externally from *M. nivalis* only in its smaller size and slightly browner coloration.

General colour above grizzled greyish brown, each hair being dark at its base, with a light subterminal portion and a

black tip; interspersed among these are longer pure black hairs. The colour is deepest across the back and paler on the flanks and cheeks. Underparts whitish, tinged with yellow; hairs with dark bases. Feet greyish. Tail long and bicolor, brown above, white below. Ears moderate, rounded, and clothed with short hairs similar in colour to the upper parts.

The skull is slightly smaller and flatter than in true *nivalis*, but the brain-case is rather more rounded at the sides. The auditory bullæ smaller, less elongate, and well rounded, thus slightly compressing the basioccipital.



1. Upper right (*imitator*). 2. Upper right (*nivalis*). 3. Lower right (*nivalis*). 4. Lower right (*imitator*).

Teeth generally resembling those of *M. nivalis*, with two important exceptions. In the species under consideration the spaces are rather narrower and smaller than in *nivalis*, the third molar of the upper jaw has four external angles instead of three, and the posterior lobe of the same tooth has a slight constriction on its inner edge, tending to form a fourth interior angle. In the lower jaw the anterior arrow-shaped head of the first molar is not symmetrical, but is elongated on its external side to form an oblong rounded space; a tendency towards this shape is found, so Dr. Forsyth Major tells me, in a specimen of *nivalis* from Mount Hermon, but

is never found among the western forms. The anterior external space of the third lower molar is similarly modified.

Dimensions. Head and body 105 mm.; tail 45; hind foot 15; ear 12.

Skull. Length of palate 12 mm.; length of nasals 8; length of molar series 6; width of brain-case above posterior roots of zygomata 13.

Hab. Tullian, Kashmir. Alt. 11,000 feet.

Type. B.M. 5. 1. 5. 12. ♂ ad. Tullian, Kashmir. Collected by Col. A. E. Ward, 14th July, 1903.

In outward appearance, as well as in skull-characters, this vole is undoubtedly allied to *M. nivalis* of Europe, which, however, has not hitherto been found east of the Caucasus; so that its discovery in Kashmir forms a considerable eastward extension of this group. Its smaller size, slightly browner coloration, and dental characters enable it to be distinguished easily from the typical *nivalis*.

XXI.—A new *Ficalbia* from West Africa.

By F. V. THEOBALD, M.A.

Ficalbia nigripes, sp. n.

Head black. Thorax pale bright yellowish brown, with two parallel dark lines behind. Abdomen deep brown, with narrow pale basal bands. Legs, antennæ, palpi, and proboscis deep blackish brown. Wings with pale scaled veins and with deep brown costa.

♂. Head clothed with flat deep black scales and black upright forked scales. Antennæ deep blackish brown, with paler dusky bands and deep brown plume-hairs. Proboscis deep blackish brown, swollen apically; palpi small, deep brown.

Thorax pale brown, clothed with long, narrow, curved, pale, dull yellowish scales, except for two parallel bare lines, and with two broad lines of long, narrow, curved, black scales on each side of the bare space in front of the scutellum and extending past it; two rows of long black bristles and numerous black ones over the roots of the wings; scutellum clothed with flat black scales and with brown border-bristles; metanotum deep brown; pleuræ pale ochreous.

Abdomen deep blackish brown, with white basal bands and brown lateral hairs.

Legs deep blackish brown ; the coxæ pale ochreous.

Wings with brown scales ; fork-cells short, of nearly equal length ; base of the first submarginal cell nearer the apex of the wing than that of the second posterior, its stem about one and a half times the length of the cell ; stem of the second posterior not quite one and a half times the length of the cell ; posterior cross-vein sloping backwards, not quite its own length distant from the mid vein ; median vein-scales in single line ; lateral vein-scales large and bluntly lanceolate, existing on the second, third, and branches of the fourth veins only, narrower ones on part of the first long vein, those on the first and sub-costal short and spatulate, like those forming the median vein-scales, only in two rows ; costa with an inner row of short spatulate scales, and the outer border with deep brown spiny ones ; the sixth vein is much curved apically.

Length 2·8 mm.

Time of appearance. December.

Hab. Kortright, Freetown, Sierra Leone, 1200 feet (*Major F. Smith, D.S.O., R.A.M.C.*).

Obs. Described from a perfect male. The specimen was bred by Major Smith from a larva taken in a hole in a brook.

This is the first *Ficalbia* that has occurred in Africa. The only other species with banded abdomen is *F. minima*, Theob., from South India, but the Indian species has banded legs.

XXII. — *American Hymenoptera: new Bees and a new Proctotrypid.* By T. D. A. COCKERELL, University of Colorado.

Prosopis crenulata, sp. n.

♂.—Length about 5 mm.

Black ; head large, abdomen slender ; labrum, greater part of mandibles, scape in front, and face below middle lemon-yellow ; supra-clypeal mark quadrate, a little higher than broad, slightly emarginate above ; lateral face-marks filling the space between the clypeus and supra-clypeal mark and the eye, truncate and minutely crenulate above ; the yellow thus ends abruptly at about the same level right across the face, though its upper margin is not straight, but concave ; flagellum brown beneath ; front and vertex strongly punctured ; mesothorax well punctured ; metathorax polished and shining, with a very narrow basal sculptured area ; thorax

entirely black; tegulæ piceous; wings strongly dusky; femora black, except more or less at apex, tibiæ and tarsi yellow, the small joints of the tarsi infuscated; abdomen black, closely and distinctly punctured.

Hab. Mexico; further particulars unknown (Baker collection, no. 1785)*.

The black scutellum distinguishes it from most of the Mexican species; I do not know of any close ally. In my table in 'Entomologist,' Aug. 1898, it runs to *P. rugosula*, Ckll., but it is quite distinct from that.

Cælixys angelica, sp. n.

♀.—Length about $9\frac{1}{2}$ mm.

Entirely black, including the legs; pubescence white; tegulæ dark brown; wings with the apical half dusky; scutellum with the lateral teeth slender and somewhat hooked, no median tooth or tubercle; concavity of first abdominal segment bounded by a distinct rim, behind which is a narrow white hair-band; segments 1 to 5 with narrow apical hair-bands; transverse grooves on segments 2 and 3 broadly interrupted in the middle; apical dorsal segment rather broad, pointed (the point not at all upturned), not notched, but rather suddenly depressed about the middle, the depressed apical part with erect hairs; last ventral segment surpassing the dorsal, broad, with the margin ciliated with dark bristles, the apex not notched, but having a minute tooth-like prominence; penultimate ventral segment with strong punctures, and no little ones between.

Hab. Los Angeles, California (*Dr. A. Davidson*).

Allied to *C. modesta*, Smith, and *C. gilensis*, Ckll., but easily known from these by the last dorsal segment having no upturned point. From *C. apacheorum*, Ckll., it is known by its smaller size, apical ventral plate with a little projection, and penultimate ventral segment without little punctures interspersed among the large ones.

Tripeolus wyomingensis, sp. n.

♂.—Length just over 11 mm.

Black, including the antennæ, legs, and their spurs; pubescence greyish creamy, pure white on face; clypeus

* Mr. E. S. G. Titus, who has access to Mr. Baker's note-book, informs me that no. 1785, the number attached to the type of *Prosopis creaulata*, signifies that it was collected by H. H. Hyde in the autumn of 1895, by "sweeping &c.," at Medellin, State of Vera Cruz, Mexico.

minutely rugose, with scattered large punctures; tegulae exceedingly dark brown: wings hyaline, with only a faint brownish tint; nervures dark reddish brown, paler basally; marginal and third submarginal cells each with a short appendicular nervure; third submarginal cell longer on marginal than on third discoidal; second submarginal cell considerably narrowed above, receiving the first recurrent nervure at its middle; basal nervure going a considerable distance basad of transverso-medial: mesothorax minutely roughened, with a broad but thinly hairy band across the anterior part, sending two tongues backwards; scutellum strongly bilobed, the lateral teeth short, black; pleura densely punctured, with a large circular bare patch: abdomen 6-banded, the first segment covered with hair, except the usual median patch, which is pointed but not greatly prolonged laterally; second segment with the lateral upward extensions of the band forming right angles, as in *T. nigriceps* (Smith); venter with pale hair-bands on the second and third segments and a coarse curled purplish-sooty fringe on the fourth.

Hab. Wyoming; no other particulars known. Received from Mr. John H. Lovell.

Superficially like *T. concolor* (Rob.), but the markings are not so yellow, and the patterns of the mesothorax and first abdominal segment are quite different; the face also is broader below, with the hair white (pale golden in *concolor*), and the sides of the vertex are densely punctured and dull, without any shining surface showing between the punctures, as it does in *concolor*. From *T. donatus* (Smith), which it rather approaches in the colour of its markings, it differs at once in the pattern of the thorax and abdomen. From *T. nigriceps* (Smith), which it approaches closely in pattern, it differs by its smaller size and wings not at all violaceous.

Triepeolus callopus, sp. n.

♀.—Length 10 mm. or slightly less.

Black, with the usual markings of pale ochraceous pubescence; legs bright ferruginous; basal three fifths of mandibles, labrum, and anterior margin of clypeus bright ferruginous; clypeus minutely roughened, with scarcely indicated scattered punctures; a prominent keel between the antennæ; scape dark; flagellum ferruginous, but much blackened, especially above, the first joint and base of second brighter; mesothorax nude, except for two stripes of pubescence on the anterior part and a patch at each posterior

lateral corner, its anterior margin quite bare, contrasting with the adjacent prothorax, which is very pubescent; scutellum with the anterior half bare and the posterior half pubescent, rather prominent, slightly bilobed, with the lateral teeth black, and very short; metathorax pubescent; pleura rather coarsely rugoso-punctate, pubescent, with a very large round bare area; tegulae apricot-colour, with hyaline margins; wings clear, second submarginal cell triangular; tibial spurs black: abdomen with entire bands on the hind margins of the first four segments; first segment with the basal half wholly covered with pubescence, and the black area a broad transverse band, rounded at the ends; second segment with the apical band sending from each side a broad process antero-mesad, forming an acute angle with the band; apex red, dorsally with a broad-oval flattened area; last ventral plate curved strongly downwards at the end; first three ventral segments with much pubescence, the last two bare, the penultimate one black margined with red.

Hab. Redondo, California (*Dr. A. Davidson*).

By the marking of the first abdominal segment this resembles *T. occidentalis* (Cresson); by the structure of the apex of the abdomen it resembles *T. penicilliferus* (Brues) and *T. concavus* (Cresson). It is a much smaller insect than either of the last-mentioned.

Synhalonia Gillettei, sp. n.

♂.—Length about 16 mm.; antennae slightly over 11 mm.

Black, with rather dull white pubescence, faintly tinged with yellowish on the thorax; antennae entirely black, apical portion crenulated, third joint hardly over a quarter length of fourth, fourth longer than fifth; clypeus and labrum lemon-yellow, clypeus coarsely rugoso-punctate; mandibles black, with an obscure pale mark on basal portion; thorax densely hairy; tegulae ferruginous, with hyaline margins; wings slightly dusky, nervures dark ferruginous, basal nervure meeting transverso-medial; legs black, small joints of tarsi ferruginous, spurs pale reddish; hair of legs all pale, that on inner side of basal joints of tarsi ferruginous; abdomen hairy, segments 3 to 6 with white pruinose or velvety bands, such as usually seen in females of *Synhalonia*; venter with short scanty dark brown pubescence, except at sides, where it is white and conspicuous.

Hab. Fort Collins, Colorado, June 12, 1902 (Colorado Experiment Station).

Nearest to *S. jrater* (Cresson), but considerably larger,

with the abdomen more hairy and distinctly banded. It has a strong superficial resemblance to *Melissodes macherantheræ*, Ckll., but the antennæ are much longer than in that species.

Synhalonia fulvitaris (Cresson).

Fort Collins, Colorado, May 27, 1900 (Colorado Experiment Station). Described from "Colorado," but this is the first indication of a precise locality or the time of flight.

Proctotrypidæ.

Proctotrypes coloradicus, sp. n.

♀.—Length 9 mm. or slightly over, with the cauda exceeding 10 mm.

Entirely bright ferruginous, only the eyes black, and the antennæ infuscated towards the end; head quadrate, but broader than long; first joint of flagellum longer than second; metathorax cancellate, with a fine median, longitudinal, raised line; second abdominal segment with only faint striæ at the extreme base; cauda somewhat less than half length of abdomen: upper wings dusky, marginal cell extremely minute, first (and only) submarginal cell extremely large; first discoidal open on outer side, the cubital nervure (which is very faint) not at all directed upwards, as it is in Ashmead's figure of *P. caudatus* (which also has the first discoidal closed); stigma not so near apex of wing as Ashmead figures for *caudatus*.

Hab. Boulder, Colorado, about 100 yards from no. 930 14th St., Oct. 1, 1904, running on the ground, looking like an ant (*Cockerell*).

Easily known by its large size, bright red colour, and the venation. It is most nearly allied to *P. pallidus*, Say.

Boulder, Colorado, U.S.A.,
December 1904.

XXIII.—*Three undescribed Coleoptera from Natal.*

By W. L. DISTANT.

AMONG some insects recently sent to me by Mr. H. W. Bell-Marley from Natal were a certain number of the smaller Longicorn beetles, some of which were described species which cannot at present be included in my enumeration of

the Longicornia of the Transvaal, though they may probably occur in that country, while three appear to be new species, one necessitating the proposal of a new genus. For the systematic position of that genus I am again indebted to the advice of my friend Mr. C. J. Gahan.

Order COLEOPTERA.

Fam. *Cerambycidae*.

Subfam. *LAMINÆ*.

Division *ACMOCERIDARIA*.

TAMBUSA, gen. nov.

Head considerably depressed between the antenniferous tubercles, which are prominent and inwardly and outwardly angulate; front oblique, with a small spinous callosity on each side near base; eyes coarsely faceted, the lower lobes large; antennæ a little longer than the body, thickly pilose, finely hirsute beneath; first joint somewhat transversely incrassate, its margins tuberculate, third and fourth longest and subequal in length, but third a little incrassate, fifth slightly longer than any of the remaining joints, which are subequal in length; pronotum about as long as broad, discally gibbous and laterally oblique, with a prominent spine near each posterior angle, two central, posterior, elevated, laminate processes, with their apices shortly tuberculously spinose, and with a short central spine between them; elytra a little narrowing posteriorly, their apices somewhat obliquely truncate, with a broad, cordate, raised, but inwardly concave process at base; acetabula of front coxæ angulate outwardly; intercoxal process of prosternum triangular; femora thickened, a little compressed at apex and much more so at base; tibiæ very slightly longer than the femora; first joint of tarsi considerably shorter than the second and third joints together.

This genus is allied to *Idactus*, Pasc.

Tambusa Marleyi, sp. n.

Fulvous brown, with some scattered fuscous mottlings; pronotum (excluding the discal processes) thickly, shortly, palely pilose, the surface very uneven, the outer margins and apices of the discal processes, the apex of the intermediate spine, and the apex of the posterior angles piceous; elytra tomentose, finely tuberculate, the tubercles (excluding those on basal process) arranged in longitudinal series, the basal

process dark fulvous, piceous towards apex, and its posterior margin very palely flavescent; there is a short, curved, inner apical fascia to each elytron, preceded by a transverse much waved line, and an irregular transverse discal spot before



Tambusa Marleyi, Dist.

middle (not reaching margins), pale ochraceous; antennæ with the bases of the fifth and succeeding joints greyish; legs (especially the tibiæ and tarsi) distinctly pilose, at base and apex of tibiæ greyish, femora and tibiæ with small scattered piceous spots.

Var.—Posterior margins of the lateral angles and the posterior margin to pronotum and humeral angles and basal process to elytra piceous.

Long. 13–15 mm.

Hab. Natal: Durban (*Bell-Marley*).

Division NIPHONIDARIA.

Soridus griseus, sp. n.

Griseous, punctured or minutely spotted with fuscous; head with the basal area from posterior margins of antenniferous tubercles fuscous, punctate, remaining portion and front griseous, the last with the apical area and a transverse fascia from between eyes fuscous; antennæ fuscous, shortly

griseously pilose; pronotum fuscously punctate, the disk confluent punctate, with a basal central griseous line; elytra finely pilose, longitudinally irregularly carinate, fuscously punctate, somewhat confluent so on lateral and



Soridus griseus, Dist.

basal areas, their apices subacuminate; sternum and legs fuscously punctate; abdomen beneath palely griseous, thickly tomentose, obscurely finely fuscously punctate.

Long. $11\frac{1}{2}$ mm.

Hab. Natal: Durban (*Bell-Marley*).

This species only differs from Gahan's genus *Soridus* in having the apices of the elytra subacuminate, not "broadly subtruncate."

Division ACANTHOCINIDARIA.

Exocentrus polymitus, sp. n.

Pale griseous, much mottled or shaded with bright dark fuscous; head and pronotum sometimes almost entirely fuscous, with the posterior angles griseous, or the surface only fuscously punctate; elytra with two spots (the uppermost largest) on each side of suture before middle, followed by two very irregular and angularly waved transverse fasciæ, humeral angles and a marginal spot before middle dark bright fuscous brown; antennæ brownish ochraceous, first joint (excluding base), apices of joints 3-5, and nearly the whole

of the remaining joints fuscous brown; legs and body beneath fuscous brown; abdomen sometimes with a narrow, central, griseous fascia; pronotum with a strong posteriorly directed



Exocentrus polymitus, Dist.

lateral spine; elytra thickly and finely punctate; antennæ about twice the length of body.

Long. 4 mm.

Hab. Natal: Durban (*Bell-Marley*).

XXIV.—*A new Lizard and a new Frog from Borneo.*

By R. SHELFORD, M.A., F.L.S.

Lygosoma (Keneuxia) Vyneri, sp. n.

Habit lacertiform; the distance between the end of the snout and the fore limb is contained once and a third in the distance between axilla and groin. Snout moderate, obtusely pointed, somewhat depressed. Lower eyelid scaly. Nostril pierced in a single nasal; supranasals present, but not in contact with each other. Fronto-nasal as broad as long, in contact with the rostral but not with the frontal; the latter as long as the fronto-parietals and parietals together, in contact with the first and second supraoculars; five supraoculars, the fifth very small, the second the largest; eight supraciliaries, the first and second largest. Fronto-parietals

and interparietal distinct, the latter rather larger than the former and almost entirely separating the parietals; a pair of nuchals; four labials anterior to the subocular. Ear-opening small. 22 scales round the body; all the scales are smooth; the dorsals are larger than the ventrals. Præanals slightly enlarged. The adpressed limbs overlap. Digits slender, with sharp claws, the basal phalanges cyclotetragonal, the distal strongly compressed; subdigital lamellæ smooth, 20 under the fourth toe. Tail equal in length to head and body. Head greyish olive, some of the scales edged with black; a series of four dorsal scales are black, each scale with a central quadrate olive-grey spot, forming four longitudinal stripes; a dorso-lateral series of scales is olive-grey; sides of neck and body and the limbs covered with brown scales, black-edged; tail greyish olive; ventral surface pale green.

	mm.
Total length.....	132
Head.....	14
Width of head.....	10
Body.....	52
Fore limb.....	19
Hind limb.....	24
Tail.....	66

Hab. Mount Balineau, Muka district, Sarawak.

The type and only known specimen of this species, which has been named in honour of His Highness the Raja Muda of Sarawak, is deposited in the Sarawak Museum. Structurally this skink is very like the other species of the section *Keneuxia*, but it differs from *L. smaragdinum*, Less., by the absence of an enlarged scale on the heel, from *L. olivaceum*, Gray, and *L. vittatum*, Edel., by the smooth dorsal scales.

Rana sariba, sp. n.

Vomerine teeth in two oblique series commencing from the inner posterior angles of the choanæ. Head broad, snout rounded; interorbital space broader than the upper eyelid; tympanum distinct, about one half the size of the eye. Fingers moderate, the first not extending beyond the second, but shorter than it; the tips of the fingers expanded into small disks about two thirds the size of the tympanum; toes half-webbed, their tips expanded into disks which are a little larger than the disks of the fingers; subarticular tubercles well developed; inner metatarsal tubercle prominent, oval; no outer tubercle. The hind limb being carried forwards along the body, the tibio-tarsal articulation just falls short of

the tip of the snout. Skin of the throat and sides of the body with minute tubercles. Reddish brown above, closely marbled with darker brown, tibiae with three dark cross-bars; pale beneath.

From snout to vent 35 mm.

Hab. Mount Saribaw, Samarahan River, Sarawak.

This rather obscure little frog in general appearance resembles small specimens of *Rana Kuhlii*, D. & B., but the distinct tympanum and expanded tips of the digits readily serve to distinguish it from that species. The type and only known specimen (a female) is deposited in the Sarawak Museum.

XXV.—*The Heterogenetic Origin of Fungus-germs and Monads.* By H. CHARLTON BASTIAN, M.A., M.D., F.R.S., F.L.S.

[Plates XIV. & XV.]

SINCE my communication to 'Nature' on this subject, on Nov. 24 of last year, I have been devoting much of my leisure time to further observations on the development and transformations of small Zooglœa masses, with the result that I have abundantly confirmed the truth of my original observations, and have also been able to fill up several gaps in my previous knowledge. I have satisfied myself also that by far the best way for readily investigating these phenomena is to obtain very thin bacterial scums, by using filtered infusions not too strong, and a depth of fluid of rather less than one inch. As all the processes that I have been describing go on in the dark quite as well as in the light, the simplest plan is to filter the infusion, prepared as previously directed *, into small one-ounce earthenware pots, over which the covers are then placed till the time comes for the examination of their contents. If three or four pots are prepared at the same time, they may be opened at will on successive days, or some may be exposed to one temperature and some to another.

It is important to bear in mind two fairly distinct aspects of my observations, corresponding with different stages in the processes described. We have to do (1) with the growth, the individualization, and the processes of segmentation taking place in masses of Zooglœa. We have also to do (2) with

* 'Nature,' Nov. 24, 1904, p. 77.

the question of the ultimate destination, or the transformation, of the products of such segmentation. These are two parts of the subject that are to some extent distinct, and which are well worthy of further separate consideration.

(1) *The Developmental Tendencies in Zooglæa.*—If it be asked, what amount of knowledge do bacteriologists possess on this subject? the answer must be “next to nothing,” if we are to judge from the extreme paucity of information on the subject which is to be found in any of their text-books. Yet if they would only deign to look at what takes place in a filtered hay-infusion, they could very soon satisfy themselves that Zooglæa masses not only grow rapidly, but undergo definite developmental processes, associated with marked molecular changes, as evidenced by their different behaviour at different stages to logwood or other stains, as well as by the results of microscopical examination. And while these molecular changes are taking place the masses may segment into larger or smaller portions and often into minute spherical or ovoid units, showing that an organizing process is taking place.

If we look at the constitution of Zooglæa masses as shown in fig. 1, A and B (Pl. XIV.), it may be seen that we have only to do with bacteria imbedded in a varying proportion of glæal material. But later on, when the mass has grown, and some amount of segmentation has taken place, as in C, it may often be seen that we have still only to do with aggregates of bacteria. At other times, it is true, the molecular changes that have taken place in the mass have so altered its constitution (making the segments very refractive) that the included bacteria are no longer recognizable, as in the paler segments shown in D, which soon become resolved into the dark brown Fungus-germs seen by their side.

But now an important link in the proof of my views may be brought forward. The Zooglæa masses in their early stages are colourless, but a large proportion of them are, as I maintain, ultimately destined to give rise to brown Fungus-germs. The assumption of the brown colour may, however, be taken on by the segments of the Zooglæa while they are still only aggregates of bacteria, as may be seen by fig. 2, A, showing nearly spherical segments of a large Zooglæa mass which were in different shades of brown, and in some of which the constituent bacteria (now themselves coloured) are plainly to be seen. The same thing occurs not unfrequently in Zooglæa masses which have as yet undergone no segmentation, as in fig. 2, D. In B a small Zooglæa aggregate is seen becoming brown, the process being rather more advanced below

than above, while in C a similar mass is to be seen which has almost completely segmented into Fungus-germs. In E we have two other much smaller masses of Zooglœa which have become brown, and which plainly show their constituent bacteria; while in F we have the same process taking place in very minute units of Zooglœa, such as give rise to discrete Fungus-germs—though in other cases very similar minute units of Zooglœa, to which I shall presently refer, are transformed either into Monads or into Amœbæ.

These facts concerning the changes taking place in large or small masses of Zooglœa, even leaving aside the question of their subsequent transformations, are surely facts of considerable importance well worthy of a little attention on the part of bacteriologists.

Although my more complete recent observations as to the assumption of a brown colour by the Zooglœa masses and their segments serve to make the relationship between them and the brown Fungus-germs more obvious than it was previously, yet the actual proof of the development of the one from the other can now be given in a more complete way—also as a result of recent observations.

(2) *The Transformation of Zooglœa Masses into Fungus-germs or Monads.*—The very distinct specimens to which I shall first refer were taken from the scum on a hay-infusion that had been exposed in a small closed pot to a temperature of 70° F. (21° C.) for seven days. Many of the Zooglœa masses had by that time become wholly transformed into brown Fungus-germs, though other masses in all intermediate stages were to be seen. Some were still in an early colourless state, as in fig. 1, A, the mass there represented having been taken from this infusion. A later stage in which the whole mass is being converted into embryo Fungus-germs is shown in fig. 3, A; and a still later stage, in which the nucleated embryo germs are far more distinct, is shown in B. In C the germs may be seen to be larger and becoming brown, while in D (shown under a lower magnification) the entire mass of the Zooglœa has been transformed into aggregates of brown Fungus-germs.

In the pot from which these specimens were taken at the end of the seventh day not a single hypha was to be found, nor were there any of the thick-walled brown cells to which Mr. Masseé refers*. All such bodies were similarly absent for many days after, during which from time to time I

* 'Nature,' Dec. 22, 1904, p. 175.

examined the contents of the pot. It was perfectly plain, indeed, that in the thousands of small Zooglœa masses undergoing this change, one had to do with no process of infection. It was clear that the Zooglœa masses were becoming organized simultaneously throughout their substance, and that all the stages of the development of the Fungus-germs into which they were being transformed could be more or less plainly traced, the changes in this case taking place without any antecedent minute segmentation of the masses. I invited Mr. Massee to come and examine these specimens for himself, but he did not do so, and nevertheless subsequently thought proper to write the letter already referred to, which appeared in 'Nature,' and was answered in a subsequent issue (January 19, 1905, p. 272).

A similar transformation of the Zooglœa masses without antecedent segmentation has been seen in other cases, though in none of them have I been able to make out the actual stages of the transformation anything like so plainly as in the specimens represented in fig. 3. In one of the cases recently seen, in which the specimens were also taken from a closed pot, the Zooglœa masses as a whole had previously assumed a pale brown tint, and rather large Fungus-germs were formed from their substance, such as are shown in fig. 4, A ($\times 700$). But, again, no hypha of any kind was ever seen among the contents taken from this pot.

Where a certain amount of segmentation has occurred in the Zooglœa mass before the brown colour is assumed (as in fig. 2, A, in which the constituent bacteria are still distinct), these brown segments subsequently become resolved into Fungus-germs, as may be seen in fig. 4, B. Such brown Fungus-germs soon assume more definite contours as in A, and they may occasionally, but very rarely, be seen to give rise to hyphæ.

As intimated in my previous communication to 'Nature,' there are various modes in which Fungus-germs originate from the Zooglœa masses. Still these different modes are only comparatively unimportant variations, dependent upon the different states of the Zooglœa masses at the time when the actual transformations take place. The principal variations seem to be these:—

(a) Zooglœa entire and uncoloured; organization throughout, and Fungus-germs when forming becoming brown, as in fig. 3.

(b) Zooglœa entire, but assuming a brown colour before the transformation into Fungus-germs occurs, as in fig. 2, D, and fig. 4, A.

(c) Zooglœa uncoloured, undergoing partial segmentation, and then the origination therefrom of Fungus-germs gradually becoming brown, as in figs. 8 and 9 in 'Nature' for Nov. 24th, 1904.

(d) Zooglœa uncoloured and undergoing partial segmentation; these segments then becoming brown, and subsequently being transformed into groups of brown Fungus-germs, as in figs. 2, A, and 4, B.

(e) A mixture of the last two processes, as shown to some extent in the lower part of fig. 9 ('Nature,' Nov. 24th).

(f) Zooglœa uncoloured and undergoing complete segmentation into colourless units, which gradually assume a brown or brownish-black tint, as in fig. 12 ('Nature,' Nov. 24th).

As I previously said, the conversion of the Zooglœa masses into aggregates of Monads takes place much less frequently than their transformation into Fungus-germs. Still the two processes may often be seen going on side by side in the pellicle. I am, indeed, disposed to think from what I have seen that some of the same kind of Zooglœa masses which in the early days become converted into Monads may, if they chance to remain untransformed for seven or eight days, be then converted into Fungus-germs rather than into Monads. It is difficult to be certain of this, but I am strongly disposed to believe that it is so. It is quite certain, however, that conversion into Monads, when it occurs, takes place almost always somewhere between the third and the fifth days, while after the latter date up to the tenth or twelfth day one finds Zooglœa masses either all brown or producing brown segments which are being converted into Fungus-germs. The Zooglœa masses and all the segments into which they divide invariably remain colourless where Monads or Amœbæ are to be the products.

Since my former communication to 'Nature' I have seen enormous numbers of the Zooglœa masses yielding Monads in the pellicle on an infusion of hay, which was exposed to light in a small beaker. The Monads were met with on the fourth and fifth days, the temperature to which the infusion had been exposed having varied from about 54°-59° F. (12°-15° C.). The Zooglœa masses were in many cases very large and presented some peculiar characters. In their early stages they always appeared as pellucid, somewhat ramified, discontinuous areas, as shown in fig. 5, A (Pl. XV.). Later, portions of the mass begin to segment as in B; later still, actual Monads may be seen beginning to form, as in fig. 6, A; while, finally, there is a more complete conversion into an aggregate of

motionless spherical or ovoidal units, as shown in fig. 6, B, which after a time become active flagellate Monads.

As I have indicated in my 'Studies in Heterogenesis,' pp. 69-73, Monads are much more commonly produced from the pellicle in another way—namely, as pale, discrete, *motionless* corpuscles more or less thickly distributed through its under layers. These are to be seen often in the course of the third or fourth day, when not a single active Monad has hitherto been found. While if the same pellicle be examined twelve or twenty-four hours later, the fluid may be discovered to be swarming with active Monads, all of about the same size, and this size agreeing with that of the previously motionless corpuscles. At other times swarms of minute Amœbæ rather than of Monads suddenly make their appearance where only motionless corpuscles were previously present.

As the corpuscles sometimes develop into Monads and sometimes into Amœbæ, I have been accustomed to speak of them as "indifferent corpuscles." Not unfrequently, however, after their formation they may remain for a much longer time quiescent and without developing in either direction. This was the case in a hay pellicle that I have recently examined, in which such corpuscles were found in enormous numbers and rather larger than usual. They were first seen when a small pot containing same hay-infusion was opened after four days, during which it had been exposed to a temperature of 70° F. (21° C.). The edge of a portion of this pellicle is represented in fig. 7, A, while in B some of the separate corpuscles are shown more highly magnified, so as to reveal the nature of their contents. Nothing like a nucleus is to be seen, nor can one be detected by the use of any of the ordinary stains even when the corpuscles have been allowed to soak in them for many hours. Logwood, carbo-fuchsin, gentian violet, and mastzellen stain have all yielded negative results. Not a trace of a nucleus is to be found, and the corpuscles seem to be mere individualized portions of Zooglœa intermediate in size between the brown units on the way to the production of Fungus-germs, which are shown in fig. 2, E and F, and, like them, containing only a few bacteria in their interior. I have examined such corpuscles over and over again, and always with similar results. If they do not speedily develop, a limiting membrane is produced which enables their contents to resist staining, and causes the corpuscles themselves to shrivel if they are mounted in glycerine and water. When these corpuscles develop quickly, which is the rule, they give rise, as I have said, more or less suddenly to swarms either of Monads or of minute

Amœbæ, and then, when thus developed, a delicate nucleus can generally be recognized even without the aid of stains.

Of course all this is very contrary to generally accepted beliefs; but if others would only investigate this subject with care, as I have done, I have little doubt but that my results would speedily be confirmed. The study of what goes on in the scum on a hay-infusion might, indeed, be strongly recommended to some who are occupied with researches on the origin of species, and the phenomena of variation in vegetal and animal organisms, as likely to yield more fundamental and more striking results than certain statistical and other methods of enquiry which at present find favour.

In conclusion, I would ask, Why do the bacteriologists not tell us what they know about Zooglœa—whether they are or are not aware of its developmental tendencies, and why it should undergo processes of minute segmentation, unless such processes are a result of an organizing tendency destined to have some definite outcome? Why, again, should it or its segments so often tend to assume a brown colour, while it is still nothing but Zooglœa, either segmented or unsegmented? Again, why, if the brown Zooglœa does not yield the brown Fungus-germs, should there be this constant association of myriads of brown Fungus-germs (in the absence of hyphæ) in association with brown masses of Zooglœa? How can they explain, other than I have done, the actual organization of a Zooglœa mass and the stages by which the brown Fungus-germs seem to be formed therein, such as are shown in fig. 3? What process of "infection" in a filtered hay-infusion contained in a closed pot could cause thousands of small Zooglœa masses to go simultaneously through similar processes of this kind—producing myriads of brown Fungus-germs—when not a single hypha is anywhere to be found, and where at first no Fungus-germs are to be met with outside the Zooglœa masses themselves? I trust the bacteriologists will vouchsafe to give us some information on these points, or, if they cannot reasonably explain them, that they may be induced to work at the subject, and satisfy themselves that something important can be learned concerning bacteria, even though it be outside their laboratories and by methods other than their own.

EXPLANATION OF THE PLATES.

PLATE XIV.

- Fig. 1.* A. An ordinary mass of Zooglœa in an early stage.
 B. A more pellucid mass in which the gloeal material is unusually abundant.

Fig. 1. C. Portions of a large Zoogloea mass at a later stage in which the contained bacteria are still distinct, though altered, within the segments.

D. Glistening segments of a Zoogloea mass in which the bacteria are completely obscured, while by their side are other segments which have become resolved into brown Fungus-germs.

A, B, and D, $\times 500$; C, $\times 700$.

Fig. 2. A. Segments of a large Zoogloea mass becoming brown, in some of which the constituent bacteria may be seen.

B. A Zoogloea aggregate in an early stage becoming brown.

C. A similar mass from the same scum segmenting into pale brown Fungus-germs.

D. Zoogloea mass as a whole becoming brown.

E. Two small Zoogloea masses which have become of a darker brown colour.

F. Still smaller Zoogloea units which have become brown, and, like the last, also show the contained bacteria.

All $\times 500$.

Fig. 3. A. Portion of a Zoogloea mass which is beginning to be transformed into an aggregate of embryo Fungus-germs.

B. A later stage of the same change, in which the embryo germs are more distinct.

C. A later stage still, in which the germs are larger and becoming brown.

D. Masses of Zoogloea which have been completely transformed into aggregates of brown Fungus-germs.

A, B, and C, $\times 700$; D, $\times 500$.

Fig. 4. A. Zoogloea masses of a pale brown colour being transformed into very distinct Fungus-germs.

B. A Zoogloea mass converted into brown, roundish segments which are being transformed into Fungus-germs.

A, $\times 700$; B, $\times 500$.

PLATE XV.

Fig. 5. A. A pellucid ramifying mass of Zoogloea.

B. Commencement of segmentation in portions of such a pellucid mass.

Each $\times 500$.

Fig. 6. A. Early stage in the formation of Monads from a similar pellucid mass of Zoogloea.

B. More complete segmentation of such a Zoogloea mass into embryo Monads.

Each $\times 500$.

Fig. 7. A. Portion of a hay pellicle showing discrete motionless corpuscles scattered through it.

B. A few of these discrete corpuscles more highly magnified and showing contained bacteria but no nucleus.

A, $\times 500$; B, $\times 700$.

XXVI.—*Descriptions of new Species of Sphegidae and Cero-
palidae from the Khasia Hills, Assam.* By P. CAMERON.

Sphegidae.

Crabro himalayensis, sp. n.

Length 10 mm. ♀.

Belongs to Bingham's (Fauna of Brit. India, Hymen. i. p. 322) division "B. Abdomen non-petiolate" and to a new section "Enclosed space at base of median segment punctured."

Black; the antennal scape beneath, two broad lines on the top of the pronotum, and marks on the sides of the abdominal segments, yellow; wings almost hyaline, the stigma fuscous, the nervures darker in colour. Vertex sparsely, the front more strongly and closely punctured and thickly covered with longish black hair; the lower part of the front, face, and clypeus covered with silvery pile. Mesonotum closely, the scutellum more sparsely punctured, its base in the centre smooth. Metanotal area distinctly punctured, the sides with a few indistinct striae, the middle with a broad and deep longitudinal furrow, which has a few transverse striae; the apical slope has, on the top, some minute scattered punctures, its apex and sides finely and closely transversely striated; the middle furrow is deep; the furrow bounding the enclosed space striated. Upper part of propleure indistinctly striated, the lower with two distinct divisions of curved striae. Mesopleural furrow deep, crenulated, the part at its base striated. Basal half of metapleure closely, minutely, obliquely striated. Mesosternum covered with longish, soft, white hair.

Crabro monozonus, sp. n.

Black; a broad yellow line on the pronotum, one on the apex of the second abdominal segment, the apex of the anterior femora broadly, the fore tarsi and the anterior tibiae in front, yellow. Wings smoky fuscous, the nervures and stigma black. ♀.

Length 9 mm.

Metanotal area obliquely striated, but not strongly, and with a narrow furrow down the centre. Front and vertex opaque, closely and distinctly punctured and covered with long blackish hair; there is no furrow below the ocelli. Face and clypeus thickly covered with silvery pubescence;

the latter not keeled in the middle, its apex broadly rounded. Mesonotum and scutellum closely punctured, the former with a narrow keel down the middle. Pleuræ smooth, thickly covered with short white hair; the furrows crenulated. Fore tarsi covered with broad leaf-like spines. Pygidium not depressed, keeled, or punctured. Abdomen sessile.

CERCERIS.

a. *Metanotal area punctured.*

Cerceris bimaculata, sp. n.

Black; a large semicircular mark on the cheeks touching the eyes, a triangular mark below the antennal keel, the clypeus (except for a broad black line on the apex), a broad band on the pronotum, the sides of the scutellum broadly, the base of the second abdominal segment, almost the apical half of the third, and a narrow interrupted line on the fourth and fifth segments, rufous. Wings smoky fuscous, lighter behind, the stigma fulvous. ♀.

Length 10 mm.

Front and vertex closely and strongly, the cheeks closely and less strongly, and clypeus more sparsely punctured. Apex of clypeus slightly waved, the outer of the three projections the larger. Antennal keel stout, black. Mesonotum closely, rugosely punctured. Metanotum with area closely punctured, the apex with two shining foveæ. Mesopleuræ reticulated, the pro- and metapleuræ aciculated. Pygidium irregularly rugosely punctured; the sixth ventral segment has on the sides, at the apex, a patch of fulvous pubescence; the hypopygium entire.

May be known from *C. himalayensis* and *canaliculata* by the scutellum being broadly rufous at the sides. The four anterior tibiæ and the anterior tarsi in front are testaceous.

Cerceris canaliculata, sp. n.

Black; the face, lower inner orbits widely, clypeus (except at the apex), a band on the pronotum, the base of the second abdominal segment, the apical half of the third, and a narrow line on the sides of the fourth segment, rufous. Wings fuscous, if anything darker in front, and with a slight violaceous tint. Legs black, the four anterior tibiæ testaceous in front. ♂.

Length 10 mm.

Metanotal area closely and distinctly punctured; the sides obliquely striated; on the apex of the segment are three furrows, the central being the larger; the hair on it is long and fuscous. Lower orbits and sides of clypeus covered with pale golden pubescence. Front and vertex closely and somewhat strongly punctured and covered with long fuscous hair; the face and clypeus less strongly punctured. Mesonotum and scutellums closely and strongly punctured. Propleuræ aciculated, the middle of the mesopleuræ reticulated, the perpendicular striæ more distinct than the longitudinal; the metapleuræ aciculated. Pygidium only slightly narrowed at the extreme apex, being of almost equal width throughout; it is irregularly rugosely punctured, except at the apex.

Belongs to Bingham's section B: *C. himalayensis* differs from it in the apex of the clypeus broadly projecting and transverse, whereas in the present species it is broadly rounded; this species wants the yellow marks behind the eyes and the central furrow on the apex of the median segment is clearly defined.

Cerceris himalayensis, sp. n.

Black; the face, inner orbits widely, the antennal keel, clypeus (except at the apex), and a small spot behind the eyes near the top, rufous; a broad line on the pronotum, scutellums, a broad band on the base of the second abdominal segment, a narrower one on the apex of the third, a narrow one on the apex of the fourth, and a narrow interrupted line on the apex of the fifth, yellow. The four anterior tibiæ yellowish in front. Wings hyaline, the basal half of the anterior and the radial and cubital cellules smoky; stigma fulvous, nervures black. ♀.

Length 10 mm.

Front and vertex strongly and closely punctured, the front more coarsely than the vertex; the clypeus sparsely, the cheeks closely and coarsely punctured. Apex of clypeus with a slight broad incision. Mesonotum closely, the scutellum, if anything, more strongly punctured; the metanotal area closely rugosely punctured. Pro- and metapleuræ coarsely aciculated; the mesopleuræ coarsely punctured, above the middle, on the basal half, is a wide longitudinal furrow. Median segment above thickly covered with long fuscous hair. Pygidium closely rugosely punctured; the apex of the hypopygium almost transverse.

Cerceris intimella, sp. n.

Black; the clypeus (except at the apex), the inner orbits broadly to the top of the antennal keel, the keel, a spot behind the top of the eyes, a line on the pronotum, the scutellums, the apex of the first abdominal segment, the base of the second more broadly, the apex of the third, and a narrow more or less interrupted line on the fourth and fifth, yellow. Wings hyaline, broadly fulvous smoky in front, the costa and stigma fulvous, the nervures fuscous. Four anterior tibiæ testaceous in front. ♀.

Length almost 15 mm.

Front and vertex closely distinctly punctured, more closely and finely behind the ocelli; clypeus sparsely punctured, the apical incision large, semicircular; the pubescence on the lower part of the inner orbits dense and silvery, on the rest long, fuscous. Pronotum closely and minutely, the mesonotum and scutellum closely distinctly, the postscutellum closely minutely, punctured; the scutellum with a slight depression in the middle. Metanotal area closely strongly punctured like the rest of the segment; the pubescence on it is black. Pro- and metapleuræ alutaceous, the former with a few obscure striæ, the latter irregularly striated at the base; the mesopleuræ strongly punctured. Pygidium closely irregularly reticulated, becoming slightly narrowed from the middle to the apex.

Comes into Bingham's section B. b.

b. *Metanotal area striated.*

Cerceris rufoplagiata, sp. n.

Black; the scape and pedicel of the antennæ, the inner eye-orbits from opposite the base of the antennæ, the antennal keel, a mark on the top of the clypeus, and its outer edge below, yellow; the upper part of the prothorax, the apex of the mesonotum in the middle and at the sides, the scutellums, a mark on the propleuræ, one behind the tubercles, the tubercles, the first abdominal segment above, with a black mark in the middle behind, the base of the second broadly, its apex narrowly, the apical two thirds of the third, and the apices of the following three segments narrowly, rufous. Wings smoky hyaline, darker in front, the stigma fulvous. Legs black, the anterior femora and tibiæ red. ♀.

Length 7 mm.

Front and vertex strongly, closely, and uniformly, the face less closely punctured, almost smooth in the middle.

Clypeus broadly rounded in the middle at the apex and densely covered with silvery pubescence. Mesonotum and scutellum rather strongly punctured. Metanotal area obliquely striated, the rest strongly and rather irregularly punctured. Propleuræ strongly obliquely striated; the mesopleuræ (except at the base) strongly and uniformly punctured. The base of the metapleuræ smooth, irregularly and finely striated above and below, the apex rugose. Pygidium rather strongly, but not very closely punctured.

The obliquely striated metanotal area brings this species into Bingham's section *C. b* near to *C. Elizabethæ*.

Cerceris aureobarba, sp. n.

Black; the clypeus (except at the apex), a mark above it, produced on the top into a narrow point, a large semicircular mark on the face touching the eyes, the third abdominal segment (except at the base), and the apices of the fourth, fifth, and sixth narrowly, yellow. Legs black, the four anterior tibiæ (except for a black line behind) and the basal joint of the tarsi yellow. Wings hyaline, smoky in front. ♂.

Length 9 mm.

Belongs to Bingham's section *C. b*.

Front and vertex strongly and deeply punctured, the punctures running into reticulations and on the front into striæ; the cheeks and clypeus covered with silky pubescence, the sides of the clypeus fringed with long golden hair. The sides of the pronotum, tegulæ, and postscutellum rufous. Pro- and mesonotum rugosely punctured, the centre of the former irregularly striated behind. Metanotum stoutly obliquely striated; the rest of it is more strongly punctured than the mesonotum. Top of propleuræ smooth, with three foveæ, the middle has three stout curved striæ, the lower part irregularly rugose. Mesopleuræ rugosely punctured (except behind, where it is finely striated above, aciculated below). Metapleuræ rugosely punctured, the base stoutly obliquely striated. Base of pygidium stoutly punctured, minutely punctured between; the hypopygium is roundly, but not deeply, incised at the apex.

c. Metanotal area smooth.

Cerceris lepcha, sp. n.

Black; the antennal scape below, a large mark on the face, triangular above, the inner orbits, the clypeus (the

yellow reaching to the eyes), the greater part of the antennal keel, the base of the mandibles, a line on the pronotum, the greater part of the scutellum, postscutellum, a line on the sides of the apex of metanotum (rounded above, transverse below), yellow. The base of the second abdominal segment all round pallid yellow, the apical two thirds of the second, the apex of the fifth, and the apical segments entirely, rufous yellow. Legs black, the anterior tibiæ testaceous; all the knees, trochanters, and the extreme base of the tibiæ yellow. Wings hyaline, the radial and the apical cubital cellules smoky, the stigma and nervures black. ♂.

Length 8 mm.

Basal joints of antennal flagellum brownish beneath, as are also the apical more obscurely. Front and vertex strongly but not very closely punctured; thickly covered with white hair, as are also the face and clypeus. Mesonotum shining, sparsely punctured, thickly covered with short white hair. Scutellum furrowed down the centre. Median segment sparsely punctured; the central furrow shallow and ending at the apex in two distinct foveæ; the basal area smooth and shining. Lower side of propleuræ with some curved striæ; the mesopleuræ strongly punctured; the apex of the metapleuræ sparsely punctured and thickly covered with white hair. Pygidium strongly, but not closely, punctured.

Tachysphex bituberculata, sp. n.

Length 11 mm. ♀.

Black; the head and thorax densely punctured, the upper part of the front covered with a short pile, the lower, laterally, thickly with silvery pubescence, the middle furrowed; above the antennæ are two shining, smooth, oblique tubercles. Face and clypeus closely punctured, thickly covered with silvery pubescence; the apex of clypeus obliquely depressed, smooth and shining before the middle; the apex projects broadly in the middle. Base of mandibles thickly covered with silvery pubescence. Mesonotum thickly covered with short white pubescence. Scutellum more shining, and, if anything, more widely punctured than the mesonotum. Base of metanotum closely reticulated all over; the oblique apex rugose and furrowed narrowly in the middle. Propleuræ above closely rugosely punctured, below shining, aciculated, and sparsely punctured. Mesopleuræ closely distinctly punctured; behind the base is a wide, not very deep furrow obscurely striated; immediately below the

tegulae is a deep depression, with an oblique slope at the base. The upper part of metapleuræ with some sharp, irregular, distinct, clearly separated keels; the rest closely covered with striae, which become stronger towards the apex. Legs pruinose, the anterior calcaria and spines pale. Wings hyaline, the apex with a narrow fuscous band; the nervures behind the stigma pale yellow; the first recurrent nervure is received shortly behind, the second in the middle of the cellule. Abdomen with brown pruinose bands; pygidium bare, aciculated, its apex more shining and distinctly punctured laterally; the sides sharply keeled; base of hypopygium smooth, the rest punctured.

Notogonia fuscinerva, sp. n.

Length 13 mm. ♀.

Agrees in coloration with *N. subtessellata*; may be known from it by the first transverse cubital nervure not having a gradual curve from the top to the bottom, but is distinctly elbowed; the second recurrent nervure is not so oblique, its bottom being opposite to its top, this being not the case with *N. subtessellata*, and the apices of the metasternal lobe are broader and more rounded.

Black; densely covered with a silvery pile, the pile on the mesonotum darker, more golden in tint. Wings hyaline, iridescent, the apex steel-blue, the nervures fuscous; the first transverse cubital nervure is distinctly elbowed in the middle, the two parts having an oblique straight slope; the second cubital cellule has the length of the third; the two recurrent nervures are received before the middle; the apex of the radius has an oblique slope. Legs thickly pruinose; the hind femora red, except at the extreme apex; tarsal spines rufous.

Head aciculated, the three depressions on the front deep; the central furrowed down the middle. Apex of clypeus smooth, glabrous, and with a small incision in the middle. Base of mandibles covered with depressed silvery pubescence, the middle rufous; palpi black, thickly covered with white hair. Median segment closely transversely striated; the furrow on apex deep and with oblique sides. Metasternal process broad, its sides raised, the apex incised, the lateral lobes broadly rounded. Abdominal segments broadly banded with silvery pile; the pygidium thickly covered with silvery, inclining to golden, pubescence; the hypopygium punctured, strongly at the apex.

Notogonia aciculata, sp. n.

Black ; covered with a silvery pile ; mandibles dark picuous towards the apex ; palpi dark testaceous and thickly covered with white pubescence. The wings from the transverse basal nervure distinctly fuscous-violaceous, behind it hyaline. Abdominal segments banded with silvery pubescence ; the pygidium closely punctured and thickly covered with pale pubescence ; the basal ventral segment strongly obliquely striated. ♀.

Length 9 mm.

Front and vertex alutaceous ; ocellus longer than broad, rounded, and having a longish narrow pedicle in front ; frontal furrow deep and obliquely widened above ; the depression on vertex shallow, indistinct. Pro- and mesonotum coarsely aciculated, the base of metanotum closely transversely striated ; a narrow keel down the middle ; on the sides of the apical slope are oblique, clearly separated striæ ; in the centre of the apex is a Ω -shaped area indistinctly keeled in the middle. Propleuræ aciculated. Mesopleuræ distinctly and closely punctured ; the metapleuræ strongly obliquely striated on the basal half, the apical aciculated strongly and obscurely striated. Apical lobes of sternal process rounded ; the middle furrow is narrow. Second cubital cellule not much more than half the length of the third ; the first transverse cubital nervure curved, the second recurrent is received distinctly behind the middle of the cellule, the two are separated by about the length of the front of second cubital cellule.

Notogonia khasiana, sp. n.

Length 10 mm. ♀.

Agrees with *N. aciculata*, but is stouter, the wings not so distinctly hyaline at the base, the second cubital cellule longer compared with the third, the apical slope of the median segment is not so distinctly striated, the metapleuræ are only indistinctly striated at the base and apex, and the upper half of the first transverse cubital nervure has a straighter more oblique slope.

Ocellus longer than broad, triangularly produced in front ; the lower part of the front, face, and clypeus thickly covered with silvery pubescence. Mandibles obscure brownish in the middle. Palpi black, thickly covered with white pubescence. Mesonotum closely minutely punctured. Median segment with the basal two thirds finely transversely striated and furrowed down the centre ; the sides of apex obscurely

irregularly striated; on the sides of apex are four oblique keels. Pleuræ aciculated; the base and apex of the metapleuræ with a few oblique keels. Sternum thickly covered with silvery pubescence; the process bluntly triangular on the sides at the apex; the central part has the basal half distinctly dilated. Wings fuscous-violaceous; the second cubital cellule is, if anything, shorter than the first; the first transverse cubital nervure is obliquely bent from shortly below the middle; the second recurrent nervure received shortly beyond the middle of the cellule; the two nervures are separated by the length of the top of the second cubital cellule. Legs and abdomen pruinose; the pubescence on the pygidium bright fulvous; the leg-spines blackish.

Notogonia vivax, sp. n.

Black; the body and legs covered with silvery pubescence, the leg-spines black; wings hyaline, with a slight but distinct yellowish tint, the apex smoky; the costa, stigma, and nervures testaceous, the apical nervures darker; the second cubital cellule in front half the length of the third; the recurrent nervures received behind the middle and separated by slightly less than the length of the second cubital cellule in front. Pile on pygidium silvery, with a slight golden tint; the hypopygium closely and distinctly punctured. ♀.

Length 12 mm.

Front and vertex alutaceous; the ocellus rounded behind, in front produced into a process as long as itself, the furrow below it deep. Mesonotum alutaceous, the pile with a yellowish tint; propleuræ stoutly irregularly striated in the middle. Median segment alutaceous, the apical slope transversely striated, the striae on the lower part finer than on the upper. Metapleuræ finely and closely obliquely striated.

This species has the yellowish-hyaline tinted wings of *N. tristis* and *N. jaculatrix*: the former may readily be known by the reticulated median segment; the latter is a larger and stouter insect, has the second cubital cellule on the top longer compared with the third, the tibial spines are shorter and rufous, not black, the pubescence on the front longer and denser, and the ocellus has only a short projection in front.

Notogonia tegularis, sp. n.

Black; the cheeks, face, and clypeus thickly covered with silvery pile; the front and vertex with fuscous hair; thorax

thickly covered with whitish pubescence, the pleuræ with a silvery pile. Legs densely covered with silvery pile; the tibial and tarsal spines, claws, and base of spurs rufous. Wings fuscous-violaceous, the nervures fuscous; the second and third cubital cellules equal in length in front; the second recurrent nervure received in the middle. Abdomen closely punctured and covered with pale pubescence; the apices of the second and third segments smooth, depressed; the penultimate segment and the pygidium thickly covered with fuscous pubescence, as is also the ventral surface. Tegulæ pale testaceous. ♀.

Length 13 mm.

Front strongly punctured above, distinctly furrowed down the middle, the lower part smooth and shining, widely furrowed, the furrow divided in two by a raised point; the lower part of vertex sparsely punctured, the upper smooth; the lateral depressions on front wide, the upper transverse one the deepest. Clypeus closely punctured (except at apex), its base thickly covered with fuscous pubescence. Mesonotum and scutellum closely punctured. Metanotum closely transversely striated, the striæ more widely separated at the base, where there is a small somewhat triangular keel. Metasternal process closely punctured, its base depressed; the two apical lobes rounded.

Notogonia testaceicornis, sp. n.

Black; the antennal scape rufous below, the flagellum rufo-testaceous, darker at the base; wings fusco hyaline, the nervures testaceous, the second cubital cellule in front half the length of the third. Legs thickly covered with white pubescence; the tarsal spines and claws rufous. ♂.

Length 14 mm.

Comes near to *N. tegularis*; may be known from it by the second cubital cellule not being as long as the third.

Face, cheeks, and clypeus thickly covered with silvery, the vertex with fuscous, pubescence. Vertex almost impunctate; the ocellar region faintly behind, strongly and closely in front, punctured, broadly depressed, furrowed before the ocelli. Front smooth and shining above, the furrow smooth and shining, the upper part the larger. Clypeus (except at apex) closely punctured, the apex rounded. Mandibles rufous before the middle, the base punctured, thickly covered with white hair. Palpi dark testaceous. Mesonotum closely punctured, thickly covered with fuscous pubescence; the scutellum more shining, less closely punc-

tured; postscutellum much more finely and closely punctured. Median segment closely and finely transversely striated and thickly covered with white pubescence. Metapleuræ (except at the base) finely punctured. Metasternal process raised in the middle behind and keeled in the centre of the raised part; the apical lobes rounded. Abdomen finely punctured, the apices of the basal four segments depressed; the middle and apical segments thickly covered with silvery pubescence; pygidium thickly covered with silvery pile; the penultimate segment bears long fulvous hair. Ventral surface thickly covered with silvery pubescence; the apical also with fuscous hair.

Notogonia strenua, sp. n.

Black, covered with silvery pubescence; pro- and mesothorax closely and distinctly aciculated, the clypeus smooth; front and vertex alutaceous, almost punctured; the lower furrow wide and deep. Basal part of median segment closely, distinctly, transversely striated, almost reticulated; the apex finely, but not very closely, transversely striated; the furrow deep, narrowed in the middle. Metapleuræ finely, uniformly, and closely obliquely striated. Sternal process depressed in the middle at the base, the apical incision long, not quite reaching backwards to the middle, the apical lobes rounded. Abdominal segments banded with silvery pubescence; the pubescence on pygidium white. Legs densely pruinose; the spines black. Wings fuscous-violaceous, the stigma and nervures black; the second cubital cellule in front about two thirds of the length of the third; the first transverse cubital nervure roundly curved and clearly bullated below the middle; the recurrent nervures are received shortly behind the middle and separated by about half the length of the second cubital cellule; the apical abscissa of radius is long, straight, and oblique. ♀.

Length 12 mm.

Ocellus longer than broad, its apex sharply pointed. Clypeus smooth and shining. Mandibles picuous before the apex.

Notogonia sulcifrons, sp. n.

Black, densely covered with silvery pubescence. Mandibles ferruginous, the base black, covered with white hair; palpi fuscous black, covered with white pubescence. Legs thickly covered with silvery pubescence, that on the femora

long; the tarsal spines and calcaria rufous. Wings uniformly fuscous-violaceous, the nervures black. Abdomen thickly pruinose; the basal three segments broadly depressed at the apex, the apical two thickly covered with fulvous pubescence, the ventral surface thickly with pubescence, which is pale on the basal, darker on the apical, segments. ♀.

Length 13 mm.

Front and ocellar region distinctly punctured; there is a broad deep furrow below the ocellus. Face and clypeus thickly covered with silvery pubescence; the apex of clypeus rounded, smooth, bare, and shining. The white hair on the thorax is thicker and longer on the pleuræ, and, to a less extent, on the apex of metanotum. Mesonotum and scutellum punctured all over, but not closely or strongly; the postscutellum is more weakly punctured. Metanotum finely, closely, transversely striated. The lower part of the pro- and mesopleuræ striated at the apex. Sternal process has a broad keel down the middle, the apical lobes rounded. Second cubital cellule in front one third of the length of the third; the first recurrent nervure is received the length of the top of the second cubital cellule from the base, the second shortly behind the middle of the cellule.

[To be continued.]

BIBLIOGRAPHICAL NOTICES.

Trouessart's 'Catalogue of Mammals.'

Catalogus Mammalium, tam Viventium quam Fossilium. By E. L. TROUËSSART. *Quinquennale Supplementum: Pt. 2. Rodentia.* Berlin, 1904. Pp. 289-546. Price 12s.

SINCE the general remarks which appeared in our notice of the first part of the reissue of this valuable Catalogue apply also to the one before us, our comments on the latter may be relatively brief. It is highly satisfactory to find that Dr. Trouessart is making such good progress with his arduous task, this fasciculus bringing the work down to the end of the Rodents. Of course there are faults in this part, as in its predecessor, for no human being could possibly carry out such a piece of work without making some errors; but such mistakes as have come under our notice are trivial, and in no wise detract from the value of the Catalogue or from the credit due to the indefatigable author for carrying out his task so thoroughly. The value of this Catalogue to practical workers is simply inexpressible.

Comparing the present classification of the Rodentia with that adopted a dozen years ago, the most notable changes (apart from those in the nomenclature and the number of generic and subgeneric

divisions of some of the existing groups) are to be found among the extinct forms. We notice, for example, the inclusion in the order of a number of Eocene genera, such as *Plesiadapis*, *Indrodon*, and *Microsypops*, which were originally regarded as lemuroids or insectivores, but are now considered by American palaeontologists to represent a primitive group of rodents—the Protoglires. Whether this identification is well founded remains to be seen. Another important and apparently well-justified change is the transference of the Oligocene and Miocene *Trechomys*, *Theridomys*, and their allies from the neighbourhood of the Octodontidae to a position in the Sciuromorpha between the Anomaluridae and the Sciuridae. The extinct Maltese *Leithia*, together with *Pseudosciurus* and *Sciuroides*, is now definitely placed in the Anomaluridae, although the right of the latter to retain its position in the Sciuromorpha is only provisionally admitted.

In accordance with advanced modern views, we find the old genus *Sciurus* split up into a number of separate generic groups; and we note many other changes in nomenclature, such as the substitution of Jaculidae for Dipodidae, thus showing that the author is keeping his work well abreast of the latest innovations. Why, however, Myoxidae is retained in place of Gliridae is not easy to understand; and the substitution of the name Agoutidae for Dasyproctidae, on account of the replacement of the generic term *Celogenys* by *Agouti*, seems altogether uncalled for, seeing that *Dasyprocta* still remains as the generic title for the agutis. The number of new specific names proposed in this fasciculus appears to be very small.

R. L.

Museum Handbooks.

The Manchester Museum, Owens College. 1904.

UNDER the direction of Dr. W. E. Hoyle, the Director, papers relating to the Manchester Museum and its contents are from time to time issued to the public. For the most part these are gathered from various serial journals, consequently their re-issue in the present form will be welcomed.

Three of these are now before us, of which two deal with matters palaeontological and one with recent Cephalopods.

Mr. H. Bolton's 'Palaeontology of the Lancashire Coal-Measures' provides a useful summary of this subject, especially helpful to those working in the museum, where the specimens described are deposited.

Prof. W. Boyd Dawkins has prepared the second of these palaeontological pamphlets, 'On the Discovery of *Elephas antiquus* at Blackpool.' He takes for his text the finding of a tooth of this species, which he, with the aid of his wife and son, dug up by the aid of umbrellas! Having described the tooth he passes on to discuss the question, "How did the tooth come to be embedded in the Lower Boulder-Clay?" In answering this question the author gives some interesting and valuable information on the deposition of the boulder-clay and of other fossil Mammalia found in association with this Elephant.

Dr. Hoyle's 'Diagnostic Key to the Genera of Recent Dibranchiate Cephalopoda' is necessarily extremely technical, but it will, without question, prove invaluable to those desiring to identify adults of this group.

We venture to think the prices charged for the papers by Dr. Hoyle (one shilling and sixpence) and Mr. Bolton (one shilling) a little high, at least when compared with the wonderful shillingsworth provided by the authorities of the Natural History Museum at S. Kensington. But probably the authorities of the Manchester Museum cannot afford to publish these handbooks at a loss, or at least with but an infinitesimal profit!

MISCELLANEOUS.

On a Marine Pseudoscorpion from the Isle of Man. By A. D. IMMS, B.Sc. (Lond.), Zoological Laboratory, University of Birmingham.

ABOUT the shores of Port Erin Bay, during August 1904*, I came across a species of pseudoscorpion which frequented the rocks about halfway between the limits of high and low tides. The fact of this being so unusual a habitat for an animal belonging to this order led me to make a careful search for it, but it resulted, however, in my obtaining only five individuals. They were found to agree in all respects with *Obisium maritimum*, Leach, and I am indebted to the Rev. O. Pickard-Cambridge, F.R.S., for confirming my identification of that species.

Four of the specimens were found deep in the crannies and fissures with which the slaty rocks of the locality abound, while the fifth example was met with in the act of crawling over the rocks and weed. The first specimen was obtained while searching for the eggs of the marine Collembolan *Anurida maritima*. To discover the latter it is necessary to be provided with a stout hammer and chisel in order to split open the fissures in the depths of which they are deposited. In the recesses of these fissures there are to be found, in addition to the pseudoscorpion, adults of *Anurida maritima*, larvæ, pupæ, and imagines of the Coleopteron *Micralymma brevipenne*, and numerous individuals belonging to a species of an *Acarus*, which I have not yet been able to determine. It is probable that the *Obisium* preys upon the Collembola and most likely upon the *Acarus* also. When alarmed or irritated, it was observed to run about actively in both a forward and backward direction with outstretched pedipalps, but it was not seen to run sideways, as is known to be the case with some pseudoscorpions.

The nature of the habitat of *Obisium* and of the other Arthropods associated with it is such that they have to endure submersion twice every twenty-four hours. Unlike *Anurida* (or, according to Laboulbène, *Micralymma*), *Obisium* has no efficient hairy covering

* While occupying the table rented by Birmingham University at the Biological Station, Port Erin.

which serves to retain a coat of air for use during respiration under water, and it therefore probably has to rely upon the store of air contained within its tracheal system. Plateau* has pointed out that 46 genera and 80 species of tracheate Arthropods are known to inhabit the sea-shore and to be subjected to submersion by the water. In the greater number of these, he remarks, the power of living under such conditions is not due to their possessing any special mechanisms to enable them to do so, but to the general property those animals have of being able to resist asphyxiation for a prolonged period.

When in the living condition, *Obisium maritimum* is easily recognized by the olive-greenish colour of the body contrasted with the bright red-brown of the pedipalps. The species was described by Leach † as follows:—

“*C. pedibus secundis articulo 2 cylindraceo, 3 ovato; basi attenuato 4 ovato; digitis brevibus subcurvatis.*

“Long. corp. 2–2½ lin.

“Habitat in Anglia occidentali inter rupes ad littora maris. Communicavit Dom. C. Prideaux.

“Color livido-fuscus, pedibus 4 anticis pallide ferrugineis; 8 posticis pallidis.

“Thorax antice nonnunquam ferrugineus.”

It has been redescribed and excellently figured by Pickard-Cambridge ‡; his description is given below:—

“Length slightly over one line.

“*Cephalothorax* and *abdomen* dark brown tinged with olive, and very glossy; *palpi* and *falces* red-brown; legs pale yellow-brownish tinged with olive. *Cephalothorax* slightly longer than broad, sides parallel, truncated in front in an oblique line on either side from the centre, where there is a slight but distinct shallow depression. *Eyes* rather large, very nearly of equal size; those of each pair are separated from the fore-margin and from each other by a diameter's interval. The hairs with which this species is furnished are long, fine, and simple. The *palpi* are long and strong; the bulb of the pincers is of a cylindrical-oval form; the claws are strong and no more than (if even quite as much as) equal to the bulb in length and very slightly curved.”

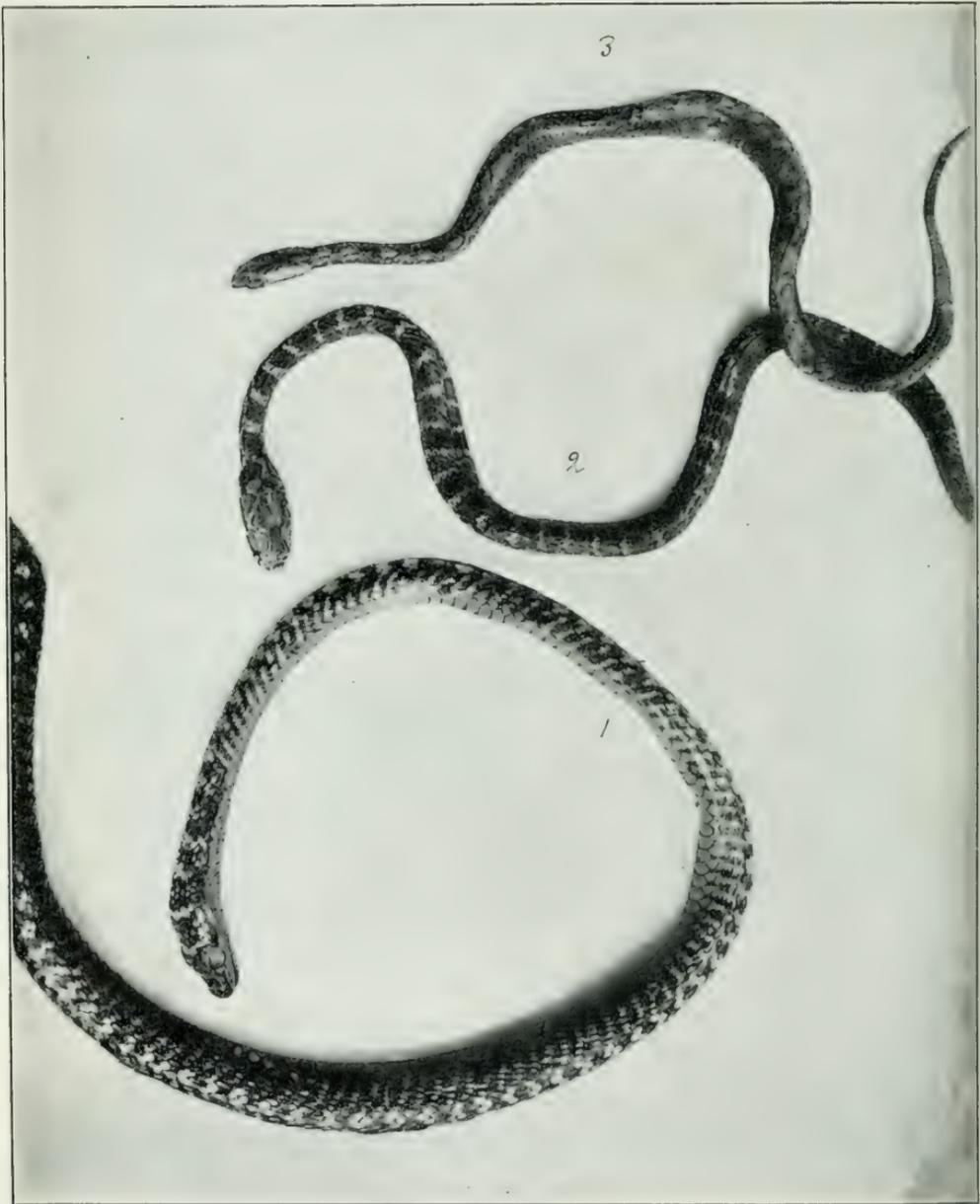
Pickard-Cambridge remarks that he has received specimens from the Devonshire coast, where it was found under stones below high-water mark; and from Jersey, where it occurs in a similar situation. He further adds that it does not appear to be known on the Continent of Europe.

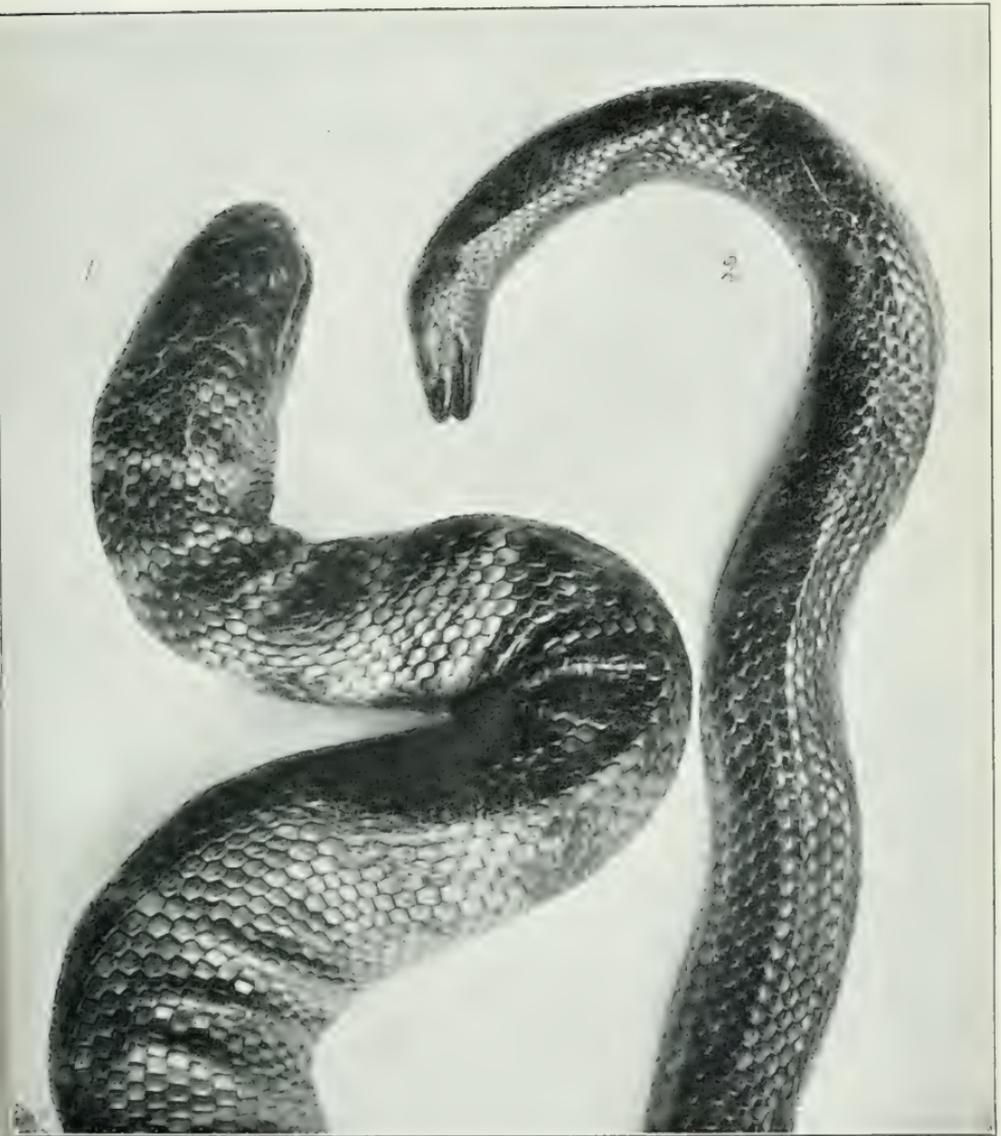
The present communication constitutes but the second recorded instance of the occurrence of this species in the British Isles since the time of Leach.

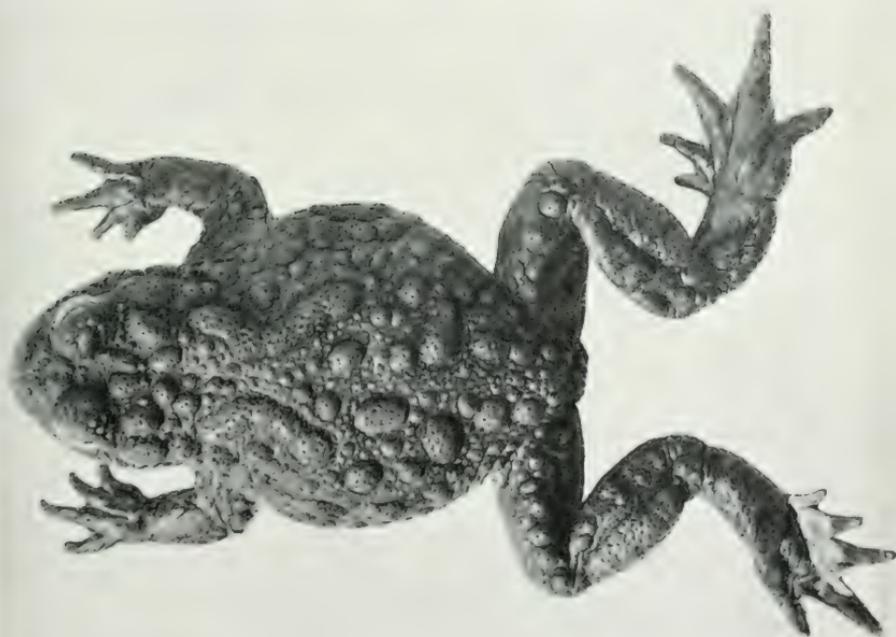
* Journ. de l'Anat. et Phys. xxvi. 1890, pp. 236–269.

† Zool. Miscell. iii. 1817, p. 52, pl. 141. fig. 1.

‡ Proc. Dorset Nat. Hist. & Antiq. Field Club, xiii. 1892, pp. 215–216, pl. B. fig. 8.







BOMBINATOR MAXIMUS.

FIG. 1.

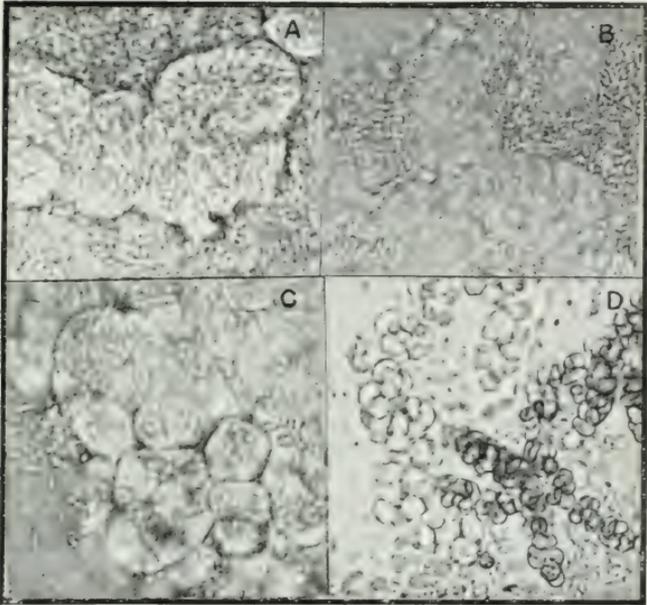


FIG. 2.

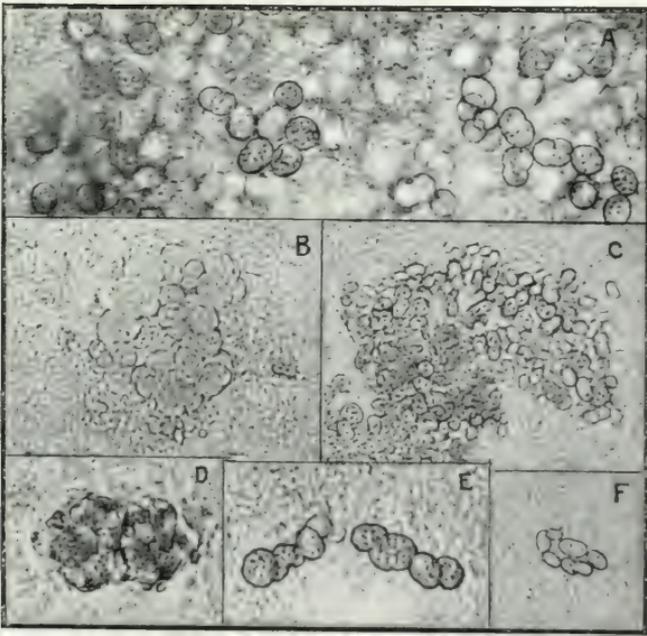


FIG. 3.

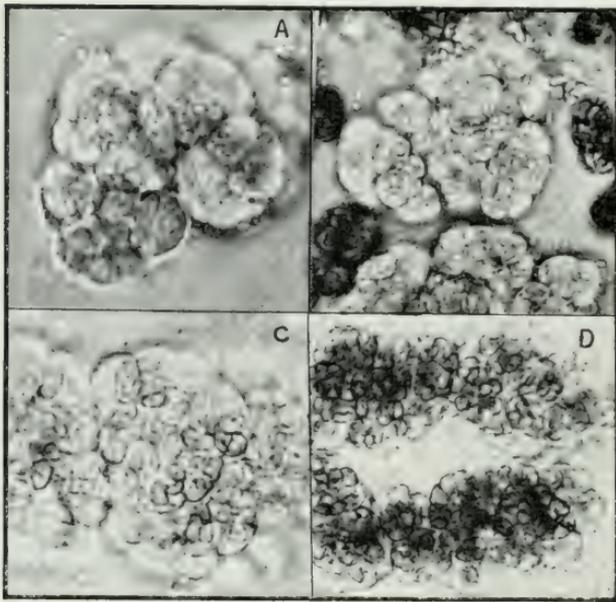


FIG. 4.

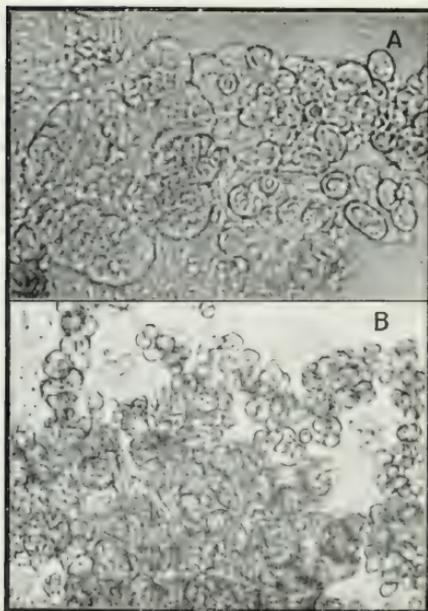


FIG. 5.

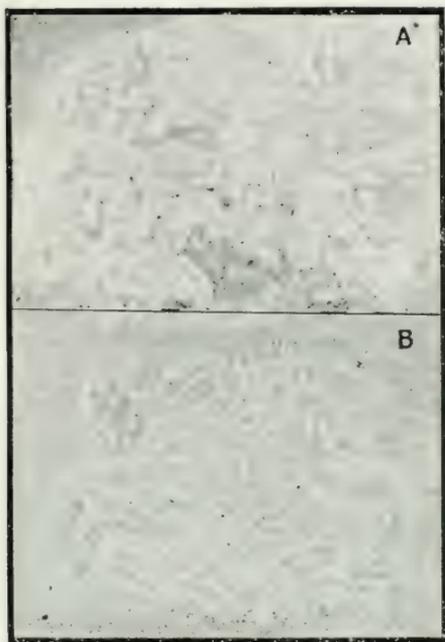


FIG. 6.

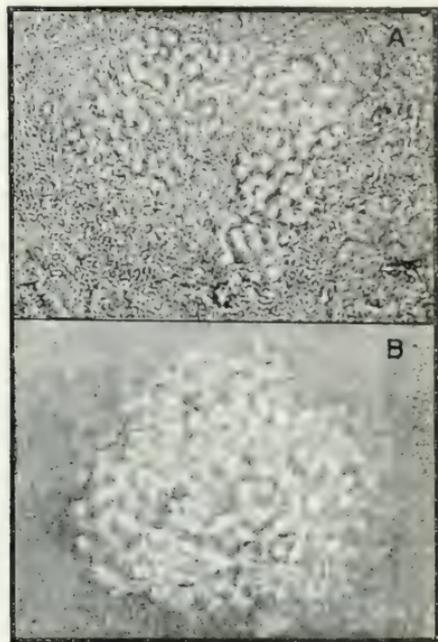
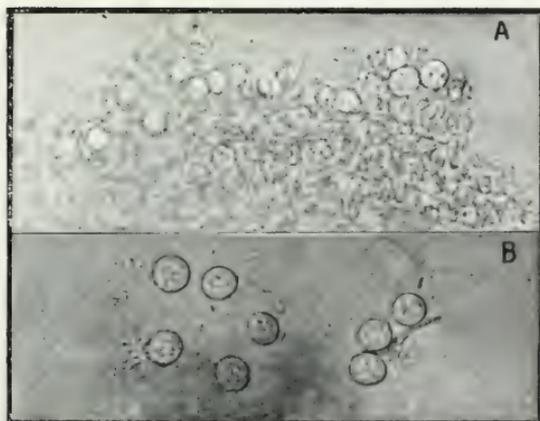


FIG. 7.



THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 87. MARCH 1905.

XXVII.—*Natural History Notes from the R.I.M.S. 'Investigator,' Capt. T. H. Heming, R.N. (retired), commanding.*—Series III., No. 6. *An Account of the new and some of the rarer Decapod Crustacea obtained during the Surveying Seasons 1901–1904.* By A. C. MACGILCHRIST, M.A., M.B., Ch.B., Capt. I.M.S., Surgeon-Naturalist to the Survey.

DURING the season 1901–1902 the R.I.M.S. 'Investigator' was engaged in surveying parts of the Persian Gulf. Here most of the trawling and dredging operations were in comparatively shallow water, and a goodly collection of Brachyura was obtained. During the following two seasons the Tenasserim and Arakan coasts were being surveyed, and the collections were obtained mostly by deep-sea trawling *en route* between Bombay and the survey-ground on the outward and homeward journeys.

Besides a short account of some of the rarer species and varieties obtained, three new species of Macrura, two new species of Anomura, together with one new genus and five new species of Brachyura are here described.

MACRURA.

Fam. Peneidæ.

PENEUS, Fabr.

Peneus fissurus, Spence Bate.

Peneus fissurus, Spence Bate, 'Challenger,' vol. xxiv. pt. i. 1888, p. 233.

This species is new to the Indian fauna. This year, strange
Ann. & Mag. N. Hist. Ser. 7. Vol. xv. 17

to say, they were caught in abundance on two occasions in the Gulf of Martaban, 46 and 61 fathoms. In one haul fifteen males and seven females were obtained.

They agree in all details with Spence Bate's description. In the Indian variety the rostrum is long, horizontal, slightly turned up at the tip, and armed dorsally with 6 (sometimes 5) teeth; it is half (or more) the length of the carapace, longer in the female, where it is $1\frac{1}{2}$ -2 mm. more than half the length of the carapace, and is about twice the length of the eye.

The antennules of the female are shorter and more slender (both peduncles and flagella) than those of the male, and in consequence the antennal scale, which in the male is shorter than the antennular peduncle, is in the female considerably longer than the peduncle.

The antenna is about $1\frac{1}{2}$ times the length of the body (excluding the rostrum).

Two typical specimens of female and male give the following measurements:—

	Female. mm.	Male. mm.
Length of body, excluding rostrum	68	73
„ rostrum	12	12
„ antenna	99	106
„ smaller antennular flagellum	$6\frac{1}{2}$	$18\frac{1}{2}$
„ larger „ „	11	24
„ carapace	19	21

On analysis and comparison of about two dozen specimens the following sexual differences are apparent:—

Female.—Rostrum about twice the length of the eye and $1\frac{1}{2}$ -2 $\frac{1}{2}$ mm. longer than half the length of the carapace: antennular peduncle considerably shorter than the antennal scale; its *larger* flagellum very slightly longer than half the length of the carapace, and its smaller flagellum about two thirds the length of the larger.

Male.—Rostrum seldom twice the length of the eye and about half the length of the carapace: antennular peduncle projects beyond the antennal scale; its *smaller* flagellum is very little shorter than the carapace, and the larger flagellum is a third as large again as the smaller.

Roughly speaking, the smaller flagellum of an adult male is about three times the length of that of a female. The small young male resembles the female as regards the relative lengths of antennal scale and antennular peduncle and flagella.

The sixth abdominal segment is not twice the length of the fifth. Exopodites are not present on any of the legs. Epipodites are absent from the external maxillipeds as well as from the last three pairs of legs. There are no pleurobranchiæ on the last two thoracic segments.

BENTHESICYMUS, Spence Bate.

Benthesicymus armatus, sp. n.

In the general form, cut, and outline of rostrum and carapace this species resembles *B. brasiliensis* (Sp. Bate), but in the former there is a distinct hepatic spine as in *B. moratus* (S. I. Smith, Alb. Crust. 1886, p. 90).

With *B. moratus* this species is very closely allied. They differ only in the following points:—*B. moratus* has a sharp tooth posteriorly on the carina of the dorsum of the third, fourth, and fifth abdominal segments; its third abdominal segment is carinated; its sixth abdominal segment is more than twice as long as high; its antennal scale is relatively narrower, and the rostrum—judging from the description—is not raised so much at the base as in this species.

The rostrum is long, reaching the tips of the eyes, and is dorsally armed with two small teeth. Between the crest of the rostrum and the cervical groove the median carina is very prominent; behind this it is distinct, though less prominent, to very nearly the posterior margin of the carapace. The post-antennular angular projection of the carapace ends acutely anteriorly, and from this lobe a crest passes backwards in the direction of the hepatic spine. The branchiostegal spine, which is placed well back on the margin of the antero-lateral sinus, is larger than the hepatic spine and is well buttressed posteriorly. The carapace is deep, as in *B. brasiliensis*.

The eyes are in a bad state of preservation; they seem to be deficient in pigment.

The antennular peduncles reach about half-way along the antennal scales. The antennal scales are broad, being only about $2\frac{1}{2}$ times as long as broad.

The last joint of the endopodite of the first maxilliped is $\frac{1}{5}$ – $\frac{1}{6}$ as long as the penultimate joint, and the distal extremity of the exopodite suddenly ends in a flagellum. The second and third maxillipeds agree in all details with the description and plates of *B. moratus* (*loc. cit.*).

The branchial formula is typical of *Benthesicymus* Alcock, Desc. Cat. Ind. Deep-sea Crust. 1901, p. 43). Rudimentary exopodites are present on all the legs.

A small carina begins on the posterior two thirds of the fourth abdominal segment, and is continued backwards; on the sixth segment it is a rigid well-marked carina which terminates abruptly at the posterior margin. There is no tooth or spine on any of these segments. The third abdominal segment has neither carina nor spine. The sixth abdominal segment is barely twice as long as high. The telson has had its tip broken off.

Only one specimen (a female) has been obtained—trawled at Sta. 287, Arabian Sea, 1506 fathoms—and it gives the following measurements:—

	mm.
Length of rostrum	10.5
" carapace with rostrum	61.6
" antennal scale	31
Breadth of " "	12.3
Length of sixth abdominal segment	25
" endopodite of tail-fan	23.5
" exopodite "	32.5
Length from tip of rostrum to tip of telson (about)	157

This species is most closely connected with *B. moratus*, but can be distinguished from it by the points of difference already noted. From *B. Tanneri* and *B. brasiliensis* it can be distinguished by the presence of an hepatic spine and the absence of teeth on the carinae of the abdominal segments. In *B. Bartletti* there is a long spine on the dorsum of the fifth abdominal segment. In *B. altus* the posterior margin of the sixth abdominal segment is elevated to form a transverse ridge.

Will be figured in an early issue of the "Illustrations of the Zoology of R.I.M.S. 'Investigator.'"

GENNADAS, Spence Bate.

Gennadas carinatus (?), S. I. Smith.

Benthescymnus carinatus, Smith, Alb. Crust. in Rep. U.S. Fish. Comm. 1882, p. 396; Alcock and Anderson, J. A. S. B. pt. ii. vol. lxiii. 1894, p. 147; Alcock, Desc. Cat. Ind. Deep-sea Crust. 1901, p. 46.

At Sta. 306, Arabian Sea, 930 fathoms, a large specimen (apparently the female of this species) was trawled. Previous to this there was only one specimen (a male, caught in the same locality, near the Laccadives, 902 fathoms) in the Indian Museum.

The following are the measurements of this female:—

	mm.
Length of rostrum	13
" carapace	56
" abdomen	88
" antennal scale	30.5
Breadth of " "	14.5
Length of sixth abdominal segment	22
" telson	24.4
" inner uropod	26
" outer "	29

It agrees in all details with descriptions of this species, except as regards the relative lengths of sixth abdominal segment, telson, and endopodites of tail-fan. The sixth abdominal segment is slightly shorter than the telson, and the telson is not quite so long as the endopodite of the tail-fan.

A sternal tubercle is present in the female between the bases of the first pair of abdominal appendages. The crest-like dorsal carina on the third abdominal segment occurs only on the posterior two thirds.

The "thelyceum" is peculiar. Between the bases of the fourth pair of legs a prominent central papilla stands. Towards this papilla a hairy process passes inwards and backwards from the base of each of the third pair of legs, and from the base of each of the fourth pair of legs a tongue-shaped process projects inwards and backwards posterior to the papilla. The papilla thus stands in the centre between the tips of these four processes.

Fam. Pandalidæ.

HETEROCARPUS, A. M.-Edwards.

Heterocarpus longirostris, sp. n.

At Sta. 310, Bay of Bengal, 960 fathoms, two males of this species were trawled. Of known species they are most closely allied to *H. levigatus*, from which they differ only in the following characters:—

The rostrum is straighter and much longer (being about $1\frac{3}{4}$ times the length of the carapace) and is multiserrate dorsally, the teeth being $\frac{IV-9}{12-14}$; the orbital spine is much larger, it is as large and projects quite as far as the branchiostegal spine; the blunt carina of the third abdominal somite is posteriorly acutely produced to a bluntish point, and is not merely strongly convex; the sharp antennular scale is shorter, it falls well short of the extremity of the second

joint of the antennular peduncle; the antennal scale is longer and narrower: it is about $\frac{2}{3}$ length of the carapace, and its greatest breadth is very little more than $\frac{1}{4}$ its length.

	mm.
Length from tip of rostrum to tip of telson	144.5
Length of rostrum	54
" carapace	31
" fifth abdominal somite	5.8
" sixth " " 	9
" telson	18

H. oryx (A. M.-Edwards) differs from this species in having spines on the third, fourth, and fifth abdominal segments and antennular flagella shorter than rostrum. In *H. carinatus* (S. I. Smith) the rostrum is shorter; antennular flagella are shorter than rostrum; third and fourth abdominal terga are produced posteriorly as spines.

This species has been figured, and will appear in "Illustrations of the Zoology of R.I.M.S. 'Investigator,'" Crust. pt. xi., which is now being issued.

Fam. Glyphocrangonidæ.

GLYPHOCRANGON, A. M.-Edwards.

Glyphocrangon longirostris (?), Smith.

Glyphocrangon longirostris, Smith, 'Albatross,' Dec. Crust. 1881, p. 51.

Of this species, which is new to the Indian fauna, two specimens (male and female) were trawled at Sta. 326, off the Arakan coast, Bay of Bengal, 1100 fathoms. They are smaller than the specimens described by Smith, but agree with descriptions of this species except as regards the eyes. In the Indian specimens the eyes are decidedly smaller (length of carapace, including rostrum, about $8\frac{1}{2}$ times the greatest diameter of the eyes) and are not of a dark purplish brown, but of a washed-out purple or a tint resembling blackberry much diluted with cream.

	Male.	Female.
	mm.	mm.
Length from tip of rostrum to tip of telson..	64	73
Length of rostrum	14.8	17
" carapace, excluding rostrum	14	17
Greatest diameter of eye	3.4	4
Length of antennal scale	6.5	7.6
Greatest breadth of antennal scale	3.9	4.4
Length of telson	12.2	14.2
" inner lamella of uropod	9	10.4
" outer " " 	8.5	9.5

The rostrum narrows from the antero-lateral teeth forwards; the antero-lateral teeth are large and prominent. The anterior part of the third carina is represented by 3 or 4 very small discrete tubercles on the hepatic area. There are a few scattered small low tubercles on the dorsum of the carapace between the carinæ. The large tubercles representing the first and second carinæ and the broad flat low tubercles of the abdomen have, like the other carinæ of the carapace, an eroded worm-eaten appearance. A fine velvety pile covers the carapace and rostrum.

There are only nine branchiæ on either side—arthrobranchiæ (5) on ninth to thirteenth somites, and pleurobranchiæ (4) on eleventh to fourteenth—each series diminishing in size from behind forwards. From its reduced number of branchiæ, its relatively small eyes, which are somewhat deficient in pigment, and its dorsal and subdorsal carinæ of the carapace being broken up into lines of tubercles, this Indian species would come under Alcock's subgenus *Plastocrangon* (Alcock, Desc. Cat. Ind. Deep-sea Crust. 1901, pp. 125 & 133).

Of Indian species already known it is most nearly related to *G. (Plastocrangon) cæcescens*, from which it differs in having larger eyes; rostrum longer, slender throughout, acute, and with only two pairs of teeth; a less granular surface; and only one tooth on the anterior part of the fourth carina. *G. sicaria* (Faxon) differs from this species in having the orbital spines smaller and less deflected outwards and the anterior part of the fourth carina divided by a notch into two prominences, of which the posterior is the more salient. In *G. nobilis* (A. M.-Edwards) the rostrum is relatively shorter and its median dorsal keel does not run so far back; the 3 or 4 tubercles representing the anterior part of the second (subdorsal) carina are all produced to spinous points, and not merely the foremost of them; the tubercles on the abdomen are more numerous and discrete; the eyes have more pigment.

Fam. Axiidæ.

CALASTACUS, Faxon.

Calastacus longispinis, McArdle.

Calastacus longispinis, McArdle, Ann. & Mag. Nat. Hist. ser. 7, vol. viii. Dec. 1901, p. 522; Illus. Zool. Invest., Crust. pl. lvii. figs. 2, 2a.

This species was described by McArdle from a single specimen (female) dredged in the Arabian Sea at Sta. 279

in 300 fathoms. This season another female—a more complete and larger specimen (length of carapace and rostrum 16.6 mm., of abdomen 27 mm.)—was trawled at Sta. 297 in the Gulf of Oman, 700–689 fathoms.

The median carina running backwards from the rostrum carries a large procurved acute spine in the anterior part of the gastric region. There is some variation in the number of spines on the rostrum and gastric region of the carapace. The margin of the rostrum has 4 or 5 spinelets in front of a basal spine on either side in its free portion, and on the continuation backwards of the rostral margin on each side the spines vary from 2 to 4 and may display a want of symmetry in number and position on the two sides of the same specimen. The spines lying between these and the median carina similarly vary from 2 to 3 in number.

The chelipeds were wanting in McArdle's specimen. In this specimen the larger is 26 mm. long, the hand alone measuring $9\frac{1}{2}$ mm. The ischium, merus (except distal part), and palm are much compressed. The lower borders of ischium, merus, and hand, and the upper borders of merus and carpus (distal parts), palm, and finger are spinose. These spines are best developed on the merus; elsewhere (except at distal end of lower border of ischium) they are mere spinules. There is a small spine on the upper border of ischium near its distal end. The fingers are about as long as the palm and their prehensile edges are finely serrulate, the teeth pointing towards the tips of the fingers; there is no hiatus left on closure. The smaller cheliped is 17 mm. long; the inferior borders of ischium and merus are spinose; the fingers are very minutely and regularly serrulate.

The second pair of ambulatory legs are $25\frac{1}{2}$ mm. long; the third pair are very slightly shorter; the fourth pair resemble the second and third pairs, but are considerably shorter and more slender.

The telson has a fair-sized terminal spine with an upcurved tip.

ICONAXIOPSIS, Alcock.

Iconaxiopsis spinigera, sp. n.

In size this species is intermediate between *I. laccadivensis* and *I. andamanensis*. The length of the rostrum is also intermediate; it usually reaches to about the middle of the second joint of the antennular peduncle, but shows considerable variation in length, sometimes falling short of the end of the basal joint, sometimes reaching the distal end of the

second joint of the peduncle. The edges of the rostrum are microscopically serrulate, as in *I. laccadivensis*. A median dorsal carina passes back from the rostrum for a short distance on the gastric region. On the average the rostrum is longer in the female. Little reliance can be placed on the length of the rostrum in determining this species.

The abdomen is longer than the carapace; the pleura of the second, third, and fourth abdominal segments are vertically produced and pointed. The carapace with the rostrum is about as long as the first five abdominal segments combined. The projecting pleura are very pliable, yet retain their smooth surface. In the female the appendages of the first abdominal segment are uniramous, slender and long, about $\frac{2}{3}$ the length of those of the second segment; in the male they appear to be wanting. They also seem to be wanting in the male of *I. laccadivensis*, but are present and well developed in the male of *I. andamanensis*. The telson has a small median posterior spine.

The eye-stalks are very short and the eyes have no pigment. All that is visible of the eyes is a fair-sized hemispherical white lobule on either side of the base of the rostrum.

The upper antennular flagellum is about as long as the carapace (without the rostrum) measured in the mid-dorsal line, is slightly longer than the lower or inner flagellum and is two or more times its thickness.

Both "stylocerite" and "scaphocerite" are large; the former is the longer and almost reaches the end of the antennal peduncle.

The exopodite of the second maxilliped is much longer than the endopodite. The branchiæ agree with the typical formula of *Iconaxiopsis* as given by Alcock (Desc. Cat. Ind. Deep-sea Crust., Macr. 1901, p. 194), except that I was unable to find any rudimentary podobranch or arthrobranch on the second maxilliped; they differ widely from the formula of *Iconaxius* (Spence Bate).

The chelipeds are massive, chelate, and subequal, the left (rarely the right) being the larger in both sexes. Both chelipeds are about the same length and are approximately as long as the abdomen; more than half this length is made up by the hand. The more massive cheliped has a longer, deeper, and more inflated palm than the other. In the former the palm is longer than the fingers, in the latter the fingers are longer than the palm. The upper border of the palm carries a row of (usually about 8) forwardly directed and prominent spines, which increase in size from behind

forwards and are easily visible to the naked eye. The palm, and especially the fingers, have numerous long hairs. On the upper margin of the free finger there is generally a spinule, best developed on the larger hand and in the male. A ridge, which is spinulose, runs along the outer margin of the broad lower border of the palm and fixed finger. The stouter hand presents a hiatus when the fingers are closed; into this space there projects from the basal end of the prehensile edge of the free finger a broad compressed tooth. The fixed finger is finely serrated in its distal two thirds, on the far side of a fair-sized conical tooth. In the smaller hand there is no hiatus; the fingers are curved inwards and excavated on their inner surface; the prehensile edge of the fixed finger is finely serrated. At the base of the fixed finger, at the distal end of the outer surface of the palm, a conical spine, simple or multicuspoid, projects forwards.

In the female the larger hand is sometimes arrested in its development; for instance, in one specimen the large tooth on the free finger is in evidence, yet there is no hiatus, or, as in another specimen, not even this tooth is developed, and the larger hand exactly resembles the smaller in shape and form.

The lower borders of the ischium and merus of the chelipeds are spinose, and 1-3 small low spinules are sometimes visible on the upper border of the merus at its distal end.

The first to fourth pairs of ambulatory legs are slender; the first pair are shorter than the second and third pairs, smooth and minutely chelate. The second and third pairs are about equal in length; their propodites are compressed and have along their posterior borders a row of small tufts of setæ, which at first sight appear like fine spinules. The fourth pair of legs are about the same length as the first pair. The dactyli of the second, third, and fourth pairs of legs are short and subspathulate, and their distal edge is finely serrated, the anterior tooth being produced as a long curved hook.

The eggs are round, large (about 1.6 mm. in diameter), and few in number, about a dozen on the average.

At Sta. 310, Bay of Bengal, 960 fathoms, about a dozen specimens were trawled; of these five were females, four of which were egg-laden. An average-sized specimen gave the following measurements:—

	mm.
Length of carapace and rostrum	8
" abdomen	13
" chelipeds	13
" hand	7.5

This species differs from *I. laccalivensis* in being of larger size, upper border of palm spinose in all its extent, fingers more setose, rostrum shorter, pleura of second to fourth abdominal segments more pointed, eyes without pigment, fixed finger in neither hand has two basal enlarged teeth separated by a notch. In *I. andamanensis* the rostrum is shorter and its edges smooth, eyes longer and more slender, pleura of second to fourth abdominal segments are not vertically produced or pointed, upper border of palm is not spinose, carapace with rostrum measured in the mid-dorsal line is merely a little longer than the first four abdominal segments combined.

This species will be figured in an early issue of "Illustrations of the Zoology of R.I.M.S. 'Investigator.'"

ANOMURA.

Fam. Pylochelidæ.

CHEIROPLATEA, Spence Bate.

Two specimens (male and female) of a new species of this genus were obtained at Sta. 327, off the Arakan coast, 419 fathoms. Each was housed in the mud-lined cavity of a piece of water-logged bamboo. They are closely allied to, but quite distinct from, *C. cenobita* (Spence Bate, Chall. Macr. Crust. pt. i. 1888, p. 12).

These specimens have been handed over to Major Alcock, Superintendent of the Indian Museum, by whom they will be described in his monograph on the Indian Paguridea, which will shortly be published.

This new species will be figured in "Illustrations of the Zoology of R.I.M.S. 'Investigator.'"

Fam. Lithodidæ.

LITHODES, Latreille.

Lithodes Agassizii, S. I. Smith.

Lithodes Agassizii, S. I. Smith, Bull. Mus. Comp. Zool. x. 1882, p. 8, pl. i.; Henderson, Chall. Anom. p. 42.

A large female of this species, measuring with outspread legs about $2\frac{1}{2}$ feet across, was taken at Sta. 301, northern part of the Arabian Sea, 1000 fathoms.

	mm.
Length of carapace, excluding rostrum and posterior spines	105
Length of rostrum with its spine	22
" spines at base of rostrum	18
" larger spines of carapace	14-28
" smaller " "	3-5
" larger spines on margin of carapace	12-28
" smaller " " " "	3-8
Greatest breadth of dorsal surface of carapace, excluding spines	93

The large spines on the carapace are less numerous than in any of the specimens described by Smith; in all other details this specimen agrees with Smith's description.

The gastric region is armed with three pairs of large spines, the cardiac region with two pairs, the intestinal with one pair, and the branchial region on either side with six large spines; the more posterior of these twelve pairs of spines on the dorsum of the carapace are longer than the anterior, and dotted in between these dorsal spines are about an equal number of smaller spines about $\frac{1}{3}$ the size of the large spines. On the margin of the carapace behind the large hepatic spine and the cervical suture are 9 large spines and 2-7 intervening smaller spines about half (or less) the size of the larger. These marginal spines are not exactly symmetrical in place or size on the two sides. There is a small median spine in the sinus in the middle of the posterior border of the carapace.

This specimen differs very little from Smith's larger adult specimen. Like the latter it is nine tenths as broad as long, and the number of *large* spines differ only on the branchial regions and margin of carapace, where the difference in length of the larger and smaller spines may not have been so pronounced as in this specimen. The rostral spine, however, and the spines at its base are much longer in this specimen, being as long as the average large spine on the carapace, and resemble those of Smith's smaller adult specimen.

The abdomen has three large outstanding spines situated on the central plate which represents the fused first and second abdominal terga; the other spines on the abdomen are small in comparison with these three.

A figure will be given in the next issue of "Illustrations of the Zoology of R.I.M.S. 'Investigator.'" "

Fam. Galatheidæ.

MUNIDOPSIS, Whiteaves, Faxon.

Munidopsis dasypus, Alcock.

Munidopsis dasypus, Alcock, Ann. & Mag. Nat. Hist., April 1894, p. 329; Alcock, Descr. Cat. Ind. Deep-sea Crust., Macr. and Anom. 1901, p. 252; Illus. Zool. Invest. pl. xiii. fig. 9.

Although numerous adult female specimens of this species have been caught in past years, the males have hitherto been represented by only two small young specimens. This season, at Sta. 331, east of Andamans, 569 fathoms, two adult males were obtained; the extreme length of body of the larger male is 55 mm., and the length of chelipeds is 69 mm.

The chelipeds of the male are (right and left approximately equally) enlarged in all joints and in all dimensions when compared with those of the female. The palms are much broadened and the fingers when closed leave at their base a fairly wide hiatus, into which a 3- or 4-cusped tooth projects from the mobile finger.

The extreme length of body of the larger male caught prior to this season was 28 mm., and its chelipeds were slender throughout, like those of the female, and without a hiatus at the base of the fingers.

There seem to be considerable and fairly frequent variations from the typical (and much the commonest number) 4 spines on the posterior border of the carapace. Variations found are 2, 3, 5, and 7.

A figure of the male will appear in "Illustrations of the Zoology of R.I.M.S. 'Investigator.'"

Munidopsis Wardeni, Anderson, var. *andamanica*.

Munidopsis Wardeni, Anderson, J. A. S. B. vol. lxx. pt. 2, 1896, p. 99; Alcock, Descr. Cat. Ind. Deep-sea Crust., Macr. and Anom. 1901, p. 257; Illus. Zool. Invest., Crust. pl. lv. fig. 1.

As mentioned by Alcock in his Descriptive Catalogue of Anomura, there are in the Indian Museum two small specimens of *M. Wardeni* dredged off the Andamans in 500 fathoms, and in these the abdominal terga have no spines. This season two similar but larger specimens (one an egg-laden adult female) were trawled at Sta. 351, east of the Andamans, in 569 fathoms, so that there would seem to be a distinct variety of species *Wardeni* in that locality.

Measurements of egg-laden female :—

	mm.
Length of body from tip of rostrum to end of telson. .	45
„ chelipeds.	54

Besides the absence of spinules on the transverse carinae of the second and third abdominal terga, the surface of the carapace generally is smoother and its ridges and rugæ less prominent.

Munidopsis Milleri, Henderson, var.

Munidopsis Milleri, Henderson, Chall. vol. xxvii., Anom. p. 155.

This specimen agrees with *M. Goodridgei* (Alcock and Anderson) and *M. spinipes* (sp. n. et sub descr.) in differing from all other Indian species in having the eyes fused ventrally, immovable, and furnished with no spine or spinule. This variety also comes from much the same depth and locality as *M. Goodridgei*: the former from 568 fathoms, west of Ceylon; the latter from 130 fathoms, off the Travancore coast.

This specimen differs from Henderson's description of *M. Milleri* in the following points :—

(1) Gastric area armed with one pair of spines and three (instead of one) pairs of spinules. These spinules are arranged one pair behind the other and all lying on the circumference of an imaginary circle on the posterior half of the gastric region, thus :—the first pair situated behind the spines; the second pair behind these and wider apart, placed on the lateral margins of the gastric region; the third pair close together near the posterior margin of the gastric region.

(2) Rostrum is not spinulose, but subsquamiform.

(3) Instead of a spinule being present on the anterior border of the carapace behind the antennal peduncle, the largest spine on the carapace is situated there.

(4) Inner margin of palm is spinose and the upper surface is not smooth and glabrous, but has a few scattered tubercles and tufts of long silky hairs.

(5) There is a well-marked spinule in the centre of the triangular dilated area of the carapace, lying between the two divisions of the cervical groove.

This specimen differs from *M. Goodridgei* chiefly in :—

(1) Posterior border of carapace spinulose.

(2) An extra spine on the lateral border of the carapace.

(3) Three extra pairs of spinules on the gastric region and

a spine on either side of the carapace between the two divisions of the cervical groove.

Unfortunately only one specimen (a male) was obtained at Sta. 334, west of Ceylon, 568 fathoms.

Munidopsis spinipes, sp. n.

This species agrees with *M. Goodridgei* and *M. Milleri*, var. (above described), amongst Indian species in having the eyes absolutely immovable, yet furnished with neither spine nor spinule.

The carapace is convex, subquadrangular, about the same breadth in front and behind. A pair of large spines are situated anteriorly on the gastric region. There is no vestige of a spine or spinule on the cardiac region or posterior border of the carapace. The rostrum is short and styliform; towards its tip there is obscure microscopic serration on its lateral margins. The supra-antennal spines are of good size. On the lateral border there are three large spines and one or two spinules, situated thus:—One spine at the antero-lateral angle, a second at the anterior angle of the triangular area lying between the two divisions of the cervical groove, and the third immediately behind the posterior division of the same groove; behind the second spine and lying with it between the two divisions of the cervical groove there may be one or two spinules, diminishing in size from before backwards.

The abdomen is smooth and has a few scattered hairs; the second tergum is transversely bicarinate, and the third transversely grooved. In the telson on either side between the two lateral plates there is a small calcareous patch, much the same as in *M. ciliata*.

The basal joint of the antennule has one spine and three spinules: the spine (large) on the outer side and two spinules on the inner side of the distal end of the joint; whilst the third spinule is on the far side of the globular swelling on the upper and outer surface of the basal joint. On the inner edge of the merus of the external maxillipeds there are two large spines.

The chelipeds are subequal and much longer than (nearly a third as long again as) the fully extended body. The arm has three longitudinal rows of spines and four large terminal spines; the wrist has two rows of spines and four terminal spines; both edges of the outer surface of the palm are spinose. The fingers are not straight, but meet throughout their length; the fixed finger is finely serrated, and a little

beyond its centre it has a projecting lobe which fits into a corresponding depression in the free finger. The free finger is finely dentate in its distal half or so; its proximal half forms a projection, with its free margin coarsely dentate, which fits into a depression at the basal end of the fixed finger. There is no epipodite on any of the thoracic legs.

The ambulatory legs are long; the first pair are longer than the fully extended body. The merus of the first three pairs has a row of spines almost throughout the whole extent of its anterior border, and this is continued along the anterior border of the carpus as a row of spines, and not merely as a terminal spine; their dactylus is hardly or only very slightly more than half the length of the propodite.

Three egg-laden females and one male were taken in the trawl at Sta. 310, Bay of Bengal, 960 fathoms. The male unfortunately had lost its chelipeds. The largest female gives the following measurements:—

	mm.
Length of fully extended body, including rostrum ..	30.6
„ chelipeds	39
„ first pair of ambulatory legs	31.8

This species is very closely allied to *M. Goodridgii*, from which it differs mainly in having no spines or spinules on the cardiac region; chelipeds not very unequal, both of them much longer than the fully extended body, and both edges of the outer surface of the palm spinose; legs more spinose, the carpus having a row of two or more spines, and not merely a terminal spine on its anterior border; the lateral border of the carapace with three spines and two spinules instead of two spines and one spinule.

This new species has been figured for the next issue of "Illustrations of the Zoology of R.I.M.S. 'Investigator.'"

Munidopsis (Orophorhynchus) ciliata, Wood-Mason.

Munidopsis ciliata, Wood-Mason, Ann. & Mag. Nat. Hist., Feb. 1891, p. 200; Faxon, Mem. Mus. Comp. Zool. xviii. 1895, p. 84; Alcock, Desc. Cat. Ind. Deep-sea Crust., Anom. p. 267; Illus. Zool. Invest., Crust. pl. xi. fig. 3.

Munidopsis brevimana, Henderson, Chall. Anom. p. 154, pl. xvii. fig. 1.

One male specimen (length of body, including rostrum, 43 mm.; length of chelipeds $24\frac{1}{2}$ mm.) was caught at Sta. 326, Bay of Bengal, 1100 fathoms. It presented the following peculiarities:—Carapace and abdomen tomentose; lateral margins of carapace armed with only three spines, two only

being present between the two divisions of the cervical groove and no spine at all at the extreme antero-lateral angle of the carapace. In other respects this specimen agrees with descriptions of *M. ciliata*.

Last season at Sta. 310, Bay of Bengal, 960 fathoms, three small specimens of this species were caught in the same trawl: the smallest had the five typical spines on the lateral margins of the carapace; the other two had an extra small spine (making four in all) between the two divisions of the cervical groove. The number of spines on the lateral borders of the carapace of this species would thus seem to vary from three to six.

Fam. Uroptychidæ.

UROPTYCHUS, Henderson.

Uroptychus glyphodactylus, sp. n.

Length of carapace, including rostrum, less than its greatest breadth. Carapace moderately convex from side to side, its surface and margins all smooth and glabrous except for a spine at each antero-lateral angle. Hardly any indication of regions. Rostrum has a broad base, but is exceedingly short, horizontal, and placed on a lower level than the summit of the carapace; in length it is considerably shorter than the eye-stalks. The pterygostomial region is very limited in extent, smooth, slightly inflated, and produced anteriorly as a well-marked acute spinule.

The eyes are of moderate size and, to the naked eye, of a uniformly brown colour; but under a lens they appear as a delicate dark brown network enclosing large pale facets. The eye-stalks are short, stout, and freely mobile.

The antennal acicle is very short and stunted, not more than $\frac{1}{3}$ the length of the antennal peduncle, the distal end of the penultimate joint of which the acicle does not reach. Like the rostrum it is broad at the base and rapidly tapers to a point. The flagellum is barely twice the length of the peduncle.

	Male.	Female.
	mm.	mm.
Length of body, including rostrum.....	11	
" " excluding " 	$10\frac{1}{4}$	
" carapace, including rostrum	$4\frac{3}{4}$	$4\frac{3}{4}$
" chelipeds	26	22
" second pair (longest) of ambulatory legs	12	12
Greatest breadth of carapace	$5\frac{1}{4}$	$5\frac{1}{4}$

The chelipeds are long and smooth, except for a spinule on the dorsal margin of the ischium at its distal extremity and 1-3 prominent spinules at the distal ends of both merus and carpus on their upper and inner aspects. There are a few tufts of hairs (2-5 in each tuft) scattered sparingly on the joints, but mostly on the carpus; these tufts may escape notice unless looked for with a lens. On the fingers there are numerous hairs. The palm is very slightly shorter than the wrist and slightly dilated. The fingers are elegantly curved, forming at their base a wide hiatus, into which a conical tooth projects from the prehensile edge of each finger—that from the free finger being the larger and more distally placed. The summits of these two teeth are seen under a strong lens to be furnished with numerous spiniform cusps. In slightly more than their distal or apical third the closed fingers leave no gap, the prehensile margins in that region being smooth or very minutely serrulate. The chelipeds are about five times the length of the carapace, including the rostrum.

The ambulatory legs are about one third the stoutness of the chelipeds; the first pair are slightly shorter than the second, which are about half the length of the chelipeds; the third pair are more than a dactylus shorter than the first or second pair. The legs are smooth, unarmed, and glabrous, except the dactyli and the posterior border of the propodites. These latter parts are well coated with hairs. The dactyli are strongly curved and long, being about the same length as the propodite, and their posterior border is finely toothed in its distal two thirds; the posterior border of the propodites is unarmed.

The abdomen is smooth and has hairs only on the margins of the pleura, telson, and caudal swimmerets. The telson is much shorter than (about half the length of) the caudal swimmerets.

The ova are large, about 1 mm. diameter, and comparatively few in number.

One male and an egg-laden female were trawled at Sta. 331, east of the Andamans, 569 fathoms. The female was found and preserved clinging to a species of *Virgularia*, the first pair of ambulatory legs fixed to the stem from below upwards, and the second and third pairs clasping the stem from above downwards (or behind forwards).

In the female neither spines nor hairs are so well developed as in the male. For instance, the spine at the distal end of the upper margin of ischium of cheliped is hardly evident, and there are fewer and less prominent spines at

the distal ends of merus and carpus. The chelipeds of the female are much more slender and shorter than those of the male. Both chelipeds of the male are approximately equally enlarged (right palm possibly slightly more dilated than the left).

Of species hitherto described this one comes nearest *Diptychus uncifer* (A. M.-Edwards) and *D. politus* (Henderson). The new species differs from the former in having a shorter rostrum and still shorter antennal acicle; merus of cheliped smooth on its under surface, and no sharp tubercle on under surface of ischium; merus and carpus armed distally; fingers entirely different. It differs from *D. politus* in the rostrum being much shorter and the acicle still more so; carapace broader than long; fingers different. This species can be at once distinguished by the form of the fingers, size of rostrum and antennal acicle, and the carapace being broader than long.

The telson and caudal swimmerets of the females of this genus are not so acutely flexed on the preceding segments or so closely applied to them as in the males.

Figures of both the male and female, the latter clinging to a species of *Virgularia*, will appear in "Illustrations of the Zoology of R.I.M.S. 'Investigator.'"

BRACHYURA.

OXYRRHYNCHA.

Fam. Maïidæ.

Cyrtomaia Goodridgei, McArdle.

Cyrtomaia Goodridgei, McArdle, Ann. & Mag. Nat. Hist. ser. 7, vol. vi., Nov. 1900, p. 472; Ill. Zool. Invest. pl. lix. figs. 1, 1 a, 1 b, & 1 c.

Of this species, described by McArdle from a single large male specimen, this season three more specimens—an adult and a young male and an egg-laden female—were obtained.

Dimorphism in the male.—The adult male was caught at Sta. 332, south-east of South Andaman Island, 279 fathoms. It is somewhat smaller than McArdle's specimen, but it presents this very striking and curious difference—its chelipeds are in all joints, but especially the distal extremities of the palms, very much enlarged and inflated. In the general arrangement of the spines on the chelipeds both specimens agree, and the gape (about 45°) is similar in both. The hiatus, however, left at the base of the fingers when closed is in the enlarged chelipeds much wider. The fingers

are stout at the base and rapidly taper towards the tips, and for this reason they appear relatively shorter than in McArdle's specimen. Both chelipeds of this new specimen are equally enlarged, and the relative lengths of their joints are maintained and correspond with those of the type specimen. Those ambulatory legs which happen to be present are not disproportionate in length or thickness when compared with the "type."

In the small male (length of carapace and rostrum 11 mm.) caught at Sta. 322, east of South Andaman Island, 378 fathoms, the chelipeds are slender and resemble a female's.

There is no evidence of the "type" having been attacked by parasites or other disease which might account for the chelipeds not being enlarged.

The relative size of the hand and palm in the "type," new male, and egg-laden female respectively can be judged from the following measurements:—

	Type ♂. mm.	New ♂. mm.	Ovige- rous ♀. mm.
Length of carapace and rostrum	33½	29	21½
" gastric spine	13	11	7
" branchial spine	8	7	4
Greatest breadth	32	28	21
Length of chelipeds	77	100	45½
" hand	35½	46½	21
Maximum and minimum breadth of palm	5½-3½	11-4	2½-1¾

Description of the female.—The egg-laden female was caught at Sta. 323, west of Cape Negrais, 463 fathoms. As in the male, on the strongly deflexed anterior portion of the carapace are well-raised granular ridges, three on either side extending from the large gastric spine to (1) the prominent postocular spine, (2) base of rostrum, and (3) base of concavity of orbital notch. The two innermost ridges which run to the base of the rostrum are thickly coated with long peg-shaped hairs. Rostral spines form a U-shaped interspace and the interantennular spine descends in the same plane as the deflexed anterior portion of the carapace. There is merely a warty tubercle or prominence on a granular mesial ridge midway between the two long gastric spines. Similarly a short warty transverse ridge represents the small intestinal spine.

The antero-external angle of the merus of the external maxillipeds is produced as a flat rounded projection armed with 3 or 4 acute spinules on its margin. Chelipeds and legs are armed with spines and setæ.

In the female the chelipeds are only very slightly stouter than the first ambulatory legs. The fingers are very indistinctly toothed, the prehensile edges being merely roughened; they are not close-fitting. A small but well-marked acute spine is present at the base of the free finger on its dorsal aspect (present also in the male).

The sternum of the female has seven prominent spines, arranged as follows:—a spine at the base of each cheliped; another at the base of each of the first pair of ambulatory legs, on the margin of the concavity in which the eggs lie; a pair of spines placed transversely at the anterior edge of the same cavity; one (smaller) spine in the middle line between the last pair mentioned and the anterior border of the sternum. The whole space between the bases of the four pairs of legs is concave and occupied by the eggs, which are small and numerous.

The abdomen of the female is broad and carinate, except the posterior two thirds of the last segment; it consists of seven distinct segments, of which the fifth and sixth are broadest. The surface is very granular and sparsely covered with longish hairs. A granular tubercle is present on the carina of the first segment and a prominent acute spine on that of the sixth segment. The ambulatory legs diminish in length and girth from first to last; the last two pairs are very slender; the last pair in this egg-laden female are acutely flexed and carried dorsally.

Colour in life deep pink.

The female and the enlarged chelipeds of the male will be figured in an early issue of "Illustrations of the Zoology of R.I.M.S. 'Investigator.'"

Fam. Parthenopidæ.

EUMEDONUS, Edw.

Eumedonus granulosus, sp. n.

Carapace depressed and sharply pentagonal. Bifurcation of rostrum at tip very faint, occasionally absent, and then the bilobed nature of the rostrum can only be made out by the median longitudinal dorsal groove. The rostrum is transversely narrower and thicker (dorso-ventrally) than in *E. zebra*, where it is a broad thin lamina deeply bifid at the tip. There are no coloured band-markings on the carapace. The surface of the body generally, including chelipeds and legs, is coarsely but evenly and regularly granular. The regions of the carapace are well defined.

Chelipeds of female are no longer than the ambulatory legs, those of the male are much longer; in both sexes they are more massive and armed with spines which are granular and not very acute. The most prominent of these spines is, as in *E. zebra*, that at the inner angle of the wrist. The palms of the male have no teeth on their upper border, those of the female have 2-4 teeth. The chelipeds are unequal in both sexes, the chief difference being in the relative size of the palms; there is little difference in length, and that difference is due mainly to the palm of the right hand being longer as well as stouter than that of the left.

The ambulatory legs are only slightly compressed; the upper border of the merus is seldom cristate, but is granular (that of fourth pair being dentate) and ends in a distal tooth.

This species differs from *E. zebra* in having its surface coarsely granular; no coloured bands on carapace; rostrum narrower, thicker, and only faintly notched at the tip; merus of legs not (or very seldom) strongly compressed or cristate.

Commensalism.—Fixedly adhering to the carapace and legs of a large male are a few tubicolous worms (*Serpula*) and one small patch of what seems to be Foraminifera Perforata (*Polytrema*).

At Sta. 291, 49-48 fathoms, two adult males, two ovigerous females, and several young specimens were got; at Sta. 296, 47 fathoms, an egg-laden female and a young male were obtained: all are from the Persian Gulf, mud and sand bottom.

The largest specimens give the following measurements:—

	Ovigerous female.	Male.
	mm.	mm.
Length of cheliped	11	21
„ carapace	10	11·5
„ third pair of ambulatory legs ..	12	13·5
Greatest breadth of carapace.....	10·8	11·5

This new species will be figured in an early issue of "Illustrations of the Zoology of R.I.M.S. 'Investigator.'"

OXYSTOMA.

Fam. Leucosiidæ.

OREOPHORUS, Rüppell.

Oreophorus reticulatus, Adams and White.

Oreophorus reticulatus, Alcock, Carcin. Fauna Ind., Oxyst. p. 174 and references.

Of this very variable species a single ovigerous female was

taken at Sta. 291, Persian Gulf, 49-48 fathoms. The carapace is 12 mm. long and 15 mm. broad; the length of the chelipeds is 15 mm. The eggs are minute and numerous; they do not interfere with the tight closing on the thorax of the lid-like abdomen.

This specimen presents the following peculiarities:—The surface and edge of the carapace, the pterygostomial regions, the external maxillipeds, the anterior margin of the thorax, and the chelipeds down to the very fingers are prettily ornamented in parts with an encrusting growth of Foraminifera (*Polytrema miniacum*, Moebius, 'Meeresfauna von Mauritius'). These Foraminifera form dark red irregular jagged processes on the grey-coloured carapace and other parts. The caverns are shallow; the second cavern has a wide open communication with the third, so wide that they look like one elongate cavern. The floors of the caverns and of the channel which bounds the intestinal region have bead-like granules scattered over them. The tumid branchial regions are raised to a rugged peak, as in *O. reticulatus*, var. *alcicornis*, but the tip is not bifid. The outer surface of both fingers is smooth, without any trace of rows of pits.

Of seven Indian Museum specimens from off Ceylon, 34 fathoms, five have fingers exactly as in this specimen, the other two have well-marked rows of pits on the outer surface of the fingers. These Ceylon specimens are also encrusted, but nothing like to the same extent, with the same species of Foraminifera; they have, however, three distinct and separate caverns on either side, and the branchial regions are tumid, but not raised and rugged.

Ixoides cornutus, gen. et sp. n.

This genus agrees with *Arcania* and *Ixa* in having the hands much longer than broad, tapering from a swollen base, and the fingers opening in a nearly vertical plane, the tip of the dactylus movable through an arc of about 60°. It is more closely allied to *Ixa*, but it can be distinguished from either by the following diagnostic points:—The fingers are two thirds the length of the palm, or about half the combined lengths of wrist and palm; the sides of the carapace are produced into two stout, conical, horn-like processes, tapering from their base; carapace is globular and its median regions are not pronouncedly demarcated by channels or grooves; the merus of the external maxilliped has its outer edge cut away and bevelled, and this bevelled edge forms the inner wall of the afferent branchial canal; the front is moderately

prominent, projecting about as far as the salient edges of the afferent branchial canal.

The carapace of this species is globular, rhomboidal, not very much broader than long, produced at the junction of the antero-lateral and postero-lateral borders into a stout horn-like process, which projects straight outwards, tapering steadily but very gradually until in its distal fifth it rapidly tapers off to a point; the proximal end of the lateral processes is not inflated or sausage-shaped, as in *Ixa*. Except for a deep sulcus on either side of the intestinal region, separating it from the branchial regions, there is no pronounced grooving of the carapace; in the adult faint indications of grooving can be made out, and in the young this grooving, although faint, is more discernible; much more distinct grooving can be seen in species of *Arcania*. The carapace in the young is covered with small vesiculous granules, which in the adult for the most part disappear, except in the anterior part of the carapace and at the bases of the processes. Between these vesiculous granules the surface is rough and finely granular. At either end of the posterior margin is a large, stout, papilliform process about a third of the length of the lateral processes. On the middle of the intestinal region there is a much smaller bullous projection. The front is bilobed and projects further forward than in *Ixa*. A very small bullous projection occurs on the summit of the antero-lateral convexity of the subhepatic region.

The orbits are emarginate on the dorso-lateral aspect in the region of the orbital sutures. The antennules do not fold so obliquely (by reason of the front of the carapace projecting more forwards) as in *Ixa*. The antennal peduncles are small but distinct, and their flagella rudimentary.

The external maxillipeds, as in *Ixa*, are partly sunken below the level of the edges of the buccal cavern, which is triangular, and the ischium is grooved along its inner border, but the merus is quite different and peculiar in its shape. The merus is grooved only in its basal fifth or so; beyond this its outer edge is bevelled to such a degree that the upper surface in its distal two thirds is a mere ridge, and the bevelled outer edge dovetails with the margin of the efferent branchial canal and forms the inner wall of the afferent branchial channel. The inner borders of the exognaths are concave, their distal ends curving inwards and converging. The surface of the exognath is strongly convex and, like the raised outer border of the ischium, has a band of vesiculous granules; its distal free margin is well fringed with hairs

and falls short of the raised anterior edge of the afferent branchial canal by a distance equal to about half the length of the merus.

The chelipeds are long, about twice the length of the carapace; the distal half of the hand is very slender; the fingers are about two thirds the length of the palm and are filiform.

The abdomen of the adult male (female unknown) consists of five pieces, the third, fourth, and fifth segments having coalesced; in the young specimen the sutures are still visible.

Three specimens (one large and two small males) were taken at Sta. 292, Persian Gulf, mud bottom, 53 fathoms. The largest gave the following measurements:—

	mm.
Length of carapace	29
Breadth, including lateral processes	62.5
Length of lateral process	14.5

Only one cheliped is present in the large specimen, and that one has had the tips of the fingers broken off; but one of the smaller specimens has a complete cheliped, which shows the following characters:—The cheliped is slightly more than twice the length of the carapace; the fingers are well under half the length of the hand, are slightly hooked at the tip, and have their prehensile edges closely set with small microscopic jagged teeth, and at regular intervals a few larger and recurved teeth. This specimen gives the following measurements:—

	mm.
Length of carapace	10
„ cheliped	20½
„ palm	5.6
„ free finger	3.8

This species has been figured for “Illustrations of the Zoology of R.I.M.S. ‘Investigator.’”

Fam. Dorippidæ.

ETHUSA, ROUX.

Ethusa hirsuta, McArdle.

Ethusa hirsuta, McArdle, Ann. & Mag. Nat. Hist. ser. 7, vol. vi., Nov. 1900, p. 474; Illus. Zool. Invest., Crust. pl. lix. figs. 2, 2a.

This species was described by McArdle from an adult

female and a young male. This season two males were caught at Sta. 333, off the west coast of Ceylon, 400 fathoms.

Description of adult male.—The chelipeds are very unequal; the right is in all joints and in all dimensions much larger than the left: the disparity in size is most marked in the palm, the right being many times larger than the left. The left cheliped resembles that of the female, is not enlarged, and is more slender than the first and second pairs of ambulatory legs; the right cheliped is more massive than these legs in all joints. The left cheliped does not reach as far as the fingers of the right, and the right cheliped is about three quarters the length of the first pair of ambulatory legs. The fingers meet only at their tips, and the prehensile edges are smooth and without a vestige of teeth, unless a smooth rounded lobe or bulging on the under surface of the free finger of the enlarged cheliped be excepted. The palm of the enlarged cheliped is large, broad, and inflated, and the fingers are short and stout.

	Male.
	mm.
Length of carapace	12
Breadth "	12
Length of smaller cheliped	17½
" larger "	24
" first ambulatory legs.....	35
" second " "	40

A noteworthy and what appears to be a specific character of *E. hirsuta* is the length of snout or spout formed by the efferent branchial channels. This spout, in either sex, extends forwards well between the bases of the antennules. In none of the males in the Museum collection do the external orbital spines reach quite as far forwards as the rostral spines; they fall short, however, by very little. The inner pair of frontal teeth have a distinct tendency to be stouter and longer than the outer pair and to point slightly outwards.

The large male, which has the dimensions given above, will be figured in the next issue of "Illustrations of the Zoology of R.I.M.S. 'Investigator.'"

CYCLOMETOPA.

Fam. Xanthidæ.

XANTHODES, Dana.

Xanthodes cumatodes, sp. n.

Carapace roughly hexagonal; frontal and antero-lateral

borders forming together a strongly convex arch; the postero-lateral borders strongly convergent; the fronto-orbital border much more than half the greatest width of the carapace.

The anterior two thirds of the carapace are markedly areolated and peculiarly granular; the granules are bead-like and for the most part arranged in transverse rows, these rows occupying the tops of successive small ridges, which look like wavelets or ripples moving in a forward direction. Between these rows of granules and in the grooves defining the regions the carapace is smooth. The margins and sides of the carapace, along with the posterior third of the surface, are fairly uniformly studded with granules. No hairs on carapace. A sinuous groove marks off the fronto-orbital region; the gastric region is defined and divided into three subregions by similar deep grooves, while a shallow longitudinal groove on either side divides the lateral gastric subregions in two; the branchio-hepatic regions are divided by grooves into about four areas (a marginal, two dorsal, and an internal triangular one).

Front bilobed; the outer angle is not sharply marked off, and from it pass inwards two beaded ridges, which give the front the appearance of having a double edge. The outer angle is separated from the supraorbital margin by a well-marked notch. Antero-lateral border divided into four granular lobes or teeth. Between the first tooth and the external orbital angle there is a depression which allows, in a dorsal view, a small tubercle to be seen; this tubercle lies close to the first tooth of the antero-lateral border and lies in a line between it and the angle of the buccal cavity. The third lobe or tooth is largest, the first smallest; the second and fourth are about equal.

The three grooves of the orbital border are distinct. The inner and outer ends of the lower orbital margin end in teeth, the inner being much the larger. The basal antennal joint is short and just reaches the front. A small dog's-ear-shaped flap projects from the eye-stalk on to the dorsal aspect of the cornea, and on this stands a tuft of setæ. There is a transverse row of granules on the front of the eye-stalk just internal to the cornea, the uppermost granule being usually enlarged and dentiform.

The anterior edge of the merus of the external maxilliped is almost transverse; there is a notch in it just external to the inner angle. The longitudinal ridges that define the efferent branchial canals are indistinct and do not reach the anterior boundary of the buccal cavern.

The chelipeds are not twice the length of the carapace;

merus not entirely hidden beneath the carapace; its outer surface has transverse rows of pearly granules and its upper border is spinulose in its distal part. Outer surface of wrist and palm furnished with pearly granules. The outer surface of the wrist is irregular, but generally shows a transverse groove at the distal end and a prominent tooth at the angle of the upper or inner border. The outer surface of the palm shows three parallel longitudinal furrows, as in *X. Lamarckii*, the pearly granules at the margins of the furrows being arranged in rows. The inner surface of the palm is smooth and polished. The fingers are pointed and blackish brown in spirits.

Upper margin of merus of ambulatory legs serrulate. The upper border of the carpus is peculiar; it is furnished with a central and a subdistal hump, which make it saddle-shaped. The upper border of the propodite is convex and, like that of the carpus, finely granular. A fine longitudinal granular ridge runs along the outer surface of carpus and propodite. Dactylus is long and bristly and ends in a short horny spine.

Six females (four ovigerous) and one male were trawled at Sta. 292, Persian Gulf, mud bottom, 53 fathoms. The male, which is about the size of the largest female, gives length of carapace 8, length of cheliped 12, and greatest width 11.3 mm.

This species will be figured in an early issue of "Illustrations of the Zoology of R.I.M.S. 'Investigator.'"

ACTUMNUS, Dana.

Actumnus margarodes, sp. n.

Carapace subcircular, with concave postero-lateral borders, strongly areolated and moderately convex; it is not much broader than long. Fronto-orbital border is about two thirds the greatest width of the carapace. The central lobes of the front are prominent, somewhat depressed, and the central notch is shallow; the outer angles of the front are not large, are well marked off from the central lobes, but are only marked off from the supraorbital angles by a shallow groove. The antero-lateral border is cut into three teeth exclusive of the outer orbital angle.

The main areolation on the anterior half of the carapace is -U- shaped, and is surmounted by a band (1-2 deep) of sharp crystalline granules; the lateral arms are continued outwards and backwards in a gentle curve towards the third or last tooth of the antero-lateral border. A short

transverse band of these granules also lies on the branchial region on either side in a line between the posterior teeth of the antero-lateral borders. A similar band marks the anterior cardiac region, and the inner halves of the supra-orbital margins are likewise furnished with these granules. A few of these crystalline granules also occur on the upper aspect of the wrist and palm of both the larger and smaller chelipeds.

The posterior half of the carapace has a dense short furry coating, as also have thorax, abdomen, chelipeds to bases of fingers, and the exposed surfaces of the legs.

The supra-orbital margin has a notch just internal to the outer angle. The outer orbital angle is dentiform and similar to the teeth of the antero-lateral border. Just below the outer angle is an angular notch. The basal antennal joint just reaches the front; the orbital hiatus is not closed.

The chelipeds are unequal; upper border of arm is serrulate; inner angle of wrist is sharp, its exposed surface having a few sharp crystalline granules, as also has the outer surface of the palm. Margins of legs are fringed with long hairs.

Only one male specimen was obtained, at Sta. 292, Persian Gulf, 53 fathoms. Length of carapace 6 mm., the greatest width 7.5 mm. A figure of this specimen will be given in "Illustrations of the Zoology of R.I.M.S. 'Investigator.'"

Fam. Cancridæ.

TRICHOPELTARIUM, A. M.-Edwards.

Trichopeltarium ovale, Anderson.

Trichopeltarium ovale, Anderson, J. A. S. B. vol. lxx. pt. 2, p. 103; Illus. Zool. Invest., Crust. pl. xxv. figs. 4, 4a; Alcock, Carc. Faun. Ind. no. 4, Brach. Cyclom. pt. 2, 1899, p. 96.

This species was described by Anderson from a single specimen (a female) caught off the west coast of Ceylon. This season another female was caught at Sta. 323, west of Cape Negrais, 463 fathoms, and also a male at Sta. 322, east of South Andaman Island, 378 fathoms.

Description of male.—It is smaller than any of the females in the Museum collection. As in the female, a very prominent and procurved lateral epibranchial spine is present on either side; it is about the same size as the frontal prongs. The three frontal spines are about the same length; in the specimens available the central spine is in the male very

slightly shorter and in the females very slightly longer than the lateral. The measurements of the male are as follows :—

	mm.
Length of carapace, including mid-frontal spine..	55
Greatest breadth of carapace.....	47
Depth of carapace	29
Length of greater cheliped	91
" smaller " 	51
" first pair of ambulatory legs	85

The corneæ are very deficient in pigment and are represented by small, hemispherical, pinkish-tinged patches placed obliquely (posterior aspect) on the summit of the long, slender, but rigid eye-stalks, which are freely movable in the horizontal plane. These corneal patches seem to be very easily detached, for they are absent from about half the number of eye-stalks examined.

The chelipeds are very unequal in the male: all joints of the larger cheliped (the right) are enlarged in all dimensions. The merus is huge, and is not curved to correspond with the inflated pterygostomial region; it is straight, and fully half the joint projects free beyond the margin of the carapace. The most marked difference between the two chelipeds is in the hands. The palm of the larger cheliped is inflated and its inner surface is practically smooth, being coated merely by very minute vesiculous granules. The fingers are markedly different in the two chelipeds. Instead of being long, slender, acute, curved, slightly excavated on the inner surface, and of equal length (tips coinciding), as in the smaller cheliped and in those of the female, the fingers of the larger cheliped are straight, stout, and relatively short. The fixed finger is relatively very short and inflated: the free finger is deep and vertically compressed; its free border is highly arched and is armed with spines, tubercles, and hairs almost to the very tip. The free finger is $21\frac{1}{2}$ mm. long and overlaps in parrot-beak fashion the short fixed finger, which is only 13 mm. long. The fingers, when approximated, are not close-fitting, and each has 6 or 7 coarse teeth. The smaller cheliped is stouter than the legs.

Both sternum and abdomen are much narrower than in the female. At the level of the interspace between the bases of the first and second pairs of ambulatory legs the breadth of the abdomen is about $\frac{1}{3}$ breadth of sternum in the same transverse line. The abdomen is seven-jointed and covered with coarse hairs; the first two segments bear spines just as in the female; the other segments, however, have neither

spines, tubercles, nor granules, but are all smooth like the last segment of that of the female. The vasa efferentia perforate the coxopodites of the last pair of legs, the openings being of fair size.

The male has been figured for "Illustrations of the Zoology of R.I.M.S. 'Investigator.'"

Fam. Corystidæ.

GOMEZA, Gray.

Gomezia distincta, de Haan, var.

Corystes (Oidea) distincta, de Haan, Faun. Jap., Crust. 1850, p. 45, pl. xiii. fig. 2.

Gomezia, Gray, Zool. Misc. p. 39.

The only difference between this variety and the type described by de Haan is that the spine of the infraorbital margin of this one is much shorter than (in fact reaches only about a third of the way along) the supraorbital spine.

It should also be noted that of the ten marginal spines on either side of the carapace the four anterior ones, although decidedly larger and with broader bases than the following spines, are not by any means so much larger in comparison with these latter as the figure given by de Haan represents them. In this case it requires more than a superficial examination or glance to make out that the four anterior spines are larger; in de Haan's figure these four are enormous compared with the following spines.

Only one specimen (a male), 8 mm. long and 5.5 mm. broad, was caught, and unfortunately its chelipeds and legs are wanting. It was trawled at Sta. 292, Persian Gulf, 53 fathoms.

This genus is new to the Indian fauna.

C A T O M E T O P A.

Fam. Gonoplacidæ.

CERATOPLEX, Stimpson.

Ceratoplax granulosa, sp. n.

Length of carapace is three quarters its greatest breadth. Front is a little less than one third its greatest breadth, deflexed, decidedly arched, and deeply notched.

Not only is the palm on its outer surface covered with very prominent vesiculous granules, but the surface and sides of the carapace as well, except a transversely oval patch

about half the breadth of the carapace stretching across the intestinal region, where the surface of the carapace is densely pitted. Regions of carapace are fairly well marked out. Surface of carapace, chelipeds, and legs sparsely covered with hairs and the margins are more thickly coated and with coarser hairs, which latter have a tendency to be arranged in rows, as, for instance, on the propodite of the first ambulatory leg.

	Male.
	mm.
Breadth of carapace	16
Length "	12
Breadth of front	5
Length of third pair of legs	27

Orbits are widest internally, corresponding with the eye-peduncles, which are conical, with the broad base internal. Eyes are fairly well pigmented, little, if at all, deficient in pigment. The antero-superior margin of the eye-peduncle is acute, covered with longish hairs, and lies in line with a similarly hair-clad transverse ridge at the upper borders of the deflexed front, this ridge marking the angle of flexion of the front on the carapace proper.

The basal joint of the antenna reaches the level of the lower border of the orbit and falls short of reaching the posterior border of the deflexed front merely by the breadth of the slender second antennal joint. The second antennal joint projects by more than half its length beyond the front and supports the third joint (which is more than half the length of the second joint) and a moderately long flagellum.

The buccal cavern gradually widens from behind forwards; longitudinal ridges of endostome evanescent; ischium of external maxillipeds a little longer than broad and with a longitudinal sulcus; merus transverse, with the antero-external angle produced and rounded, and with a notch at the antero-internal angle from which the next joint springs.

Chelipeds are shorter than legs; the inner angle of the wrist is produced to form a very distinct tooth or spine, and on the upper margin of the merus is a subdistal tooth, very well developed and prominent and more acute than that on wrist. Ambulatory legs are compressed, except the dactyli, which are styliform; the third pair, which are the longest, are $2\frac{1}{4}$ times the length of the carapace, and the fourth or last pair are much smaller than the others. Projecting distally from the postero-superior margins of the coxopodites of the ambulatory legs are peculiar tortoise-foot-like processes, the distal free margin of each process being toothed

or pectinate and reaching a fair distance along the ischiopodite. They are most easily seen when the legs are drawn away from the sides of the carapace, for these small processes, which are rigidly fixed to the coxopodites, then project dorsally—free and solitary. When the legs are drawn up towards the sides of the carapace each process lies in close contact with the posterior surface of the basipodite and ischiopodite of its own leg, and gives support to these joints in forward movements (legs being fixed) of the body of the crab. The largest process is that of the third or largest pair of legs. The process arises from the coxopodite immediately above and continuous with the usual angular projection of the coxopodite in the region of the hinge-joint between coxo- and basipodite.

The first two abdominal segments are very short: the first is very broad, but does not reach the bases of the last pair of legs; it is wedged firmly in between the posterior border of the carapace and the thorax.

Colour in life dark muddy grey.

One specimen (a male of the above dimensions) was caught at Sta. 328, Gulf of Martaban, 61 fathoms.

This new species differs in the following points from the hitherto described species:—In *C. ciliata* the outer surface of palm is smooth and polished; carapace punctate and regions not distinguishable; third pair of ambulatory legs shorter. In *C. arcuata* basal antennal joint shorter; upper margin of palm not cristate; outer surface of palm smooth and naked; general configuration of carapace different. In *C. hispida* a thicker coating of hairs, and hairs coarser; carapace pitted; front broader; eyes deficient in pigment. In *C. (?) levis* carapace smooth and shiny; front wider; wrist and outer surface of palm smooth. With *C. villosa* and *C. leptocheles* (Zehnter) this new species has very little in common.

C. granulosa will be figured in the next issue of “Illustrations of the Zoology of R.I.M.S. ‘Investigator.’”

Fam. Palicidæ.

PALICUS, Philippi.

Palicus investigatoris, Alcock, var.

Palicus investigatoris, Alcock, Care. Faun. Ind., no. 6, Brach. Catom. p. 455.

This variety differs from the “type” only in the following characters:—

(1) There is a small but distinct fissure towards the inner end of the lower border of the orbit.

(2) The four teeth of the front are not equally acute; the inner two are long and acute, but the outer, although projecting well forward, are broad, blunt, and rounded at the end.

(3) The teeth on the posterior border resemble more those of *P. serripes* in being broad and blunt.

(4) Between the sharp little tubercles on the arcole of the carapace the surface is not smooth, but is densely and finely granular.

Only a male (9 mm. long and 11 mm. broad) was obtained, Sta. 291, Persian Gulf, 49-48 fathoms.

Fam. Ptenopladæ.

PTENOPLAX, Alcock and Anderson.

Ptenoplax dentata, sp. n.

Carapace very flat and depressed, transversely oval, and its antero-lateral borders dentate. Surface very finely granular beneath a short furry coating; front and antero-lateral borders with much longer hairs. Front proper is extremely narrow, about $\frac{1}{4}$ greatest breadth of carapace; in length about $\frac{1}{9}$ greatest breadth of carapace, deflexed, and with its tip free, horizontal, and tapering to a point—not expanded and bilobed as in *P. notopus*. Orbital and frontal borders together are slightly more than $\frac{1}{3}$ greatest breadth of carapace; antero-lateral border is long, convex, and armed with 3 teeth (besides the supraorbital tooth); postero-lateral border is convex and smooth; posterior border proper is straight and raised. Regions of carapace are fairly well defined. The branchial regions are much depressed and less inflated than in *P. notopus*. The two transverse sutures so conspicuous and sharply defined in *P. notopus* are not present, but the blunt, convex, transverse ridges in which the sutures exist in *P. notopus* are here quite as prominent and similarly situated, the anterior passing across the carapace between the penultimate teeth of the antero-lateral borders.

The side-walls of the carapace are also finely granular and meet the dorsal surface almost at right angles. The pterygostomial regions are deeply grooved and the sternum is pentagonal, as in *P. notopus*, their surface being finely granular.

	Male. mm.
Length of carapace, including front	9
" " alone	7 $\frac{3}{4}$
Greatest breadth of carapace	11
Length of hand	7 $\frac{1}{2}$

Orbits are incomplete; their inferior border is formed by the basal joint of the antennule, that of the antenna, and the infraorbital spine. A vertical antero-posterior plane through the supraorbital spine passes between the basal joint of the antenna and the infraorbital spine. Eye-stalks are short and conical; the cornea (small and hemispherical) is placed obliquely (looking outwards) on the summit of the eye-stalk. The basal joint of the antennule is hugely inflated, globular, freely mobile, and with a finely granular surface; second and third joints cylindrical and comparatively slender, fold transversely on the swollen basal joint. The antennæ arise on the same level with and between antennule and infraorbital spine, and the flagellum is about half the length of the carapace.

The eyes, second joint of antennule, and the inflated basal antennule joint all extend outwards and reach about the same distance. This is a specific character of this new species. In *P. notopus* the eyes extend outwards as far as the infraorbital spine, and the second antennule joint also extends well beyond the inflated basal joint and reaches the basal joint of the antenna.

Epistome is linear; buccal cavity is wider in front than behind. Efferent branchial channels are well defined, patulous, and produced anteriorly. External maxillipeds are subpediform and leave uncovered the greater part of the underlying mouth-parts; the palp arises from the apex of the small oval merus; merus and ischium have a finely granular surface.

Chelipeds are unsymmetrical in the male; both are about the same length, but the right is thicker in all its joints. Both hands are also of equal length, but they differ in the relative lengths of palm and fingers; the right hand has not only a stouter but also a slightly longer palm than the left, but the latter makes up the difference by having longer fingers. The length of the hand, which equals that of the remaining part of the cheliped minus the wrist, is very slightly less than the length of the carapace. The smaller palm is compressed, the larger inflated. Fingers are longer than palm, compressed, acute, curved, and slightly excavated on the inner surface. The fingers of the smaller hand are

in-distinctly serrated, those of the larger are coarsely dentate. Surface of chelipeds (except fingers) is finely granular and the margins of arm and wrist are fringed with long hairs.

The first three pairs of ambulatory legs are slender, compressed, have a finely granular surface as far as the merus (inclusive), and end in sabre shaped dactyli; carpopodites and propodites are fringed with long hairs. The fourth or last pair of legs are small, subdorsal in position, and arise near the middle line of the body.

The abdomen of the male consists of five separate segments—third, fourth, and fifth being fused—and has a finely granular surface. The abdomen corresponds very closely with that of *P. notopus*, even to the crescentic ridge on the sixth segment. Its breadth opposite the penultimate pair of legs is about a third of the breadth of the sternum at the same point. The genital ducts open as in *P. notopus*.

Only a single specimen, and of the above dimensions, was obtained, trawled at Sta. 332, south-east of South Andaman Island, 279 fathoms.

This specimen is of special interest, as it adds a second species to the hitherto solitary species—*P. notopus*—of the family Ptenoplaciæ of the Indian fauna. The two species resemble each other closely, but differ markedly in the following points:—The sculpture and outline of the front and carapace, especially the antero-lateral borders and the transverse sutures of the carapace; the orbits; the relative lengths of the eyes, the second and basal joints of the antennules.

Has been figured for "Illustrations of the Zoology of R.I.M.S. 'Investigator.'" "

XXVIII.—*Natural History Notes from the R.I.M.S. 'Investigator,' Capt. T. H. Heming, R.N. (retired), commanding.*—Series III., No. 8. *On a new Genus of Teleostean Fish closely allied to Chiasmodus.* By A. C. MACGILCHRIST, M.A., M.B., Ch.B., Capt. I.M.S., Surgeon-Naturalist to the Marine Survey.

Suborder PERCESOCES (Boulenger).

Fam. Chiasmodontidæ, Gill.

Dysalotus Alcocki, gen. et sp. n.

B. 7. D. VIII. 27. A. 27. P. 11. V. I, 5.

The body is elongate and compressed; its height contained

nearly eight times in the total length without the caudal. The head is large, low, and long, contained about $3\frac{1}{2}$ times in the same standard length.

The snout is very long and depressed, about 3 times the diameter of the eye and more than $\frac{1}{3}$ the length of the head. The eyes are lateral, wide apart, small, and deep-set. The interorbital space is more than twice the diameter of the eye, nearly flat from side to side, and traversed by two anteriorly converging ridges which enclose a V-shaped space. The nostrils are slightly nearer to the eye than to the tip of the snout.

The mouth is very deeply cleft, reaching beyond the eyes. The lower jaw projects beyond the upper; no barbel. The mucous system of the head is well developed.

The body is naked except the posterior half or so, which is furnished with minute spiny scales arranged for the most part in rows parallel to the lateral line; the spinules have a backward inclination.

The lateral line is single, uninterrupted, very broad, and conspicuous; it runs from the upper angle of the gill-opening to the base of the caudal, curved slightly downwards, and contains a row of about 41 distinct pores.

Two separate dorsal fins: the first begins slightly posterior to the vertical through the base of the pectoral, and contains 8 slender spines; the second begins a couple of millimetres behind the first, is much the longer, and contains 27 rays. The anal is equal, opposite and similar to the second dorsal. Caudal symmetrically forked. Pectorals long (about half the length of the head) and slender, in position nearer the ventral than the dorsal line; all rays branched. Ventrals (I, 5) short (not so long as snout), inserted below the pectorals, but connected only by ligament with the clavicular arch.

Vent about 8 mm. in front of where the anal fin begins. No anal papilla; small urogenital papilla behind the vent.

The jaws are distensible, with four series of setiform teeth, similar in both jaws; those of the inner rows longest; all movable and turned inwards. No vomerine teeth; a single row of small teeth—depressible backwards—on each palatine. Tongue free. Gill-openings very wide, with membranes joined only quite anteriorly. Seven branchiostegals. Gills four; last gill-cleft a foramen merely. Branchial arches weak and gill-rakers represented by small fixed and fairly numerous teeth similar to those of the mouth. Pseudo-branchiæ are present.

An air-bladder is present, but without an open duct. The

pyloric caeca were densely matted together and entangled with parasitic worms: there were about nine caeca. Beside these the hepatic duct opened into the gut. Vertebrae 39 (15 abdominal and 24 caudal). Abdomen extends well behind the vent into the tail. The stomach is elongate, *cæcal* in shape, and empty; its inner surface presented large, coarse, longitudinal rugæ. Liver small.

Two strange Structures.

1. *An unobliterated yolk-sac* (?).—Lying free in the peritoneal cavity to the right of the stomach and extending from the liver anteriorly to near the vent was an elongate bladder with a shiny pearly external coating of peritoneum. Its posterior end was free and broad; its anterior end was narrow and formed a long neck which was distinctly traced up to the large vessels of the liver; from these vessels a large branch descended along the neck, and broke up into smaller branches in the bladder-wall.

2. *A rectal cæcum*.—From the region of the pyloric caeca there descended a cæcum which entered the anterior or ventral surface of the rectum about 2 mm. above the vent. In the posterior part of its course it was in intimate connexion with the ventral aspect of the rectum. Its anterior relations could not be ascertained with certainty, as during the unravelling of the pyloric caeca the anterior extremity of the cæcum got broken.

The colour in life was violet-black.

A single specimen, about $9\frac{1}{2}$ inches long, was caught in the trawl at Sta. 315, Bay of Bengal, near the Andamans, 705 fathoms. It has been figured and will appear in the next issue of the "Illustrations of the Zoology of the R.I.M.S. 'Investigator.'" "

Named after Major Alecock, F.R.S., Superintendent of the Indian Museum, in gratitude for the guidance and help he has invariably given to the Surgeon-Naturalist.

XXIX.—*List of a small Collection of Odonata (Dragonflies) from Ceylon, collected by Mr. E. Ernest Green, with Notes on the Genus Zygonidia and its Allies, and Descriptions of new Species of Zygonidia, Kirb., and Onychothemis, Brauer, from Ceylon and Tonkin.* By W. F. KIRBY, F.L.S., F.E.S., &c.

I HAVE lately received, through Mr. W. J. Lucas, an assortment of dragonflies collected by Mr. E. Ernest Green, chiefly

at Kandy, in 1900 and 1901; and although there is but one new species among them, it seems worth while to give a complete list, because the specimens are all ticketed with dates and localities. A single ant-lion, not yet determined, but probably belonging to the genus *Creagrís*, Hag., was among the dragonflies.

Libellulidæ.—LIBELLULINÆ.

1. *Tholymis tillarga*, Fabr.

Kandy, Dec. 1900. (2 specimens.)

2. *Pantala flavescens*, Fabr.

Caught at light, Peradeniya, Oct. 11, 1900; also at Kandy and Yatigantata, Nov. 1900. (3 specimens.)

3. *Neurothemis tullia*, Dru.

Kandy, Nov. and Dec. 1900. (2 specimens.)

4. *Trithemis aurora*, Burm.

Peradeniya, June 1900; Kandy, Dec. 1900. (4 specimens.)

5. *Brachythemis contaminata*, Fabr.

Kandy, Dec. 1900. (18 specimens.)

6. *Macrodiplax vittata*, Kirb.

Ramisaram Island, S. India. (1 specimen.)

7. *Zygonidia ceylonica*, Kirb., sp. n. (*infra*).

Kandy, Feb. 1901.

8. *Orthetrum sabina*, Dru.

Peradeniya, June 1900; Kandy, Nov. and Dec. 1900. (4 specimens.)

9. *Orthetrum pruinatum*, Burm.

Kandy, Nov. and Dec. 1900. (4 specimens.)

10. *Diplacodes trivialis*, Ramb.

Kandy, Nov. 1900; Peradeniya and Jaffera, March 1901. (4 specimens.)

11. *Acisoma panorpoides*, Ramb.

Kandy, 1900. (1 specimen.)

Agrionidæ.—*AGRIONINÆ*.12. *Neurobasis chinensis*, Linn.

Haugam, Nov. 1900; Kandy, Feb. 1901. (4 specimens.)

13. *Vestalis apicalis*, Selys.

Matale, March 1900; Kandy, Nov. and Dec. 1900. (13 specimens.)

14. *Micromerus finalis*, Selys.

Kandy, Nov. 1900. (2 specimens.)

Agrionidæ.—*CÆNAGRIONINÆ*.15. *Platysticta tropica*, Selys.

(Kandy?), Nov. 1900. (1 specimen.)

16. *Disparoneura cæsia*, Selys.

Kandy, Nov. and Dec. 1900. (5 specimens.)

17. *Micronympha senegalensis*, Ramb.

Ramisaram Island, S. India. (1 specimen.)

18. *Micronympha aurora*, Brauer.

Kandy, Dec. 1900. (1 specimen.)

19. *Archibasis ceylonica*, Kirb.

Jaffera, March 1901. (2 specimens.)

Notes on the Genus Zygonidia, Kirb., and its Allies.

Since I founded this genus (Ann. & Mag. Nat. Hist. (7) v. pp. 533, 540, 1900) for *Zygonidia insignis*, Kirb., from Hainan, several additional notes have been published. Mr. Laidlaw has described another species from Malacca, and the Natural History Museum has received four specimens from Tonkin and Ceylon, referable to undescribed species.

Krüger has discussed *Zygonyx* (*Neurocera*) *ida*, Selys, and considers *Zygonyx ida* and *Z. iris* too close to form more than separate sections in one genus (Stett. ent. Zeit. lxiii. pp. 110-113, 1902).

In *Pseudomacromia torrida*, Kirb., the front ridge of the middle and hind femora is armed with numerous short spines,

directed towards the knee, and becoming rather longer towards the extremity of the femora, where they are followed by three or four long setæ. The front carina of the front femora and the hind carina of the hind femora are also armed with extremely fine teeth.

The genus *Pseudomacromia* must therefore be placed in the immediate neighbourhood of *Zygonidia*, though the claws are not bifid, but dentated*.

I add here a list of the described species of *Zygonidia*, with descriptions of new species from Ceylon and Tonkin.

Genus ZYGONIDIA, Kirb.

Zygonidia, Kirb. Ann. & Mag. Nat. Hist. (7) v. pp. 532, 540 (June 1900).

1. *Zygonidia insignis*, Kirb.

Zygonidia insignis, Kirb. l. c. pp. 533, 540, pl. xii. fig. 1 (June 1900).

Hab. Hainan.

2. *Zygonidia malayana*, Laidlaw.

Zygonidia malayana, Laidlaw, Proc. Zool. Soc. Lond. 1902. i. pp. 73-75, fig. 11 (femur).

Hab. Kwala Aring, Malay Peninsula.

3. *Zygonidia ceylonica*, Kirb., sp. n.

♂.—Long. corp. 57 mm.; exp. al. ant. 102 mm., lat. 9 mm., long. pter. 2½ mm.; lat. al. post. 14 mm., long. pter. 3 mm.

♀.—Long. corp. 55 mm.; exp. al. ant. 105 mm., lat. 11 mm., long. pter. 3 mm.; lat. al. post. 16 mm., long. pter. 3 mm.

Male.—Head: upper part rich purple, sides of frons and genæ yellow; the rest of the face dull bluish black, except the mentum, which is shining black, bordered on the sides and front with yellow. Occiput black. Thorax and abdomen black above, with three yellowish spots on the median line between the wings; a strong carina, narrowly lined with yellowish, on segments 2-8 of the abdomen. Pleura greenish blue, with broad yellow sutures; first two abdominal segments with a small yellow spot on each side. Legs blackish; femora with numerous short spines directed towards

* Cf. Sjöstedt, Bihang Svenska Akad. xxv. (4: 2) pp. 23-26 (1900).

the knee, probably followed in perfect specimens by 3 or 4 long cilia.

Abdomen slightly dilated at base; terminal appendages about as long as the eighth segment, which is shorter than the seventh, which again is shorter than the sixth. Upper appendages of usual form, waved and pointed; lower one nearly as long, broad at base, with the narrowed extremity turned upward; below the basal half is a large oval excrescence, preceded by a tubercle on the under surface of the eighth segment.

Wings clear hyaline; pterostigmata, as in all the genus, dark brown; front wings with 16 antenodal cross-nervures, the last discontinuous on the left-hand side, and 9-11 postnodals in the upper space, the postnodals rarely coinciding with those in the lower; cells beyond the pterostigma single; nodal sector undulating, arched strongly downwards at the extremity; a single row of cells between the nodal and subnodal sectors, except close to the margin; two cross-nervures in the lower basal cell; triangle with one cross-nervure above the middle, and followed by three rows of cells, increasing towards the margin; subtriangular space consisting of 3 cells; upper sector of the triangle rising from its apex, the lower rising considerably beneath it.

Hind wings with 11 antenodals and 11 postnodals; 1 nervure in the lower basal cell; base of triangle distinctly nearer the base of the wing than the arculus, and its point not extending to the level of the triangle of the fore wings. Triangle traversed, followed by one row of 3 cells and one or two rows of 2 increasing; sectors of the triangle rising from a point.

All the wings rather pointed, owing to their rapid contraction beyond the point where the sectors of the arculus reach the margin. Membranule small, especially on the fore wings, greyish brown, whitish towards the base.

Female.—Head: metallic green above; face and mentum as in the male, but more broadly and brightly yellow on the sides, and no yellow in front of the mentum. Eyes brown above, broadly reddish in front and at the sides, which is only faintly visible in the male.

Thorax and abdomen black above, with 3 yellow median spots between the wings, and a slender yellow line on the carina from the second to the seventh segment of the abdomen. Pleura with 3 broad yellow bands, separated by 2 green ones; first and second segments of abdomen with the transverse carinae yellow, a large yellow trapezoidal lateral

spot on the first and a long one on the second. Denticulation of femora rather finer than in the male.

Wings of a slightly yellowish hyaline; front wings with 16 antenodal nervures on the right side, the last discontinuous; 15 continuous ones on the left side; 11 postnodals on the right side in the upper space and 10 on the left; membranule whitish, very narrow; otherwise as in the male. Hind wings with 11 antenodals and 10 or 11 postnodals; otherwise as in the male.

Hab. Kandy, Feb. 1901 (*E. E. Green*). Two specimens, ♂ and ♀.

Distinct from all the other species before me by the comparatively short pterostigma.

4. *Zygonidia cænea*, Kirb., sp. n.

♂.—Long. corp. 5½ mm.; exp. al. ant. 97 mm., lat. 10 mm., long. pter. 4 mm.; lat. al. post. 12 mm., long. pter. 3¼ mm.

♀.—Long. corp. 57 mm.; exp. al. ant. 110 mm., lat. 11 mm., long. pter. 5 mm.; lat. al. post. 15 mm., long. pter. 4½ mm.

Male.—Head purple above; frontal ocellus very conspicuous, yellow; face black, with a slight greenish tinge; the genæ, the lower border of the frons, and the rhinarium yellowish; mentum broadly bordered with yellow at the sides.

Thorax brown above, dull yellowish on the sides, with two broad bronzy-green bands in front above and two on the pleura on each side. Abdomen bronzy black above, 3 interalary spots on thorax, and narrow yellow lines on abdominal carinae, as in *Z. ceylonica*. Base of abdomen slightly inflated, dull yellow on the sides as far as the base of the fourth segment, crossed by broad black lines at the end of each segment, and a narrower one on the carina of the second segment. Legs black, the femoral denticulation very fine.

Wings of a slightly yellowish hyaline, and very slightly clouded at the tips; front wings with 16 antenodal cross-nervures, the last discontinuous, the fifth on the right-hand side V-shaped, and 9 or 10 postnodals; the postnodals in the upper space rarely corresponding with those in the lower; cells beyond the pterostigma single; nodal sector undulating, arched strongly downward at the extremity; a single row of cells between the nodal and subnodal sectors, except irregularly towards the margin; two cross-nervures in the lower

basal cell, triangle with a cross-nervure just above the middle, and followed by three rows of cells, only increasing towards the margin, subtriangular space consisting of 3 cells; upper sector of the triangle rising from its extremity, the latter separated, and rising considerably below.

Hind wings with 11-12 antenodal and 10-11 postnodal cross-nervures; two cross-nervures in the lower basal cell; triangle with 1 or 2 cross-nervures, its base somewhat nearer the base of the wing than the arculus, and its apex not extending to the level of the triangle of the front wings. Triangle followed by one row of 3 cells, and several rows of 2 increasing; sectors rising from a point.

Membranules smoky grey, that of the hind wings followed by a smoky shade over the cells which immediately border it.

Female.—Upper part of the head bronzy green, with the conspicuous yellow frontal ocellus; face from the lower part of the frons to the rhinarium inclusive yellow, except for very narrow black sutures; below this to the mentum bronzy black, except a yellow spot at the base of the mandibles; mentum black in the middle, with the sides broadly yellow. Thorax and pleura nearly as in the male, but the pleura brighter yellow, and marked with 3 black depressed spots: 2 higher ones just in front of each of the metallic-green bands, and 1 lower one a little behind the first pleural green band. Interalary spots dark yellow, much larger than in the male, and a much broader stripe of the same colour, expanded on the front segments, running over the carina of the abdomen to the end of the seventh segment; the slightly inflated basal segments are mostly of the same colour, which is continued by a row of long lateral spots, gradually shortening, as far as the seventh segment. Legs bronzy black, femora finely denticulated, and with terminal setæ; front femora pale beneath.

Wings rather deeper-coloured than in the male, and more clouded towards the tips. Fore wings with 16-17 antenodal cross-nervures, the last discontinuous, and 10-11 postnodals. Nodal sector more arched towards the extremity than in the male, the space between the nodal and subnodal sectors thus widening considerably just before the extremity, where it again contracts. Triangle crossed by one or two cross-nervures; lower basal cell with two cross-nervures; membranule small, brown; other characters as in the male.

Hind wings with 11 antenodal and 11 or 12 postnodal nervures. One cross-nervure only in the lower basal cell; triangle traversed by 1 nervure; membranule brown, as are

also the immediately adjacent cells; other characters as in the male.

Hab. Tonkin (*Fruhstorfer*).

Allied to *Z. insignis*, of which the female is unknown. The male is very distinct from any other described species of *Zygonidia* by possessing two cross-nervures in the lower basal cell of the hind wings. The female has but one, as usual.

Genus NEUROCENA, Kirb.

Neurocena, Kirb. Ann. & Mag. Nat. Hist. (7) v. p. 541 (1900).

Neurocena ida, Hagen.

Zygonyx ida, Hagen & De Selys, &c. (*cf.* Kirb. *l. c.*).

Neurocena ida, Kirb. *l. c.*; Laidlaw, Proc. Zool. Soc. Lond. 1902, i. p. 72, pl. v. fig. 1.

Another specimen (σ) from Province Wellesley is now in the Natural History Museum.

Genus ONYCHOTHEMIS, Brauer.

Onychothemis, Brauer, Verh. zool.-bot. Ges. Wien, xviii. pp. 170, 365, 732 (1868); Kirb. Trans. Zool. Soc. Lond. xii. pp. 258, 284 (1889).

Two species only have been described in this remarkable genus:—*O. abnormis*, Brauer (*ll. cc.*), from the Philippines, and *O. testacea*, Laidlaw (P. Z. S. 1902, i. pp. 75, 76, fig. 12 (leg), and pl. v. fig. 2), from Malacca. *Libellula hova*, Ramb., from Madagascar, doubtfully referred to *Onychothemis* by Brauer and Kirby, is now referred by Karsch and Calvert to *Pseudomacromia*, Karsch (*nec* Kirb.).

I have just discovered a specimen of a third and extremely handsome species in the Natural History Museum which resembles *Zygonidia* in neuration (last antenodal discontinuous, triangle of the fore wings placed beyond the level of that of the hind wings, base of triangle of hind wings nearer the base of wings than the arculus), but differs from it entirely by the great spines on the femora and tibiae and the simple claws. There is no carina on the fourth segment.

Onychothemis notabilis, Kirb., sp. n.

Long. corp. 54 mm.; exp. al. ant. 100 mm., lat. 11 mm., long. pter. $4\frac{1}{2}$ mm.; lat. al. post. 13 mm., long. pter. 4 mm.

Female.—Head metallic green above, with the ocelli conspicuously yellow; face black, lower border of frons, upper border of nasus, and rhinarium dull yellow, also genae and

base of mandibles; mentum black, sides yellow; occiput black, occipital triangle and two spots behind each eye yellow; a yellow transverse band on back of collar; thorax and abdomen black, thorax with a conspicuous median line; pleura greenish bronzy, with three rather narrow oblique yellow stripes, the first shortest and followed below by a curved yellow stripe above the middle coxæ; interalary spaces spotted with yellow; abdomen very slightly inflated at base, with no longitudinal line above, but with a yellow spot in front of the second segment, the sutures from the second to the fifth segments and the carina of the third segment narrowly yellow; a row of large lateral spots, divided by the carina, from the third to the seventh segments, a small one below the carina on the eighth, and an additional spot, bisected by a dark line, on each side of the median carina on segments 6 and 7. Legs black; front femora denticulated beneath, and with 1 long spine towards the extremity on the inner side; tibiæ setose beneath, with 5 long spines diminishing in length on the outer side, and 2 or 3 shorter ones on the inner; middle and hind femora with rows of spines, increasing in length towards the extremity and longest on the hind femora; middle tibiæ with 4 and hind tibiæ with 5 pairs of long oblique spines, not quite symmetrical. Claws large, curved, not toothed or bifid.

Wings yellowish hyaline, slightly smoky at the tips, neuration black; pterostigma very dark reddish brown; front wings with 16 or 17 antenodal cross-nervures, the last not continuous, and 10-11 postnodal cross-nervures; nodal sector much waved, one row of cells between the nodal and subnodal sectors, increasing towards the margin; sectors of the arculus rising at two thirds of its length; one cross-nervure in the lower basal cell; triangle traversed slightly above the middle, placed beyond the level of that of the hind wings, regular, and followed by 3 rows of post-triangular cells; subtriangular space consisting of 3 cells. Membranule of moderate size, grey, as also on the hind wings.

Hind wings with 10 antenodal and 11-12 postnodal cross-nervures; triangle open (the base placed nearer the base of the wing than the arculus), followed by one row of 3 cells and then by rows of 2 or 3 increasing; sectors of the triangle rising in a point at its lower angle.

Hab. Tonkin (*Fruhstorfer*).

A single female specimen of this handsome species.

XXX.—Description of a new Species of *Palophus* (Phasmida) from West Africa. By W. F. KIRBY, F.L.S., F.E.S.

LARGE Phasmida are probably numerous in Africa, but they are at present usually received only as single unpaired specimens, and are very little known. Herewith I describe a male specimen lately received from West Africa, allied to *Palophus centaurus* of Westwood, and associate with it, with some slight hesitation, a specimen which has been in the Natural History Museum for some years, included in the series of *P. centaurus*, from which it appears to be distinct, though the differences are less salient than in the male.

Palophus Alldridgei, sp. n.

Dimensions (♂).

	mm
Long. corporis..... (circa)	190
" capitis	5
" cornu	5
" pronoti	7
" mesonoti	27
" metanoti	10
" segm. med.	13
" tegm	16
Exp. al.	190
Long. fem. ant.	51
" " med.	38
" " post.	45

Dimensions (♀).

	mm.
Long. corporis	230
" capitis	8
" cornu	9
" pronoti	9½
" mesonoti	44
" metanoti	15
" segm. med.	20
" tegm	25
Exp. al.	175
Long. fem. ant.	63
" " med.	45
" " post.	50

Male.—Almost uniform wood-brown. Head with a double laminated crest, slightly oblique, trifid above, and slightly dentated in front; behind it is a short, pointed, conical tubercle on each side, and several smaller pointed tubercles. Median

segment trifold, with the middle section pointed in front, as in *P. centaurus* ♂. Front femora and tibiæ hardly curved, the others more or less so; four hinder tibiæ with an oval lamella near the extremity above, which is rudimentary on the front tibiæ; middle femora with a large single or double laminated and rectangular projection near the base; right-hand tibia with a small tooth on the under surface just beyond the lamella. Tegmina brown, blackish in the middle, with ill-defined white spaces towards the base, and near the middle of the costa. Coriaceous portion of the wings wood-brown, with blackish, occasionally interrupted, lines on the longitudinal nervures. Membranous portion of the wing hyaline, nearly the apical third (from about one third of the length on the costal side to about two fifths of the length of the hind margin) reticulated with light brown, and large partly connected white spots and markings, irregularly arranged in rows. The inner oblique border of this tessellated area becomes indistinct and irregular, fading into the hyaline portion of the wing.

Hab. Bonthe, Sherbro, W. C. Africa.

This specimen was found by Mr. T. J. Alldridge (after whom I have named it at his request) in his bedroom at Bonthe, and kindly presented by him to the Museum. The male is allied to *Palophus centaurus*, Westw., but longer, more slender, and with variegated wings. From *P. hippotaurus*, Karsch (which, judging from the description, I refer to *Bactrodema*, Stål), which it resembles in wing-coloration, it differs by its unarméd thorax. The males of *P. centaurus* in the Museum have the tips of the wings only slightly clouded, much less so than in the insect described and figured by Brongniart (Nouv. Arch. Mus. Paris, (3) iii. p. 197, pl. viii., 1892), which has the outer subcostal area of the wings tessellated, and perhaps belongs neither to *P. centaurus* nor to *P. Alldridgei*. The exact locality of Brongniart's specimen is not stated.

Female.—Light greyish brown; head with an erect double lamellated crest, tridentate above and slightly dentated in front; behind its base are two rows of raised spines on each side, the front and inner ones longest. Mesothorax with a short black dash on each side about the middle, but asymmetrical. Abdomen with a slight double lamella on the fifth segment. Front femora with a row of undulated lamellæ above and two near the middle on the outer side; tibiæ with three more distinct double ones on the outer and two smaller ones on the inner side (tarsi wanting). Middle and hind femora and tibiæ much arched, the femora with a large lamella above and below near the base; tibiæ with several

small and irregular lamellæ. Tegmina wood-brown, more strongly humped than in the male, blackish on the hump, and whitish towards the base. Wings as in the male, except that the whole membranous area is brown, tessellated with irregular rows of large subhyaline spots.

Hab. W. Africa (*Swazzy*).

In the true *P. centaurus* the wings of the female are blackish, with the subhyaline spots much more numerous, much smaller, less confluent, and more regular.

XXXI.—*Descriptions of new West-African Frogs of the Genera Petropedetes and Bulua.* By G. A. BOULENGER, F.R.S.

A FEW years ago* I had occasion to offer some remarks on the genus *Petropedetes*, Reichenow, and pointed out the differential characters of the three species then known, all three from West Africa, viz. *P. cameronensis*, Reichen., the type of the genus, with the toes half-webbed and the tympanum half the diameter of the eye; *P. Johnstoni*, Blgr., with a mere rudiment of web between the toes, and the tympanum half the diameter of the eye; and *P. (Tympnoceros) Newtomi*, Bocage, with a mere rudiment of web between the toes and with a very large tympanum, remarkable for the presence, in the male, of a dermal appendage projecting from its centre. I have since received examples of two new species, differing from those previously described in the fully webbed toes, and for these I propose the names *P. natator* and *P. palmipes*; the former is from Sierra Leone, the latter from South Cameroon. The genus *Bulua* was described by me quite recently † for a new frog from South Cameroon, *B. ventrimarmorata*; a second species, from the same country, may now be added, and is here described as *B. albiventris*.

Petropedetes natator.

Tongue rather feebly notched behind, without conical papilla. Vomerine teeth in two small groups close together behind the level of the choanæ. Head strongly depressed, a little broader than long; snout rounded, shorter than the

* P. Z. S. 1900, p. 439.

† Ann. & Mag. Nat. Hist. (7) xiii. 1904, p. 262.

orbit, with obtuse canthi and nearly vertical, concave lores; interorbital space as broad as the upper eyelid; tympanum moderately distinct, barely half the diameter of the eye. Fingers moderately elongate, much depressed, with large, cordiform terminal disks; first finger shorter than second; toes rather short, broadly webbed to the disks, which are a little smaller than those of the fingers; subarticular and inner metatarsal tubercles feebly prominent. The tibio-tarsal articulation reaches to between the eye and the tip of the snout; tibia half as long as head and body; foot about two fifths length of head and body. Upper parts closely covered with round granules intermixed with elongate warts; lower parts smooth. Male with internal vocal sacs, a sharp tooth-like process at the symphyseal extremity of each ramus of the mandible, and a more or less distinct large oval gland on the lower side of the thigh. Olive-brown above, with round darker spots on the body and cross-bars on the limbs; lower parts brown.

From snout to vent 55 mm.

Several specimens from Sierra Leone, presented to the British Museum by Major F. Smith, R.A.M.C.

Major Smith informs me the specimens were taken from a mountain torrent in a rocky bed at an altitude of 800 feet. The frog is a powerful swimmer and jumper, and clings to rocks, roots of trees, &c. by means of its digital disks.

Petropedetes palmipes.

Tongue rather feebly notched behind, with a conical papilla in the middle. Vomerine teeth in two short transverse or oblique series behind the level of the choanae. Head strongly depressed, as long as broad; snout obtusely pointed, a little shorter than the orbit, with obtuse canthi and very oblique concave lores; interorbital space narrower than the upper eyelid; tympanum rather indistinct, about one third the diameter of the eye. Fingers rather elongate, with large, cordiform terminal disks; first finger shorter than second; toes moderately elongate, webbed to the disks, which are a little smaller than those of the fingers; subarticular and inner metatarsal tubercles feebly prominent. The tibio-tarsal articulation reaches beyond the tip of the snout; tibia three fifths to two thirds as long as head and body; foot nearly half as long as head and body. Skin shagreened or glandular above; a more or less distinct glandular line along the middle of the head and body; lower parts smooth. Male with internal vocal sacs and a well-defined large oval gland

on the lower side of the thigh. Dark olive above, spotted or marbled with darker and lighter; limbs with broad dark and narrow light cross-bars; lower parts dirty white.

From snout to vent 53 mm.

Several specimens from Efulen, South Cameroon, collected by Mr. G. L. Bates.

Bulia albiventris.

Series of vomerine teeth nearly straight, widely separated in the middle, and not extending outwards beyond the choanae. Head much depressed, broader than long; snout short, rounded; no canthus rostralis; eye moderate; interorbital region about once and a half as broad as the upper eyelid; tympanum very indistinct, its diameter about half that of the eye. Fingers short, with slightly swollen tips, first and second equal; toes moderate, the tips dilated into small disks; subarticular and inner metatarsal tubercles feebly prominent. The tibio-tarsal articulation reaches the posterior border of the eye. Skin smooth. Dark brown or black above, with small round white spots on the sides; hind limb with light spots or marblings; lower parts white, throat sometimes marbled with brown.

From snout to vent 25 mm.

Three specimens from Efulen, South Cameroon, collected by Mr. G. L. Bates.

XXXII.—*Remarks on Mr. N. Rosén's List of the Snakes in the Zoological Museums of Lund and Malmö.* By G. A. BOULENGER, F.R.S.

THE naming of snakes from descriptions is a difficult task for beginners, who should not be encouraged to publish descriptions of so-called new species, which only go to swell the synonymy. There is no book in existence by the aid of which the difficulties connected with the study of the dentition can be entirely overcome, and I doubt whether such a book will ever be written. I have done my best to supply a guide to the determination of snakes ('Catalogue of Snakes in the British Museum,' 1893-1896), and that it does not work in the hands of some students, as evidenced by Mr. Rosén's paper published in the last number of these 'Annals,' I deeply regret.

Of the new species described the types of only two are figured with sufficient clearness to be recognizable, and both these prove to be identical with quite common species. *Coluber fasciatus* of Rosén is based on a *Drymobius Buddaertii*, var. *Rappii*, Gthr., and the snake from Java named after Prof. Lilljeborg, and for which a new genus is proposed under the preoccupied name *Anisodon*, is a *Psammodynastes pulverulentus*. Probably many of the other determinations, if they were looked into by a competent herpetologist, would be found to be unreliable.

There is, however, one case in which the identification cannot be questioned, and that is the common *Chrysopela ornata* figured on pl. xi. fig. 1. Of this snake I have examined the vertebræ in several specimens, in spirit or prepared as skeletons, and I cannot find more than a keel under the posterior precaudal vertebræ, which are figured by Mr. Rosén as with strongly developed hypapophyses (p. 171. fig. d). As this snake is quite common in collections, and the necessary examination can easily be made on a spirit-specimen, I would invite any reader who may be interested in this matter to verify my statement.

XXXIII.—*Crustacea Copepoda new to Science from Devon and Cornwall.* By Canon A. M. NORMAN, F.R.S., and THOMAS SCOTT, LL.D., F.L.S.

WE are preparing for publication a catalogue of the Crustacea of Devon and Cornwall. In that catalogue, while both authors are concerned in the whole, Dr. Scott will more especially undertake the part which relates to the free-living Copepoda, while the rest of the Crustacea will be chiefly treated of by Canon Norman. We have thought it desirable to publish the following preliminary descriptions of some new species of minute Copepoda. They were collected by Canon Norman during visits to the Devon and Cornish coasts in the years 1875, 1884, 1889, 1903, and 1904.

Genus STENHELIA, Boeck, 1864.

Stenhelia pygmaea, sp. n.

Description of the female.—Body moderately stout and tapering slightly towards the posterior end. The specimen from which the description is prepared was only .36 mm.

(about $\frac{1}{7}$ of an inch) in length and carried a single moderately large ovisac; the forehead is produced into a small but distinct rostrum.

Antennules short, eight-jointed, first and second joints large, the fourth to the seventh very small; the third and last are subequal and also small, but rather larger than the intermediate joints, as in the formula—

Proportional lengths of the joints	20	20	9	4	3	3	4	11
Numbers of the joints from proximal end of antennule.	1	2	3	4	5	6	7	8

Outer ramus of posterior antennæ small and triarticulate. Mandible-palp moderately stout, with two small branches. Second maxillipeds not very robust, and armed with slender elongated terminal claws.

Inner branches of first pair of legs slender and considerably longer than the outer branches, the first joint only slightly longer than the last, while the middle joint is rather more than half the length of the first; the outer branches reach to near the end of the middle joint of the inner branches. Second, third, and fourth legs also slender; the outer branches of the fourth legs are only slightly longer than the inner. Fifth pair of legs small: primary joint broadly subtriangular, but with the apex truncated and bearing three setæ of nearly equal length and one about the same length as the others near the distal end of the inner margin. Secondary branch moderately narrow, subcylindrical, tapering slightly towards the distal extremity; breadth scarcely equal to half the length; apex slightly produced in the middle to form the base for a slender seta; a slender seta springs from near the distal end of the inner margin, and there are also about four setæ on the outer margin, the two lower ones being stouter than the others.

Furcal joints very short.

Hab. Dredged near Eddystone Lighthouse, Aug. 31st, 1904; apparently not common. No males observed.

The small size of the female, the peculiar structure of antennules, of the first pair of legs, and the form and armature of the last pair distinguish this from any other known to us. This species has recently been observed in dredged material from the Firth of Forth.

Stenhelia simulans, sp. n.

Description of the female.—The female of this species has a general resemblance to *Stenhelia ima*, G. S. Brady. Antennules eight-jointed, moderately stout, scarcely so elongated

as those of *S. ima*; the first four joints are together equal to about twice the entire length of the last four; first, second, and fourth joints subequal, but the second rather longer than the other two; third about half the length of the second and nearly equal to the last; the fifth, sixth, and seventh small, as shown in the formula—

Proportional lengths of the joints..	20	26	12	20	6	7	9	14
Numbers of the joints.....	1	2	3	4	5	6	7	8

Antennæ nearly as in *S. ima*; outer ramus small, tri-articulate.

Second maxillipeds moderately stout; second joint about twice as long as broad, having a series of minute bristles arranged horizontally on the lateral aspect and near the middle, and with a small but distinct seta on the inner margin and towards the distal end; terminal claw moderately slender.

First pair of natatory legs moderately slender; the outer branches reach to about the end of the first joint of the inner, and the exterior spines are slender and elongated; each of the three joints fringed with minute cilia on the outer margin; first and second joints with also a number of delicate cilia on the inner margin; inner branches have the first joint rather longer than the entire length of the second and third, while the end joint is fully twice the length of the middle one. The last pair are somewhat similar to those of *S. ima*, but the secondary joints are proportionally broader, being about half as broad as long; there is also a slight difference in the armature.

Hab. Dredged near Chequer Buoy in the neighbourhood of Plymouth, Aug. 14th, 1903; apparently not common.

The more important differences between the species just described and *S. ima*, which it resembles, are found in the proportional lengths of the joints of the antennules, the greater proportional length of the outer branches of the first pair of legs, and in the secondary joints of the fifth pair being proportionally broader.

Stenhelia neglecta, sp. n.

Description of the female.—This species is moderately slender and about .8 mm. in length. Rostrum moderately elongated and slender. The antennules resemble those of *Stenhelia ima* in length and number of joints, but the lengths of the joints differ as shown by the formula—

Proportional lengths of the joints..	14	8	6	10	2	4	3	7
Numbers of the joints.....	1	2	3	4	5	6	7	8

Outer ramus of the antennæ small and apparently triarticulate, but the middle articulation is minute and somewhat indistinct.

First pair of legs slender; inner branches moderately elongated; first joint about as long as the entire outer branch, while the second and third are about half the length of the first, the middle joint being very small. The next three pairs are also slender and elongated; the inner branches of the fourth pair, which are somewhat shorter than the outer, are provided with a moderately long plumose seta near the middle of the inner margin of each of the three joints, two similar setæ and a small spine spring from the apex of the last joint. The fifth pair are of moderate size; inner portion of primary joint narrow, subtriangular, and provided with a seta and two moderately stout spines on the inner margin and two setæ at the apex; the secondary joint, which is rather narrow, subcylindrical for about three fourths of its length, then tapering obliquely to the pointed extremity, extends considerably beyond the end of the primary branch, and is furnished with two setæ on the distal half of the inner margin, two on the outer margin, and one at the apex.

Furcal joints very short.

Hab. Dredged at Salcombe in 1875, and in Mill Bay, Plymouth, among algæ, in August 1903.

This may be distinguished from other described species by the structure of the slender first pair of natatory legs and the peculiar form of the female fifth pair.

Stenhelia varians, sp. n.

In this species the female closely resembles *Stenhelia neglecta*, just described, but differs in the following more or less important particulars:—The first four joints of the eight-jointed antennules are together nearly three times the entire length of the last four; the second joint is the longest and is more than twice the length of the third, while the fourth is about one and a half times longer than the same joint; the next three joints are very small and subequal, but the end joint is about as long as the combined lengths of the two preceding ones, as indicated by the formula—

Proportional lengths of the joints. .	8	17	8	12	3	4	4	7
Numbers of the joints.	1	2	3	4	5	6	7	8

The outer rami of the second antennæ are triarticulate, the middle joint being the smallest. The mouth-organs and natatory legs are similar to those of *S. neglecta*. The fifth

pair also resemble in some respects those of the species referred to, but differ somewhat in form and armature; the primary joints terminate in a narrower apex, and on the inner margin there are short and subequal setæ and two slender terminal setæ of unequal length; the space that separates this pair of setæ from the nearest of the other three is distinctly wider than that which separates these three from one another; the secondary joints are subovate and nearly twice as long as broad; the outside edge is nearly straight, but the inner is broadly convex; a seta springs from near the middle of the outer margin and four from the angularly rounded extremity of the joint.

Furcal joints short.

Hab. Dredged outside the harbour at Fowey, Cornwall, May 12th, 1903; not common. No males were observed.

Stenhelia longirostris, sp. n.

The form we describe under this name was dredged at Salcombe in 1875. It is not unlike *S. reflexa*, T. Scott, in its general appearance and in the structure of some of its appendages; it is, however, a smaller species, the specimen from which the description was prepared measured about $\cdot 88$ mm. ($\frac{1}{8}$ of an inch) in length. Body subcylindrical, with the forehead produced into an elongated and rather slender rostrum. The first joint of the eight-jointed antennules in the female is slightly longer than the second and nearly twice as long as the third joint; the fourth, which is also rather longer than the third, has the upper distal angle produced forward to near the end of the following joint to form the base of a long sensory filament; the fifth, sixth, and seventh joints are small and nearly equal in length, while the last is about twice the length of the preceding one. The formula shows approximately the proportional lengths of all the joints—

Proportional lengths of the joints..	13	11	7	9	3	3	3	5
Numbers of the joints.....	1	2	3	4	5	6	7	8

The three-jointed outer ramus of the second antennæ is of moderate length.

The first joint of the second maxillipeds bears two moderately long setæ on the inner aspect of the distal end; second joint narrow, subcylindrical, and furnished with a longitudinal row of spinules on its inner aspect, and a small seta near the middle and another near the end of the inner margin; terminal claw slender and moderately elongated. In the

first pair of natatory legs the proximal joint of the inner branches is about equal to the entire length of the outer, but the second joint is only about half the length of the third, while the second and third joints are together about equal to two thirds the length of the proximal joint; the joints of the outer branches are subequal. The next three pairs are similar to those in *Stenhelix reflexa*.

The fifth pair has the inner portion of the primary joint produced into a narrow subtriangular plate, the bluntly rounded apex of which reaches to about the middle of the secondary joint; there are three setæ on the inner margin, the upper two are short and subequal, the lower moderately elongated; there are also two slender and moderately long apical setæ of unequal length. The secondary joint is moderately narrow and elongated, the breadth being scarcely half the length; it is broadest near the proximal end and tapers gradually to the truncate and somewhat angular apex; a small seta springs from near the distal end of the inner margin, two of moderate length from the truncate apex, and three small ones from the lower half of the outer margin; that one of these three which is nearest the distal end is the smallest and is provided with a peculiarly thickened base.

No males of this species have been observed. The peculiar form and armature of the fifth pair of thoracic feet appear to be characteristic of the species.

The furcal joints in this species are short.

GENUS PARASTENHELIX, I. C. Thompson & A. Scott, 1903.

Parastenhelix anglica, sp. n.

The genus *Parastenhelix* was instituted by I. C. Thompson and Andrew Scott for two species which, though having a close resemblance to *Stenhelix*, differ in possessing nine-jointed antennules, in the middle joint of the outer ramus of the antennæ being nearly as long as the joint on either side, and in having the inner branches of the first natatory legs two-jointed, the first joint being considerably longer than the three-jointed outer branches. The form I have now to describe agrees so closely with the typical species that I have little hesitation in ascribing it to the same genus, even though the inner branches of the first pair of legs be apparently three-jointed. In this form the antennules are composed of nine joints; the first four are together equal to fully twice the entire length of the other five, the second is considerably

longer than the third or fourth, which are subequal; all the other joints are smaller, as shown by the formula—

Proportional lengths of the joints.	25	.46	.34	.34	.12	.10	.8	.6	.16
Numbers of the joints	1	2	3	4	5	6	7	8	9

The outer ramus of the second antennæ is three-jointed and moderately elongated, the middle joint being about as long as the end one.

The mandibles resemble those of *Stenhelia*; the basal joint of the mandible-palp becomes broader towards the distal end and is furnished with two unarticulate branches, the distal one being more elongated than the other. The second maxillipeds resemble those of *Stenhelia hispida*, G. S. Brady.

The first thoracic legs have the inner branches very long and slender and apparently three-jointed; the first joint is about half the length of the second, but the end one is very short; a plumose seta springs from the inner distal angle of the first joint, while the end joint bears two claw-like terminal spines of unequal length; the outer branches reach to about the middle of the inner ones. The second, third, and fourth pairs are slender and moderately elongated; in the outer branches of the fourth pair the first and second joints bear exteriorly a small spine near the distal end and a plumose seta on the inner margin, while the end joint is furnished with two terminal spines—one small and one long and slender—and a moderately long seta; the first two joints of the inner branches are each furnished with a seta on the inner margin, while two setæ spring from the inner margin of the third joint, which also bears two setæ and a small spine at the apex. The fifth pair has a small primary joint, subtriangular in form and provided with five setæ on the lower half of the inner margin and apex. The secondary joint is elongated, the upper portion is subcylindrical, the greatest breadth being equal to about a third of the entire length; at about a third from the distal end the outer margin slopes gradually inwards till it meets the nearly straight inner margin; a single short seta springs from near the lower end of the inner margin and five from the distal third of the outer margin, the apical and middle setæ being elongated, but the other three moderately short.

Furcal joints very short.

Hab. Dredged outside of Fowey Harbour, Cornwall, on May 9th, 1903; rare. No males were observed.

Genus AMEIRA, Boeck, 1864.

Ameira simplex, sp. n.

Description of the female.—Body moderately slender; rostrum somewhat prominent; length .64 mm. ($\frac{1}{10}$ of an inch).

Antennules short, moderately stout, eight-jointed, first and second joints longer and somewhat more robust than the others, third to the sixth short and subequal; the last two are also small, as shown by the formula—

Proportional lengths of the joints..	15	15	9	8	6	7	3	5
Numbers of the joints.....	1	2	3	4	5	6	7	8

Antennæ small, outer ramus short and unarticulate and provided with a few terminal setæ. Mandibles also small, mandible-palp simple and one-branched.

Inner branches of first natatory legs elongated and slender; first and third joints nearly equal in length, second about half as long as the first; the outer reach nearly to the end of the second joint of the inner branches. The other three pairs are also moderately slender, and the outer branches are rather longer than the inner ones.

Fifth pair small, inner portion of primary joint subcylindrical, with the apex obliquely truncated and bearing five setæ, the second seta from the outside being much longer than the others. Secondary joint subovate, length nearly twice the width at the proximal end, the outer and inner margins are only slightly rounded and taper gently towards the narrowly rounded apex; they are each furnished with five setæ, four (three elongated and one—the second from the outside—small) are carried on the rounded apex, and a small one on the proximal half of the outer margin.

The furcal joints are fully half as long as the last abdominal segment.

Hab. Dredged in the estuary of the Exe, near Starcross, June 9th, 1884; apparently rare. No males observed.

This species bears a close resemblance to *Ameira exigua*, T. Scott, but it differs to some extent in the proportional lengths of the joints of the antennules, in the armature of the mandible-palp, in the outer branches of the first thoracic feet being as long as first and second joints of the inner branches, as well as in the joints of the inner branches being different in their proportional lengths; the armature of the fifth pair is also different in the two species.

Genus LAOPHONTINA, nov.

Somewhat like *Laophonte* in general appearance. Anterior antennæ short and composed of about six joints. Outer ramus of posterior antennæ uniaarticulate. First pair of natatory legs nearly as in *Laophonte*. Second and third pairs one-branched and more or less rudimentary. Fourth pair two-branched, outer branches three-, inner one-jointed. Fifth pair as in *Laophonte*. Only one species is known, which is described below.

Laophontina dubia, sp. n.

Length of female about .5 mm., male rather smaller. Body somewhat slender. Antennules of the female short, six-jointed; first joint stout, longer than any of the others, and with a small tooth-like process near the middle of the exterior margin and another at the inner distal angle; second joint shorter than the first and armed exteriorly with a strong projecting tooth; third rather longer, but less robust than the second; fourth and fifth very small; the last joint is longer than the fourth and fifth combined.

The male antennules are modified for grasping, but the first and second joints are similar to those of the female.

Posterior antennæ moderately slender, outer ramus small and uniaarticulate.

First thoracic feet as in *Laophonte*; inner branches elongated, two-jointed; first joint long and slender, the other short and armed with a long stout terminal claw; inner branches very small and uniaarticulate and furnished with a few small setæ. Second pair rudimentary, one-branched, each composed of a single short but moderately stout joint, bearing a few small setæ. Third pair also rudimentary and one-branched, but the branch is two-jointed and bears two spiniform terminal setæ. Fourth pair two-branched; outer branch short, stout, and three-jointed; the first and second joints bear moderately long and stout spine-like setæ on their outer margins; the end joint is very small and bears two apical setæ, one long, the other shorter and spiniform; inner branch small and uniaarticulate and furnished with elongated setæ. The fourth pair in the male are smaller than in the female and the inner branches are nearly obsolete.

The fifth pair in the female moderately large and foliaceous; primary joints broadly triangular and provided with about four plumose setæ, one at the apex and three on the inner margin; secondary joints ovate, the length being equal to

about twice the breadth; they are each provided with four plumose terminal setæ.

In the male the fifth pair are very small and rudimentary.

Furcal joints slender and about equal in length to the last abdominal segment; principal tail-setæ somewhat dilated at the base.

Hab. Dredged at St. Mary's, Scilly Islands, in May 1903.

Genus DACTYLOPUSIA, A. M. Norman, 1903*.

Dactylopusia valida, sp. n.

This species resembles *Dactylopusia tisboïdes* (Claus) in its general appearance and size. The eight-jointed antennules are short and stout; the first and second joints are longer and the fifth and seventh shorter than the others; the other four, which are nearly of equal length, are each about a third shorter than the first or second, as shown by the formula—

Proportional lengths of the joints..	13	11	7	8	5	8	5	8
Numbers of the joints.....	1	2	3	4	5	6	7	8

The three-jointed outer ramus of the posterior antennæ is moderately large and stout and provided with several setæ. The mouth-organs resemble those of *D. tisboïdes*, but the second maxillipeds are moderately stout and their terminal claws elongated and slender.

The first pair of swimming-feet are moderately stout; the outer branches are rather more than half the length of the inner and armed exteriorly with strong spines; the first and second joints are very robust, their width being about equal to three fourths of the length; the end joint is very short and furnished with four spines and a seta; the spines are of unequal length, the two outer being very small, the other two strong and slightly clawed, the inner being the longer; the inner branches are also moderately stout, the first joint elongated, the second and third very short, and the third armed with one long and one short and stout terminal claw. The second, third, and fourth pairs resemble the same three pairs in *D. tisboïdes*.

In the fifth pair the primary joints are moderately elongated and reach to about the extremity of the secondary joints; they taper slightly to the rounded distal end, which

* Cf. Ann. & Mag. Nat. Hist., April 1903. Norman, on change of names.

carries five setæ; the setæ are arranged in three groups—the two outer are close together, so also are the next two, but there is a moderately wide space between the two pairs of setæ and also between the inner pair and the last seta situated a small distance up on the inner edge; in the space between the outer and inner pairs there appears to be a small spine. The secondary joints are broadly ovate, the length being scarcely twice the width at the broadest part; the inner margin is nearly straight, but the outer is moderately convex; a small seta springs from the middle and an elongated one from near the distal end of the inner margin, while other five are arranged round the lower half of the outer margin and apex.

The furcal joints are very short.

Hab. Dredged near Beggar's Island, Plymouth, in 1889; apparently not very common.

This species is readily distinguished by the robust form and structure of the first pair of natatory legs, the stout eight-jointed antennules, and the form and armature of the fifth feet.

Dactylopusia ornata, sp. n.

Description of the female.—Body moderately robust; length .62 mm. ($\frac{1}{16}$ of an inch).

Antennules short, moderately stout, and composed of six subequal joints. Outer ramus of posterior antennæ apparently only two-jointed. Mouth-organs as in *D. rostratus*, T. Scott.

The first thoracic legs are short and stout; the three-jointed outer branches are rather shorter than the first joint of the inner ones; the first two joints have the outer margin fringed with short setæ, and a setiferous spine springs from their outer distal angles; the second joint bears also a plumose seta on its inner margin; the end joint is small and bears several spiniform apical setæ. The inner branches appear to be only two-jointed; the first is stout and elongated, and bears a long plumose seta on its inner margin; the end joint is short and probably composed of two coalescent joints, it is furnished with a stout and slightly curved claw-like terminal spine. The next three pairs resemble those in *D. rostrata* (T. Scott).

The fifth pair are broadly lamelliform; the primary joint bears interiorly five setæ of unequal lengths on the broadly rounded distal edge; the secondary joint is subquadrangular and carries five stout setæ, one being near the distal end of

the outer margin, three on the truncated apex, and one on the inner margin.

The furcal joints are very short.

The male does not differ greatly from the female except in the following particulars:—the antennules are modified for grasping, the outer branches of the second thoracic feet are armed with stronger spines than the same pair in the female, and the inner branches are only two-jointed, and the terminal spine is stout and claw-like.

The fifth pair are rather smaller than those of the female and the inner and broadly rounded portion of the basal joint bears only two apical spines.

Hab. Dredged at various places on the coast of Devon; moderately frequent. Also at Fowey, Cornwall, and New Grimsby Harbour, Scilly Islands.

Recently collected specimens were easily recognized by their peculiar colour, which was for the most part of a uniform yellow or, in some examples, yellowish grey; but what rendered the specimens so conspicuous was a band of a fine purple colour which adorned the posterior portion of the cephalic segment; this band, which covers about a third of the segment, does not extend right across, but terminates on each side a short distance from the lateral margins; moreover, the posterior edge of the band is even and coincides with the edge of the cephalic segment, but the anterior edge is deeply crenulated. Immersion in methylated spirit speedily destroys the purple colour, but the colour remains intact for a considerable time if specimens be preserved in formalin.

Dactylopusia purpurocincta, sp. n.

In this species the body is depressed, but moderately stout, and in general appearance resembles *D. flava*, Claus; length about .5 mm.

Seen from above the cephalothoracic segment is broadly and evenly rounded in front and about as long as the remaining segments of the thorax; the three segments immediately posterior to that of the cephalothorax are of a dark purplish-brown colour, but the ground-colour of the body is light yellowish.

The antennules are short and stout and appear to be composed of seven joints; the first and second, which are robust, are longer than the others. The formula shows approximately the proportional lengths of the various joints—

Proportional lengths of the joints..	14	13	8	8	5	3	7
Numbers of the joints.....	1	2	3	4	5	6	7

Antennæ stout, outer rami slender, of moderate length, and apparently only two-jointed.

The first pair of swimming-feet short and robust: outer branches considerably shorter than the inner and furnished with long, spiniform, coarsely plumose setæ on the outer margin; inner branches apparently only two-jointed, the first joint longer than the entire outer branches and strongly dilated interiorly, as in the male of *D. flava*, second and third joints coalescent and bearing a short stout terminal claw and a moderately long spiniform seta. The next three pairs are somewhat similar to those of *D. tisboides*.

The fifth feet are moderately large; primary joint a broadly quadrangular lamelliform plate bearing five strong, plumose, spiniform setæ on the distal margin, which is broadly truncate; a comparatively wide space separates the outermost seta from the one next to it. Secondary joint subcylindrical, but becoming narrower from about the middle of the joint to the end; inner margin nearly straight, with a short seta on the lower half; two stout spine-like setæ spring from the lower half of the outer margin and two from the apex.

Furcal joints very short.

Male unknown.

Hab. Dredged at Salcombe, June 30th, 1875.

This form closely resembles *D. laticaudata* and *D. æmula*, described by I. C. Thompson and A. Scott in their Report on the Copepoda collected by Professor Herdman at Ceylon in 1902. The two species, with that just described, differ in some respects from the typical *Dactylopusia*, and, as suggested by the authors referred to, "may some time require a separate genus." The coloured band in this species appeared to be quite unaffected by the long immersion in methylated spirit, forming a marked contrast to the evanescent colour of *D. ornata*.

Genus PELTIDIUM, Philippi, 1839.

Peltidium conspicuum, sp. n.

A single specimen of an apparently undescribed *Peltidium* was obtained in New Grimsby Harbour, Scilly Islands, May 23rd, 1903. It was of a uniform dark purple or ruby colour, and therefore conspicuous in the sample in which it occurred.

P. conspicuum has a general resemblance to *P. purpureum*, Philippi, but is rather larger, and the carapace wants the pellucid areas so characteristic of that species, being, on the

contrary, of a dense uniform purple or ruby colour. It measures about 1.3 mm. ($\frac{1}{15}$ of an inch) in length. The rostrum truncated, not much produced, the truncated end being obscurely tridentate.

Antennules short, stout, and six-jointed; first three joints subequal and about twice the entire length of the last three, the penultimate joint being very small; antennæ and mouth-organs as in *P. purpureum*.

The first pair of swimming-feet resemble those of the same species, but the first and second joints of the outer branches are of nearly equal length; they each bear a short seta near the middle of the outer margin and a similar seta near the distal end of the inner margin; the end joint is very short and furnished with three claws (two stout and of moderate length and one short) and a small seta. The inner branches are stout and composed of two joints; a seta springs from the distal end of the inner margins of the first and second joints, but the second joint is also furnished with two apical setæ. The second, third, and fourth pairs are apparently similar to those of *P. purpureum*. In the fifth pair the primary joint appears to be short and bears one seta on the outside and two on the inside distal angles; the second joint is also short and provided with six stout plumose setæ on the lower half of the outer margin and apex.

The first segment of the abdomen forms a trilobed plate which entirely overlaps the remaining abdominal segments and furcal joints, and in this respect differs very markedly from other described species; in these the last abdominal segment and furcal joints are exposed.

Genus MESOCHERES, nov.

Body somewhat similar in general appearance to *Scottocheres*, Giesb., the cephalothorax seen from above being ovate in outline, while the abdomen is narrow and elongated. The antennules are composed of twenty-one joints and are similar in structure to those of *Asterocheres*. The antennæ also resemble those in the same genus. The mandibles and maxillæ were damaged and could not be satisfactorily made out. The first maxillipeds are small but moderately stout, their terminal claws elongated and strongly hooked and with an elongated spine attached near the base of the claw. Second maxillipeds long and slender, and similar in structure to the same appendages in *Asterocheres*. First four pairs of swimming-feet somewhat similar to those of the same genus. Fifth pair very small and apparently two-jointed.

This genus partakes of the characters of the two genera *Asterocheres* and *Scottocheres*, but differs from both as described above.

Mesocheres anglicus, sp. n.

Cephalothorax of the female ovate, moderately robust, widest in the middle, the width being equal to fully half the length; first segment about one and a half times longer than the other segments combined: abdomen narrow and elongated, as in *Scottocheres longifurca*, Giesb., and composed of three segments, the first rather longer than the second and third together; it is widest at the proximal end and produced on each side into a hook-like process, as in the *Scottocheres* referred to; the anal segment is the smallest of the three, being only a little more than half the length of the preceding one. The furcal joints are long and slender and about four times as long as the last segment of the abdomen; the outer edge of each joint is fringed with minute bristles, and the principal apical setæ are only moderately elongated. Length about .65 mm. ($\frac{1}{38}$ of an inch).

Antennules composed of twenty-one joints and somewhat similar in structure to those of *Asterocheres Boeckii*; a moderately stout sensory filament springs from the end of the eighteenth joint. Antennæ three-jointed, the first joint longer than the next two together, the third small and furnished with one long and two short apical setæ; outer ramus small, uniaarticulate, with one or two slender apical setæ.

First maxillipeds short, armed with elongated, stout, strongly curved terminal claws; a moderately long spiniform seta springs from near the base of the claw. Second maxillipeds long, slender, and similar to the same appendages in *Asterocheres Boeckii*.

First four pairs of swimming-feet somewhat similar to those of the same species, but the armature differs to some extent, and especially that of the fourth pair; in this pair the spines on the outer margin and apex of the outer branches are large and broadly dagger-shaped, and they are all, with the exception of the inner terminal spine, finely serrated on both edges, but the inner terminal spine is only serrated on the outer edge; the first and second joints are also provided with a plumose seta on the inner margin, while the last joint bears four plumose setæ on the inner margin in addition to the four large spines on the outer margin and apex. The first joint of the inner branches bears one seta and the second and third joints two setæ on the inner margin; a similar seta

springs from a notch near the middle of the outer margin of the third joint, which is also armed with a large dagger-shaped terminal spine. The fifth pair are very small; the primary joint is nearly twice as broad as it is long and bears a single spiniform seta on the exterior distal angle; the secondary joint is indistinctly trilobed and carries two or three setæ.

Hab. Dredged in Plymouth Sound on August 12th, 1903.

Genus HERRMANNELLA, Canu, 1891.

Herrmannella parva, sp. n.

Description of the female.—Similar in general appearance to *H. rostrata*, Canu, but smaller; length of the specimen described .68 mm. ($\frac{1}{37}$ of an inch).

Antennules short and composed of seven joints, the proportional lengths of which are given in the formula—

Proportional lengths of the joints. .	14	.34	.8	.19	.19	.14	.8
Numbers of the joints.	1	2	3	4	5	6	7

Antennæ stout, four-jointed, but the penultimate joint is very small; terminal setæ curved, claw-like, and exhibiting a pseudo-articulation near the middle, as in some species of the Lichomolgidæ.

Mandibles in the form of broad falciform plates, which taper gradually to the acuminate apex. Maxillæ subcylindrical, simple in structure, and bearing each a small marginal and apical seta. First maxillipeds short, stout, and armed with a slender, curved, terminal appendage, bearing a unilateral row of small spinules, while a moderately long spiniform seta springs from the inner margin and near the base of the curved terminal appendage. The second maxillipeds are moderately stout, two-jointed, and provided with a stout terminal claw, as in *Lichomolgus liber*, Brady and Robertson.

The thoracic feet are somewhat similar to those of *Herrmannella rostrata*, Canu, but are scarcely so stout; both branches of the fourth pair are three-jointed; the first and second joints of the outer branches have each a small dagger-shaped spine at the distal end of the exterior margin, while the third joint has a similar spine in the middle of the outer margin and two apical spines, the inner one being about as long as the joint from which it springs; moreover, the second joint bears one long plumose seta and the third five similar setæ on the inner margin; the first and second joints of the inner branches have each a single seta near the distal end of

the inner margin, while the third joint bears only two terminal spines, the inner one stout and about twice as long as the other. Fifth pair very small; each foot consists of a single joint which bears two small terminal setæ.

The abdomen is moderately slender and composed of four segments; the genital segment is somewhat dilated and about equal in length to next three segments taken together; the second and third segments are small, while the fourth is rather longer than the preceding one.

The furcal joints are about twice as long as the last abdominal segment; each joint is furnished with several terminal setæ, and a single small bristle springs from near the middle of the outer edge.

Hab. Taken in Plymouth Sound, among Hydrozoa &c., near low-water, in August 1903; rare.

This small species resembles a diminutive *Pseudanthossius gracilis*, but the structure of the fourth pair of thoracic legs shows that its relationship is with Canu's genus *Herrmannella*. It differs, however, from any *Herrmannella* hitherto described by the form of the mandibles, the proportional lengths of the abdominal and furcal joints, and one or two other points mentioned in the description.

XXXIV.—*Descriptions of Two new Cyprinid Fishes from Tibet.* By C. TATE REGAN, B.A.

Gymnocypris Waddellii.

Pharyngeal teeth 4:3—3:4, cylindrical, obtusely pointed, slightly incurved. Depth of body about 5 in the length, length of head about 4. Breadth of head about $1\frac{3}{4}$ in its length, diameter of eye 6-8, length of snout $3\frac{1}{3}$ - $3\frac{2}{3}$, interorbital width 3- $3\frac{1}{3}$. Snout obtuse; mouth terminal, oblique; anterior edge of upper jaw not below the level of the lower margin of eye; maxillary nearly reaching the vertical from the anterior margin of eye. 10-13 gill-rakers on the lower part of the anterior arch, 2 or 3 on the upper part. Dorsal III 8, its origin a little nearer to tip of snout than to base of caudal; third simple ray slender and articulated above, slightly thickened and finely serrated in its basal half (in the two smaller examples), or not serrated (in the two larger ones). Anal III 5, extending to the base of caudal when laid back. Origin of ventral below about the middle of dorsal.

Caudal forked. Caudal peduncle about $2\frac{1}{2}$ as long as deep. Greyish above, silvery below. Head, body, and fins (the ventrals sometimes excepted) covered with dark spots of small or moderate size.

Four specimens, 300–400 mm. in total length, from the Yamdok Lake, a large lake without outlet at an altitude of 14,800 feet. They were obtained by Lieut.-Col. L. A. Waddell, C.B., who preserved them in salt and has presented them to the British Museum.

Nemachilus lhasæ.

Depth of body $7\frac{1}{3}$ in the length, length of head $4\frac{2}{3}$. Snout a little longer than postorbital part of head, twice as long as eye, the diameter of which is $4\frac{2}{3}$ in the length of head and equal to the interorbital width. Breadth of head $1\frac{2}{3}$ in its length and very slightly greater than its depth. Cleft of mouth extending to below the nostrils; lips moderately thick, plicated, the lower interrupted medianly; barbels six; outer rostral barbel nearly reaching the middle of the maxillary barbel, which is $1\frac{1}{2}$ the diameter of eye. Scales entirely wanting. Dorsal II 9, its origin nearly equidistant from tip of snout and base of caudal; free edge of the fin concave. Anal II 5. Pectoral extending $\frac{5}{8}$ of the distance from its base to the base of ventrals. Ventrals 9-rayed, extending to the origin of anal. Caudal emarginate. Caudal peduncle slender, $6\frac{1}{2}$ as long as deep and $1\frac{1}{2}$ the length of head. Olivaceous, with traces of darker cross-bars on the back; dorsal and caudal fins with small dark spots.

A single specimen, 84 mm. in total length, from Lhasa, collected by Capt. H. J. Walton.

Allied to *N. stenurus*, Herz.

When writing my descriptions of the Cyprinid fishes collected by Capt. Walton (*suprà*, p. 185) I overlooked this specimen.

XXXV.—*On new Species of Histeridæ and Notices of others.*
By G. LEWIS, F.L.S.

THIS paper is written to found a new genus and to describe three new species, the names of which are given in the 'Catalogue of Histeridæ' which will shortly be published. It is the twenty-fourth of the series in this Magazine; the previous paper is in vol. xiv. p. 137 (1904).

CYLISTOSOMA, gen. nov.

Body elongate, cylindrical; head retractile, with a frontal stria; thorax, antennal fossettes widely open below; elytra striate, striæ sometimes complete; prosternum compressed, striate in the typical species, rounded off at the base and received into the mesosternum; mesosternum emarginate or widely sinuous anteriorly; anterior tibiæ dentate on the outer edge.

I consider *Platysoma Richteri*, Sch., the type of *Cylistosoma*, and closely similar to it are other species from Madagascar, viz. *Platysoma (Teretrius) Fairmairei*, Théry, *obliquum*, Lew., *pulvinatum*, Sch., *quadricolle*, Lew., and in all of these the prosternal keel is distinctly striate. In the Catalogue I have associated all the cylindrical *Platysomæ* temporarily with the above, because the genus *Platysoma* as it has hitherto stood cannot be conveniently studied without division.

Hololepta trulla, sp. n.

Elongata, parallela, depressa, nigra, nitida; fronte haud striata; elytris, striis 2 dorsalibus brevissimis, 1^a appendiculata; propygidio sulco arcuatim integro, utrinque foveolato; pygidio impunctato.

L. $7\frac{1}{4}$ mill. (absque mandibulis).

This species is extremely similar to *H. paropsis*, Lew., but it is more parallel laterally; the male has no thoracic fossæ, the arched sulcus on the pygidium is somewhat angulate in the middle (not formed as a Moorish arch, as in *H. paropsis*), and posteriorly on the inner edges of the sulci are shallow but well-marked foveæ, one on each side. There is no trace of a carina on the mentum in the male.

Hab. Lake Tanganyika, Central Africa.

Lioderma acutipectum, sp. n.

Oblongum, subconvexum, nigrum, nitidum; fronte haud striata; elytris, striis, 1 brevi, 2 integra, 3 brevissima; propygidio circum parce punctato; pygidio dense punctato; prosterno ante coxas angustato.

L. 12 mill. (absque mandibulis).

Oblong, somewhat convex, black and shining; the head is nearly flat on its vertex and is without striæ, and the mentum of the male is not carinate; the thorax, the marginal striæ terminate near the eyes and the male has no fossettes, behind the anterior angles a few vague punctures are visible;

the elytra, subhumeral furrow is shortened at either end, the first dorsal stria is basal and is one third of the elytral length, the second is well marked and complete and evenly bent throughout its entire length, the third very short and basal; the propygidium is scantily punctate laterally; the pygidium is somewhat convex and densely punctate; the prosternum is triangulate at its base, but before the coxæ the keel is narrow like that of *Oxysternus*, hence its trivial name; the anterior tibiæ are 4-dentate.

The prosternal keel is similar to that of *Lioderma dorcoides*, Lew. *Hololepta strigilata*, Sch., from East Africa, also has a narrow prosternal keel, and should therefore, I think, be placed in *Lioderma*.

Hab. Kamerun, West Africa (*Dr. Sjöstedt*). One male example in the Stockholm Museum.

Hister laqueatus, sp. n.

Breviter ovalis, parum convexus, niger, nitidus; fronte, stria integra in medio retrorsum acuminata; pronoto, stria laterali valida, basi abbreviata, ad angulos punctato; elytris, striis 1-3 validis, integris, 4 basi evanescenti, 5 et suturali basi conjunctis; propygidio pygidioque lævibus; tibiis anticis extus 4-dentatis.
L. $4\frac{3}{4}$ - $5\frac{1}{4}$ mill.

Shortly oval, somewhat convex, black and shining; the head, surface punctulate, feebly impressed anteriorly, stria complete, strong at the sides, and acuminately turned backwards anteriorly; the thorax, lateral stria strongly impressed, well shortened before the base, and continued behind the head, within the stria the anterior angles have a cluster of punctures, the basal edge is also pointed; the elytra, striæ, inner humeral strong, apical, and dimidiate, 1-3 dorsal also strong and complete, interstices of 2-3 is wide at the base, 4 is evanescent or vaguely impressed at the base, 5 and sutural are looped together at the base, but the fifth is lightly impressed on the dorsum; the propygidium and the pygidium are nearly smooth, the punctuation being extremely fine; the prosternum, the anterior lobe is finely marginate, keel without striæ and narrowed between the coxæ; the mesosternum is widely arched anteriorly and marginate; the anterior tibiæ are 4-dentate on the outer edge.

On account of its general sculpture this species may be placed near *H. conformis*, Er., and *H. rubricatus*, Lew. The inner subhumeral striæ are similar in all.

Hab. Kamerun (*Dr. Sjöstedt*). In the Stockholm Museum and my own collection.

XXXVI.—*Rhynchotal Notes*.—XXX. By W. L. DISTANT.Subfam. *CICADINÆ* (continued from p. 70).

Division LAHUGADARIA.

This division is primarily divergent from *Dundubiaria* by the non-dentate lateral margins of the pronotum; the tympana are completely covered, the tympanal flaps broader than long; the opercula short, somewhat globose, wider than abdominal margin, and distinctly visible from above.

LAHUGADA, gen. nov.

Head (including eyes) considerably narrower than base of mesonotum, its length about equal to space between eyes, its lateral margins discontinuous, the lateral margins of front being almost at right angles to those of vertex; pronotum almost as long as mesonotum, narrowed anteriorly, the posterior angles prominent and rounded; abdomen considerably longer than space between apex of front and base of cruciform elevation; tympana completely covered, tympanal coverings broader than long; opercula short, somewhat globose, wider than abdominal margin, and distinctly visible from above; rostrum about reaching the posterior coxæ; tegmina and wings hyaline, the first with eight apical areas and the basal cell longer than broad.

Type, *L. Dohertyi*, Dist. (*Pomponia*).

Subfam. *GEANINÆ*.

I propose this subfamily for the reception of a considerable number of genera in which the tympanal coverings are present but imperfect and the tympanal orifices are more or less exposed.

Three subfamilies may be thus differentiated:—

- | | |
|--|---------------------|
| A. Tympanal coverings present. | |
| <i>a.</i> Tympanal coverings entirely concealing tympanal orifices | <i>Cicadineæ.</i> |
| <i>aa.</i> Tympanal coverings imperfect, more or less exposing tympanal orifices | <i>Geanineæ.</i> |
| B. Tympanal coverings absent | |
| | <i>Tibicinineæ.</i> |

Division CICADATRARIA.

In this division the tympanal coverings are rounded anteriorly, not angulate—either completely covering the orifices

anteriorly and exposing them interiorly or the reverse, or smaller, exposing them both anteriorly and interiorly; the lateral margins of the pronotum are not convexly ampliate nor medially angulate; the tegmina and wings are hyaline, sometimes maculate.

The genera composing this division are confined to the Palearctic, Oriental, and Malayan regions and represented in Japan.

Synopsis of Genera.

1. Abdomen not tuberculate beneath.
 - A. Tympanal coverings narrower, but scarcely shorter than tympanal cavities.
 - a. Lateral margins of pronotum moderately ampliate.
 - b. Head shorter than pronotum.
 - c. Abdomen longer than space between apex of head and base of cruciform elevation *Tettigia.*
 - aa. Lateral margins of pronotum straight, not ampliate.
 - bb. Head as long as pronotum.
 - cc. Abdomen short, about as long as space between apex of head and base of cruciform elevation *Emathia.*
 - B. Tympanal coverings both narrower and shorter than tympanal cavities.
 - d. Opercula in ♂ short and transverse, not or scarcely extending beyond base of abdomen.
 - e. Head deflected anteriorly, front not prominent.
 - f. Pronotum distinctly shorter than mesonotum.
 - g. Length of head about equal to breadth between eyes; abdomen in ♂ longer than space between apex of head and base of cruciform elevation.
 - h. Greatest width of tegmina only one third of length, broader than wings *Terpsosia.*
 - hh. Greatest width of tegmina considerably more than one third of length, but scarcely broader than wings *Sena.*
 - gg. Length of head less than width between eyes; abdomen in ♂ about as long as space between apex of head and base of cruciform elevation *Cicadatra.*
 - dd. Opercula in ♂ short but well developed, at least reaching the apex of the second abdominal segment *Khimbya.*
 - ddd. Opercula in ♂ extending beyond the middle of abdomen.
 - ee. Head not deflected anteriorly, the front very prominent.
 - ff. Pronotum as long as mesonotum *Lethama.*
 - C. Tympanal coverings shorter, but not narrower than tympanal cavities.
 - eee. Head with the front prominent, its lateral margins at right angles with anterior margins of vertex.

- h. Lateral margins of pronotum ampliate, narrowed anteriorly.
 i. Abdomen beneath strongly channelled near lateral margins *Kamalata*.
- hh. Lateral margins of pronotum convex anteriorly, medially concavely sinuate.
 ii. Abdomen beneath obliquely recurved near lateral margins *Basa*.
2. Abdomen in ♂ tuberculate beneath on the second and third abdominal segments *Calcagninus*.

Genus TETTIGIA.

Tettigia, Kolenat. Mel. Ent. vii. p. 6 (1857).

Type, *T. orni*, Linn. (*Cicada*).

Genus EMATHIA.

Emathia, Stål, Hem. Afr. iv. p. 8 (1866).

Type, *E. ægrota*, Stål.

Genus TERPNOSIA.

Terpnosia, Dist. Ann. & Mag. Nat. Hist. (6) ix. p. 325 (1892).

Type, *T. psecas*, Walk. (*Dundubia*).

Terpnosia confusa, sp. n.

Body above castaneous brown, finely greyishly pilose; pronotum with the centre of the posterior margin (excluding a medial spot), the apices of the lateral margins, and two central curved fasciæ pale greenish; mesonotum with the anterior lateral margin pale greenish, the margins of two obscure anterior obconical spots and the anterior angles of the cruciform elevation ochraceous; posterior margins of the abdominal segments narrowly fuscous; body beneath considerably paler in hue than above; opercula broad, transverse, convexly rounded posteriorly, not quite reaching basal segment of abdomen; rostrum just reaching basal abdominal segment. Tegmina and wings hyaline, the veins brown or brownish ochraceous; tegmina with a slight greenish suffusion, a curved series of about four small fuscous spots extending from base of second ulnar area to inner margin, the bases of the two upper apical areas a little infuscated, and a narrow elongate fuscous spot at apices of the longitudinal veins to apical areas. Tympanal covering very small, the greater part of the tympana being exposed.

Long., excl. tegm., ♂ 35 mm.; exp. tegm. 87 mm.

Hab. "India" (Brit. Mus.); Sikhim (Coll. Dist.).

This is the species figured in my Mon. Orient. Cicad. (tab. vii. fig. 21) as *T. psecas*, Walk.

Genus SENA.

Head about as long as space between eyes, lateral margins of front somewhat at right angles to lateral margins of vertex, eyes scarcely projecting beyond the anterior angles of the pronotum; pronotum shorter than the mesonotum, its lateral margins more or less oblique, the posterior angles being obliquely dilated; abdomen longer than the space between apex of head and base of cruciform elevation; tympana largely exposed, the flaps being a little shorter and very much narrower than the tympanal orifices; rostrum just passing the intermediate coxæ; opercula in male small, transverse, not extending beyond base of abdomen; anal appendages large.

Type, *S. quercula*, Pall. (*Cicada*).

Genus CICADATRA.

Cicadatra, Amyot, Ann. Soc. Ent. Fr. v. p. 153 or 349 (1847).

Type, *C. atra*, Oliv. (*Cicada*).

KHIMBYA, gen. nov.

Head deflected before eyes, the front scarcely visible above, its length much shorter than space between eyes, margins of front and vertex subobliquely continuous; pronotum distinctly shorter than mesonotum, its lateral margin sinuate, but not dentate; abdomen much longer than space between apex of head and base of cruciform elevation; tympana imperfectly covered, flaps shorter and narrower than tympanal cavity; rostrum not quite reaching posterior coxæ; opercula in male inwardly obliquely divergent, extending to a little more than a third of the abdomen; anterior femora with at least two spines on their under surface; tegmina broad, their greatest breadth considerably more than a third of their length, apical areas eight, basal cell much longer than broad.

Type, *K. evanescens*, Walk. (*Dundubia*).

LETHAMA, gen. nov.

Head horizontal, as long as space between eyes, not anteriorly deflected, front very prominent, margins of front and

vertex obliquely subcontinuous; pronotum as long as mesonotum, its lateral margin oblique, sinuate, obscurely dentate; abdomen considerably longer than space between apex of head and base of cruciform elevation; tympana imperfectly covered, the flaps shorter and narrower than the tympanal cavities; rostrum about reaching the posterior coxæ; anterior femora armed beneath with two or three strong spines; opercula extending to more than half the length of the abdomen, situate wide apart and on the lateral abdominal areas; tegmina broad, their greatest breadth more than one third of their length, apical areas eight, basal cell much longer than broad.

Type, *L. locusta*, Walk. (*Cephaloxys*).

Genus KAMALATA.

Kamalata, Dist. Ann. & Mag. Nat. Hist. (6) iii. p. 52 (1839); Mon. Orient. Cicad. p. 124 (1892).

Head moderately deflected in front of eyes, its length about equal to space between eyes, its lateral margins discontinuous, the lateral margins of vertex being more or less at right angles to those of front, its width between eyes being distinctly narrower than base of mesonotum; face globose; pronotum a little shorter than mesonotum, its lateral margins somewhat angulately sinuate, broad and laminate on posterior half; abdomen broad, robust, and moderately inflated, above somewhat laterally oblique on each side, beneath strongly channelled near each lateral margin; tympanal coverings about as broad but shorter than the tympanal cavities, their length variable, either very short as in *K. pantherina* or about half the length of cavities as in *K. javanensis*; opercula in male short, transverse, not extending beyond base of abdomen; rostrum considerably passing the posterior coxæ; anterior femora strongly spined beneath; tegmina and wings hyaline, the first maculate, variable in length, about as long as body, as in *K. pantherina*, or longer than body, as in *K. javanensis*, basal cell longer than broad; apical areas eight.

Type, *K. pantherina*, Dist.

Kamalata javanensis, sp. n.

♂. Body castaneous, finely greyishly pilose; head with transverse striations and a basal spot to front, and two spots both above and beneath the area of the ocelli, pale

ochraceous; pronotum with the posterior margin piceous, the lateral margins brownish ochraceous, a faint central longitudinal ochraceous line, and an ill-defined subverted angular spot at anterior margin, and the incisures, piceous; mesonotum with two anterior obconical spots only denoted by their piceous margins; cruciform elevation flavescens; posterior margins of the abdominal segments narrowly piceous, and the extreme lateral margins of the same colour; head beneath, sternum, legs, and opercula ochraceous, space between face and eyes and apex of rostrum piceous; transverse striations to face more or less castaneous; tegmina and wings hyaline, the veins ochraceous or brownish ochraceous; tegmina with a curved series of about four fuscous spots between radial area (near apex) and inner margin, the veins separating the ulnar and apical areas broadly infuscated, and a fuscous spot at the apices of the longitudinal veins to apical areas.

Long., excl. tegm., ♂ 32 mm.; exp. tegm. 85 mm.

Hab. Java (Paris Mus.).

Differs from *K. pantherina* by the longer tympanal coverings, which are about half the length of the cavities, and by the longer tegmina, which are considerably longer than the body; spots and markings also different.

BASA, gen. nov.

Head with front prominent and produced, its lateral margins at right angles with anterior margins of vertex, its breadth between eyes much narrower than base of mesonotum, its length about equal to that of pronotum; pronotum a little shorter than mesonotum, its lateral margins convex anteriorly and concavely sinuate before posterior angles, which are amplified; abdomen much longer than space between apex of head and base of cruciform elevation, its lateral areas obliquely depressed above; beneath with the disk somewhat flat and the marginal areas obliquely directed upward; tympanal flaps shorter, but not narrower than tympanal cavities; opercula transverse and just passing base of abdomen; anterior femora strongly spined beneath near apex; anterior tibiæ longer than femora, anterior tarsi more than half the length of tibiæ; tegmina and wings long and narrow, greatest width of the first only equal to a third of length, its basal cell much longer than broad, fourth ulnar area much compressed at base of third, apical areas eight.

Type, *B. singularis*, Walk. (*Dundubia*).

Genus CALCAGNINUS.

Calcagninus, Dist. Mon. Orient. Cicad. pp. 31 & 136 (1889).Type, *C. picturatus*, Dist. (*Leptopsaltria*).

Division FIDICINARIA.

This division is represented by a series of Neotropical genera, in all of which the tympanal orifices are more or less exposed; the tympanal flaps are always well developed and are usually somewhat angulate at their apices; the tegmina and wings are hyaline, sometimes maculate, but never opaque, they always possess eight apical areas; the lateral margins of the pronotum have sometimes their posterior angles lobately produced, but they are never convexly amplate nor medially angulate.

Synopsis of Genera.

1. Metasternum with a moderately elevated transverse central plate, which is not anteriorly angularly produced.
 - A. Head (including eyes) about equal in width to base of mesonotum; eyes scarcely projecting beyond anterior angles of pronotum.
 - a. Vertex of head at area of ocelli distinctly longer than front.
 - b. Posterior angles of pronotum a little prominent, but not lobately produced.
 - c. Tegmina with transverse vein at base of second apical area more or less vertical. *Proarna.*
 - aa. Vertex of head at area of ocelli often only very slightly longer than front.
 - cc. Tegmina with transverse vein at base of second apical area strongly oblique *Tympanoterpes.*
 - B. Head (including eyes) considerably broader than base of mesonotum; eyes projecting beyond anterior angles of pronotum.
 - bb. Posterior angles of pronotum more or less lobately produced.
 - d. Tympanal coverings large and only moderately internally deficient.
 - e. Tegmina with transverse vein at base of second apical area more or less vertical.
 - f. Vertex of head at area of ocelli about as long as front *Ollanta.*
 - ff. Vertex of head at area of ocelli much longer than front. *Pacarinu.*
 - dd. Tympanal coverings only developed on lateral areas.
 - ee. Tegmina with transverse vein at base of second apical area strongly oblique *Ariasa.*

2. Metasternum transversely elevated and anteriorly angularly or subangularly produced.
- C. Head (including eyes) about as wide as base of mesonotum; eyes not porrect *Fidicina*.
- D. Head (including eyes) considerably broader than base of mesonotum; eyes porrect, more or less stylate.
- g. Pronotum about as long as mesonotum; tympanal coverings in ♂ with their inner margins strongly concave *Hemisciera*.
- gg. Pronotum shorter than mesonotum; tympanal coverings in ♂ not concave interiorly *Majeorona*.

Genus PROARNA.

Proarna, Stål, Stett. ent. Zeit. xxv. p. 61 (1864); Hem. Afr. iv. p. 7 (1866).

Type, *P. hilaris*, Germ. (*Cicada*).

Some confusion may arise in separating this genus from *Tympanoterpes*, Stål (Ann. Soc. Ent. Fr. (4) i. p. 614, 1861), in which the founder had previously placed several of the species which he afterwards included in *Proarna*, and which again subsequently, in "Conspectus generum" (Hem. Afr. iv. p. 7, 1866), he separates primarily by the moderately erect or curved and non-oblique transverse vein at the base of the second apical vein to the tegmina.

Proarna Heidemanni, sp. n.

Body above and beneath with legs pale virescent; vertex of head crossed by a prominent black transverse fascia between the eyes; incisures to pronotum, two small anterior obconical spots to mesonotum, and the tarsi pale fulvous; tegmina and wings hyaline, extreme bases of both pale fulvous, the venation of both and costal membrane and area to tegmina pale virescent. Head (including eyes) about equal in width to base of mesonotum, eyes slightly projecting beyond the anterior angles of pronotum; vertex of head at area of ocelli longer than front; posterior angles of pronotum obtusely angulately prominent, but not lobately produced; rostrum just passing the intermediate coxæ, its apex piceous; opercula not extending beyond base of abdomen; tegmina with the transverse vein at base of second apical area almost vertical, not oblique.

Long., excl. tegm., ♂ 16-18 mm.; exp. tegm. 43-47 mm.

Hab. Argentina (*Wagner*, Brit. Mus.); Paraguay, Sapucay (Heidemann Coll.).

I have named this species after Mr. O. Heidemann, of

Washington, who has sent me a specimen of this species and has also assisted my revision by procuring me examples of many North-American species for comparison.

Proarna bufo, sp. n.

Body pale castaneous, finely and obscurely griseously pilose; area of the ocelli and mesonotum more or less piceous, the last with the lateral margins and the margins of two central anterior obconical spots pale castaneous; a spot at apex of front, lateral margins of vertex of head, lateral margins of pronotum, and cruciform elevation ochraceous; tegmina and wings pale hyaline, the first with about basal half of venation and the costal membrane and area ochraceous, remaining venation brownish ochraceous, a strongly broken curved linear fascia consisting of a little more than the basal vein of the second ulnar area, a spot on the posterior vein of third ulnar area, and a little more than the transverse vein at the base of lower ulnar area infusate; small spots at transverse veins to apical areas, and a series of rather larger outer marginal spots, fuscous. Abdomen in male short and broad, about as long as space between apex of head and base of cruciform elevation; head (including eyes) slightly narrower than base of mesonotum, eyes not projecting beyond anterior angles of pronotum; vertex of head at area of ocelli longer than front; posterior angles of pronotum only moderately subangulately produced, its lateral angles a little convexly rounded; rostrum reaching the posterior coxæ; tegmina with the transverse vein at base of second apical area somewhat vertical, not oblique.

Long., excl. tegm., ♂ 20, ♀ 28 mm.; exp. tegm., ♂ ♀ 55-57 mm.

Hab. Argentina (*S. W. Thomas*, Brit. Mus.); Bolivia (*Steinbach*, Brit. Mus.).

Allied to *P. Bergi*, Dist., but smaller; tegmina much less maculated and shaded; apical area 1=3 in length, not longer than 3 as in *P. Bergi*; breadth of apical area 8=length of 7, not broader as in *P. Bergi*.

Genus TYMPANOTERPES.

Tympanoterpes, Stål (part.), Ann. Soc. Ent. Fr. (4) i. p. 614 (1861); Hem. Afr. iv. p. 7 (1866).

Type, *T. serricosta*, Germ. (*Cicada*).

Of the species Stål originally stated were representative of his genus *Tympanoterpes*, he subsequently (in 1864) removed a no small proportion to his genus *Proarna*. The *Cicada serricosta*, Germ., must be taken as the type.

Tympanoterpes alboapicata, sp. n.

Head, pronotum, and mesonotum olivaceous green; head with front (excluding central fascia), area of the ocelli, and inner margins of eyes black; pronotum with two central longitudinal black lines, which are much obliquely reflected both anteriorly and posteriorly, and with two small black spots near their base, the incisures fuscous; mesonotum with four large black obconical spots, the two central smallest, and all narrowly margined with ochraceous, a large black spot in front of cruciform elevation which is ochraceous; abdomen brownish olivaceous, bases of segments black, greyishly pilose on each lateral area near base, and with a cretaceous spot on each side of apical segment; body beneath and legs brownish olivaceous; sternum thickly greyishly pilose; a black fascia between face and eyes; ventral lateral margins more or less cretaceously tomentose; tegmina and wings pale hyaline; tegmina with the costal membrane and area and basal half of venation olivaceous, apical half of venation, upper half of basal cell, and claval area fuscous; wings fuscous at base, venation either olivaceous or fuscous. Head (including eyes) about equal in width to base of mesonotum, eyes not protuberant; vertex of head at area of ocelli very little longer than front; posterior pronotal angles angularly lobate; abdomen short, broad, about as long as space between apex of head and base of cruciform elevation.

Long., excl. tegm., ♂ ♀ 23-24 mm.; exp. tegm. 77 mm.

Hab. Argentina (*Wagner*, Brit. Mus.).

OLLANTA, gen. nov.

Head (including eyes) broader than base of mesonotum, eyes projecting beyond anterior angles of pronotum, vertex at area of ocelli about or almost as long as front; pronotum shorter than mesonotum, its posterior angles lobately produced, its lateral margins obliquely narrowed anteriorly, very slightly sinuate; mesonotum moderately convex; abdomen short, about as long as space between apex of head and base of cruciform elevation, tympanal coverings large, their apices subacute, anteriorly but not interiorly covering cavity; rostrum reaching posterior coxæ; opercula small, transverse, only about reaching base of abdomen; face moderately globose; tegmina and wings hyaline, the first with eight apical areas.

A genus intermediate between *Proarna* and *Selymbria*.

Type, *O. mexicana*, Dist.

PACARINA, gen. nov.

Head (including eyes) broader than base of mesonotum; eyes projecting beyond anterior angles of pronotum; vertex at area of ocelli much longer than front; pronotum with the posterior angles moderately lobately produced, its lateral margins oblique, slightly sinuate, its length shorter than that of mesonotum; abdomen about as long as space between apex of head and base of cruciform elevation; tympanal coverings distinct but inwardly concavely narrowed and exposing the tympanal cavities; face convex, a little broader than the space between it and eyes; opercula about reaching base of abdomen, their lateral margins oblique, their posterior margins a little rounded; anterior femora armed with two strong spines beneath; rostrum about reaching the posterior coxæ; tegmina and wings hyaline; apical areas eight.

Type, *P. signifera*, Walk. (*Cicada*).

ARIASA, gen. nov.

Head (including eyes) wider than base of mesonotum, the eyes projecting beyond anterior pronotal angles, vertex at area of ocelli as long as or a little shorter than front; posterior angles of pronotum more or less sublobately produced; abdomen about as long as space between apex of head and base of cruciform elevation; tympana largely exposed, the flaps only upwardly developed on the lateral areas; face large and globose; rostrum reaching the posterior coxæ; opercula short, not passing base of abdomen; abdomen beneath prominently channelled at each lateral margin; tegmina and wings hyaline, the first with eight apical areas, basal cell a little longer than broad.

Type, *A. colombiæ*, Dist. (*Tympanoterpes*).

Ariasa nigrovittata, sp. n.

♀. Body above black; head with basal margin and a longitudinal fascia to front, lateral and apical margins of vertex, and an oblique fascia extending from posterior margins of eyes to near ocelli, ochraceous; pronotum with the anterior margin narrowly, the lateral and posterior margins broadly, ochraceous, each lateral area somewhat castaneous, the posterior angles black; mesonotum with two obconical spots, the margins of which are pale castaneous, a lateral fascia and the cruciform elevation of the same colour, the anterior prolongations of the last more or less shaded with

black; posterior abdominal segmental margins pale castaneous; body beneath and legs brownish ochraceous; base of face, a transverse fascia between face and eyes, apex of rostrum, and bases of ventral segmental margins, black; tegmina and wings pale hyaline; tegmina with the venation, basal cell, and claval area black; costal membrane and area, about inner half of basal cell, longitudinal veins to lower ulnar area, and oblique vein at apex of radial area pale ochraceous; wings with the venation black, basal area piceous, some of the longitudinal veins on basal area pale ochraceous, and the apical half of the abdominal area pale lacteous. The body beneath and legs are thickly and finely ochraceously pilose; head (including eyes) considerably broader than base of mesonotum; eyes projecting beyond anterior angles of pronotum; posterior pronotal angles lobately produced.

In a second female specimen from Bolivia the colour of the body above is paler, inclining more to ochraceous or pale castaneous than black.

Long., excl. tegm., ♀ 25 mm.; exp. tegm. 83 mm.

Hab. Central Brazil: Chapada (*Robert*, Brit. Mus.); Bolivia (*Steinbach*, Brit. Mus.).

Allied to *A. albiplica*, Walk.

Genus FIDICINA.

Fidicina, Amy. & Serv. Hist. des Hémi. p. 472 (1843).

Type, *F. mannifera*, Fabr. (*Tettigonia*).

Fidicina Roberti, sp. n.

♂. Head, pronotum, mesonotum, cruciform elevation, and body beneath brownish ochraceous; abdomen above black; legs pale castaneous; body ochraceously pilose; head with the area of the ocelli indefinitely extending on each side towards eyes, and margins of front, black; pronotum with the anterior margin, the incisures, and a narrow central transverse spot in front of posterior margin, black; mesonotum with four obconical spots, the two central shortest, and one on each lateral area longest, a large triangular spot in front of cruciform elevation, with a small rounded spot on each side and two similar spots in front of it, black; posterior margins of abdominal segments above obscurely castaneous, those of the first and sixth segments more prominently so; face (excluding base), fascia between face and eyes, spots to coxæ and trochanters, and apex of rostrum, black; tegmina

and wings pale hyaline; tegmina with the venation fuscous, costal membrane and area, basal cell, and inner longitudinal vein to basal ulnar area pale green, claval area bright ochraceous, preceded by piceous shadings; wings with the venation apically fuscous brown, green towards base; extreme apical area bright ochraceous, streaked with piceous.

Head (including eyes) about equal in width to base of mesonotum, much deflected in front of eyes; abdomen in male very short, about as long as space between apex of head and middle of mesonotum; tarsi two-jointed; body beneath and legs much more thickly and longly pilose than above; rostrum reaching the posterior coxæ; lateral margins of pronotum centrally moderately sinuate; opercula transverse, outer angles a little posteriorly prolonged, posterior margins concave, lateral margins convex.

Long., excl. tegm., ♂ 27 mm.; exp. tegm. 107 mm.

Hab. Central Brazil: Chapada (A. Robert, Brit. Mus.).

Fidicina lacteipennis, sp. n.

♂. Body above brownish ochraceous, abdomen a little darker and somewhat densely ochraceously pilose; head with a transverse fascia extending through area of ocelli, a transverse linear spot on each side of front, and inner margins of eyes, black; pronotum with the incisures piceous brown; mesonotum with four ill-defined macular obconical spots, of which the two central are shortest, and with two small indented piceous spots in front of cruciform elevation; basal segmental abdominal margins moderately piceous; body beneath densely griseously pilose; face and legs ochraceous; rostrum ochraceous, its apical half black; tegmina and wings hyaline, with a creamy-white suffusion, extreme bases of both ochraceous with some piceous markings; tegmina with the veins piceous, those at basal area, the basal cell, and costal membrane and area ochraceous; wings with the veins piceous, at the basal area ochraceous. Head (including eyes) slightly wider than base of mesonotum; length of head about half the width between eyes and much shorter than pronotum, which is almost as long as mesonotum; cruciform elevation anteriorly truncate, without produced anterior angles; rostrum extending midway between intermediate and posterior coxæ; anterior femora armed with two strong spines beneath.

Long., excl. tegm., ♂ 29 mm.; exp. tegm. 94 mm.

Hab. Amazons (Brit. Mus.).

Fidicina flavibasalis, sp. n.

♀. Body above olivaceous; head with the area of the ocelli, a transverse fascia between eyes, inner margins of eyes, and a narrow posterior margin, black; pronotum with two central anterior and two central posterior spots and the central incisures black; mesonotum with four obconical spots, the two central shortest, a lanceolate spot in front of cruciform elevation, and a small rounded spot at each of its anterior angulations, black; abdomen with the basal segmental margins black and with the lateral areas of the second and third segments greyishly pilose; head beneath and sternum piceous, greyishly pilose; face, a fascia between face and eyes, rostrum, coxæ, and legs virescent; abdomen beneath brownish ochraceous; tegmina and wings hyaline, basal areas of both and costal membrane of the first reddish ochraceous; venation fuscous, except at bases, where it is greenish. Head (including eyes) about as wide as base of mesonotum; lateral margins of pronotum moderately oblique and finely hirsute; anterior femora with two strong spines beneath; tarsi two-jointed.

Long., excl. tegm., ♀ 20 mm.; exp. tegm. 65 mm.

Hab. Ecuador: Cachabé (*Rosenberg*, Brit. Mus.).

Genus HEMISCIERA.

Hemisciera, Amy. & Serv. Hist. des Hémi. p. 466 (1843).

Type, *H. maculipennis*, Lap. (*Cicada*).

Hemisciera Durhami, sp. n.

Body above brownish ochraceous; lateral and posterior marginal areas of pronotum and sixth and anal segments of abdomen stramineous; head with the lateral margin of front and a broken transverse fascia between eyes black; pronotum with a narrow pale ochraceous anterior margin and black incisures; mesonotum with four large obconical black spots, of which the two central are shortest, and a small black spot in front of each anterior angle of the basal cruciform elevation; basal margins of abdominal segments piceous; body beneath and legs paler and thickly greyishly pilose; tegmina with about basal third opaquely virescent ochraceous, remainder pale creamy tale-like, the venation on apical two thirds and costal membrane and area fuscous brown; wings with almost basal half pale ochraceous, the venation on apical half fuscous brown. Head (including eyes) much wider than base of mesonotum, the eyes semistylate; pronotum about as wide

as mesonotum; rostrum passing the intermediate coxæ; anterior femora with a long subapical spine beneath; tarsi two-jointed; opercula in male transverse, posteriorly rounded, not extending beyond base of abdomen.

Long., excl. tegm., ♂ 33 mm.; exp. tegm. 100 mm.

Hab. Brazil: Para (*Dr. H. E. Durham*, Brit. Mus.).

MAJEORONA, gen. nov.

Head (including eyes) considerably broader than base of mesonotum; eyes protuberant, more or less stylate; length of head above about equal to half its breadth between eyes and about or almost as long as pronotum, which is distinctly shorter than mesonotum; abdomen about as long as space between apex of head and base of cruciform elevation; the tympanal orifices exposed interiorly, the flaps almost as long as and covering the lateral areas, not prominently concave interiorly; metasternal plate well developed, centrally longitudinally impressed and anteriorly produced on each side; rostrum reaching the posterior coxæ; anterior femora strongly spined beneath; tarsi three-jointed; opercula in male small, transverse, not extending beyond base of abdomen; tegmina and wings hyaline, the first with eight apical areas and the basal cell longer than broad.

Type, *M. aper*, Walk. (*Fidicina*).

Majeorona bovilla, sp. n.

♂. Body above black; head with the apical margin of front, lateral margins of vertex, and inner margins of eyes angularly continued to near area of ocelli, olivaceous brown; pronotum with the anterior margin narrowly and the lateral and posterior margins broadly stramineous (the lateral margins outwardly black), and with a more obscure small discal spot of the same colour; mesonotum with the margins of two central obconical spots and the cruciform elevation pale castaneous; abdomen above with its lateral margins and the posterior margins of the segments pale castaneous; body beneath and legs ochraceous; central sulcation and lateral margins of face, a fascia between face and eyes, and apices of anterior and intermediate femora, black; tegmina and wings pale hyaline, the bases of both black, mottled with brownish ochraceous, and divided by pale ochraceous veins; tegmina with the costal membrane and area black, basal cell black, with a basal central ochraceous spot, venation black, ochraceous at extreme base, transverse veins at bases of second and third apical areas a little infuscated; wings with the

lower half of venation ochraceous, the upper half black. Head (including eyes) considerably broader than base of mesonotum; eyes protuberant, moderately stylate; length of head about half its width between eyes and almost as long as pronotum, the lateral angles of which are rounded; basal areas of cruciform elevation strongly obliquely striate; opercula transverse, not passing base of abdomen; anterior femora strongly spined beneath.

Long., excl. tegm., ♂ 43 mm.; exp. tegm. 127 mm.

Hab. Central Brazil: Chapada, 2600 feet (*A. Robert*, Brit. Mus.).

XXXVII.—*The Changes and Variations in the Position of the Pectoral Fin during Development.* By H. H. SWINNERTON, D.Sc., University College, Nottingham.

FOR some time I have been investigating the development of the Teleostean pectoral fin skeleton*. This has brought into my hands an extensive series of developmental stages of the three-spined stickleback (*Gasterosteus aculeatus*). Being struck by the difference in the relative positions of the fin in the youngest and oldest stages, I measured numerous specimens of all ages, with a view to ascertaining definitely if this indicated a real shifting during development.

The investigation above referred to brings out the fact that the glenoid border tends to rotate from a horizontal to a vertical position during development. This rotation is around the ventral end of the border. Consequently this point seemed the most suitable one from which to take measurements. Two were taken in each case, viz. from this point to the tip of the snout and to the hinder extremity of the notochord.

In fig. 1 (p. 320) the vertical line represents the distance of the pectoral fin from the tip of the snout, the horizontal that from the extremity of the notochord. The oblique lines give the average position of the fin at various stages. To obtain these the specimens were put together into groups containing individuals differing in length only 1 mm., and the average was found for each group. Gaps are left because the material proved insufficient to give trustworthy results at these points.

The shortest line represents the average position of the fin

* My thanks are due to the Government Grant Committee for aid in carrying on this investigation.

for 97 individuals varying in length from 4.5 to 6.5 mm. and in age from the time of hatching to the end of the third week. This is prolonged by a dotted line, to give an idea of the course it would have taken had there been no translocation later.

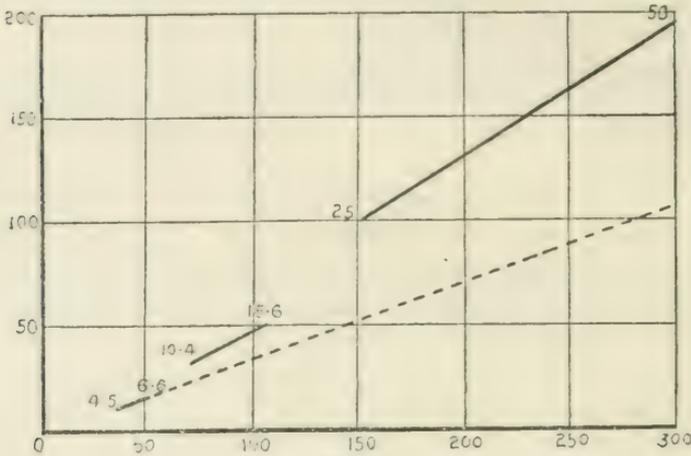


Fig. 1.

The next line represents the average position of the fin for 198 individuals varying in length from 10.4 to 15.6 mm. The age of these cannot be definitely stated, because they were not reared in the aquarium and individuals of the same age vary so greatly after the first month*. The position of this line relative to the dotted line and its increasing divergence from it show that the fin has shifted backwards and is continuing to shift.

The longest line represents the average position for 211 individuals varying in length from 25 to 50 mm., and exhibits the same facts more markedly.

Figs. 2, 3, and 4 were made from measurements of individuals varying in size from 4 to 7, 10 to 16, and 25 to 50 mm. respectively. The horizontal line represents the distance from fin to snout expressed as a percentage of the total length of the body. The vertical lines give the number of individuals with the corresponding percentage. From these it is seen that the maximum number have their fins 23 per cent. from the snout in the first group, 33 per cent. in the second,

* For example, of the two oldest specimens which I hatched and kept in the same aquarium for thirty-three days, one measured 10.8 mm. and the other only 6.4 mm.

and 39 per cent. in the last. Judging by these maxima, therefore, there is a total translocation of 16 per cent. of the length of the body. It is interesting to note that if the fifty smallest sticklebacks are taken the maximum falls upon the 22 per cent. line.

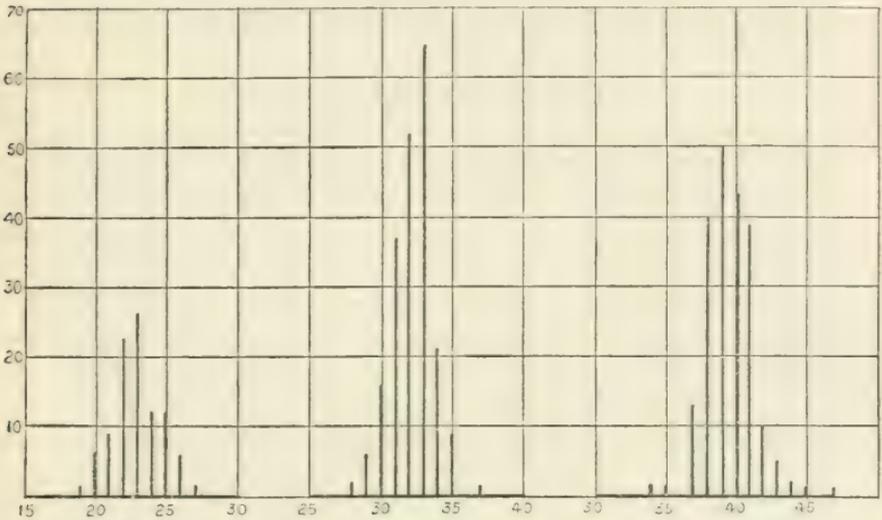


Fig. 2.

Fig. 3.

Fig. 4.

The immediate cause of the shifting of the fin is to be found in the fact that the coraco-scapular plate is at first a very insignificant portion of the pectoral skeleton, but as development advances it broadens out antero-posteriorly.

The ultimate cause may be the change in function of the pelvic fin from that of a true fin to that of a mere organ for attack or defence. The pectoral fin has therefore to perform the combined functions of the two pairs.

In view of the phylogenetic shifting forwards of the pelvic fin in Teleosts, it would be instructive if some worker with a large series of types at his disposal would ascertain if there is a corresponding phylogenetic shifting back of the pectoral fin. At present I can find no explanation of the fact that the fin shifts most rapidly just at those points in the ontogeny where my collection of specimens is poorest.

A further study of figs. 2-4 suggests that the range of variation in the position of this fin increases as life advances. In the first group the range is 8 per cent., in the second 9 per cent., in the third 13 per cent.

XXXVIII.—*A new Cricetulus from Mongolia.*

By OLDFIELD THOMAS.

AMONG a small collection of rodents from N.E. Siberia presented to the National Museum by Mr. C. W. Campbell there are two specimens of a *Cricetulus* which appears to be undescribed. It may be called

Cricetulus Campbells, sp. n.

Closely allied to *C. songarus*, Pall., which alone of described species has completely hairy palms and soles. Colour and markings apparently much as in that species, the characteristic light patches on shoulders, sides, and hips contrasting prominently with the body-colour, but the dark shoulder-stripe of *C. songarus* is less developed and the dorsal line is narrower and more sharply defined. Back greyish buffy; a prominent black dorsal line commencing faintly on the crown, becoming sharply defined on the nape, and running to the base of the tail. Lateral patches creamy buff, the grey areas dividing them but slightly darkened. Belly-hairs slaty basally, "cream-buff" terminally. Ears small, much smaller than in the true *C. songarus*; their colour as described in *C. dichrootis*, Satunin*, the black of the front half of the outer surface contrasting markedly with the white of the hinder edge of the inner. Upper surface of hands and feet silvery white. Palms densely hairy, but the tips of the digits, the usual three small pads at the base of the fingers, the very large hallucal and small median carpal pads naked. Similarly, behind, the soles are densely hairy, the tips of the digits and three small distal pads alone naked. Tail very short, about half the length of the hind foot, club-shaped, silvery whitish.

Skull short, the brain-case proportionally large and rounded. Palatal foramina parallel-sided. Bullae very small.

Dimensions of the type (measured as a spirit-specimen):—

Head and body 87 mm.; tail 7; hind foot 12; ear 11.

Skull: greatest length 24; basilar length 19; zygomatic breadth 13.7; length of nasals 9; interorbital breadth 3.7; breadth of brain-case 11.4; palate length 9.8; diastema 6.4; palatal foramina 4.1 × 1.6; length of upper molar series 3.5.

Hab. Shaborte, N.E. Mongolia (about 46° 40' N., 114° E.). A second specimen from Tatir Suma.

Type. Male (skinned out of spirit). B.M. no. 5. 2. 1. 3.

* Ann. Mus. Pétersb. vii. p. 567 (1902).

Collected 1st July, 1902, and presented by C. W. Campbell, Esq., C.M.G.

This very handsome little species seems alone allied to *C. songarus*, Pall., and *C. dichrootis*, Sat., but may be readily distinguished from the former by its smaller ears and rather different colour, and from the latter by its more completely hairy soles and its prominent dorsal line.

XXXIX.—*The Affinities of the Orkney Vole* (*Microtus orcadensis*, Millais). By C. I. FORSYTH MAJOR.

IN a joint paper by Mr. Eagle Clarke and Professor Charnock Bradley are published some new and interesting observations on the Orkney vole discovered by Mr. Millais in the Orkneys and certain parts of Shetland*. I have had an opportunity to verify the accuracy of the facts communicated, but I venture to take exception to the interpretation given to these facts, as being intended to throw light on the affinities of the species. By representing the Orkney vole as being in some respects an intermediate form of the field- and the water-vole, but more nearly allied to the latter, a misleading conception of its true affinities is conveyed.

The two British species just mentioned are so widely apart from each other that they have been placed into two distinct sections (subgenera) of the genus *Microtus*. Now the Orkney vole, by its external characters (number of foot-pads on the hind sole, absence of abdominal musk-glands), as well as by the character of its teeth, is clearly a member of the same subgenus as the field-vole, and therefore much nearer related to the latter than to the water-vole. The peculiarities of its skull by no means contradict this statement. Great width of the skull, relative shortness of the brain-case, and elongation of the rostrum, are not peculiarities proper to the water-vole alone; they occur in other subgenera also. Within the subgenus to which our common field-vole (*M. agrestis*) belongs it is the *M. arvalis* and its allies, one of the field-voles of Continental Europe and Northern Asia, which the Orkney vole approaches most in the characters of

* "On the Vole and Shrew of the Orkney Islands," by Wm. Eagle Clarke. With Report by Prof. O. Charnock Bradley, M.B., C.M. (Reprinted from 'The Annals of Scottish Natural History,' January 1905.)

the skull. The teeth of the last-mentioned being, moreover, indistinguishable from those of the *M. arvalis* group, I would assign it a place within the latter, of which it is a large-sized and otherwise remarkable form, well deserving of a specific name of its own.

One form (possibly more) of a vole with teeth of the *M. arvalis* type is represented by jaws in some of our caves and river-deposits. Not having as yet come upon fairly complete skulls, I do not venture to assert that the species *M. arvalis* was represented in Great Britain during Pleistocene times; but the *M. arvalis* group certainly was. This last circumstance will in due time presumably help to explain satisfactorily the present existence of a member of the *M. arvalis* group in the Orkney and Shetland Islands.

XL.—*Description of a new Leucania from British New Guinea.* By GEORGE T. BETHUNE-BAKER, F.L.S., F.Z.S.

Leucania diagramma, sp. n.

♂. Head and face pale grey, barred with dark grey; collar pale grey, barred with darker grey; thorax greyish; patagia edged on its upper margin with dark grey; abdomen greyish; legs pale grey, mid and hind pair with two fine dark lateral lines. Primaries greyish brown, covered with fine whitish-grey longitudinal lines, with a broad pale stripe in the cell and a broader one below the cell; a dark spot at the lower end of the cell; a postmedial row of small dark spots, on the interior of which is a transverse indefinite band of whitish grey; termen darkly spotted: secondaries greyish, paler towards the base. Underside: primaries pale grey, with the dark lines of the upperside showing through; a dark costal spot a quarter from the apex; termen finely and darkly dotted: secondaries whitish grey, finely irrorated on the costa with dark scales; termen darkly spotted.

Expanse 38 mm.

The type is in my collection from Babooni, British New Guinea (3600 feet), where it flies in September.

XLI.—*Description of a new Fish of the Genus Dentex from the Coast of Angola.* By C. TATE REGAN, B.A.

Dentex Cuninghamii.

Depth of body $2\frac{2}{3}$ in the length, length of head 3. Snout scarcely longer than eye, the diameter of which is $3\frac{1}{2}$ in the length of head and $1\frac{1}{4}$ in the interorbital width. Depth of preorbital $\frac{2}{3}$ the diameter of eye. Maxillary nearly reaching the vertical from anterior margin of eye; canines rather weak, 3 or 4 on each side in the upper jaw, 5 or 6 on each side in the lower. Cheek with 6 series of scales. 10 gill-rakers on the lower part of the anterior arch. Scales $60\frac{6}{11}$. Dorsal XII 10, the spines slender, the fourth and fifth the longest, equal to $\frac{1}{2}$ the depth of body; soft rays as long as the eye. Anal III 10, the third spine a little longer than the second, as long as the eye. Pectoral $1\frac{1}{5}$ the length of head, extending to above the third soft ray of anal; ventrals extending to the vent. Caudal widely forked. Olivaceous above, silvery below; each scale of the upper and posterior parts of the body appears to be reddish at the base and blackish at the edge.

A single specimen, 220 mm. in total length, from the coast of Angola, collected and presented to the British Museum by R. J. Cuninghame, Esq.

BIBLIOGRAPHICAL NOTICES.

Two Cytological Works.

- MOTTIER (DAVID M.). *Fecundation in Plants.* Washington (Carnegie Institution), 1904. 8vo. Pp. viii, 187. 69 figs. in text.
 FERGUSON (MARGARET C.). *Contributions to the Knowledge of the Life-history of Pinus, with Special Reference to Sporogenesis, the Development of the Gametophytes, and Fertilization.* Washington, Proc. W. Acad. Sc. vol. vi. pp. 1-202, pls. i.-xxiv. [i. e. pp. 1-154, 156-202 verso only, facing plates].

THE extreme interest and importance of the subject of these two works have created a copious literature and incited many workers in the field of research. Dr. Mottier has performed a useful task in presenting a digest of the subject, chiefly dealing with the Cryptogams and Gymnosperms, the Angiosperms being dismissed in a dozen pages. The subjects of the seven chapters will give a clue to the scheme of treatment; they are as follows:—1. Introduction, in which nuclear division is explained and illustrated; 2. Fecundation by motile isogametes, 3. by non-motile isogametes, 4. by heterogametes; 5. Ascomycetes and Rhodophyceæ; 6. Archigoniata; and 7. Angiosperms.

A few slips have been noticed in looking through the pages, as *Tulipa Celliana* (p. 178) for *Celsiana*, Alexander Brown (p. 61) for Braun; on page 67 a given figure, E, is assigned to two different authors; on page 102 "nearly amoeboid parasites" should, of course, be *merely*, and *Synchitrium decipiens*, Fries, appears as "*discipens*" (p. 37), &c.

Dr. Margaret Ferguson's paper is given up to a detailed account of her researches on a topic on which she has already published good work. The different scale of the two works now under notice may be gauged by the fact that here 141 pages are devoted to what is compressed into less than 6 pages of Dr. Mottier's paper.

In both the modern slipshod method of reference to literature is employed, namely, that of giving the author and an abbreviation for the year, as ('01) for 1901. It is a real grievance that if these references are to be checked the page is not supplied also, for the plan here followed is that of flinging a bulky paper at the reader and bidding him discover for himself where the statement cited is to be found. It is this easy writing that makes hard reading, and those who have been trained in an older and perhaps more careful school, revolt at this offhand method, now too much in vogue.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

November 9th, 1904.—J. E. Marr, Sc.D., F.R.S.,
President, in the Chair.

Mr. E. T. NEWTON, in exhibiting, by permission of the Director of H.M. Geological Survey, a specimen of *Fayolia* near to *Fayolia grandis*, found by Dr. L. Moysey of Nottingham in the Coal-Measures of Ilkeston (Derbyshire), pointed out that *Fayolia* was first described by Profs. Renault & Zeiller in 1884, in their monograph on the 'Houiller de Commeny.' In 1894 Mr. Seward described the first British specimen, from Northumberland, in the Leeds 'Naturalist,' but thought that it was not a plant. There was some resemblance to certain spiral egg-cases of Elasmobranchs; but Dr. Günther was unwilling to accept the Northumberland fossil as the egg-case of a fish. Mr. Kidston had not yet seen the specimen now exhibited; but, from a sketch, he recognized its relation to *Fayolia*. At present, there was still uncertainty as to the exact nature of this fossil.

The following communications were read:—

1. 'Notes on Upper Jurassic Ammonites, with Special Reference to Specimens in the University Museum, Oxford: II.' By Miss Maud Healey.

This paper gives a redescription of the types of *Cardioceras vertebrale*, Sow., *C. scarbrugense*, Y. & B., *C. cordatum*, Sow., and

C. excavatum, Sow., and their varieties. Four varieties of the first, nine of the second, three of the third and fourth, are defined, and a description is given of a new species of *Cardioceras* belonging to the same group. Notes on species allied to the group and on others which have been wrongly confused with it are added. These species are so closely connected by innumerable transitional forms that their limits cannot be definitely fixed. The term 'species' is therefore used as equivalent to Prof. J. W. Gregory's *circulus*: 'It includes a number of "forms," which vary along lines radiating outward from a central type. Some of the members farthest removed from the centre may be within the range of another *circulus*, for the different *circuli* may overlap or be connected by an indefinite series of individuals.' Each *circulus* is made up of *subcirculi* or varieties, and several *circuli* make up a group which need not necessarily correspond with a genus. *C. cordatum* is retained as the name of the whole group, although the type is a most unsatisfactory little specimen from the Corallian of Shotover.

2. 'On the Occurrence of *Elephas meridionalis* at Dewlish (Dorset). Second communication: Human agency suggested.' By the Rev. Osmond Fisher, M.A., F.G.S.

This paper is in continuation of one published by the Author in 1888. The site in which the elephant-remains were found is a narrow trench, examined to a depth of 12 feet in places, with nearly-vertical sides, a smooth, chalk-bottom, and an abrupt end. It was not a fault or a stream-course, and it was partly filled with fine dust-like sand which may have been wind-borne. The trench cuts diagonally across the scarp; and, even if it could be accounted for by natural agencies, it is difficult to explain how it happened that so many elephants fell into it. The Author points out that in Africa elephants are caught by the natives in pitfalls of similar character constructed on the tracks leading to watercourses. This trench is in a corresponding position with regard to a stream, and it is suggested as possible that the trench may have been of human origin. There is, however, no conclusive evidence elsewhere that man was contemporary with *Elephas meridionalis*, which is characteristic of the Pliocene Age.

November 23rd, 1904.—J. E. Marr, Sc.D., F.R.S.,
President, in the Chair.

The following communication was read:—

'On an Ossiferous Cavern of Pleistocene Age at Hoe-Grange Quarry, Longcliffe, near Brassington (Derbyshire).' By Henry Howe Arnold-Bemrose, M.A., F.G.S., and Edwin Tulley Newton, F.R.S., V.P.G.S.

During quarrying-operations in Hoe-Grange limestone-quarry in April 1902 the workmen broke into a cavern. The discovery was

first made known to the writers by Mr. J. Ward, of the Cardiff Museum, but the news of mammalian bones being found soon spread, and many of the remains were carried away. An arrangement to work the cave systematically was made, with the permission of the owner, Major Nicholson, and it has now been entirely worked out, the results being given in the present paper.

The quarry is situated near the top of the plateau, at about 1100 feet above Ordnance-datum. The cave is evidently a master-joint in the limestone, enlarged by water, and, besides being a swallow-hole, has served as a hyæna-den. The large number of mammalian remains found includes lion, hyæna, rhinoceros, *Elephas*, and other Pleistocene forms; but, besides these, there were numerous bones and teeth of fallow-deer, mixed with the Pleistocene remains at all horizons in the cave. The physical conditions are such as to preclude, as the Authors think, any idea of a redeposition of the bones at any date subsequent to the Pleistocene Period; and it is concluded, therefore, that the fallow-deer (*Cervus dama*) was a Pleistocene species, although hitherto supposed to be a much later introduction.

MISCELLANEOUS.

On Chelonethi. By C. J. WITTE, Copenhagen.

By an oversight, which I greatly regret, the names *Chelifer punctatus*, Keys., and *Ch. brevidigitatus*, Keys., have been confused in my paper "On *Chelonethi* &c." in the January number of the 'Annals.' I have not examined *Ch. brevidigitatus*, as stated on p. 112, but *Ch. punctatus*; the former species is not in the collections of the British Museum, only the latter. The remarks on "*Chelifer brevidigitatus*, Keys. 1885 (3), pp. 48-49, tab. iv. figs. 6-6c;" consequently refer to *Ch. punctatus*, Keys. 1885 (3), pp. 45-46, tab. iv. figs. 3-3c.

Owing to the same confusion of the names, "*a*¹⁷ and *b*¹⁷" in the synopsis (p. 97) must be altered to

- | | |
|---|-------------------------------|
| <i>a</i> ¹⁷ . Hairs of the tergites within a distinct white spot; head higher than broad, distinctly longer than fingers | <i>punctatus</i> , Keys. |
| <i>b</i> ¹⁷ . Hairs not situated in distinct white spots | <i>brevidigitatus</i> , Keys. |

An indistinctly written Museum label caused the locality for *Ideoroncus mexicanus*, Bks., to be wrongly given on p. 130. It should be "Chantilly, Windward side of Grenada, West Indies." On p. 139, fourth line from bottom, for "sternite" read "segment."

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 88. APRIL 1905.

XLII.—*A Revision of the Fishes of the South-American Cichlid Genera Acara, Nannacara, Acaropsis, and Astronotus.*
By C. TATE REGAN, B.A.

THE Cichlidæ have recently been monographed by Pellegrin (Mém. Soc. Zool. France, xvi. 1904), who has dealt in a most interesting manner and at considerable length with their anatomy and with the biological problems which they present. However, I have arrived at somewhat different conclusions as to the distinction and arrangement of species in certain genera, which must be my excuse for the present paper.

The genera here dealt with are distinguished from other American Cichlidæ by the following combination of characters:—Dorsal fin without notch between spinous and soft portions; gill-rakers short, in small or moderate number; anal fin with 3 spines; teeth conical; præoperculum entire; no lobe on the anterior branchial arch. Their relations to each other may be shown thus:—

I. Soft vertical fins scaleless or scaly at the base only. D. XIII-XVI 7-12; A. III 6-11.

A. Maxillary not exposed; præmaxillaries moderately protractile.

Upper lateral line well separated from dorsal fin *Acara*.

Upper lateral line separated from dorsal fin by only $\frac{1}{2}$ a series of scales for most of its length *Nannacara*.

B. Maxillary exposed; præmaxillaries very protractile. *Acaropsis*.

II. Soft vertical fins covered with small scales; D. XII-XIV 19-21;

A. III 15-16 *Astronotus*.

I have given a list of the specimens in the British Museum on which my descriptions are based, with the total length of each in millimetres.

ACARA.

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.
*Æquidens**, Eigenm. & Bray, Ann. Ac. N. York, vii. 1894, p. 616.
Acara, Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 171 (1904).

Body deep or moderately elongate, compressed; scales large, usually finely ctenoid. Two lateral lines, the upper well separated from the spinous dorsal. Mouth small or moderate; premaxillaries moderately protractile; maxillary not exposed distally; jaws with small conical teeth in bands, those of the outer series more or less enlarged; upper surface of head scaly to between the orbits; cheeks and opercular bones scaly; præoperculum entire. Gill-rakers few and short; no lobe on the upper part of the anterior branchial arch. A single dorsal, with XIII–XVI 7–12 rays; anal with III 6–11 rays; soft dorsal and anal scaleless or scaly at the base; caudal truncate or rounded. Pectoral asymmetrical, with 12–15 rays; ventrals below or a little behind the base of the pectoral.

Eighteen species from S. America, extending into Panama.

Skeleton.

In *A. tetramerus* the supraoccipital crest is high and extends forwards on the frontals, which are hollowed out anteriorly to form the posterior margin of the depression in which the premaxillary processes lie. The latter are rather short, extending nearly to above the orbit; the parietal crests are moderately strong and extend to above the middle of the orbits. There are 26 vertebræ (13+13); parapophyses are developed on the præcaudal vertebræ from the fourth; the ribs are subsessile. The fourth vertebra bears a pair of feeble inferior apophyses. The lower pharyngeals are united by a straight suture.

* Eigenmann and Bray say, "No type was indicated for *Acara* until Gill in 1858 restricted it by exclusion of species of *Astronotus* and *Cichlasoma* to Heckel's *Acara crassispinis*. But it has since been determined that the *Acara crassispinis* of Heckel is a synonym of *Lobotes ocellatus*, Agassiz, which is the type of *Astronotus*. The name *Acara* is therefore the exact synonym of *Astronotus*." This argument appears unsound. After removing from Heckel's genus the species which belong to *Astronotus*, *Cichlasoma*, and *Acaropsis*, I use *Acara* for the remainder, regarding Gill's restriction of the name *Acara* to a species which was already the type of another genus as invalid.

This genus is scarcely distinct from the African *Paratilapia*, which differs in having the maxillary more or less exposed distally and in the constantly smaller size of the scales of the thoracic region. The distinction between *Acara*, with 3 anal spines, and *Cichlosoma*, with 4 or more anal spines, is somewhat arbitrary, but convenient.

Synopsis of the Species¹.

I. Præoperculum scaleless.

A. Dorsal and anal fins scaleless.

1. Depth of body $2-2\frac{2}{3}$ in the length.

a. 5 or 6 gill-rakers on the lower part of anterior arch.

* 2 or $2\frac{1}{2}$ scales between lateral line and anterior rays of soft dorsal. D. XIII-XVI 9-11. A. III 8-10.

1. *tetramerus*.

** 1 or $1\frac{1}{2}$ scales between lateral line and anterior rays of soft dorsal.

† Dorsal spines subequal from about the fourth to the twelfth. D. XIII-XV 10-11. A. III 6-8.

‡ Caudal peduncle from $\frac{3}{4}$ to as long as deep.

Depth of body $2-2\frac{1}{3}$ in the length; middle dorsal spines more than $\frac{2}{3}$ the length of head

2. *vittata*.

Depth of body $2\frac{2}{3}-2\frac{3}{4}$ in the length; middle dorsal spines usually less than $\frac{2}{3}$ the length of head

3. *sypilus*.

‡‡ Caudal peduncle $\frac{1}{2}-\frac{2}{3}$ as long as deep.

4. *paraguayensis*.

†† Dorsal spines increasing in length throughout; caudal peduncle $\frac{1}{2}-\frac{2}{3}$ as long as deep.

D. XIII-XIV 9-11. A. III 7-9. Sc. $24-26\frac{3}{8}$ 5. *pulehra*.

D. (XIV) XV 10-11. A. III 8-9. Sc. $26-28\frac{3}{8-9}$ 6. *cæruleopunctata*.

b. 7 to 9 gill-rakers on the lower part of anterior arch.

D. XIII-XV 9-12. A. III 8-9.

Dorsal spines subequal from the fifth; cheek with 3 series of scales

7. *æquinoctialis*.

Dorsal spines increasing in length throughout; cheek with 3 or 4 series of scales

8. *rivulata*.

Dorsal spines subequal from the fourth; cheek with 4 or 5 series of scales

9. *Geayi*.

2. Depth of body $2\frac{1}{2}-2\frac{2}{3}$ in the length.

D. XIII-XIV 9-10. A. III 7-9. Caudal peduncle longer than deep

10. *zamorensis*.

D. XV 10. A. III 8. Caudal peduncle deeper than long

11. *sapayensis*.

¹ *Heros centralis*, Holmberg (Rev. Argent. i. 1891, p. 183), is an insufficiently described species of doubtful position placed by Pellegrin in this genus. It may prove to be a *Geophagus* of the type of *G. Balzani*, Perugia. *Acara minuta*, Hensel (Arch. f. Nat. 1870, p. 71), appears to me to be founded on young examples of *Geophagus gymnocephalus*, Hensel.

- B. Soft dorsal and anal scaly at the base.
- D. XIII 10. A. III 7. Caudal peduncle $\frac{3}{8}$ as long as deep 12. *guianensis*.
- D. XIV-XVI 9-11. A. III 8-10. Caudal peduncle $\frac{1}{3}$ - $\frac{2}{3}$ as long as deep 13. *portalegrensis*.
- II. Præoperculum scaly ¹.
- A. Two series of scales on the cheek and one series on the præoperculum.
1. 23-26 scales in a longitudinal series.
- D. XIII-XIV 7-10. A. III 8. Dorsal and anal fins scaleless 14. *dorsijera*.
- D. XIV-XV 9-10. A. III 7. Soft dorsal and anal scaly at the base 15. *Thayeri*.
- D. XVI 9-10. A. III 7. 16. *flavilabris*.
2. 28-29 scales in a longitudinal series. D. XVI 10-11. A. III 8. 17. *frenifera*.
- B. Three series of scales on the cheek and one or two series on the præoperculum. D. XV 10-11. A. III 9-11. 18. *Maronii*.

1. *Acara tetramerus*.

Acara tetramerus, Heck. Ann. Mus. Wien, ii. 1840, p. 341; Günth. Cat. Fish. iv. p. 277 (1862); Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 65; Cope, Proc. Ac. Philad. 1872, p. 255, and Proc. Am. Phil. Soc. xxxiii. 1894, p. 106; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 171 (1904).

Acara viridis, Heck. t. c. p. 343; Günth. t. c. p. 280.

Acara diadema, Heck. t. c. p. 344.

Acara pallidus, Heck. t. c. p. 347; Günth. t. c. p. 280.

Chromys punctata, Casteln. Anim. Am. Sud, Poiss. p. 13, pl. viii. fig. 1 (1855).

Chromys uniozellata, Casteln. t. c. p. 15, pl. vi. fig. 1.

Acara vittata (non Heck.), Günth. t. c. p. 279.

Acara uniozellata, Günth. t. c. p. 281.

Astronotus tetramerus, Eigenm. & Eigenm. Proc. U.S. Nat. Mus. xiv. 1891, p. 68; Eigenm. & Bray, Ann. Ac. N. York, vii. 1894, p. 617.

Æquidens tetramerus, Eigenm. & Kennedy, Proc. Ac. Philad. 1903, p. 534.

Depth of body $2-2\frac{1}{3}$ in the length, length of head $2\frac{3}{4}-3$. Snout shorter than postorbital part of head. Diameter of eye $2\frac{2}{3}-3\frac{2}{3}$ in the length of head, interorbital width $2\frac{2}{3}-2\frac{3}{4}$. Depth of præorbital $\frac{1}{2}-1\frac{1}{6}$ the diameter of eye. Maxillary extending about to the vertical from anterior margin of eye; jaws equal anteriorly; fold of the lower lip not continuous; cheek with 3 or 4 series of scales; præoperculum scaleless; 5 or 6 gill-rakers on the lower part of anterior arch. Scales $25-27$ $\frac{3-3\frac{1}{2}}{5-10}$, 2 or $2\frac{1}{2}$ between lateral line and anterior

¹ ? *A. frenifera*.

rays of soft dorsal. Dorsal XIII-XV (XVI) 9-11, commencing above the opercular cleft, the spines subequal from the fourth or slightly increasing in length to the last, which is $\frac{2}{5}$ - $\frac{1}{2}$ the length of head. Anal III 8-10. Dorsal and anal fins scaleless. Pectoral at least as long as the head; ventral extending to origin of anal or beyond. Caudal rounded. Caudal peduncle $\frac{1}{2}$ - $\frac{2}{3}$ as long as deep. Olivaceous, with 5 dark cross-bars, the first crossing the anterior 7 or 8 scales of the lateral line, the second the 9th or 10th and 3 succeeding scales of the lateral line, below which it bears a blackish blotch; a dark spot below the posterior part of eye; a dark ocellated spot on the upper part of the base of caudal; usually a dark longitudinal band from lateral blotch to caudal spot, sometimes continued forward to the eye; vertical fins dusky, usually spotted.

R. Amazon; Guiana.

1-5. (90-181 mm.)	S. America.	Sir R. Schomburgk.
6. (112 mm.)	Essequibo River.	Mr. Ehrhardt.
7. (110 mm.)		
8-10. (71-124 mm.)	Cudajas.	Mus. Comp. Zool.
11-13. (81-96 mm.)	Cudajas.	Prof. A. Agassiz.

2. *Acara vittata*.

Acara vittata, Heck. Ann. Mus. Wien, ii. 1840, p. 346; Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 72, pl. iii. fig. 1.

Acara vittata (part.), Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 173 (1904).

Depth of body $2\frac{1}{5}$ - $2\frac{3}{5}$ in the length, length of head $2\frac{3}{4}$ - $2\frac{1}{2}$. Snout shorter than postorbital part of head. Diameter of eye $3-3\frac{3}{4}$ in the length of head, interorbital width $2\frac{2}{3}$ -3. Depth of præorbital about equal to diameter of eye. Maxillary extending nearly to below the anterior margin of eye; jaws equal anteriorly; cheek with 3 series of scales; præoperculum scaleless; 6 gill-rakers on the lower part of anterior arch. Scales 24-26 $\frac{3}{9}$, 1 between lateral line and anterior rays of soft dorsal. Dorsal XIII-XIV 10-11, commencing above the opercular cleft, the spines subequal from about the fourth to the twelfth, which are more than $\frac{2}{3}$ the length of head, the last $\frac{1}{2}$ the length of head; soft fin extending nearly to middle of caudal. Anal III 7-8. Dorsal and anal fins scaleless. Pectoral as long as the head; ventral extending to origin of anal or beyond. Caudal* rounded or truncate. Caudal peduncle nearly as long as deep. Olivaceous, with obscure darker cross-bars; a dark longitudinal

* Dr. Steindachner has very kindly informed me that in adult males the caudal is even slightly emarginate.

band from eye to end of soft dorsal; a dark vertical stripe below the posterior margin of eye; a dark spot on the upper part of the base of caudal; vertical fins with dark spots.

Guiana; R. Amazon; R. Paraguay.

The examples described by Steindachner measure up to about 130 mm. in total length.

3. *Acara sypsilus*.

Acara sypsilus, Cope, Proc. Ac. Philad. xxiii. 1872, p. 255, pl. xi. fig. 3.

Acara vittata (part.), Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 173 (1904).

Depth of body $2\frac{1}{3}$ – $2\frac{2}{5}$ in the length, length of head $2\frac{4}{5}$. Snout a little shorter than 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 $\frac{3}{2}$ the diameter of eye. Maxillary extending to the vertical from anterior margin of eye; lower jaw slightly shorter than the upper; fold of the lower lip not continuous; cheek with 3 series of scales; præoperculum scaleless; 5 or 6 gill-rakers on the lower part of anterior arch. Scales 26–27 $\frac{3}{8-9}$, $1\frac{1}{2}$ between lateral line and base of anterior rays of soft dorsal. Dorsal XIV–XV 9–10, commencing above extremity of operculum, the spines subequal from the fourth or fifth to the twelfth or thirteenth, which are $\frac{1}{3}$ – $\frac{2}{5}$ the length of head; last spine from $\frac{2}{5}$ to nearly $\frac{1}{2}$ the length of head; soft fin extending nearly to middle of caudal. Anal III 7 (8). Dorsal and anal fins scaleless. Pectoral as long as the head; ventral extending to origin of anal or beyond. Caudal subtruncate. Caudal peduncle $\frac{3}{4}$ – $\frac{1}{2}$ as long as deep. Olivaceous, with about 7 darker cross-bars and with a dark longitudinal band from eye to end of base of dorsal; a dark vertical stripe below the posterior part of eye; vertical fins dusky, with darker spots, which are most distinct on the soft dorsal.

Upper Amazon.

1-3. (95-101 mm.)

Canelos.

C. Buckley, Esq.

I have little doubt that these specimens belong to the species which Cope founded on very young specimens and which appears to differ from *A. vittata* in the more slender body, longer snout, narrower interorbital space, and less elevated spinous dorsal.

4. *Acara paraguayensis*.

Acara paraguayensis, Eigenm. & Kennedy, Proc. Ac. Philad. Iv. 1903, p. 534; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 175 (1904).

Depth of body $2\frac{1}{6}$ – $2\frac{1}{4}$ in the length, length of head $2\frac{2}{3}$ – $2\frac{3}{4}$. Snout shorter than postorbital part of head. Diameter of eye $2\frac{3}{4}$ – $3\frac{1}{4}$ in the length of head, interorbital width $2\frac{1}{4}$ –3. Depth of præorbital equal to diameter of eye or less. Maxillary extending to the vertical from anterior margin of eye; jaws equal anteriorly or the lower the shorter; fold of the lower lip not continuous; cheek with 3 series of scales; præoperculum scaleless; 6 gill-rakers on the lower part of anterior arch. Scales 24–26 $\frac{2\frac{1}{2}$ – 3 , 1 or $1\frac{1}{2}$ between lateral line and anterior rays of soft dorsal. Dorsal XIV (XIII–XV) 9–10, commencing above the opercular cleft, the spines subequal from the fourth to the twelfth, which are more than $\frac{2}{3}$ the length of head, thence slightly increasing to the last, which is $\frac{1}{2}$ the length of head; longest soft rays extending nearly to middle of caudal. Anal III 7 (6–8). Dorsal and anal fins scaleless. Pectoral a little longer than the head; ventral extending beyond origin of anal, sometimes to the posterior end of base of anal. Caudal rounded. Caudal peduncle $\frac{1}{2}$ – $\frac{2}{3}$ as long as deep. Body with about 7 dark cross-bars, the third bearing a large blackish blotch below the seventh to the tenth scales of the lateral line; a dark longitudinal stripe from eye to lateral blotch; a dark vertical stripe below the eye; a dark spot on the upper part of the base of caudal; soft dorsal with oblique dark stripes or series of spots posteriorly.

R. Paraguay.

- | | | |
|------------------|----------------------------|---------------------|
| 1. (97 mm.) | Corumbo, Matto Grosso. | Spencer Moore, Esq. |
| 2. (79 mm.) | Descalvados, Matto Grosso. | Dr. Ternetz. |
| 3-5. (49-71 mm.) | Carandasiño, Matto Grosso. | Dr. A. Borelli. |

5. *Acara pulchra*.

Cychlasoma pulchrum, Gill, Ann. Lye. N. York, vi. 1858, p. 382.

Acara caeruleopunctata, var. *latijrons*, Steind. Denkschr. Ak. Wien, xxxix. 1879, p. 27.

Acara pulchra (part.), Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 176 (1904).

Depth of body $2\frac{1}{6}$ – $2\frac{1}{4}$ in the length, length of head $2\frac{3}{4}$ – $2\frac{5}{8}$. Snout shorter than postorbital part of head. Diameter of eye $3\frac{1}{4}$ – $3\frac{1}{2}$ in the length of head, interorbital width $2\frac{1}{5}$ – $2\frac{2}{3}$. Depth of præorbital a little less than diameter of eye. Maxillary extending to the vertical from anterior margin of eye;

jaws equal anteriorly; fold of the lower lip not continuous; cheek with 3 series of scales; præoperculum scaleless; 6 gill-rakers on the lower part of anterior arch. Scales 24-26 $\frac{3}{8}$, 1 or $1\frac{1}{2}$ between lateral line and anterior rays of soft dorsal. Dorsal XIII-XIV 9-11, commencing above opercular cleft, the spines increasing in length to the last, which is $\frac{1}{2}$ the length of head; fourth spine $\frac{1}{3}$ - $\frac{2}{5}$ the length of head; soft fin pointed, the longest rays extending nearly to the end of caudal. Anal III 7-9. Dorsal and anal fins scaleless. Pectoral a little longer than the head; ventral extending nearly to middle of anal; caudal rounded. Caudal peduncle $\frac{1}{2}$ - $\frac{3}{5}$ as long as deep. Olivaceous, with 7 or 8 dark cross-bars, the third crossing the 9th or 10th and succeeding scale of the lateral line and bearing a blackish blotch below the lateral line; a dark vertical bar below the posterior $\frac{1}{2}$ of eye; sides of the head and anterior part of the body with blue spots, some of those on the head confluent to form stripes; fins dusky, the spinous dorsal with about 3 almost longitudinal dark stripes, the soft dorsal with narrow oblique stripes or series of spots; caudal with dark spots.

Colombia; Venezuela; Trinidad.

1-3. (114-125 mm.)	Baranquilla, Colombia.	Kay Thomson, Esq.
4-6. (105-119 mm.)	Trinidad.	L. Guppy, Esq.

This species has been confounded with *A. cæruleopunctata*, from which it is distinguished by the larger scales, fewer dorsal spines, broader interorbital space, and more produced soft dorsal and anal.

6. *Acara cæruleopunctata*.

Acara cæruleopunctata, Kner & Steind. Sitzb. Bayern Ak. 1863, p. 222, and Abhandl. Bayern Ak. x. 1864, p. 16, pl. ii. fig. 3; Günth. Trans. Zool. Soc. vi. 1869, p. 449.

Æquidens cæruleopunctatus, Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1898, p. 1514.

Acara pulchra (part.), Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 176 (1904).

Depth of body $2\frac{1}{5}$ - $2\frac{1}{3}$ in the length, length of head $2\frac{1}{5}$ -3. Snout shorter than postorbital part of head. Diameter of eye $3\frac{1}{2}$ in the length of head, interorbital width $2\frac{1}{2}$ - $2\frac{2}{3}$. Depth of præorbital equal to diameter of eye or less. Maxillary extending to the vertical from anterior margin of eye; jaws equal anteriorly; fold of the lower lip not continuous or subcontinuous; cheek with 3 series of scales; præoperculum scaleless; 5 or 6 gill-rakers on the lower part of

anterior arch. Scales 26-28 $\frac{3}{8-9}$, 1 or $1\frac{1}{2}$ between lateral line and anterior rays of soft dorsal. Dorsal * XIV-XV 10-11, commencing above opercular cleft, the spines increasing in length to the last, which is nearly $\frac{1}{2}$ the length of head; fourth spine nearly $\frac{1}{3}$ the length of head; soft fin pointed, the longest rays extending to the middle of caudal. Anal III 8-9. Dorsal and anal fins scaleless. Pectoral nearly as long as the head; ventral extending to or a little beyond origin of anal; caudal subtruncate or rounded. Caudal peduncle $\frac{3}{5}$ - $\frac{4}{5}$ as long as deep. Olivaceous, with 5 dark cross-bars, the third bearing a blackish blotch below the lateral line; sides of head and anterior part of body with blue spots; 2 or 3 oblique blue lines from eye to maxillary; fins dusky, the posterior part of the soft dorsal with oblique series of spots, the caudal obscurely spotted.

Panama; North-western Ecuador.

1-2. (129 and 134 mm.)
3-4. (102 and 142 mm.)

Rio Chagres.
N.W. Ecuador.

O. Salvin, Esq.
Mr. Rosenberg.

7. *Acara æquinocialis*, sp. n.

Chromis rivulata (part.), Günth. Proc. Zool. Soc. 1859, p. 418.

Acara pulchra (part.), Günth. Cat. Fish. iv. p. 280 (1862).

Acara rivulata (part.), Bouleng. Boll. Mus. Torin. xiv. 1899, no. 335, p. 5; Pelleg. Mém. Soc. Zool. France, xvi. 1903, p. 177 (1901).

Depth of body $2-2\frac{1}{5}$ in the length, length of head $2\frac{2}{3}-2\frac{4}{5}$. Snout shorter than postorbital part of head. Diameter of eye $2\frac{1}{5}-3\frac{1}{5}$ in the length of head, interorbital width $2\frac{1}{2}-3$. Depth of præorbital equal to the diameter of eye or less. Maxillary extending to the vertical from anterior margin of eye; jaws equal anteriorly; fold of the lower lip not continuous; cheek with 3 series of scales; præoperculum scaleless; 8 or 9 gill-rakers on the lower part of anterior arch. Scales 25-26 $\frac{3-3\frac{1}{2}}{8-9}$, $1\frac{1}{2}$ between lateral line and anterior rays of soft dorsal. Dorsal XIII-XV 10-12, commencing above the opercular cleft, the spines subequal from the fifth, which is more than $\frac{2}{5}$ the length of head; soft fin pointed, extending nearly to middle of caudal. Anal III 8-9. Dorsal and anal fins scaleless. Pectoral at least as long as the head; ventral extending to origin of anal or beyond. Caudal subtruncate or rounded. Caudal peduncle $\frac{3}{5}$ - $\frac{3}{4}$ as long as deep. Olivaceous, with darker cross-bars, the first crossing the first 7 or 8 scales of the lateral line, the second the 9th or 10th and 3 succeeding scales of the lateral line, bearing a large

* Of the four specimens three have fifteen dorsal spines.

blackish blotch below the lateral line; sometimes a dark vertical stripe below the eye; 2 or 3 blue lines from eye to maxillary; sides of head and anterior part of body with blue spots; vertical fins dusky, obscurely spotted.

Western Ecuador.

1-4. (52-96 mm.) types of the species. W. Ecuador.
5-6. (55 and 76 mm.) Rio Vinces. Dr. H. Festa.

Although similar to *A. rivulata* in colour, this species is markedly different in other characters.

8. *Acara rivulata*.

Chromis rivulata (part.), Günth. Proc. Zool. Soc. 1859, p. 418.

Acara pulchra (part.), Günth. Cat. Fish. iv. p. 280 (1862).

Acara rivulata (part.), Bouleng. Boll. Mus. Torin. xiv. 1899, no. 335, p. 5; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 177 (1904).

Depth of body $2\frac{1}{5}$ - $2\frac{2}{5}$ in the length, length of head 3. Snout as long as postorbital part of head. Diameter of eye $3\frac{2}{3}$ -4 in the length of head, interorbital width 3- $3\frac{1}{4}$. Depth of præorbital 1- $1\frac{1}{4}$ 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 3 or 4 series of scales; præoperculum scaleless; 7 or 8 gill-rakers on the lower part of anterior arch. Scales 27-28 $\frac{3-4}{9-10}$, $1\frac{1}{2}$ between lateral line and anterior rays of soft dorsal. Dorsal XIV-XV 10-12, commencing above the opercular cleft, the spines increasing in length to the last, which is a little more than $\frac{2}{5}$ the length of head; fourth spine $\frac{1}{3}$ the length of head or a little less; soft fin pointed, the longest rays extending nearly to middle of caudal, sometimes beyond. Anal III 8-9. Dorsal and anal fins scaleless. Pectoral nearly as long as the head; ventral extending nearly to origin of anal; caudal rounded; caudal peduncle as long or nearly as long as deep. Brownish above, yellowish below; 4 or 5 cross-bands on the side which are much broader than the interspaces between them, the first crossing the first 7 or 8 scales of the lateral line, the second the 9th or 10th and 3 succeeding scales of the lateral line, bearing a large blackish blotch below the lateral line; a blackish vertical stripe below the eye; 3 blue lines from eye to maxillary; sides of head with blue spots; vertical fins dusky, obscurely spotted.

Western Ecuador.

1. (136 mm.) type of the species. W. Ecuador.
2-4. (113-126 mm.) Rio Peripa. Dr. H. Festa.

9. *Acara Geayi*.

? *Acara Heckelii*, Müll. & Trosch. in Schomburgk, Guiana, iii. p. 624 (1848); Günth. Cat. Fish. iv. p. 279 (1862).

Acara Geayi, Pellegr. Bull. Mus. Paris, 1902, p. 417; Mém. Soc. Zool. France, xvi. 1903, p. 178 (1904).

Depth of body $2-2\frac{1}{3}$ in the length, length of head 3. Snout longer than postorbital part of head. Diameter of eye $2\frac{1}{2}-3$ in the length of head and equal to the interorbital width. Depth of præorbital greater than diameter of eye. Maxillary not reaching the vertical from the anterior margin of eye; jaws equal anteriorly; fold of the lower lip not continuous; cheek with 4 or 5 series of scales, præoperculum scaleless; 7 gill-rakers on the lower part of anterior arch. Scales 26-27 $\frac{1}{5}$. Dorsal XIV-XV 9-11, commencing a little in advance of the opercular cleft, the spines subequal from the fourth, the last $\frac{1}{2}-\frac{2}{3}$ the length of head. Anal III 8. Dorsal and anal fins scaleless. Pectoral as long as the head; ventral extending to middle of anal; caudal truncate. Caudal peduncle $\frac{3}{8}$ as long as deep. Brownish; a curved blackish band from the origin of dorsal through the eye to the suboperculum and another from below the middle of the spinous dorsal across the side nearly to the mid-ventral line. Soft dorsal, anal, and caudal with light spots.

Guiana.

1. (84 mm.)

Essequibo.

Mr. Ehrhardt.

2. (91 mm.)

Cayenne.

Warsaw Museum.

10. *Acara zamorensis*, sp. n.

Acara sypsilus (non Cope), Bouleng. Boll. Mus. Torin. xiv. 1899, no. 335, p. 6.

Acara vittata (part.), Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 173 (1904).

Depth of body $2\frac{2}{3}$ in the length, length of head 3. Snout shorter than the postorbital part of head. Diameter of eye $3\frac{1}{2}$ in the length of head, interorbital width 3. Depth of præorbital equal to diameter of eye. Maxillary extending to the vertical from anterior margin of eye; jaws equal anteriorly; fold of the lower lip not continuous; cheek with 3 series of scales; præoperculum scaleless; 5 gill-rakers on the lower part of anterior arch. Scales $27\frac{3}{5}$, 1 between lateral line and anterior rays of soft dorsal. Dorsal XIII (XIV 9) 10, commencing behind the opercular cleft, the spines increasing in length to the last, which is $\frac{2}{3}$ the length of head; fourth spine $\frac{2}{7}$ the length of head; longest

soft rays extending to anterior $\frac{1}{4}$ of caudal. Anal III (7-8) 9. Dorsal and anal fins scaleless. Pectoral $\frac{2}{3}$ the length of head; ventral extending to origin of anal; caudal subtruncate. Caudal peduncle $1\frac{1}{3}$ as long as deep. Reddish brown, with about 7 blackish cross-bars, the first three bearing longitudinally expanded blotches below the lateral line; a faint dark bar below the posterior part of eye; a dark spot at the base of caudal; sides of head and anterior part of body with blue spots; vertical fins dusky, posterior part of dorsal and the caudal obscurely spotted.

Amazons of Ecuador.

1. (101 mm.) type of the species. Rio Zamora. Dr. H. Festa.

11. *Acara sapayensis*.

Acara sapayensis, Regan, Ann. & Mag. Nat. Hist. (7) xii. 1903, p. 628.

Acara riculata (part.), Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 177 (1904).

Depth of body $2\frac{2}{3}$ in the length, length of head $2\frac{5}{6}$. Snout a little shorter than postorbital part of head. Diameter of eye $3\frac{1}{4}$ in the length of head, interorbital width $2\frac{2}{3}$. Depth of præorbital $\frac{3}{4}$ the diameter of eye. Maxillary extending to the vertical from the anterior margin of eye; lower jaw a little shorter than the upper; cheek with 3 series of scales; præoperculum scaleless; 5 gill-rakers on the lower part of anterior arch. Scales $26\frac{3}{5}$, 1 between lateral line and anterior rays of soft dorsal. Dorsal XV 10, originating behind the opercular cleft, the spines increasing in length to the last, which is $\frac{2}{3}$ the length of head; fourth spine $\frac{1}{4}$ the length of head; soft fin pointed, the longest rays extending beyond the middle of caudal. Anal III 8. Dorsal and anal fins scaleless. Pectoral nearly as long as the head; ventral extending to origin of anal; caudal subtruncate. Caudal peduncle $\frac{4}{5}$ as long as deep. Brown, with 6 or 7 blackish cross-bars on the upper half of the body, extending on to the base of the dorsal fin; some oblique blue lines from eye to maxillary and blue spots on the side of the head; vertical fins dusky.

N.W. Ecuador.

1. (114 mm.) type of the species. R. Sapayo. Mr. Rosenberg.

12. *Acara guianensis*, sp. n.

Depth of body 2 in the length, length of head 3. Snout shorter than postorbital part of head. Diameter of eye $3\frac{1}{4}$

in the length of head, interorbital width $2\frac{2}{3}$. Depth of præorbital $\frac{3}{4}$ 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 3 series of scales; præoperculum scaleless; 5 gill-rakers on the lower part of anterior arch. Scales 25 $\frac{3}{4}$. Dorsal XIII 10, commencing above the opercular cleft, the spines subequal from the fourth, the last nearly $\frac{1}{2}$ the length of head, the middle soft rays elongate, extending to the end of caudal. Anal III 7. Soft dorsal and anal scaly at the base. Pectoral longer than the head; ventral extending a little beyond the origin of anal; caudal rounded. Caudal peduncle $\frac{5}{8}$ as long as deep. Body with 5 or 6 dark cross-bars, the second crossing the 7th to 10th scales of the lateral line and bearing a large darker blotch below the lateral line; the third and fourth bars with smaller and fainter blotches; a dark bar below the posterior part of eye and a dark spot on the upper half of the base of caudal; soft dorsal, posterior part of anal, and base of caudal spotted.

Guiana.

1. (110 mm.) type of the species. Guiana. Berlin Museum.

13. *Acara portalegrensis*.

? *Acara dimerus*, Heck. Ann. Mus. Wien, ii. 1840, p. 341; Günth. Cat. Fish. iv. p. 277 (1862).

Acara portalegrensis, Hensel. Arch. f. Nat. 1870, p. 52; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 173 (1904).

Depth of body 2 in the length, length of head $2\frac{2}{3}$ -3. Snout shorter than postorbital part of head. Diameter of eye $2\frac{1}{2}$ - $3\frac{1}{2}$ in the length of head, interorbital width $2\frac{1}{4}$ - $2\frac{1}{2}$. Depth of præorbital $\frac{1}{2}$ - $\frac{3}{4}$ the diameter of eye. Maxillary extending to or beyond the vertical from anterior margin of eye; jaws equal anteriorly; fold of the lower lip not continuous; cheek with 2-3 series of scales; præoperculum scaleless; 5 or 6 gill-rakers on the lower part of anterior arch. Scales 24-26 $\frac{3}{8}$. Dorsal XIV-XVI 9-11, commencing above the opercular cleft, the spines not or but slightly increasing in length posteriorly, the last $\frac{2}{3}$ - $\frac{1}{2}$ the length of head, the longest rays extending to middle of caudal or beyond. Anal III 8-10. Soft dorsal and anal scaly at the base. Pectoral as long as the head; ventral extending to origin of anal or beyond; caudal rounded. Caudal peduncle $\frac{1}{3}$ - $\frac{2}{3}$ as long as deep. Body with 8 or 9 dark cross-bands, the third bearing a blackish blotch below

the lateral line; a dark band from eye to lateral blotch; a dark bar or spot below the eye; a white line from eye to nostril and beyond; often a large dark ocellus on the upper part of base of caudal, this varying considerably and sometimes completely wanting; posterior part of soft dorsal and anal with oblique dark stripes; dark stripes on the caudal more or less oblique if an ocellus be present, vertical if it be absent.

Rio Paraguay; Rio Grande do Sul.

1. (76 mm.)	Descalvados, Matto Grosso.	Dr. Ternetz.
2. (119 mm.)	Paraguayan Chaco.	Dr. Ternetz.
3. (120 mm.)	Luqui, Paraguay.	Dr. A. Borelli.
4. (95 mm.)	Paraguayan Chaco.	Graham Kerr, Esq.
5-6. (88 and 96 mm.)	Bahia Negra, N. Chaco.	G. Boggiani.
7-9. (38-82 mm.)	Carandasiñho, Matto Grosso.	Dr. A. Borelli.
10. (64 mm.)	Rio Grande do Sul.	Dr. H. von Ihering.

14. *Acara dorsigera*.

Acara dorsigera, Heck. Ann. Mus. Wien, ii. 1840, p. 348; Günth. Cat. Fish. iv. p. 280 (1862); Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 76; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 174 (1904).

Depth of body $2\frac{1}{5}$ in the length, length of head $2\frac{3}{4}$ - $2\frac{4}{5}$. Head very similar to that of *A. tetramerus*, but with 2 series of scales on the cheek and 1 series on the præoperculum; 6 gill-rakers on the lower part of anterior arch. Scales 23-24 $\frac{21}{9}$. Dorsal XIII-XIV 7-10. Anal III 8. Dorsal and anal fins scaleless. Pectoral as long as the head. Caudal rounded. Caudal peduncle $\frac{1}{2}$ as long as deep. Olivaceous, with 7 or 8 more or less distinct darker cross-bars; a dark blotch below the ninth to eleventh scales of the lateral line; a dark longitudinal band from eye to lateral blotch; a dark spot on the spinous dorsal between the eighth and tenth spines; soft dorsal, anal, and caudal with series of alternate light and dark spots.

R. Amazon; R. Paraguay.

The examples described by Heckel and Steindachner measure up to 53 mm. in total length.

15. *Acara Thayeri*.

Acara Thayeri, Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 68, pl. i. fig. 2; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 175 (1904).

Depth of body 2 in the length, length of head 3. Snout shorter than postorbital part of head. Diameter of eye 3 in the length of head, interorbital width $2\frac{2}{3}$ - $2\frac{3}{4}$. Maxillary not extending to below the eye; jaws equal anteriorly; cheek

with 2 series of scales, præoperculum with 1 series; 6 gill-rakers on the lower part of anterior arch. Scales 23-24 $\frac{21}{5}$. Dorsal XIV-XV 9-10, commencing above the opercular cleft, the spines only slightly increasing after the fifth, the last nearly $\frac{1}{2}$ the length of head; soft fin extending to middle of caudal or beyond. Anal III 7. Soft dorsal and anal scaly at the base. Pectoral as long as the head; ventral extending to origin of anal or beyond. Caudal rounded. Caudal peduncle $\frac{1}{2}$ as long as deep. Olivaceous, with obscure darker cross-bars; a dark longitudinal band from eye to below the fourth scale of the lateral line; a dark blotch on and below the sixth to the tenth scales of the lateral line, and another above it extending on to the spinous dorsal; soft dorsal, anal, and caudal sometimes with dark spots.

R. Amazon.

The examples described by Steindachner measure up to 110 mm. in total length.

16. *Acara flavilabris*.

Acara flavilabris, Cope, Proc. Am. Phil. Soc. xi. 1870, p. 572, and xvii. 1878, p. 696; Proc. Ac. Philad. 1872, p. 255, pl. xi. fig. 4.

Closely allied to *A. Thayeri*, which it resembles in having 2 series of scales on the cheek and 1 series on the præoperculum, and quite wrongly placed in the synonymy of *A. tetramerus* by Steindachner and by Pellegrin. Dorsal XVI 9-10. Anal III 7. Scales 24 $\frac{23}{5}$. Caudal peduncle apparently more than $\frac{1}{2}$ as long as deep. A dark blotch on the lateral line before the middle of the side of the body; a dark bar at the base of caudal; lower lip yellowish.

River Ambyiacu, Upper Amazon.

Cope states that all five specimens examined by him agree in having 16 dorsal spines.

17. *Acara frenifera*.

Acara freniferus, Cope, Proc. Ac. Philad. 1872, p. 255; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 177 (1904).

Apparently allied to the preceding species, but with more numerous scales, 28-29 in a longitudinal series. Dorsal XVI 10-11. Anal III 8. Body with dark cross-bars; a blackish spot below the middle of the dorsal fin, connected with the eye by a blackish longitudinal band.

River Ambyiacu, Upper Amazon.

18. *Acara Maronii*.

Acara Maronii, Steind. Denkschr. Ak. Wien, xliii. 1882, p. 141, pl. ii. fig. 4; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 179 (1904).

Depth of body $1\frac{2}{3}$ – $1\frac{3}{4}$ in the length, length of head 3. Snout considerably shorter than postorbital part of head. Diameter of eye 3 in the length of head, interorbital width $2\frac{1}{2}$. Depth of præorbital $\frac{3}{4}$ the diameter of eye. Maxillary extending to the vertical from anterior margin of eye; jaws equal anteriorly; fold of the lower lip slightly interrupted; cheek with 3 series of scales, præoperculum with 1 or 2 series; 5 or 6 gill-rakers on the lower part of anterior arch. Scales $24\frac{33-4}{5}$. Dorsal XV 10–11, commencing above the opercular cleft, the spines not or but slightly increasing in length posteriorly, the last $\frac{1}{2}$ the length of head, the longest soft rays produced to or beyond the end of caudal. Anal III 9–11. Soft dorsal and anal strongly scaly at the base. Pectoral as long as the head; ventral extending beyond origin of anal, sometimes nearly to the posterior end of base of anal; caudal rounded. Caudal peduncle $\frac{1}{4}$ – $\frac{1}{3}$ as long as deep. Brownish; a blackish curved band from origin of dorsal through eye to suboperculum; a blackish blotch above the lateral line below the posterior dorsal spines.

Guiana.

1–2. (83 and 87 mm.)
3. (77 mm.)

Surinam.
Demerara.

Mr. Kappler.
F. G. Beckford, Esq.

NANNACARA, gen. nov.

Closely allied to *Acara*, but the upper lateral line runs obliquely upwards to the spinous dorsal, from which it is separated by only half a series of scales for most of its length.

A single species from the Essequibo.

Nannacara anomala, sp. n.

Acara punctulata (part.), Günth. Ann. & Mag. Nat. Hist. xii. 1863, p. 441.

Depth of body $2\frac{3}{4}$ in the length, length of head 3. Snout much shorter than postorbital part of head. Diameter of eye 3 in the length of head and greater than the interorbital width. Depth of præorbital $\frac{1}{3}$ the diameter of eye. Maxillary extending to below the eye; jaws equal anteriorly; fold of the lower lip continuous; cheek with 2 series of scales, præoperculum with 1 series; 5 or 6 gill-rakers on the

lower part of anterior arch. Scales 23-24 $\frac{13}{8}$, $\frac{1}{2}$ a scale between upper lateral line and dorsal fin for most of its length. Dorsal XVI 8, commencing above the opercular cleft, the spines subequal or slightly increasing after the sixth, the last nearly $\frac{1}{2}$ the length of head; soft fin extending beyond middle of caudal. Anal III 8. Pectoral as long as the head; ventral extending to origin of anal. Caudal rounded or pointed, the middle rays being somewhat produced. Caudal peduncle $\frac{1}{2}$ as long as deep. Brownish, with a dark longitudinal stripe from eye to base of caudal and a dark oblique stripe from eye to angle of præoperculum; soft dorsal, anal, and caudal obscurely spotted.

R. Essequibo.

1 2. (55 and 57 mm.) types of the species. R. Essequibo. Mr. Ehrhardt.

This curious species was considered by Pellegrin to be probably identical with *Biotodoma Agassizii*, Stdr. However, there is no trace of a lobe on the upper part of the anterior branchial arch, and the scaly præoperculum also separates it from the known species of *Biotodoma*.

ACAROPSIS.

Acara (part.), Heck. Ann. Mus. Wien, ii. 1840, p. 338; Günth. Cat. Fish. iv. p. 276 (1862).

Acaropsis, Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 80; Eigenm. & Bray, Ann. Ac. N. York, vii. 1894, p. 613; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 180 (1904).

Differs from *Acara* only in the somewhat larger mouth, very protractile præmaxillaries, and exposed maxillary.

A single species from the Amazon, Venezuela, and Guiana.

The skeleton is very similar to that of *Acara tetramerus*, but the greater length of the ascending processes of the præmaxillaries, which extend to above the middle of the orbit, is correlated with a somewhat shorter occipital crest and shorter and weaker parietal crests. There are 25 vertebræ (12+13), the third bearing a pair of feeble inferior apophyses.

Acaropsis nassa.

Acara nassa, Heck. Ann. Mus. Wien, ii. 1840, p. 353; Günth. Cat. Fish. iv. p. 281 (1862).

Acara cognatus, Heck. t. c. p. 356.

Acara unicolor, Heck. t. c. p. 357.

Acara (*Acaropsis*) *nassa*, Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 81, pl. ii.

Acaropsis nassa, Eigenm. & Bray, Ann. Ac. N. York, vii. 1894, p. 613; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 180 (1904).

Depth of body $2-2\frac{1}{4}$ in the length, length of head $2\frac{3}{5}-2\frac{3}{4}$. Snout not longer than eye, the diameter of which is $2\frac{2}{5}-3\frac{1}{5}$ in the length of head and equal to or greater than the inter-orbital width. Depth of præorbital $\frac{1}{4}$ to a little more than $\frac{1}{2}$ the diameter of eye. Mouth oblique; lower jaw projecting; maxillary extending to below anterior part or middle of eye; præmaxillary processes extending to above posterior margin of eye; cheek with 2 or 3 series of scales, none on the præoperculum; 10-11 gill-rakers on the lower part of anterior arch. Scales 23-24 ³₅₋₉, $\frac{1}{2}$ a scale between lateral line and anterior rays of soft dorsal. Dorsal XIII-XIV 9-11, commencing above the opercular cleft, the spines increasing in length to the last, which is $\frac{1}{2}$ the length of head, the soft fin pointed, extending to middle or posterior extremity of caudal. Anal III 8-9. Dorsal and anal fins scaleless. Pectoral longer than the head, extending to above middle of anal. Caudal rounded. Caudal peduncle $\frac{1}{3}-\frac{2}{5}$ as long as deep. Brownish; a blackish spot on the middle of the side, another at the origin of the lateral line, a third below the posterior part of eye, and a fourth on the angle of the præoperculum, the last often ocellated; a dark spot on the upper $\frac{1}{2}$ of the base of caudal; soft vertical fins usually with small dark spots.

R. Amazon; R. Orinoco; Guiana.

1. (152 mm.)	R. Cupai.	
2. (140 mm.)	Demerara.	F. G. Beckford, Esq.
3. (Skeleton.)	Teffé.	Mus. Comp. Zool.
4. (195 mm.)	Tonantins.	Paris Museum.

ASTRONOTUS.

Astronotus, Swains. Nat. Hist. Fish. ii. p. 229 (1839); Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 182 (1904).

Acara (part.), Heck. Ann. Mus. Wien, ii. 1840, p. 338.

Hygogonus, Günth. Cat. Fish. iv. p. 303 (1862).

Astronotus (part.), Eigenm. & Bray, Ann. Ac. N. York, vii. 1894, p. 615.

Body ovate, compressed; scales rather large, ctenoid. Two lateral lines. Mouth moderate; maxillary scarcely exposed; jaws with small conical teeth in bands and with an outer series of rather strong teeth; upper surface of head scaly to between the orbits; cheeks and opercular bones scaly; præoperculum entire. Gill-rakers few and short. A single dorsal, with XII-XIV 19-21 rays; anal with III 15-16 rays; soft vertical fins densely covered with small

scales; caudal rounded. Pectoral asymmetrical, with 15 rays; ventrals a little behind the base of the pectoral.

A single species from South America.

The skeleton is very similar to that of *Acara tetramerus*, but there are 31 vertebrae (16 + 15), the third and fourth forming a very distinct inferior process for the attachment of the pharyngeal muscles.

Astronotus ocellatus.

Lobotes ocellatus, Agass. in Spix, Pisc. Bras. p. 129, pl. lxxviii. (1829).
Astronotus ocellatus, Swainson, Nat. Hist. Fish. ii. p. 229 (1839); Eigenmann & Bray, Ann. Ac. N. York, vii. 1894, p. 617; Pellegrin, Mém. Soc. Zool. France, xvi. 1903, p. 182 (1904).
Acara crassispinis, Heck. Ann. Mus. Wien, ii. 1840, p. 356.
Cyehla rubroocellata, Schomb. Fish. Guiana, ii. p. 153, pl. x. (1843).
Hygrogonus ocellatus, Günth. Cat. Fish. iv. p. 303 (1862).
Acara compressus, Cope, Proc. Ac. Philad. 1872, p. 256.
Acara ocellata, Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 77.
Acara hyposticta, Cope, Proc. Am. Phil. Soc. xvii. 1878, p. 697.
Astronotus ocellatus, var. *zebra*, Pellegrin, t. c. p. 183.
Astronotus hypostictus, Pellegrin, l. c.

Depth of body $2-2\frac{1}{4}$ in the length, length of head 3. Snout as long as or longer than eye, the diameter of which is $4-4\frac{1}{3}$ in the length of head, interorbital width $2\frac{1}{4}-2\frac{1}{3}$. Depth of præorbital $\frac{1}{2}$ the diameter of eye. Mouth oblique; lower jaw slightly projecting; maxillary very slightly exposed, extending to below anterior $\frac{1}{2}$ of eye; præmaxillary process extending to above anterior $\frac{1}{4}$ of eye; cheek with 7-9 series of scales, none on the præoperculum; 7-9 gill-rakers on the lower part of anterior arch. Scales $33-38$ ^{$\frac{6\frac{1}{2}-7\frac{1}{2}}{17-20}$} , those of the thoracic region considerably smaller than on the sides of the body. Dorsal XII-XIII (XIV) 19-21, commencing above the opercular cleft, the spines slightly increasing in length to the last, which is $\frac{1}{3}$ the length of head. Anal III 15-16. Pectoral nearly as long as the head. Caudal rounded. Caudal peduncle $\frac{2}{5}-\frac{1}{2}$ as long as deep. Brownish, with a blackish ocellated spot on the upper $\frac{1}{2}$ of the base of caudal and sometimes 2 or 3 more on the base of the soft dorsal; pectoral with a blackish spot on the inner side near the base.

Guiana; R. Amazon; R. Paraguay.

1. (255 mm.)	Teffé.	Mr. Salmin.
2. (Skeleton.)	Teffé.	Prof. A. Agassiz.
3. (240 mm.)	Para.	Dr. E. A. Göldi.
4. (250 mm.)	Carandasiñho, Matto Grosso.	Dr. A. Borelli.
5. (225 mm.)	Manaos.	Paris Museum.

XLIII.—*Notes on the Natural History of East Finmark.* By
 Canon A. M. NORMAN, M.A., D.C.L., LL.D., F.R.S.,
 F.L.S.

[Concluded from vol. xii. p. 417.]

THE delay which has taken place in the conclusion of these notes has arisen from two or three minute Cœlenterata which I was unable to identify and which required a good deal of working out. Pressure of other work has prevented this being done, and as the other species of Cœlenterata were neither numerous nor for the most part rare, I have now thought it best to omit the Cœlenterata altogether, and to no longer delay the printing of the notes on Foraminifera and on Botany which have been so long awaiting publication.

FORAMINIFERA.

Astrorhiza limicola, Sandahl.

Psammosphæra fusca, E. Schulze.

Hyperammia subnodosa, H. Brady.

Rhabdammina discreta, H. Brady.

Haplophragmium latidorsatum, Borneman.

— *globigeriniforme*, Parker & Jones.

— *glomeratum*, H. Brady.

— *canariense*, d'Orbigny.

— *crassimargo*, Norman, nom. nov. Brady, 'Challenger' Foram. p. 310, pl. xxxv. fig. 4; Goës, "Synopsis Arctic and Scandinavian Recent Marine Foraminifera" (Kongl. Svenska Vet.-Akad. Handl. vol. xxv. 1894, p. 21, pl. v. figs. 92-94). A larger and much more tumid form than *canariense*, and the two are quite distinct when found living in company.

Reophax fusiformis, Williamson.

Hippocrepina indivisa, Parker.

Trochammia squamata, Parker & Jones.

Ammodiscus incertus, d'Orbigny.

— *charoides*, Jones & Parker.

Webbina hemisphærica, Jones, Parker, & Brady.

Spiroplecta biformis, Parker & Jones.

Valvulina conica, Parker & Jones.

Cassidulina lævigata, d'Orbigny.

— *crassa*, d'Orbigny.

Bulimina pyrula, d'Orbigny.

— *arctica*, d'Orbigny.

— *elegans*, d'Orbigny.

— *fusiformis*, Williamson.

Virgulina Schreibersiana, Czjzek.

Bolivina punctata, d'Orbigny.

— *plicata* (d'Orb.), Brady.

Uvigerina angulosa, Williamson.

— *tenuistriata*, Reuss.

Polymorphina problema, d'Orbigny.

— *rotundata*, Borneman.

— *compressa*, d'Orbigny.

— *amygdaloides* (Reuss), Brady.

— *gibba*, d'Orbigny.

Cristallaria crepidula, Fichtel & Moll.

Nodosaria soluta, Reuss.

— *levigata*, d'Orbigny.

— *acuminata*, Reuss (= *Pseudium acuminatum*, Reuss). A produced form of *N. levigata* with oblique suture (see Schlicht, 'Foram. des Septentrientiones von Pietzpuhl,' 1870, pl. xxv. figs. 1-10).

— *communis*, var. *Verneullii*, d'Orbigny.

— *calomorpha*, Reuss.

— *pauperata*, d'Orbigny. The specimens thus named are from the Varanger and Bög Fiords. Dr. H. B. Brady examined them and called them "*radicula* running into *N. brevis*," but they exactly correspond to the Greenland form assigned by Goës to *N. pauperata* as "*megalosphærica*," and figured by him (*l. c.* pl. xii. figs. 677-683).

Lagena globosa, Walker & Jacob.

— *lavis*, Montagu.

— *striata*, d'Orbigny.

— *distoma*, Parker & Jones.

— *lineata*, Williamson.

— *semilineata*, J. Wright.

— *costata*, Williamson.

— —, forma *acuticosta*, Reuss.

— *finmarchica*, sp. n. This is a very beautiful *Lagena* belonging to the *striato-punctata* group, having a form not unlike that species and with the same very slender neck. It is larger than any specimen of *striato-punctata* that I have seen. Its marked character consists in the costæ, which are each composed of three very distinct riblets, while the puncta, instead of being

on the costæ, are between them, as in *L. Fieldingiana*. A single specimen was taken at Vadsö, near the entrance to the harbour, in 10–25 fathoms.

Lagena squamosa, Montagu.

— *hexagona*, Williamson.

— *levigata*, Reuss.

— *lagenoides*, Williamson.

— *Orbigniana*, Sequenza.

— *pulchella*, H. B. Brady.

Globigerina bulloides, d'Orbigny.

Pullenia sphaeroides, d'Orbigny.

Truncatulina lobatula, Walker & Jacob.

Patellina corrugata, Williamson.

Pulvinulina Karsteni, Reuss.

— *exigua*, H. B. Brady.

Polystomella striato-punctata, Fichtel & Moll.

Nonionima umbilicata, Montagu.

— *depressula*, Walker & Jacob.

— *stelligera*, d'Orbigny.

— *scapha*, Fichtel & Moll.

— *turgida*, Williams.

— *communis*, d'Orbigny. This approaches very closely to *N. turgida* in general characters, but instead of being very tumid, as in that species, it is as compressed as *N. scapha*. Dr. H. B. Brady saw my specimens, and referred them to *N. communis*, d'Orbigny (For. Foss. Vien. p. 108, pl. v. figs. 7, 8). It was taken on the same ground as *N. turgida*, and was distinguishable at a glance; nor could I find any intermediate forms.

Operculina ammonoides, Gronovius.

Miliolina tricarinata, d'Orbigny.

— *trigonula*, Lamarek.

— *seminulum*, Linné.

— *subrotunda*, Walker & Boys.

Biloculina ringens, Lamarek.

BOTANY.

Dredging or shore-collecting every day, and on arriving at home the sorting and preserving of the captures, left little time for botanizing. Still some was made. In the middle of the day we always landed at some new spot, and after a hurried luncheon Schneider and myself set off to explore

the neighbouring ground while the boatmen were finishing their dinner, resting, and smoking. Thus three quarters of an hour was spent by him in entomologizing, by myself in botanizing. Then at night, again, between 9 and 12 p.m. he was often busy with his net while I was plant-hunting. On Sundays a longer ramble was taken, during which many good plants were found. Still no ground was examined which was further than a mile from the shores; but had excursions been made inland among the copses and on the hills, the list of plants here given would have no doubt been considerably extended. It was a great treat to explore an Arctic flora so different in many respects from our own, represented by so many of our Alpine forms and yet including so many other beautiful species. The rarest plant I found was *Arenaria lateriflora*, of which I believe the only European habitat is near the falls of the Pasvic River, and as Herr Schneider was aware of this fact we did not lose the opportunity of seeking it. *Dianthus superbus* is a lovely pink, which was in full flower, ornamenting the cliffs on the eastern side of one of the fiords on the north coast which we passed in the steamer; but I have forgotten which fiord it was. Among the other more beautiful plants new to me were the various species of the families Polemoniaceæ and Ericaceæ. Striking among the latter were the bushes of the Arctic *Ledum palustre*, the delicious scent of which perfumed the air for a considerable distance from the bog in which the plants were growing.

In this high latitude, of course, large numbers of those found in the temperate climate of our islands are absent; for instance, it may interest some reader who knows nothing of the geographical distribution of plants to mention a few of the familiar friends which he must not expect to meet with so far north. There are no such shrubs as holly, ivy, honeysuckle, dog-rose (of any British species), blackberry (*Rubus fruticosus*), gorse, or broom. There is no common daisy*, celandine (*Ranunculus ficaria*), sweet violet, primrose, cowslip, bluebell†, wood-anemone, or foxglove; the only clovers are *Trifolium repens* and *pratensis*; the only *Campanula* is *C. rotundifolia*; there are no English poppies; while *Geranium pratense* and the whole of the annual species of that genus are absent.

Of garden weeds the common groundsel would seem to be scarce, for I failed to find it in weedy gardens which I examined, and no other species of *Senecio* occurs.

* *Bellis perennis* is confined to quite the southern part of Norway.

† *Scilla nutans* is not found in Norway at all.

There are no bindweeds (*Convolvulus*), no sow-thistles (*Sonchus*), no annual species of *Veronica*, and the only *Chenopodium* is *C. album*; and the common thistles of our fields—*Carduus nutans*, *acanthoides*, *lanceolatus*, and *arvensis*—are not to be found.

The rapidity of growth which takes place in Arctic regions cannot fail to strike the stranger as truly wonderful. A spot, barren and brown when first seen, will a fortnight later be vivid with green clothing and bright with flowers and waving rushes and grasses. But the healthiness and vigour of plants grown in pots within doors struck me as still more remarkable. At the furthest and darkest corners of rooms, where in England they would at once pine and die, they flourish and flower as vigorously as they would with us when grown in a sunny south window. This is no doubt accounted for by the fact that in the comparatively dark corners they receive during the twenty to twenty-four hours of daylight as much invigorating stimulus as they would do in England when subjected to a much stronger light in our shorter days. In the long rest of the winter darkness plants no doubt also lay up a force of strength ready to burst forth at the first awakening from their sleep.

In 1860 Sir Joseph D. Hooker published, in *Trans. Linn. Soc.* vol. xxiii. pp. 251-348, an exhaustive paper, "Outlines of Distribution of Arctic Plants." He there estimates the total number of flowering plants found within the circumpolar Arctic circle to be 762 species. Of these he gives no less than 616 as occurring in Arctic Europe, 586 of which he regards as of Scandinavian origin, and the small remaining 30 as of American or Asiatic origin. Zoologists no longer regard the Arctic Circle as the boundary of the Arctic fauna, but take an isothermal line. Now if we take as our isothermal line that which indicates an average temperature throughout the year of the freezing-point, 32° Fahr., we shall find that the whole of Western, by far the larger part of Central, and all Northern Norway except the extreme north-east, where I was working, have a higher temperature. With such a boundary a very large number of the species regarded by Hooker as Arctic would be excluded. On the other hand, if the same isothermal line be followed across America and Asia, it will be found very far south of the Arctic Circle in America, passing about 50° W. through the most southern extremity of Hudson's Bay, and in Asia, in about the same latitude, crossing Lake Baikal. Using, then, this isothermal, it would follow that almost the whole of Norway would be excluded, while in America and Asia vast regions

would be added. An estimation of the flora of such regions would give extremely different figures from those given by Hooker relating to plants found north of the arbitrary line of the Arctic Circle irrespective of climatic conditions.

In the voyage homewards from Vadsö to the Lofoten Islands, where I stopped for a few days, I was so fortunate as to find in a fellow-passenger Herr A. Landmark, the Government Inspector of Inland Fishery in Norway, who is a very good botanist. He went through my herbarium, and kindly named for me many plants with which otherwise I should have found much difficulty, *e. g.* the species of *Eriophoron*. He also was so good as to give me several plants which he had collected at Tana and Nyborg, and which I have included in the following lists. In England I am much indebted to the kindness of two specialists who determined for me the difficult *Salices* and the *Carices* and allies, Dr. F. Buchanan White having examined the former and Mr. Arthur Bennett the latter.

In the following list I have indicated the exact localities where the plants were procured by the use of initial letters, as below :—

- B. Bög Fiord (on or near the shores of).
- K. Klosterelv Fiord (on or near the shores of).
- L. Lang Fiord (on or near the shores of).
- N. Nyborg (*Herr Landmark*).
- P. Elvenes and Pasvic River.
- S. Kirkenes and its neighbourhood in Sydvaranger.
- T. Tana (*Herr Landmark*).
- V. Vadsö and Nordvaranger.

The nomenclature of species in the following list is that of C. J. Hartman's 'Handbok i Skandinavien's Flora,' but I have not adopted his arrangement of families, which is that of Fries, but have followed that which is better known to English botanists.

RANUNCULACEÆ.

Ranunculus lapponicus, <i>Lin.</i> P.	|	Thalictrum kemense, <i>Fr.</i> T.
— hyperboreus, <i>Rottb.</i> V., N.	|	Caltha palustris, <i>Lin.</i> V.
— acris, <i>Lin.</i> V.	|	Trollius europæus, <i>Lin.</i> V.

CRUCIFERÆ.

Cardamine pratensis, <i>Lin.</i>	|	Draba incana, <i>Lin.</i> V., S.
Capsella bursa-pastoris, <i>Lin.</i>	|	— hirta, <i>Lin.</i> T.
Cochlearia officinalis, <i>Lin.</i>	|	

VIOLACEÆ.

Viola suecica, *Fr.* V., N. | *Viola biflora*, *Lin.* V.

DROSERACEÆ.

Drosera rotundifolia, *Lin.* | *Drosera longifolia*, *Lin.*

CARYOPHYLLACEÆ.

<i>Silene acaulis</i> , <i>Lin.</i>	|	<i>Stellaria humifusa</i> , <i>Roth.</i> L.
<i>Melandrium sylvestre</i> , <i>Röhl</i>,	|	— <i>alpestris</i> , <i>Fr.</i> L.
var. <i>alpestre</i> , <i>Fr.</i> T.	|	<i>Cerastium alpinum</i> , <i>Lin.</i>
<i>Dianthus superbus</i> , <i>Lin.</i>	|	— <i>triviale</i> , <i>Link.</i> P.
<i>Stellaria nemorum</i> , <i>Lin.</i> S.	|	<i>Arenaria lateriflora</i> , <i>Lin.</i> P.
— <i>media</i> , <i>Lin.</i> S.	|	<i>Helianthus peploides</i> , <i>Lin.</i> S.
— <i>uliginosa</i> , <i>Murr.</i> V.	|	<i>Sagina nivalis</i> , <i>Lindbl.</i> T.
— <i>crassifolia</i> , <i>Ehrb.</i> S.	|	— <i>saxatilis</i> , <i>Wimm.</i> S.

GERANIACEÆ.

Geranium sylvaticum, *Lin.* V.

LEGUMINOSÆ.

<i>Lathyrus palustris</i> , <i>Lin.</i> N.	|	<i>Oxytropis campestris</i> , <i>DC.</i> N.
— <i>maritimus</i> , <i>Fr.</i> S.	|	<i>Phaca frigida</i> , <i>Lin.</i> N.
<i>Vicia cracca</i> , <i>Lin.</i> S.	|	<i>Trifolium repens</i> , <i>Lin.</i>
<i>Astragalus alpinus</i> , <i>Lin.</i> N.	|	

ROSACEÆ.

<i>Prunus padus</i> , <i>Lin.</i>	|	<i>Rubus saxatilis</i> , <i>Lin.</i> S., V.
<i>Spiræa ulmaria</i> , <i>Lin.</i> V.	|	— <i>castoreus</i> , <i>Læst.</i> P.
<i>Alchemilla vulgaris</i> , <i>Lin.</i> V.	|	— <i>arcticus</i> , <i>Lin.</i> T.
— <i>alpina</i> , <i>Lin.</i> V.	|	— <i>chamæmorus</i> , <i>Lin.</i> S.
<i>Potentilla anserina</i> , <i>Lin.</i> S.	|	<i>Geum rivale</i> , <i>Lin.</i>
— <i>verna</i> , <i>Lin.</i> N., P.	|	<i>Sorbus aucuparia</i> , <i>Gertn.</i> S.
<i>Comarum palustre</i> , <i>Lin.</i> S., V.	|	

ONAGRACEÆ.

<i>Epilobium angustifolium</i> , <i>Lin.</i>	|	<i>Epilobium alpinum</i> , <i>Lin.</i> S.
— <i>palustre</i> , <i>Lin.</i> S.	|	

PORTULACEÆ.

Montia fontana, *Lin.* V.

SAXIFRAGACEÆ.

<i>Saxifraga stellaris</i> , <i>Lin.</i> , var. <i>co-</i>	|	<i>Saxifraga cæspitosa</i> , <i>Lin.</i> P.
mosa, <i>Retz.</i> S., V.	|	<i>Chrysosplenium tetrandrum</i> , <i>Lund.</i>
— <i>nivalis</i> , <i>Lin.</i> V.	|	V.
— <i>rivularis</i> , <i>Lin.</i> V.	|	<i>Parnassia palustris</i> , <i>Lin.</i>

CRASSULACEÆ.

Rhodiola rosea, *Lin.*

UMBELLIFERÆ.

<i>Cerfolium sylvestre</i> , <i>Lin.</i>	|	<i>Haloscias scotica</i> , <i>Lin.</i> S.
<i>Angelica archangelica</i> , <i>Lin.</i> N.	|	

CORNACEÆ.

Cornus suecica, *Lin.* V.

CAPRIFOLIACEÆ.

Linnæa borealis, *Lin.* V.

VALERIANACEÆ.

Valeriana officinalis, *Lin.*

COMPOSITÆ.

<i>Matricaria inodora</i> , <i>Lin.</i> S.	|	<i>Saussurea alpina</i> , <i>DC.</i> S.
<i>Gnaphalium norvegicum</i> , <i>Gumm.</i> P.	|	<i>Cirsium heterophyllum</i> , <i>All.</i> V., S.
— <i>supinum</i> , <i>Lin.</i> S.	|	<i>Crepis multicaulis</i> , <i>Ledeb.</i> V.
<i>Antennaria dioica</i> , <i>Gærtn.</i> V.	|	<i>Taraxacum officinale</i> , <i>Lin.</i> S.
<i>Solidago virgaurea</i> , <i>Lin.</i> V.	|	<i>Hieracium alpinum</i> , <i>Lin.</i> S.
<i>Petasites frigida</i> , <i>Lin.</i> V.	|	

CAMPANULACEÆ.

Campanula rotundifolia, *Lin.* V.

ERICACEÆ.

<i>Myrtillus nigra</i> , <i>Gilib.</i> S.	|	<i>Andromeda hypnoides</i> , <i>Lin.</i> V.
— <i>uliginosa</i> , <i>Lin.</i> S.	|	<i>Calluna vulgaris</i> , <i>Salisb.</i> V.
<i>Oxycoccus palustris</i> , <i>DC.</i> P.	|	<i>Phylodoce cærulea</i> , <i>Bab.</i> V., S.
— —, var. <i>microcarpus</i> , <i>Turc.</i>	|	<i>Azalea procumbens</i> , V., S.
S.	|	<i>Ledum palustre</i> , <i>Lin.</i> S.
<i>Vaccinium vitis-idaea</i> , <i>Lin.</i> S.	|	<i>Pyrola rotundifolia</i> , <i>Lin.</i> V., S.
<i>Arctostaphylos alpina</i> , <i>Spr.</i> V., S.	|	— <i>secunda</i> , <i>Lin.</i> K.
<i>Andromeda polifolia</i> , <i>Lin.</i> V., S.	|	— <i>minor</i> , <i>Lin.</i> S.

GENTIANACEÆ.

Menyanthes trifoliata, *Lin.* V.

POLEMONIACEÆ.

<i>Polemonium pulchellum</i> , <i>Bury.</i>	|	<i>Diapensia lapponica</i> , <i>Lin.</i> S., V.
— <i>campanulatum</i> , <i>Fries.</i> N.	|	

BORAGINACEÆ.

<i>Myosotis sylvatica</i> , <i>Ehrb.</i> L.		<i>Stephanhammaria maritima</i> , <i>Lin.</i> S.
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SCROPHULARIACEÆ.

<i>Melampyrum sylvaticum</i> , <i>Lin.</i>		<i>Rhinanthus minor</i> , <i>Ehrb.</i> S.
— <i>pratense</i> , <i>Lin.</i> S.		<i>Euphrasia officinalis</i> , <i>Lin.</i> S.
<i>Pedicularis palustris</i> , <i>Lin.</i> B.	|	<i>Bartsia alpina</i> , <i>Lin.</i> S.
— <i>lapponica</i> , <i>Lin.</i> S., V.	|	<i>Veronica longifolia</i> , <i>Lin.</i> N.
<i>Scæptrum carolinum</i> , <i>Rudb.</i> S.	|	— <i>alpina</i> , <i>Lin.</i> V.

LABIATÆ.

Galeopsis tetralit, *Lin.* S. | Thymus serpyllum, *Lin.* T

PRIMULACEÆ.

Primula stricta, *Horn.* N. | Trientalis europæa, *Lin.* V.
— sibirica, *Jacq.* S.

LENTIBULARIACEÆ.

Pinguicula vulgaris, *Lin.* V. | Pinguicula villosa, *Lin.* P.
— alpina, *Lin.* V.

PLANTAGINACEÆ.

Plantago major, *Lin.* S. | Plantago maritima, *Lin.* S.

POLYGONACEÆ.

Polygonum viviparium, *Lin.* P. | Rumex acetosa, *Lin.*
— aviculare, *Lin.* S. | — acetosella, *Lin.*
Kœningia islandica, *Lin.* V. | Oxyria digyna, *Campb.* V., S.

EMPETRACEÆ.

Empetrum nigrum, *Lin.*

URTICACEÆ.

Urtica dioica, *Lin.* S.

AMENTIFERÆ.

Salix myrtilloides, *Lin.* P. | Salix myrsinites, *Lin.* S.
— phylicifolia, *Lin.* S. | — herbacea, *Lin.* S.
— glauca, *Lin.* S. | Betula odorata, *Bechst.* S.
— lanata, *Lin.* S. | — nana, *Lin.* V., S.
— lapponum, *Lin.* S. | Alnus incana, *Lin.* S.

CONIFERÆ.

Pinus sylvestris, *Lin.* | Juniperus communis, *Lin.*

ORCHIDACEÆ.

Orchis maculata, *Lin.* S. | Listera cordata, *R. Br.* N.
Cœloglossum viride, *Lin.* S. | Corallorhiza innata, *R. Br.* S.

ALISMACEÆ.

Triglochin maritimum, *Lin.* K. | Triglochin palustre, *Lin.* S.

LILIACEÆ.

Allium schœnoprassum, var. sibiricum, *Lin.*

MELANTHACEÆ.

Tofieldia palustris, *Huds.* V. | Veratrum album, *Reich.* T.

JUNCACEÆ.

Juncus filiformis, <i>Lin.</i> S.	|	Luzula parviflora, <i>Desv.</i> S.
— trifidus, <i>Lin.</i> S.	|	— campestris, <i>DC.</i> S.
— biglumis, <i>Lin.</i> S.	|	— spicata, <i>DC.</i> S.

CYPERACEÆ.

Scirpus cæspitosus, <i>Lin.</i> S.	|	Carex salina, var. minor, <i>Boott.</i> B.
Eriophorum vaginatum, <i>Lin.</i> S.	|	— aquatilis, <i>Wahl.</i> S.
— angustifolium, <i>Roth.</i> S.	|	— Goodenovii, <i>Gay.</i>
— russeolum, <i>Fr.</i> V.	|	— Persoonii, <i>Sieb.</i> V.
— callithrix, <i>Cham.</i> P.	|	— vitilis, <i>Fries.</i> S.
— Scheuchzeri, <i>Hoppe.</i> S.	|	— canescens, <i>Lin.</i> S.
Carex rotundata, <i>Wahl.</i> B.	|	— tenuiflora, <i>Wahl.</i> P.
— glaucum, <i>Scop.</i> S.	|	— loliacea, <i>Lin.</i> P.
— capillaris, <i>Lin.</i> S.	|	— norvegica, <i>Wahl.</i> N.
— limosa, <i>Lin.</i>	|	— incurva, <i>Lightf.</i> N.
— irrigua, <i>Hoppe.</i> S.	|	— glareosa, <i>Wahl.</i> N.
— rariflora, <i>Smith.</i> S.	|	— chordorrhiza, <i>Elrb.</i> V.
— vaginata, <i>Tausch.</i> S.	|	— capitata, <i>Lin.</i> S.
— alpina, <i>Sw.</i> B.	|	— dioica, <i>Lin.</i> S.
— salina, <i>Wahl.</i>	|	

GRAMINEÆ.

Elymus arenarius, <i>Lin.</i> S.	|	Aira flexuosa, <i>Lin.</i> S.
Festuca rubra, <i>Lin.</i> S.	|	Alopecurus geniculatus, <i>Lin.</i> V.
Poa trivialis, <i>Lin.</i> S.	|	Calamagrostis stricta, <i>Nutt.</i> B.
— alpina, <i>Lin.</i> V.	|	Phleum alpinum, <i>Lin.</i> V., S.
— annua, <i>Lin.</i> S.	|	Hierochloe borealis, <i>Schrank.</i> B.
Aira cæspitosa, <i>Lin.</i> B.	|	Anthoxanthum odoratum. S.

EQUISETACEÆ.

Equisetum palustre, <i>Lin.</i>	|	Equisetum hyemale, <i>Lin.</i> N.
— sylvaticum, <i>Lin.</i>	|	

FILICES.

Polypodium phegopteris, <i>Lin.</i>	|	Cystopteris fragilis, <i>Lin.</i>
— dryopteris, <i>Lin.</i>	|	— montana, <i>Hænke.</i>
Polystichum spinulosum, <i>DC.</i>	|	

LYCOPODIACEÆ.

Lycopodium selago, <i>Lin.</i>	|	Lycopodium complanatum, <i>Lin.</i>
— annotinum, <i>Lin.</i>	|	— alpinum, <i>Lin.</i>
— clavatum, <i>Lin.</i>	|	

CORRIGENDA &c. ('Annals,' 1903.)

Vol. xi. p. 569.—For "*Berenicea prominens*, Lamouroux (Expos. méthod. des Genres de l'Ord. des Polypiers, 1821, p. 80, pl. lxxx. figs. 1, 2)," read *Berenicea annulata* (p. 81,

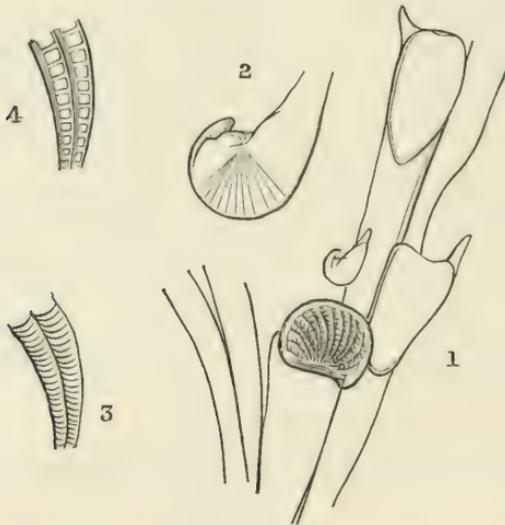
pl. lxxx. fig. 6). To anyone consulting the plate it must be obvious that the reference was, by some mistake which I am unable to account for, erroneous, and that the netted state of Hincks's *Chorizophora Brongniartii* is fig. 6. It follows that while the specific name *annulata* should, in my opinion, supersede that of *Brongniartii*, the generic name *Chorizophora* must be retained.

Vol. xi. p. 577.—For *Bugulopsis Peachii* read

Bugula elongata, Nordgaard.

1902. *Bugula elongata*, Nordgaard, "Die Bryozoen des westlichen Norwegens," Die Meeresfauna von Bergen, p. 140, pl. i. figs. 1-6.

The specimens which I referred to *Bugulopsis Peachii* must be transferred to the *Bugula elongata* of Nordgaard. The general resemblance of the two species is remarkable: in form of zoecia and oecia they are almost identical; moreover the peculiar sculpturing of the latter is of similar character. The chief point of



difference consists in the occasional development in *Bugula elongata* of a very minute avicularium, situated on the middle of the side of the zoecium, from which it usually hangs as it were backwards, as shown in the woodcut here given; but these avicularia are rarely developed, and there may be an entire zoarium without any avicularia. The other points in which the species

may be distinguished from *Bugulopsis* are that the form of growth in the latter is that of a little bush and the zoarium is charged with carbonate of lime; in *B. elongata* the growth is from a single stem giving forth branches for the most part dichotomously, and the zoarium is altogether chitinous, as is usual in the genus *Bugula*. These last differences were regarded by me as simply varietal, and it was not until my attention was directed to his species by Herr Nordgaard that I discovered on some of my specimens a few of the peculiar avicularia. It is probable, as suggested to me by Herr Nordgaard, that other records of *Bugulopsis Peachii* from Arctic localities may likewise be referable to his species; and I find that I have this form from as far south as the Bergen and Hardanger Fiords. In the adjoining woodcut, fig. 1 represents the zoœcia, oœcia, and avicularium of *Bugula elongata*, fig. 2 the avicularium more magnified, fig. 3 radii of the oœcium highly magnified, while fig. 4 illustrates the corresponding radii in the oœcium of *Bugulopsis Peachii* for comparison.

Vol. xi. pp. 580 & 581.—For *Kinekoscias* read *Kinetoscias*.

Vol. xi. p. 595.—“Genus *Oochilina*, gen. nov. Type *Oochilina* (*Membranipora*) *crassimarginata*, Hincks.” Mr. Waters kindly called my attention to the fact that M. F. Canu had in 1900 instituted a subgenus *Crassimarginitella*, with the same type, *Membranipora crassimarginata*, Hincks (Canu, “Révision des Bryozoaires du Crétacé figurés par d’Orbigny,” Bull. Soc. Géol. France, sér. 3, vol. xxviii. 1900, p. 369). This paper was not in my library when I wrote, and the Zool. Record, which I had consulted, contained no reference to the genus.

In this same paper of Canu the following genera may be mentioned as having reference to what I have written:—

“*Rhynchotella* (subgen.). Type *Membranipora rhynchota*, Busk,” p. 367, and “*Rhamphonotus*, Gray (*sic*). Type *Membranipora Flemingii*, Busk,” p. 417, should read *Rhamphonotus*, Norman. Type *Rhamphonotus minax*, Busk, = *rhynchota*.

At p. 373 a subgenus *Foratella* is instituted in which is placed among other species *Membranipora Lacroixii*, Audouin.

At p. 380 a genus *Nichtina* is formed with *Membranipora membranacea*, Linné, as its type.

At p. 382 we find *Pyripora*, d'Orbigny, 1847, type *P. catenaria*, Jameson. I have not seen d'Orbigny's paper of 1847, but in his 'Paléont. Française,' Terrains Crétacé, 1850-1852, p. 538, under the genus *Pyripora* there is no reference to the species in question, and the fossil species referred by Cauu to this genus would scarcely seem to be congeneric with *M. catenularia*.

Vol. xii. p. 100, lines 6 & 13.—For *Membraniporella*, Hincks, read *Membraniporella*, Smitt.

XLIV.—Description of a new Species of *Opisthostoma* from North Borneo. By EDGAR A. SMITH, I.S.O.

ALTOGETHER twenty-three species of this genus from the northern parts of Borneo have been described, and probably many other forms still remain to be discovered.

Opisthostoma fraternum, sp. n.

Testa dextrorsa, pyramidalis, anguste umbilicata, rufescens; anfractus $6\frac{1}{2}$, regulariter lento accrescentes, perconvexi, lamellis paucis, tenuibus, obliquis, in medio anfractuum in spinas productis, instructi, ultimus pone constrictus, dein descendens et subito ascendens atque retroversus, antice solutus, infra spinis excavatis cristatus; apertura subcircularis; peristoma obliquum, duplex, album, margine interno expanso, tubæformi, externo tenuissimo, aliquanto dilatato.

Diam. max. 2.75 mm.; alt. 2.25.

The identification of many of these minute objects is almost impossible or, at all events, very uncertain, from description or figures such as have as yet appeared. It is only by actual comparison of specimens that the differences become appreciable. The present species bears a closer resemblance to *O. concinnum*, Fulton, than to any other. It differs from it, however, in being a trifle smaller, having more convex and higher whorls, fewer lamellæ, and the outer peristome is less interrupted on the right side. The delicate oblique lamellæ are about fourteen in number upon the penultimate whorl and are produced at the middle into short hollow spines directed obliquely upwards. This row of spines is continued under the body-whorl, forming a crest, between the constriction and the peristome, of about six or seven spines. The distance of the solution of the anterior portion of the body-whorl is a trifle variable. Even under the microscope no spiral sculpture is traceable, but some feeble lines of growth may be observed.

XLV.—On the Skull of *Gonorhynchus Greyi*.
By W. G. RIDGEWOOD, D.Sc., F.L.S.

[Plate XVI.]

GONORHYNCHUS, the sole existing genus of the family Gonorhynchidæ, is an aberrant Teleostean fish whose affinities have often been the subject of debate and are not even now definitely known. Having been recently engaged upon an investigation on the cranial osteology of the fishes of the families Elopidae and Albulidae (Proc. Zool. Soc. 1904, ii. pp. 35–81), Mormyridæ, Notopteridæ, and Hyodontidæ (Journ. Linn. Soc., Zool. xxix. 1904, pp. 188–217), Clupeidæ (Proc. Zool. Soc., in the press), and Osteoglossidæ (Journ. Linn. Soc., Zool., in the press), I took up the study of the skull of *Gonorhynchus* with no little interest, since there was every hope for believing that in the characters of so complex a structure evidence might be forthcoming as to the relationship existing between the Gonorhynchidæ and the other families of the Malacopterygii.

The material available consisted of three skulls of *Gonorhynchus Greyi* at the British Museum, two of them being prepared specially for the investigation. My thanks are due to Mr. G. A. Boulenger, F.R.S., for facilities offered for the examination of these specimens.

The genus *Gonorhynchus* was established in 1763 by Gronovius (Zoophyl. Gronov. fasc. i. 1763, genus 199, p. 55, pl. x. fig. 2), who placed it immediately before the genus *Cobitis*, with which he must have thought it closely related, because in Gray's British Museum Catalogue, printed in 1854 from the manuscript of Gronovius, the fish appears on p. 41 under the name *Cobitis gonorhynchus*.

Gonorhynchus was placed among the carps by Gmelin (Syst. Nat. Linn. i. 3, 1788, p. 1422), Schneider (Bloch and Schneider, Syst. Ichthyol. 1801, p. 443), Lacepède (Hist. Nat. Poiss. v. 1803, p. 570), and Cuvier (Règne Anim. ii. 1817, p. 196); but Valenciennes (Hist. Nat. Poiss. xix. 1846, pp. 203, 204, and 208) objected on the ground of its numerous (nine) pyloric cæca and because the maxillæ shared with the premaxillæ the bounding of the upper border of the mouth. Valenciennes (*l. c.* p. 179) associated it with *Chanos* by reason of the large size of the branchiostegal membrane and the absence of teeth from the jaws. He pointed out further that *Gonorhynchus*, like *Chanos* and *Albula*, has a

conical head, with snout projecting above the reduced mouth (*l. c.* p. 204).

Gonorhynchus was obtained on the 'Erebus' and 'Terror' Expedition, and Richardson (*Zool. Voy. 'Erebus' and 'Terror,'* ii. Fishes, part 7, 1845, p. 44), thinking it a new genus, named it *Rhynchæna*, because of its projecting muzzle, and placed it among the Cyprinoids.

Schlegel (Siebold's 'Fauna Japonica,' Pisces, 1850, p. 217) placed the genus *Gonorhynchus* between *Leuciscus* and *Cobitis*. In Günther's 'Catalogue of Fishes in the British Museum' (vii. 1868) the family Gonorhynchidæ follows the Cyprinidæ and precedes the Hyodontidæ, Osteoglossidæ, and Clupeidæ; in the 'Study of Fishes,' 1880, by the same author, the family comes after the Salmonidæ, Percopsidæ, and Haplochitonidæ, and before the Hyodontidæ, Pantomodontidæ, Osteoglossidæ, and Clupeidæ.

Kner (*Reise der Fregatte 'Novara,'* Zool. i. 1869, Fische) placed the family Rhynchænae, containing the genus *Gonorhynchus*, between the Elopidae, Chirocentridæ, and Lutodeiræ on the one hand and the Cyprinodontes and Cyprinoidæ on the other. On page 342 he notes that the form of the accessory branchial organ of *Gonorhynchus* testifies to the relation which this fish bears to *Chanos* and the true Clupeids.

By Cope ("Ichth. Lesser Antilles," *Trans. Amer. Phil. Soc.* n. s. xiv. 1871, p. 455) the Gonorhynchidæ are bracketed with the Sauridæ, because they have the "parietals united" and "no tail vertebrae." (As is shown below, the parietals of *Gonorhynchus* are separated.)

Gill ("Families of Fishes," *Smithsonian Miscell. Coll.* 1872, p. 16) placed the family Gonorhynchidæ between the Salmonoids, Scopelids, and Alepocephalidæ on the one hand and the Hyodontidæ and Clupeidæ on the other.

According to Smith Woodward (*Brit. Mus. Cat. Foss. Fishes*, iv. 1901, p. ix) the Gonorhynchidæ are but slightly modified Scopelids; but Boulenger declines to admit any close affinity between the Gonorhynchidæ and the Haplomi (Scopelidæ, Esocidæ, &c.), and lays stress on the presence of a mesocoracoid element in the shoulder-girdle of *Gonorhynchus* and its absence from that of the Haplomi. He places the family Gonorhynchidæ at the end of the suborder Malacopterygii, following the Salmonidæ, Alepocephalidæ, and Stomiidæ, and preceding the Cromeriidæ (*Ann. & Mag. Nat. Hist.* (7) xiii. 1904, p. 165).

For a highly specialized family the Gonorhynchidæ are of great antiquity; they date back to the Cretaceous period,

when all the characteristic features of *Gonorhynchus* except the extension of scales over the head had already been acquired. The genus *Notogoneus* of the freshwater Eocene deposits of North America and Europe differs from the recent *Gonorhynchus* only in the absence of pterygoid and lingual teeth, the shape of the subopercular bone, and the position of the dorsal fin (see Smith Woodward, Proc. Zool. Soc. 1896, pp. 500-504, and B. M. Cat. Foss. Fishes, iv. p. ix).

The cranium of *Gonorhynchus Greyi* (Pl. XVI. figs. 2, 3, and 4) is long and flattened, and in the ethmoid and orbital regions rather slender. The frontals form nearly the whole of the roof of the cranium and exhibit no median suture. The parietals are separated by the supraoccipital, and extend back to cover the epiotic prominences; the tubular scales of the transverse commissure of the sensory-canal system are readily removable from the parietal and supraoccipital bones, upon which they are set. The exoccipitals fail to meet above the basioccipital, so that the foramen magnum is not bounded by the exoccipitals alone. The foramen for the passage of the vagus nerve is remarkably large.

The cranium articulates with the vertebral column by a hemispherical head, which is not removable, and consists of a portion of a vertebral centrum fused with the basioccipital and lower parts of the exoccipitals. This convexity of the occipital articulation is not peculiar to *Gonorhynchus*, for Owen and Klein have recorded it in *Fistularia* (Anat. of Vert. i. 1866, p. 107, and Jahresh. Württ. 1881, p. 325), and Klein in *Syngnathus*, *Phyllopteryx*, *Gastrotrochus*, and *Ostracion* (Jahresh. Württ. 1885, p. 108). The most recent observations are those of Starks, who states that the basioccipital condyle is a round knob in the families *Fistulariidae* and *Aulostomidae* (Proc. U.S. Nat. Mus. xxv. 1902, pp. 619-634).

The ascending wings of the parasphenoid rise high; they pass up in front of the pro-otic and come into contact with the alisphenoid and postfrontal of each side. The parasphenoid fails to reach as far back as the posterior end of the basioccipital; the eye-muscle canal does not open posteriorly; neither the parasphenoid nor the vomer bears teeth. The alisphenoids are widely separated, and there is no orbitosphenoid nor basisphenoid. The ethmoidal region is long, and the mesethmoid, which is small and flat, is separated

from the prefrontals by a considerable tract of ethmoid cartilage.

The post-temporal consists almost entirely of its epiotic limb, the only other part being a delicate sensory-canal scale of tubular shape and horizontal disposition. The anterior end of this tube is in contact with another tubular scale, which represents the supratemporal, but has not the tri-radiate form characteristic of the supratemporal bone in Malacopterygian fishes generally, since the forking of the horizontal sensory canal into the supraparietal commissure and the squamosal branch occurs just in front of it, and not within it.

From the opisthotic there extends a rod of bone, a kind of intermuscular bone, in the direction of the post-temporal, which, however, it fails to reach. Fibrous tissue intervenes between its posterior extremity and the post-temporal, and the relations between the intermuscular bone and the post-temporal are such as to open up an interesting question whether the opisthotic limb of the post-temporal has not in Teleostean fishes generally the morphological value of an ossified ligament or intermuscular bone. In view of the dermal origin of the post-temporal and the depth below the surface at which its opisthotic limb occurs it is highly probable that such is the case. In *Gonorhynchus* a second and similar intermuscular bone runs from the back of the exoccipital parallel with the above, but situated nearer to the median plane and having no connexion with the post-temporal bone. Such intermuscular bones are not uncommon in Teleostean fishes, and a comparative account of them is given in the 'Proceedings of the Zoological Society,' 1904, ii. pp. 59, 65, 66.

The nasal is a long slender bone of tubular shape, and the preorbital (fig. 5, *por*) is large and has a conspicuous keel near its lower edge, as already shown by Smith Woodward (Proc. Zool. Soc. 1896, p. 503, and fig. 5, *x*). There are no suborbital or postorbital bones.

The gape is bounded above by the premaxillæ alone, although the maxilla is about twice as long as the premaxilla, and extends more anteriorly than that bone, as well as more posteriorly. The premaxilla articulates with the ventro-external surface of the maxilla at about one third of the length of the latter from its anterior end; a short process of the premaxilla extends in front of this articulation, but the main part projects backward and downward. The extreme anterior end of the maxilla articulates with the cartilaginous anterior termination of the palatine. There is no articulation

between the ethmoid region of the cranium and the maxilla, nor between the ethmoid and the premaxilla. Neither maxilla nor premaxilla bears teeth; there is no surmaxilla.

The mandibular ramus (Pl. XVI. figs. 1 and 5) is of remarkable shape, since the articular and dentary components of the coronoid process are widely separated, the dentary component standing high and being situated near the anterior end of the jaw. The lower margin of the gape is nearly at right angles to the long axis of the mandibular ramus. The dentary is but slightly larger than the articular and bears no teeth. The angular is distinct from the articular, and there is a sesamoid articular lying on the buccal side of the articular (fig. 1, *sa*).

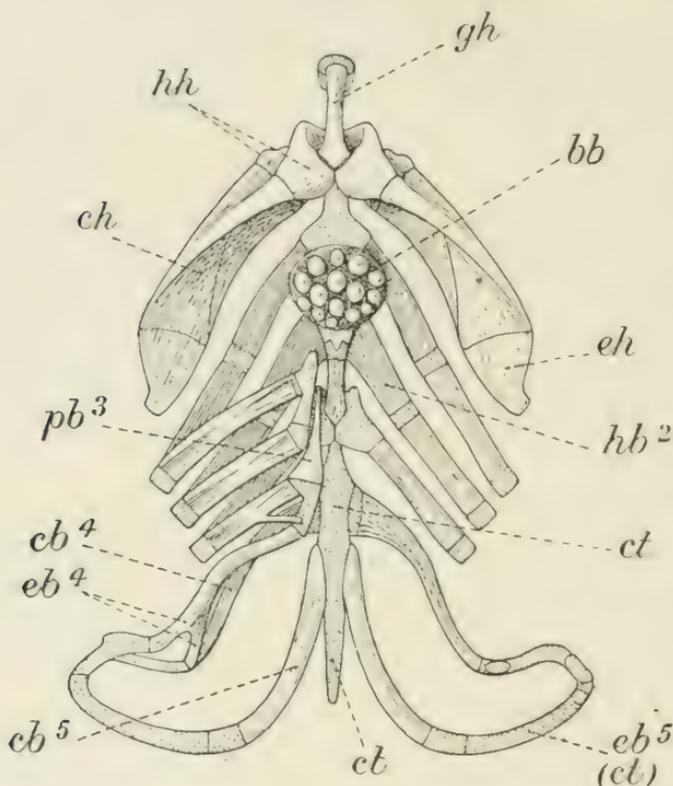
The hyomandibular articulates with the cranium by two barely separated heads, the anterior one small and the posterior one broad. The diminution in the size of the mouth appears not to have affected the hyomandibular, the main axis of which is about vertical (figs. 1 and 5, *hm*); the symplectic, however, is sharply bent forward. The metapterygoid is reduced to a thin rod of bone which runs from the lower end of the hyomandibular to the hind end of the entopterygoid.

The entopterygoid bears at its posterior end a circular patch of stout bluntly conical teeth, reminding one of those of *Osteoglossum*; but although the entopterygoid steadies itself against the side of the parasphenoid, there is no definite articulation with that bone such as occurs in *Osteoglossum*. The ectopterygoid is straight and does not run down the anterior edge of the quadrate. The hyopalatine arch is very thin at the junction of the palatine with the entopterygoid and ectopterygoid, and there is a ligamentous attachment here with the prefrontal. The palatine is curiously inflated and comes close to the surface of the head in front of the preorbital bone in such a manner as to simulate one of the cheek-plates. The bulk of the palatine lies in advance of the dentary symphysis (figs. 1 and 5, *pl*).

The lower or horizontal part of the preopercular is larger than the upper or vertical part (fig. 5, *pop*). There are four branchiostegal rays, the two posterior ones considerably larger and flatter than the other two. They are all attached to the outer face of the epihyal.

The lower hypohyal is larger than the upper. The urohyal is moderately small, and is broadened out in front into a horizontal plate. The glossohyal is narrow and tipped by a hemispherical cartilage (text-fig., *gh*). The first basibranchial is cartilaginous; the second is large and bears on

its upper surface about twenty strong blunt teeth, which engage with the teeth on the entopterygoids, and with the latter constitute the entire dentition of the animal. The third basibranchial is a small rod-like bone, clearly distinct from the second. The fourth and fifth basibranchials are



Gonorhynchus Greyi; hyobranchial skeleton, dorsal view. The epibranchials and pharyngobranchials of the right side are not shown.

bb. Dentigerous plate covering the second basibranchial.
cb. Ceratobranchial.
ch. Ceratohyal.
ct. Cartilage.
eb. Epibranchial.

eh. Epihyal.
gh. Glossohyal.
hb. Hypobranchial.
hh. Hypohyal.
pb. Pharyngobranchial.

represented by a rod of cartilage which is continued back for some little distance behind the mesial ends of the fifth ceratobranchials.

The last two branchial arches are large and slender and

support the epibranchial organ. The fourth and fifth ceratobranchials are slender curved rods of bone. A fifth epibranchial (text-fig., *eb* 5) is present in the form of a curved rod of cartilage distinct from, but in the same line with, the posterior cartilaginous epiphysis of the fifth ceratobranchial. At its upper end it meets the Y-shaped cartilage that constitutes the posterior part of the fourth epibranchial. The ossified part of the fourth epibranchial consists of a broad thin lamina of bone, vertically disposed, and therefore seen edgewise in the text-figure.

The first hypobranchial is as long as the first ceratobranchial, the second is nearly as long as the second ceratobranchial, the third hypobranchial is cartilaginous. The first pharyngobranchial is wanting and there is no spicular bone; the second and third pharyngobranchials have the normal relations.

In utilizing the characters of the skull of *Gonorhynchus* as the basis for a discussion of the affinities of the genus I think it may be taken for granted that the family Gonorhynchidæ falls within the suborder Malacopterygii as defined by Boulenger (*Ann. & Mag. Nat. Hist.* (7) xiii. 1904, pp. 163-165), for the presence in the Gonorhynchidæ of a mesocoracoid element in the shoulder-girdle excludes the family from the Haplomi, and the absence of Weberian ossicles disposes of the hypothesis upheld by the earlier writers that the Gonorhynchidæ are allied to the Cyprinoids.

The extension in *Gonorhynchus* of the upstanding process of the parasphenoid so far as to touch the alisphenoid and postfrontal bones is paralleled in *Osteoglossum*, the process reaching the alisphenoid in *O. Leichardti* and the postfrontal in *O. bicirrhosum* and *O. formosum*; and the entopterygoid of *Gonorhynchus* bears at its posterior end a patch of stout teeth, which engage with the basibranchial teeth much as in *Osteoglossum*; and, further, the first basibranchial remains unossified, as in *Heterotis*. But the Osteoglossidæ (*Osteoglossum*, *Heterotis*, and *Arapaima*) are a sharply delimited family, distinguished by the sculpturing of the superficial bones of the skull, the meeting of the parietal bones, the sutural union of the nasal bones with one another and with the anterior ends of the frontal bones, the presence of a stout peg-like process of the parasphenoid for articulation with the entopterygoid, the smallness of the subopercular, the bounding of the upper border of the gape by the

maxilla as well as the premaxilla, and the absence of the lower hypohyal: none of these features are exhibited by *Gonorhynchus*.

The Pandodontidæ are more nearly allied to the Osteoglossidæ than to any other family of Teleostean fishes, and resemble them in the presence of a paired peg of the parasphenoid for articulation with the entopterygoid, in the large size of the nasal bones and their incorporation into the cranium, and in the meeting of the parietal bones. In those characters in which *Pantodon* differs from the Osteoglossidæ—such, for instance, as the absence of the interopercular and the fusion of the two premaxillary bones—it does not approach the Gonorhynchidæ.

Phractolemus, the sole genus of the family Phractolemidæ, has a remarkably aberrant skull, only a few features of which can be found to recur in the skull of *Gonorhynchus*. Such are the failure of the first basibranchial to ossify, the small size of the mouth, the reduction of the dentition, and the forward position of the coronoid process. Of these features the first occurs in genera as remotely allied as *Heterotis*, *Notopterus*, and *Cromeria*, although not occurring in *Osteoglossum* and *Arapaima*, with which *Heterotis* has obvious relations. The second and third characters are such as have clearly been evolved independently in a number of groups of fishes, while the last appears to be connected with the reduction in the size of the mouth, and is met with (to a slighter extent) in such unrelated genera as *Leptolepis*, *Labeo*, and *Chatoëssus*.

Notopterus, as above mentioned, is a form which has a cartilaginous first basibranchial—the feature is so unaccountable that one seizes upon it as possibly affording a clue to the elucidation of the question of affinity. But the suggestion of close relationship between *Gonorhynchus* and *Notopterus* is not sustained by a closer examination of the cranial characters, for *Notopterus* has the right and left parietal bones meeting in the median line, an orbitosphenoid traversed by the cranial cavity, a lateral cranial foramen, an air-containing vesicle at the side of the occipital region of the cranium, teeth on the parasphenoid, a gape bounded above by both premaxilla and maxilla, no subopercular bone, tendon-bones projecting downward from the posterior end of the second basibranchial, a single hypohyal on each side—characters which collectively dissociate this genus from *Gonorhynchus*.

The Mormyridæ are a sharply marked family whose

nearest relations are the Notopteridæ, but they are more remote from *Gonorhynchus* than is *Notopterus* itself, and may be dismissed forthwith.

The genus *Hyodon*, while presenting no cranial characters which would negative the possibility of affinity with *Gonorhynchus*, affords no affirmative evidence. It retains certain primitive characters which have been lost in *Gonorhynchus*, such, for instance, as the bounding of the upper border of the gape by both maxilla and premaxilla, the meeting of the right and left parietal bones, the presence of teeth on the parasphenoid, the continuation of the cranial cavity through the orbitosphenoid, and the presence of a basisphenoid. So far as the evidence of the characters of the skull bears upon the question, it is not beyond the bounds of possibility that *Gonorhynchus* should have been descended from some ancestral branch of the family Hyodontidæ, differing from the modern *Hyodon* in having a smaller supratemporal, in having no air-containing vesicle by the side of the occipital region of the cranium, and in possessing an angular bone distinct from the articular.

None of the characteristic features of the Clupeoid skull are met with in *Gonorhynchus*. The most striking of such features are the presence of a posterior temporal groove, a temporal foramen, pre-epiotic fossa, auditory fenestra, right and left posterior wings of the parasphenoid, with eye-muscle canal opening between them, and bullate swellings in the squamosal and pro-otic bones for lodging vesicular diverticula of the swim-bladder. No suggestion of any of these is to be found in *Gonorhynchus*.

Gonorhynchus was by Valenciennes associated with *Chanos* because of the large size of the branchiostegal membrane and the absence of teeth. It is true that there are several respects in which *Chanos* differs from the Clupeidæ proper and approaches *Gonorhynchus*—such, for instance, as the want of teeth in the jaws, the want of a temporal foramen, pre-epiotic fossa, auditory fenestra, posterior wings of the parasphenoid, and orbitosphenoid and basisphenoid bones, the reduction in size of the mouth, so that the maxilla fails to form part of the boundary of the gape, the absence of surmaxillæ, the separation of the quadrate from the metapterygoid, and the reduction in the number of the branchiostegal rays. But the large size of the posterior temporal fossa and the completeness of its roof are distinctly against the supposition of Valenciennes.

This last objection applies also to the families Elopidae

and Albulidæ. They are undoubtedly primitive families, and must have separated early from the common stock of the Teleostean fishes, but one cannot regard the forward intrusion of the trunk-muscles as anything but a character of specialization which has been generated subsequently to the severance of these families from the common stem. The ancestral Elopids and Albulids were, of course, upon the line of descent of the Gonorhynchids, but the relationship is not nearer.

The Stomiatiidæ, in so far as they depart from the primitive type, are specialized in a direction contrary to that along which *Gonorhynchus* has become modified; the well-developed maxilla, formidable dentition, wide gill-opening, reduction of opercular skeleton, and presence of a hyoid barbule in the Stomiatiidæ indicate how futile it would be to search for any evidence of close affinity between them and the Gonorhynchidæ.

On comparing the skull of *Gonorhynchus* with that of *Cromeria* there is to be noted a similarity in respect of the rod-like form of the metapterygoid and of the palatine (in *Gonorhynchus* the posterior portion only), the distinctness of the angular from the articular bone, the failure of the first basibranchial to ossify, the smallness of the number of the branchiostegal rays, and the narrowness of the gill-opening. But against these resemblances there has to be set such a large number of differences as suggests that the allies of *Gonorhynchus* are not to be sought in the direction of the Cromeriidæ. *Cromeria*, for instance, has the frontal bones widely separated, whereas in *Gonorhynchus* they are so closely united that the interfrontal suture is obliterated, it has no ectopterygoid, no symplectic, no ascending process of the parasphenoid, no projecting snout, a single hypohyal on each side, no epibranchial organ, a cartilaginous glossohyal, an ossified fourth pharyngobranchial, and ossified fourth and fifth basibranchials (see Swinnerton, Zool. Jahrb., Abth. Anat. xviii. 1903, pp. 58-70).

Of the two remaining families which I propose to consider—the Alepocephalidæ and Salmonidæ—the former is to a certain extent specialized in relation with its deep-sea habits, but in some respects remains more primitive than the latter. It has no opisthotic, no teeth on the maxilla, an eye-muscle canal closed behind*, and an opercular bone very narrow in

* In a comparison involving the Salmonidæ this character cannot be allowed to carry much weight, since although the canal is open in such

front; but, on the other hand, it possesses two surmaxillæ and an ossified first pharyngobranchial in addition to the spicular. *Alepocephalus* resembles *Gonorhynchus* in possessing an epibranchial organ, borne by the fourth and fifth arches, and in possessing a cartilage which may be identified as the fifth epibranchial; but the list of resemblances is soon exhausted.

On the other hand, the Salmonidæ, though offering no close resemblances to the Gonorhynchidæ, consist of a variety of forms but little specialized and highly plastic. For the purposes of comparison the genus *Salmo* is less suitable than such a form as *Coregonus*, for the Salmones have an excess of cartilage, presumably of secondary origin, in the cranium, and no membranous interorbital septum such as *Coregonus* has. It may be pointed out that within the family Salmonidæ there are forms, such as *Coregonus oxyrhynchus*, with prominent snout and reduced mouth with no teeth.

Although a study of the cranial osteology of the Gonorhynchidæ and Salmonidæ cannot bring forward direct evidence of affinity between these families, the hypothesis of the descent of the Gonorhynchidæ from the Salmonoid stock is open to little objection of any serious import. The Salmonidæ have an ossified first basibranchial, whereas this element of the copular skeleton fails to ossify in *Gonorhynchus*; but, as already shown, this basibranchial behaves in its ossification in a most capricious manner in admittedly closely allied genera. The Salmonidæ have no epibranchial organ; but this organ, as I have indicated in a former paper (Proc. Zool. Soc. 1904, ii. p. 81), has certainly been evolved independently in a number of different groups of fishes, and in these exhibits such differences in structure and position with regard to the parts of the branchial skeleton that one may reasonably allow that the Gonorhynchidæ have developed their epibranchial organ since their separation from the ancestral stock of the Malacopterygii.

EXPLANATION OF PLATE XVI.

- Fig. 1.* *Gonorhynchus Greyi*; hyopalatine arch of the left side, with preopercular bone and mandible, mesial aspect.
Fig. 2. Cranium, seen from left side.
Fig. 3. Back view of cranium.
Fig. 4. Dorsal view of cranium.
Fig. 5. Complete skull, right side.

species of *Coregonus* as I have been able to examine, and also in *Salmo Rappii*, it is closed posteriorly in *Salmo hucho*.

Abbreviations employed.

<i>al.</i> Alisphenoid.	<i>opc.</i> Opercular.
<i>an.</i> Angular.	<i>p.</i> Parietal.
<i>ar.</i> Articular.	<i>pl.</i> Palatine.
<i>bo.</i> Basisoccipital.	<i>pm.</i> Premaxilla.
<i>cm.</i> Commissural sensory-canal bones.	<i>pof.</i> Postfrontal.
<i>d.</i> Dentary.	<i>pop.</i> Preopercular.
<i>ecp.</i> Ectopterygoid.	<i>por.</i> Preorbital.
<i>emp.</i> Entopterygoid.	<i>prf.</i> Prefrontal.
<i>eo.</i> Exoccipital.	<i>pro.</i> Pro-otic.
<i>ep.</i> Epitotic.	<i>ps.</i> Parasphenoid.
<i>f.</i> Frontal.	<i>pt.</i> Post-temporal.
<i>hm.</i> Hyomandibular.	<i>q.</i> Quadrate.
<i>iop.</i> Interopercular.	<i>sar.</i> Sesamoid articular.
<i>me.</i> Mesethmoid.	<i>soc.</i> Supraoccipital.
<i>mpt.</i> Metapterygoid.	<i>sop.</i> Subopercular.
<i>mx.</i> Maxilla.	<i>sq.</i> Squamosal.
<i>n.</i> Nasal.	<i>st.</i> Supratemporal.
<i>op.</i> Opisthotic.	<i>sy.</i> Symplectic.
	<i>v.</i> Vomer.

XLVI.—*Descriptions of some new Species of Noctuidæ from Tropical South America.* By HERBERT DRUCE, F.L.S. &c.

Lycophotia tetraonis, sp. n.

Female.—Head, collar, tegulæ, and thorax greyish brown; abdomen and legs paler brown. Primaries dark brown, the base and costal margin irrorated with greyish scales; a sub-marginal greyish line extends from near the apex to the anal angle, the fringe alternately light and dark brown: secondaries hyaline white, the outer margin near the apex with a row of fine small black dots. Underside: primaries grey-brown, with a marginal row of black dots: secondaries as above, the costal margin irrorated with brown scales.

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

Hab. N. Peru, Huancabamba, 6000-10,000 feet (*Mus. Druce*).

Mamestra albifluviata, sp. n.

Male.—Front of head black; top of the head and the collar greyish; tegulæ and thorax black; antennæ and abdomen black, the base of the abdomen greyish; legs black, banded with white. Primaries white, the inner half black, with a white mark just below the middle, a large y-shaped black mark on the costal margin close to the apex, a black spot

about the middle and one nearer the base; the fringe alternately black and white: secondaries white, the apex, costal, and outer margin broadly bordered with pale brown; the fringe dark brown. Underside: primaries brownish black, with four minute white dots on the costal margin near the apex: secondaries white, the costal margin and apex black.

Expanse $1\frac{1}{4}$ inch.

Hab. Colombia, Honda, 1000 feet (*Mus. Druce*).

This species is allied to *Mamestra albomarginata*, Druce.

Mamestra canosticta, sp. n.

Female.—Head, antennæ, collar, tegulæ, and thorax reddish grey-brown, abdomen and legs paler; a tuft of greyish scales at the base of the abdomen. Primaries reddish brown, thickly irrorated with greyish scales; a marginal row of round grey spots extends from the apex to the anal angle; the fringe reddish brown: secondaries dark brown, the fringe yellowish brown. Underside: both wings pale brown, irrorated with darker brown scales, the secondaries rather paler than the primaries.

Expanse $1\frac{3}{4}$ inch.

Hab. Bolivia (*Garlepp, Mus. Druce*).

Hadena elæistis, sp. n.

Female.—Head, antennæ, collar, tegulæ, and thorax dark brown, the collar and tegulæ edged with pale greyish brown; abdomen reddish brown. Primaries dark brown; the costal margin, veins, and streaks pale greyish brown; a greyish-brown band extends from the apex to the middle of the inner margin; the outer margin pale greyish brown; the fringe dark brown: secondaries semihyaline whitish brown, the veins all dark brown.

Expanse $1\frac{4}{5}$ inch.

Hab. North Peru, Huancabamba, 6000–10,000 feet (*Mus. Druce*).

Hadena œnistis, sp. n.

Female.—Head, antennæ, collar, tegulæ, and thorax reddish brown, the tegulæ and collar edged with grey; abdomen greyish brown, the sides reddish brown; anus and legs reddish brown: primaries dark brown, the costal and inner margin reddish brown; a pale greyish streak extends from the base to the end of the cell; a narrow pinkish-grey band crosses the wing from the apex to the inner margin; a sub-marginal row of small white spots with black points; the

marginal line greyish brown; the fringe alternately dark and light brown: secondaries dark brown, palest at the base. Underside: primaries dark brown, the outer margin reddish brown: secondaries light reddish brown, whitish in the middle, with a dark brown spot at the end of the cell.

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

Hab. Peru, Huancabamba, 6000-10,000 feet (*Mus. Druce*).

Nephelistis conservulodes, sp. n.

Female.—Head, antennæ, collar, tegulæ, and thorax pale reddish brown; abdomen greyish brown; anus yellowish. Primaries dark brown, with a large double V-shaped mark about the middle of the costal margin extending over the wing almost to the inner margin; the V-shaped mark is edged by a fine yellow line; the outer margin from the apex to the anal angle bordered with pinkish brown; a marginal zigzag fine black line from the apex almost to the anal angle: secondaries sordid white, brown at the apex and round the outer margin; a brown dot at the end of the cell. Underside: primaries blackish brown, the apex and outer margin bright red-brown: secondaries almost the same as the upperside, but paler and redder in colour.

Expanse $1\frac{3}{4}$ inch.

Hab. Interior of Colombia (*Wheeler, Mus. Druce*).

Eriopyga fulvida, sp. n.

Male.—Head, antennæ, collar, tegulæ, and thorax pinkish fawn-colour; abdomen pale brown, the anal tuft yellowish fawn-colour; legs and underside of abdomen dark colour. Primaries pinkish fawn-colour, crossed by three very indistinct yellowish lines, the first near the base, the second beyond the cell, the third submarginal; the fringe fawn-colour: secondaries pale brownish yellow. Underside of both wings very pale yellow, shaded with pink on the costal margins of both wings.

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

Hab. South Brazil, Rio (*Mus. Druce*).

Eriopyga thermistis, sp. n.

Male.—Head, antennæ, collar, tegulæ, and thorax pale brownish fawn-colour; abdomen light grey above, the underside and legs reddish brown; the anal tuft yellowish. Primaries pale brownish fawn-colour, the outer margin from the apex to the anal angle dark brown: secondaries yellowish

white, the fringe yellow. Underside: both wings yellowish white, darkest along the costal margins of both wings.

Expanse $1\frac{1}{4}$ inch.

Hab. Colombia, Sierra del Libane, 6000 feet (*H. II. Smith, Mus. Druce*).

Poliodes viola, sp. n.

Female.—Head, antennæ, collar, tegulæ, thorax, and abdomen dark grey, the anus and underside of the abdomen and legs pinkish grey. Primaries dark grey, crossed from the costal to the inner margin by several very indistinct, fine, zigzag, black lines; five small black streaks close to the apex; fringe grey: secondaries white, the veins and outer margins pale brown, the fringe white. Underside: primaries dark grey, shaded along the costal margin and at the apex with pink: secondaries white, the costal margin pinkish.

Expanse 2 inches.

Hab. North Peru, Huancabamba, 6000–10,000 feet (*Mus. Druce*).

Tmetolophota polygona, sp. n.

Female.—Head, collar, and tegulæ dark brown, edged with pale fawn-colour; thorax and antennæ brown; abdomen greyish brown, slightly reddish on the underside; legs reddish brown. Primaries pale fawn-colour, with three bands of black streaks edged with yellow between the veins, the first along the costal margin, the second extending from the apex to the middle of the inner margin, the third submarginal near the apex; the fringe pale fawn-colour: secondaries semihyaline brownish white, the apex and outer margin darker brown; the fringe pale fawn-colour. Underside: primaries dark reddish brown; secondaries pale brownish white, shaded with reddish brown; a small black dot at the end of the cell.

Expanse 2 inches.

Hab. North Peru, Huancabamba, 6000–10,000 feet (*Mus. Druce*).

XLVII.—*Three new Coleoptera from E. Africa belonging to the Lucanidæ and Cetoniidæ.* By CHAS. O. WATERHOUSE.

Lucanidæ.

Metopodontus Elizabethæ, sp. n.

♂.—Black. Mandibles rufo-piceous, as long as the head and thorax united, shining, curved downwards from near the

base; with a strong tooth close to the base, a more prominent one at one quarter from the base, a similar one at one third from the apex, and a small one close to the apex. Between the large teeth there are one or two small ones. The head is transversely quadrate, with a slight rounded swelling close to the anterior angle of the thorax; the upper side is semi-circularly impressed, slightly raised in front, with a deep emargination, so as to form two somewhat acute teeth. The head and thorax are both granulose, but the granulation at the side of the head is much stronger than elsewhere. The elytra are yellow, with the suture, the base, and the margins narrowly bordered with black. The tibiæ are pale reddish yellow; the anterior have a black line along the outer edge, which has a few very small teeth; the middle pair have an acute spine at the middle; the posterior pair are unarmed. The tarsi are reddish, marked with black.

Long. corp. 38-40, mandib. 17-20 mm.

Hab. Usagara, German East Africa (*Rev. A. N. Wood*).

The smaller specimen has two small teeth about the middle of the left mandible. The larger example has two small teeth about the middle of the left mandible and one similarly placed on the right mandible, and both mandibles have a small tooth before the apical one.

This species is closely allied to *M. Savagei*, which it represents in E. Africa. It differs in the arrangement of the colour and in the strongly deflexed mandibles.

Cetoniidæ.

DICELLACHILUS, gen. nov.

General form of *Compsocephalus*. Mentum rather abruptly narrowed in front of the middle, somewhat strongly bilobed in front, with a deep fovea at the base. Sternal process very slightly prominent, obtusely rounded.

♂.—Head with an acute angular projection on each side in front of the eye; a short erect horn in front, compressed at its base, expanded into two retrocurved acute horns at the apex. Forehead with a longitudinal keel, which terminates in front with a slight tubercle. Anterior tibiæ rather short and broad, furnished with two teeth on the outer edge besides the dentiform apical angle.

♀.—Head with the portion in front of the eyes sub-quadrangular, gently concave, with a slight keel in the middle, truncate in front, gently sinuate. Anterior tibiæ as in the male.

Dicellachilus Woodi, sp. n.

Black, dull above, shining beneath. Head shining, strongly punctured. Antennæ and palpi pitchy. Thorax convex, dull, broadest just before the base, very slightly narrowed anteriorly for some distance, and then rounded off to the eyes; the posterior angles rounded; the margins beset with short black hair. Elytra orange-yellow, with the suture and margins black; the black at the suture is broad for two thirds its length and then narrows to the apex: the black extends along the base in some examples, and sometimes there is a narrow edging of black at the apex.

Long. 30 mm.

Hab. Usagara, German East Africa (*Rev. A. N. Wood*).

BETTONIA, gen. nov.

Closely resembles *Compscephalus*, but the anterior tibiæ are nearly alike in both sexes, of normal form, armed externally with three acute teeth; the male has sometimes one or two small teeth on the inner lower side.

♂.—Forehead with a small tubercle; a small ridge above each eye and a short, transverse, lamelliform horn in front; the lateral margins of the clypeus on each side of this horn flattened, arcuately rounded, as in *Compscephalus*. Thorax normal, as in the female. Prosternal process scarcely prominent, obtusely rounded.

Bettonia mutabilis, sp. n.

Head pitchy red in front, obscure greenish at the back. Thorax, scutellum, and elytra dull, the former obscure greyish or bluish green, the elytra brownish purple. Pygidium rather thickly punctured with transverse punctures; in the male each puncture bears a fulvous hair. Underside shining, entirely blue or variegated with green and purple.

♂.—Head with a small tubercle on the vertex. Clypeal horn erect, one third broader than high, a little wider at the apex than at the base, closely punctured, gently emarginate at the apex. Anterior tarsi not conspicuously longer than in the female.

♀.—Head strongly punctured. Forehead with a very faint indication of the tubercle. Clypeus subquadrate, with angles rounded; the margins slightly reflexed, the anterior margin gently sinuate.

Long. 25 mm.

Hab. Lagari, British East Africa (*C. Stuart Betton*).

Var., ♂.—Entirely greyish green above. Tubercle on the vertex more distinct, shining. Clypeal horn shorter and relatively broader and less distinctly punctured.

Hab. British East Africa (*A. B. Percival*).

XLVIII.—On some Batrachians and Reptiles from Tibet.

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

THE fishes obtained by Lient.-Col. L. A. Waddell, C.B., and Capt. H. T. Walton, of the Tibet Frontier Commission, have already been described by my colleague Mr. Regan. I now beg to offer a list of the batrachians and reptiles collected by these gentlemen and preserved in the Natural History Museum.

BATRACHIANS.

1. *Rana Pleskei*, Gthr.

Nanorana Pleskei, Günth. Annuaire Mus. Zool. St. Pétersb. 1896, p. 199; Bedriaga, Przewalski Reis., Zool. iii. i. p. 32, pl. i. fig. 5 (1898).

Numerous specimens were collected by both Lient.-Col. Waddell and Capt. Walton up to an altitude of 15,000 feet. So far only one species of batrachian—*Bufo vividis*, Laur.—was known to occur at such an altitude. The few examples previously described by Günther and by Bedriaga were obtained in the Province Sze-Chuen and in North-eastern Tibet.

Two small groups of vomerine teeth are sometimes present behind the level of the choanæ, the outer metatarsals are more or less separated by web, at least distally, and a true web does not exist between the fingers. I am therefore unable to accept the genus *Nanorana*.

Rana Pleskei is very closely allied to *R. Blanfordii*, Blgr., the habitat of which is unknown.

REPTILES.

1. *Alsophylax tibetanus*, sp. n.

Head rather strongly depressed, one and one third as long as broad; snout obtusely pointed, slightly longer than the diameter of the orbit or the distance between the eye and the ear-opening; latter moderately large, oval, oblique. Body

depressed. Limbs moderate; digits rather slender; 21 transverse lamellæ under the fourth toe. Head and body covered with smooth granules, smallest on the occiput; on the back these granules are intermixed with numerous irregularly disposed smooth tubercles; ventral scales flat, smooth, subimbricate. Rostral with median cleft above; nostril between the rostral, the first upper labial, and three nasals; nine upper and seven lower labials; symphysial large, triangular, followed by a pair of large chin-shields. Tail covered with irregular, imbricate, smooth scales. Greyish above, with small dark brown spots and vermiculations, and six crescentic brown, dark-edged cross-bands, the first from eye to eye across the nape, the sixth on the base of the tail; lower parts white.

	mm.
Total length.....	102
Head.....	15
Width of head.....	11
Body.....	39
Fore limb.....	19
Hind limb.....	25
Tail.....	48

A single female specimen from Chaksam Ferry, Tsangpo Valley, 12,500 feet, presented by Lieut.-Col. L. A. Waddell.

2. *Agama himalayana*, Stdr.

Chaksam and Lhasa.

3. *Phrynocephalus Theobaldi*, Blyth.

Chaksam, Kamba Jong, and Gyantse.

The black spot on the belly is variable and not a sexual character.

XLIX.—*Rhynchotal Notes*.—XXXI. By W. L. DISTANT.

Subfam. *GÆANINÆ* (continued from p. 319).

THIS communication completes the enumeration of the genera which are included in this subfamily, reserving the inquiry as to a few others which have been described but not yet seen by the writer. These, with any that may come to hand and not yet described, will be referred to when

examined, and their proposed location denoted, as is done in two examples at the end of the present instalment.

Division ZAMMARARIA.

In this division the pronotal margins are amplified and usually medially angulate; the tympanal orifices are more or less exposed—little in *Odopœa* and very largely in *Zammara*; the tegmina and wings (with the exception of some species of *Odopœa*) are hyaline and usually more or less spotted.

This division is entirely confined to Tropical and Sub-tropical America.

Synopsis of Genera.

- | | |
|---|------------------|
| A. Tympanal coverings outwardly complete, the orifices only exposed inwardly. | |
| <i>a.</i> Pronotum shorter than mesonotum. | |
| <i>b.</i> Head (including eyes) about equal in width to base of mesonotum | <i>Odopœa.</i> |
| B. Tympanal coverings inwardly complete, the orifices only exposed outwardly. | |
| <i>aa.</i> Pronotum as long as mesonotum. | |
| <i>c.</i> Head (including eyes) narrower than base of mesonotum | <i>Miranha.</i> |
| C. Tympanal coverings outwardly complete, the orifices very widely exposed internally. | |
| <i>d.</i> Head (including eyes) about as wide as base of mesonotum | <i>Zammara.</i> |
| <i>dd.</i> Head (including eyes) only about two thirds the breadth of base of mesonotum | <i>Orellana.</i> |

Genus ODOPEA.

Odopœa, Stål, Ann. Soc. Ent. Fr. (4) i. p. 616 (1861).

Type, *O. dilatata*, Fabr. (*Tettigonia*).

Odopœa perspicua, sp. n.

Head, pronotum, and mesonotum virescent; mesonotum with subobsolete traces of four obconical spots on anterior margin, the two central smallest; the anterior margin of the cruciform elevation a little castaneous and greyishly pilose; abdomen above dark castaneous, basally, centrally, longitudinally paler; body beneath and legs greenish ochraceous; tegmina very pale brownish, much suffused and streaked with green, especially on basal half, and with two prominent transverse subcostal spots between radial area and apex; wings pale castaneous, much suffused with dark castaneous on basal and apical areas. Head (including eyes) about as wide as base

of mesonotum; lateral pronotal margins angularly amplified; opercula in male short, not meeting inwardly; tegmina long and narrow.

Long., excl. tegm., 29 mm.; exp. tegm. 80 mm.

Hab. São Thomé (*Negreiros*, Paris Mus.).

MIRANHA, gen. nov.

Head (including eyes) a little narrower than base of mesonotum, the front moderately prominent, but only about half the length of vertex, lateral margins of vertex a little convex; pronotum about as long as mesonotum, its lateral margins amplified and medially angulate; abdomen about as long as space between apex of head and base of cruciform elevation, its lateral areas above moderately oblique, the tympanal orifices inwardly covered but outwardly exposed; abdomen beneath with the disk oblique on each side, but with the lateral margins broadly subreflected; rostrum passing the posterior coxæ; opercula small, transverse; tarsi three-jointed; tegmina and wings hyaline, the first with eight apical areas, and the basal cell considerably longer than broad.

Type, *M. imbellis*, Walk. (*Zammara*).

Genus ZAMMARA.

Zammara, Amy. & Serv. Hist. Hémi. p. 468 (1843).

Type, *Z. tympanum*, Fabr. (*Tettigonia*).

ORELLANA, gen. nov.

Head (including eyes) only two thirds the width at base of mesonotum, its length about equal to that of pronotum, vertex nearly twice the length of front; pronotum about twice as broad as long, its lateral margins broadly amplified and medially angulate; mesonotum a little longer than pronotum and (including basal cruciform elevation) about as long as pronotum and head together; abdomen short, broad, about as long or sometimes shorter than space between apex of head and base of cruciform elevation; tympanal coverings outwardly complete and covering lateral areas, but the orifices widely exposed internally; opercula in male small, transverse, not passing base of abdomen; face broader than the space between it and eyes; tegmina and wings hyaline, more or less maculate; tegmina with eight apical areas; tarsi two-jointed.

Allied to *Zammara*.

Type, *O. columbia*, Dist. (*Zammara*).

Orellana brevis, sp. n.

Head, pronotum, and mesonotum olivaceous green; head with the area of the ocelli, or sometimes completely, shaded with dull castaneous; pronotum with a central fascia and the incisures black; mesonotum with two central obconical spots, on each side of which is a small spot on anterior margin, and a large oblique fasciate spot on each side of posterior disk, black; abdomen above brownish ochraceous; segmental margins, tympanal coverings, and lateral areas of mesonotum bright emerald-green; body beneath and legs pale green; face and apices of tibiae and tarsi more or less dull castaneous; abdomen beneath with the stigmata whitishly tomentose; tegmina and wings hyaline, venation fuscous, brownish at base; tegmina with the interior of the basal cell green, costal membrane, a spot at end of radial area, a spot on transverse vein at base of second apical area, and sometimes a spot in upper ulnar area fuscous brown. Head (including eyes) about two thirds the width of mesonotum at base; lateral margins of pronotum strongly amplified and medially obtusely angulate; lateral tympanal coverings about as broad as the internally exposed orifices; abdomen very short, not longer than space between anterior margin of pronotum and base of cruciform elevation; rostrum reaching posterior coxæ.

Long., excl. tegm., ♂ 24-26 mm.; exp. tegm. 84-92 mm.

Hab. Colombia (Brit. Mus.).

Division HAMZARIA.

This division, at present including only a single Eastern genus, has much affinity with the Neotropical division Zammararia. The pronotal margins are amplified; the tympanal coverings only concealing about half of the tympanal orifices; the tegmina and wings almost wholly opaque.

Although the condition of the tympanal orifices allies this division to the Zammararia, with which the dilated pronotal margins also agree, the genus *Hanza*, on which it is founded, could, apart from the tympanal characters, be easily confused with the genus *Platypleura* belonging to the subfamily Cicadinae.

Genus HAMZA.

Hanza, Dist. Trans. Ent. Soc. Lond. 1904, p. 674.

Type, *H. bouruensis*, Dist. (*Platypleura*).

Division GÆANARIA.

This division, at present represented by three Eastern genera, is to be principally recognized by the following characters:—The tegmina and wings are opaque and generally more or less brilliantly coloured; the lateral margins of the pronotum are neither amplified nor dilated; the tympanal orifices are largely exposed, the tympanal coverings being a little narrower and much shorter than the orifices, and with their anterior margins convex.

Synopsis of Genera.

- A. Tegmina with the venation normal; apical areas eight.
 a. Head longer than pronotum, front somewhat porrectly produced.
 b. Greatest breadth of tegmina more than one third of their length *Cicada*.
 aa. Head not longer than pronotum, obliquely depressed in front of eyes.
 bb. Greatest breadth of tegmina only about one third of their length *Balinta*.
 B. Tegmina with the venation reticulate, ulnar and apical areas broken up into many cellular divisions *Talainga*.

Genus GÆANA.

Gæana, Amy. & Serv. Hist. Hém. p. 463 (1843).

Type, *G. maculata*, Drury (*Cicada*).

BALINTA, gen. nov.

Head (including eyes) about as wide as base of mesonotum and as long as pronotum, obliquely depressed in front of eyes; pronotum about as long as mesonotum, its lateral margins sinuate, the posterior angles moderately dilated; abdomen in male much longer than space between apex of head and base of cruciform elevation; tympanal coverings both shorter and narrower than the tympanal orifices, which are most exposed inwardly; opercula in male small and transverse, widely separated, and not extending beyond base of abdomen; rostrum reaching posterior coxæ; anterior femora strongly spined beneath; tegmina and wings opaque; tegmina with their greatest breadth about one third their length and with eight apical areas.

Type, *B. octonotata*, Westw. (*Cicada*).

Balinta auriginea, sp. n.

♀. Head, pronotum, and mesonotum yellow; head with some marks at the area of the ocelli and the lateral margins of vertex black; pronotum with a broad central longitudinal fascia, two large spots on each lateral area, and the lateral margins black; mesonotum with a broad irregular central fascia, a somewhat shorter fascia on each lateral area, and the central base of cruciform elevation, black; abdomen reddish ochraceous, with a central longitudinal fascia, and three large segmental spots on each side, black; body beneath and legs piceous brown; face and space between face and eyes yellow; a large spot near apex of face and a spot at inner margins of eyes black; femora (excl. lim^s apices) testaceous; tegmina bronzy brown, with three pale spots, two on postcostal area and one at inner angle; some faint pale streaks in the apical areas; wings sanguineous, the apical and posterior margins black.

Long., excl. tegm., ♀ 20 mm.; exp. tegm. 52 mm.

Hab. Mts. du Ht. Song-Chai (Paris Mus.).

Allied to *B. octonotata*, Westw.

Genus TALAINGA.

Talainga, Dist. Ann. & Mag. Nat. Hist. (6) v. p. 166 (1890).

Type, *T. Binghami*, Dist.

Division PSITHYRISTRIARIA.

Head (including eyes) considerably narrower than base of mesonotum, tympanal coverings as long as but very much narrower than the orifices, which are thus inwardly exposed; abdomen narrowed posteriorly, a little longer than the space between the apex of head and base of cruciform elevation; tegmina and wings hyaline: tegmina with the venation abnormal; apical areas eight, the lower one very small; ulnar areas much compressed, broad, especially the two lowermost.

Genus PSITHYRISTRIA.

Psithyristeria, Stål, Öfv. Vet.-Ak. Förh. 1870, p. 712.

Type, *P. specularis*, Stål.

Division MOGANNIARIA.

Tegmina and wings hyaline, the tegmina spotted or in part more or less brilliantly coloured; body ovate, more or less attenuated anteriorly and posteriorly; head with the front more or less triangularly produced; tympanal flaps present, but incomplete, the tympanal orifices in part exposed.

Two genera are here included in this division, one Neotropical and the other Oriental in distribution.

Synopsis of Genera.

- A. Anterior femora not spined beneath.
 a. Body short and robust; abdomen shorter than pronotum and mesonotum together; head frontally narrowed and produced.
 b. Lateral margins of pronotum dentate *Pachysaltria*.
 B. Anterior femora spined beneath.
 aa. Body robust; abdomen a little shorter or almost as long as space between apex of head and base of cruciform elevation; head strongly conically produced.
 bb. Lateral margins of pronotum oblique, not dentate. *Mogannia*.

Genus PACHYPSALTRIA.

Pachysaltria, Stål, Ann. Soc. Ent. Fr. (4) i. p. 616 (1861).

Type, *P. cincto-maculata*, Stål (*Cicada*).

Genus MOGANNIA.

Mogannia, Amy. & Serv. Hist. Hém. p. 467 (1843).

Type, *M. conica*, Germ. (*Cicada*).

Mogannia mandarina, sp. n.

♀. Body and legs black, shining; head, pronotum, and mesonotum somewhat longly ochraceously pilose; abdomen above with a broad central, longitudinal, ochraceously pilose fascia; underside of body and legs somewhat less longly pilose; tegmina and wings hyaline, the venation piceous; tegmina with the basal half shining black, containing a transverse hyaline fascia divided by the dark veins, occupying basal half of radial area and terminating beneath basal cell; head with the front longly produced, its apex terminating in a tuft of long ochraceous hairs.

Long., excl. tegm., ♀ 18 mm.; exp. tegm. 45 mm.

Hab. Hong Kong (Brit. Mus.).

Allied to *M. nusalis*, White.

Mogannia Horsfieldi, sp. n.

♀. Head, pronotum, and mesonotum very thickly ochraceously pilose; abdomen above black, with a broad, central, longitudinal, ochraceously pilose fascia; body beneath and legs piceous, the first thickly and the legs sparingly ochraceously pilose; tegmina and wings hyaline, extreme bases of both reddish ochraceous, the venation brownish or piceous; tegmina with the basal half connected at posterior angle with a very broad submarginal fascia, piceous brown; wings with the basal area beyond the reddish-ochraceous base pale fuscous.

Long., excl. tegm., ♀ 15 mm.; exp. tegm. 36 mm.

Hab. Java (*Horsfield*, Brit. Mus.).

ADDENDA.

Division CICADATRARIA (*ante*, p. 304).

TAMASA, gen. nov.

Body moderately short, abdomen not longer than space between apex of head and base of cruciform elevation; tympanal coverings both narrower and shorter than tympanal cavities; head shorter than pronotum, which is slightly shorter than mesonotum.

A genus intermediate between *Tettigia* and *Terpsosia*. From *Tettigia* it is separable by the structure of the tympanal coverings, which are both narrower and shorter than tympanal cavities, and by the short abdomen; from *Terpsosia* it also differs by the short and opaque abdomen, the greater width of the head between eyes = to width of base of mesonotum, and by the tympanal coverings being subangulate anteriorly.

Type, *T. tristigma*, Germ. (*Cicada*).

Subfam. CICADINÆ.

Division HETEROPSALTRIARIA

(to follow Cicadaria, vol. xiv. p. 425).

This division, at present represented by a single genus, is to be distinguished from the Cicadaria by the distinct venation of the tegmina, the radial area being very large and

General dorsal area between "pinkish buff" and "buff," lightening on the limbs to "cream-buff." Head and fore-back less uniform, more heavily lined with blackish. Intermediate band between the white lateral line and the white of the belly darker than the general colour, more or less mixed with blackish. Under surface very short-haired, partly naked in the axillary and inguinal regions, white. Upper surface of hands and feet cream-buff. Short-haired part of tail darker buffy. Long hairs of tail, as seen from below, buff basally, occasionally approaching ochraceous buff, then cream-buff, with a subterminal ring of black and a broad cream-buff tip. In *X. e. leucoumbrius* the basal part of the tail-hairs is ordinarily "ochraceous buff" or even "ochraceous."

Skull apparently quite as in *leucoumbrius*, the posterior premolar proportionally large; rounded-quadrangular, not small as in the East-African species.

Dimensions of the type (measured in the flesh):—

Head and body 262 mm.; tail 240; hind foot 63.

Skull: greatest length 61.7; basilar length 49; zygomatic breadth 33; palate length from hensenion 30.3; front of large premolar to back of m^3 11.3; breadth of large premolar 3.5.

Hab. Yo, Lake Chad.

Type. Adult male. Original number 44. Collected 11th October, 1904, and presented by Capt. G. B. Gosling. Four specimens.

Xerus erythropus lacustris, subsp. n.

Colour darker than in any of the allied forms, the back heavily blackened, so as nearly to match Ridgway's "mummy-brown." Crown still darker, glossy blackish, speckled with buffy. Area below white lateral line broader than usual, finely speckled blackish. Under surface even more thinly haired than usual, dull buffy whitish along the middle line, the sides of the belly buffy, as are the inner sides of the limbs and the upper surface of the hands and feet. Forearms dark ochraceous clay-colour. Hairs of upper side of tail black at their bases, those of the lower side ochraceous buff basally.

Skull with the large premolars characteristic of *X. erythropus*, contrasting in this respect with the geographically allied *X. microdon*.

Dimensions of the type:—

Head and body 305 mm.; tail 240; hind foot 64.

Skull: greatest length 64; basilar length 50; zygomatic breadth 32.5; palate length from hensenion 30.3; front of large premolar to back of m^3 12; breadth of posterior upper premolar 3.8.

Hab. Masindi, Unyoro.

Type. Adult female. B.M. no. 2. 11. 1. 5. Collected 23rd June, 1897, by Dr. W. J. Ansorge.

An isolated skull and two young skins collected by Emin Pasha in Monbuttu appear also to be referable to this form.

Xerus microdon, sp. n.

General colour above tawny clay-colour, becoming more blackish on the crown and muzzle, more ochraceous on the base of the tail. White markings as in *X. erythropus*. Dark area below lateral line blackish brown. Sides of belly and inner sides of limbs washed with pale buffy. Forearms dull buffy. Upper surface of hands and feet cream-buff. Bases of tail-hairs strong ochraceous buff.

Skull as usual. Posterior upper premolar comparatively small, cylindrical.

Dimensions of the type (measured on the skin):—

Head and body 285 mm.; tail 225; hind foot (wet) 63.

Skull: greatest length 62; basilar length 49; zygomatic breadth 33; palate length from hensenion 29; front of large premolar to back of m^3 12; diameter of large upper premolar 3.

Hab. British East Africa. Type from Kitui, alt. 1000 m.; other specimens from Ukambani (*Jackson*).

Type. Adult male. B.M. no. 1. 2. 5. 4. Original number 51. Collected 20th September, 1900, and presented by S. L. Hinde, Esq.

Xerus microdon fulvior, subsp. n.

Similar in all essential characters to true *microdon*, but the colours richer, darker, and more tawny throughout. Back tawny ochraceous, becoming deep rufous on rump; hands, wash along sides of belly, hind limbs, and top of feet ochraceous buff instead of buffy or cream-buff. Forearms between ochraceous and clay-colour. Bases of tail-hairs dark tawny.

Dimensions of type:—

Head and body 295 mm.; tail (imperfect); hind foot 62.

Skull: greatest length 64.5.

Hab. Fort Hall, Mt. Kenya district. Alt. 1300 m.

Type. Adult male. B.M. no. 3. 11. 1. 4. Original number 170. Collected 10th June, 1903, and presented by S. L. Hinde, Esq. Two specimens.

LI.—*A new Subspecies of Glossina palpalis, Rob.-Desv., the Disseminator of Sleeping Sickness.* By ERNEST E. AUSTEN.

THE British Museum has just received from Dr. F. Creighton Wellman, of Benguella, W. Africa, some specimens of a tsetse-fly which, though obviously belonging to *Glossina palpalis*, Rob.-Desv., are sufficiently distinct from the typical form to be regarded as representing a new subspecies, which may be termed *Glossina palpalis Wellmani*, subsp. n.

The new subspecies may be characterized shortly as follows, by indicating the points in which it differs from the typical form :—

Glossina palpalis Wellmani, subsp. n.

♂ ♀.—Frontal stripe pale ochraceous; thoracic markings much reduced, so that *the thorax in a well-preserved specimen appears spotted*, the antero-lateral markings taking the form of spots or blotches; the *spot immediately behind the inner extremity of the humeral callus* on each side small, ovoid, or nearly circular, and especially conspicuous when the insect is viewed from above and slightly from behind; femora pale, the dark blotches much reduced.

Katumbela River, Angola, W. Africa; November 1904 (*Dr. F. C. Wellman*). Six specimens (1 ♂, 5 ♀ ♀). Types in British Museum.

Writing from Benguella, under date Feb. 5, 1905, Dr. Wellman says:—"I took about eighty specimens of these tsetse-flies in four days along the banks of the Katumbela River, two days from the coast, in the height of the rainy season."

The above specimens are of especial interest as being the first recorded examples of any form of *Gl. palpalis* from Portuguese West Africa and as showing that the range of the species in question, which has recently been stated by Laveran* to occur at Sengaleam (about thirty miles from

* 'Comptes Rendus,' t. cxxxix. (séance du 31 Octobre, 1904) p. 659.

Cape Verde), extends at least as far south as $12^{\circ} 30'$ S. lat. In all probability *Glossina palpalis Wellmani* will eventually be proved to exist right down to the Cunene River, the southern boundary of Angola, if not further; and it is to be hoped that evidence to decide the southern limit of *Gl. palpalis* will shortly be forthcoming.

In conclusion, it may be remarked that the British Museum possesses two females of *Gl. palpalis* from the Gambia (Dr. J. E. Dutton), belonging to a form somewhat similar to *Wellmani*; in the Gambia form, however, the ground-colour of the abdomen is paler and the thorax is less conspicuously spotted.

LII.—The Bonin Island Sambar.

By R. LYDEKKER.

THE most northerly limit in the Pacific for deer of the sambar group has been supposed to be Formosa, from which we have *Cervus Swinhoei*, or, as I prefer to call it, *C. unicolor Swinhoei*. I have lately, however, had the opportunity of inspecting two specimens of sambar from Bonin Island, lying about one degree to the east-south-east of the southern end of Japan. One specimen is the skull of a female acquired by the late Mr. H. Seebohm in 1889, and presented by his executors to the British Museum in 1896 (96. 2. 28. 4). The second is the skin, skull, and antlers of a male belonging to Mr. Rothschild.

That the Bonin deer is a sambar is shown not only by Mr. Rothschild's specimen, but likewise by the female skull, which exhibits the proximally expanded nasals, the deep lachrymal pit, and the small auditory bulla characteristic of that group.

The female skull, which is fully adult and has a basal length of $8\frac{3}{4}$ inches, indicates a species of the approximate size of the dusky Philippine sambar (*C. u. nigricans*), and therefore much smaller than the Formosan animal. Certain details in the form and relations of the nasals and premaxillæ distinguish the Bonin skull from two specimens of that of *nigricans*, but I have no means of ascertaining whether such features are constant. Be this as it may, the Bonin sambar differs from *nigricans* by the much lighter colour of the under-parts and limbs, there being a sharp line of demarcation between the brown of the back and the rufous fawn of the

flanks, while the lower segment of the limbs is nearly white. The tail, too, is shorter and white below, instead of uniformly dusky.

It is thus obvious that in respect of colour the Bonin deer comes much nearer to the Formosan than it does to the dusky Philippine sambar (I have not a specimen of the larger Luzon sambar with which to compare it). Accordingly, for all I can say to the contrary, it may be an imported breed of the Formosan sambar, dwarfed by the small area of its habitat. But as there is no evidence of this, it may be provisionally regarded as a distinct island race under the name of *Cervus (Rusa) unicolor boninensis*, with the female skull in the British Museum as the type.

LIII.—*On the South-African Curculionidæ of the Genus*
Cossonus, Clairv. By GUY A. K. MARSHALL, F.Z.S.

THE genus *Cossonus* has practically a world-wide distribution, but, as at present known, is better represented in America than anywhere else. Only eight species have hitherto been recorded from Southern Africa, and six more are described in the present paper. But even with this increase it seems probable that the number of South-African species might readily be doubled when the area is more thoroughly worked. The timber-belts of the Transkei and Pondoland, the yellow-wood forests of Natal, the heavily wooded regions which adjoin the eastern littoral from Zululand northward into the tropics, are all practically virgin ground for the coleopterist, and when adequately explored will doubtless yield many new forms.

These insects seem, as a rule, to be but poorly represented in collections, for unless specially searched for they are not likely to be met with by the casual collector. All our species with whose habits I am acquainted live under the bark of decaying trees; but they seem to require damp surroundings, and thus in the drier parts of the country they are only to be found in trees which are subject to moist decay, such as Euphorbias and a few soft-wooded species like the Erythrinæ. In these latter I have only found them when the trees were being killed by the attacks of certain Longicorn or Buprestid larvæ, the *Cossoni* being usually found in the moist decaying matter left in the tracks of these larvæ just beneath the bark. With them also occur a few other Curculionidæ, such as

Corynemerus, *Phlæophagus*, &c., as well as various Nitidulidæ, Staphylinidæ, and some dipterous larvæ. These in turn attract the predaceous Histeridæ of such genera as *Hololepta*, *Pachycerarus*, *Placodes*, and *Epivichinus*, which doubtless prey on the *Cossoni* as well as on the other insects.

It will probably be found that most of the species have a fairly wide distribution. This is certainly the case with *C. abscissus*, Boh., which ranges from Algoa Bay to the Equator and across the continent to Camerun. *C. suturalis*, Boh., has also been found both in Natal and on the Congo, but has not hitherto been recorded from any intermediate localities.

Synoptic Key for the South-African Species of Cossonus.

1. (24.) Rostrum more or less strongly dilated in the apical half.
2. (7.) Intervals on elytra bearing rows of punctures.
3. (4.) Prothorax very deeply incised near apex, bipartite; the intervals near the suture carinate, much narrower than the striæ 1. *C. abscissus*, Boh.
4. (3.) Prothorax simply constricted near apex, not incised; the intervals near the suture plane, as broad as the striæ.
5. (6.) Prothorax without any discal impressions or a central carina; rostrum very gradually dilated from base to apex 2. *C. Sheppardi*, sp. n.
6. (5.) Prothorax with a distinct carina and a longitudinal basal impression on each side of it; rostrum suddenly and very strongly dilated at apex 3. *C. carinicollis*,
[Fähr.
7. (2.) Intervals on elytra impunctate.
8. (21.) Prothorax distinctly impressed or carinate on the disk.
9. (20.) Rostrum without any central furrow above.
10. (19.) Elytra with only 9 complete striæ and a short subhumeral one; the central impression on prothorax not interrupted transversely.
11. (14.) Prothorax with the smooth discal areas finely and sparsely punctured.
12. (13.) Prothorax subpyriform, the sides gradually dilated from apex to beyond middle; metasternum evenly but sparsely punctured 4. *C. africanus*, Boh.
13. (12.) Prothorax subquadrate, the sides rapidly dilated from apex to before middle, thus forming a distinct shoulder; metasternum with a large central impunctate area 5. *C. incivilis*, Fähr.

14. (11.) Prothorax with the smooth discal areas impunctate.
15. (18.) Forehead with a distinct central fovea; central carina of prothorax very narrow, obsolete or incomplete.
16. (17.) Forehead with a shallow transverse impression; thoracic impression narrower, deeper, more sharply V-shaped, and without a central carina; elytra black. 6. *C. transvaalensis*, [sp. n.]
17. (16.) Forehead without a transverse impression; thoracic impression broader and shallower, and with an irregular central carina; elytra ferruginous brown, with the suture and lateral margins black. 7. *C. suturalis*, Boh.
18. (15.) Forehead with no central fovea; central carina of prothorax complete, broad and impunctate. 8. *C. umzila*, sp. n.
19. (10.) Elytra with 10 complete striæ; the central impression on prothorax transversely interrupted about middle. [sp. n.]
20. (9.) Rostrum with a central furrow at base. 9. *C. chirindensis*, F.
21. (8.) Prothorax plane and smooth, without a carina or any distinct impressions; body much depressed. 10. *C. elongatulus*, F.
22. (23.) Rostrum longer than head and only slightly dilated; head short, subconical; elytra with 9 shallow striæ, the intervals being broad and plane. 11. *C. glabricollis*, Boh.
23. (22.) Rostrum shorter than head and broadly dilated; head elongate, subquadrate; elytra with 10 deep striæ, the intervals narrow and subcarinate. 12. *C. complanatus*, [sp. n.]
24. (1.) Rostrum subcylindrical, not dilated at apex. [sp. n.]
25. (26.) Rostrum impunctate dorsally; central impression on prothorax at base only, the median carina indistinct anteriorly. 13. *C. immeritus*, [Fähr.]
26. (25.) Rostrum punctate dorsally; central impression on prothorax reaching from base to apex, the median carina distinct throughout. [sp. n.] 14. *C. scrobicollis*,

1. *Cossonus abscissus*, Boh.

Cossonus abscissus, Boh. Schön. Gen. Curc. iv. p. 1036 (1838); Gerst. Wieg. Arch. 1871, i. p. 75.

Long. $5\frac{1}{2}$ –7, lat. $1\frac{3}{4}$ –2 mm.

Head subconical, obsolete punctate on vertex, forehead strongly punctured and with a broad central impression containing a deep round fovea; eyes slightly prominent. *Rostrum* stout, about as long as broad, scarcely curved, strongly dilated from base to apex; upper surface with a central impression (continued from forehead) at the base only, plane

anteriorly, with distinct confluent punctuation and occasionally a faint central carina; antennæ inserted about middle, piceous. *Prothorax* bipartite, longer than broad, apex truncate and much narrower than base, which is deeply bisinuate; a very deep constriction near apex; the posterior portion slightly convex, evenly set with large deep punctures and with an obsolete median carina; the anterior portion somewhat raised and much less coarsely punctured; colour dull black, bare. *Elytra* separately rounded at base, a little broader than prothorax at shoulders, which are sloping, sides subparallel to beyond middle; upper surface slightly convex, with only eight complete striæ, containing rows of very large and deep foveolæ, the third and fourth rows each divided into two at base by narrow carinæ extending only a short distance, the intervals very narrow, each with a row of indistinct and distant punctures bearing minute setæ, which can only be perceived with difficulty; colour dull black. *Legs* closely punctured and with sparse pale pubescence, femora black, tibiæ and tarsi piceous.

CAPE COLONY: Algoa Bay (*Dr. H. Brauns*); NATAL: Malvern (*C. N. Barker*); TRANSVAAL: Leydenburg (*Dr. J. W. B. Gunning*); MASHONALAND: Victoria.

TYPE missing; in Ecklon and Zeyher's collection.

This species may be readily recognized from all its South-African congeners by the structure of the thorax. The only specimen I have taken was found under the bark of a large dead acacia. The species has been recorded by Faust from Camerun and by Gerstaecker from Arusha in German East Africa. Some specimens are covered with a fine earthy indumentum, which can be made to scale off; it is not quite clear whether this is a natural covering or merely adventitious.

2. *Cossonus Sheppardi*, sp. n.

Long. 5-6, lat. $1\frac{1}{5}$ - $1\frac{1}{2}$ mm.

Head subconical, almost impunctate on vertex, forehead closely and coarsely punctured and with a small central fovea, each puncture being filled with a short, depressed, scale-like, white seta; eyes prominent. *Rostrum* stout, about as long as head, scarcely curved, gradually dilated from base to apex; upper surface plane, with punctures and setæ similar to those on forehead; antennæ ferruginous, inserted in front of middle. *Prothorax* longer than broad, apex truncate, base faintly bisinuate, sides slightly rounded, broadest rather behind middle and strongly constricted near apex; upper surface slightly convex, without any central furrow or

carina, evenly set with large shallow punctures, each containing a very short white seta; colour dull black. *Elytra* subtruncate at base, a little broader than prothorax at shoulders, which are rounded, sides subparallel to beyond middle; upper surface somewhat convex, with ten complete striæ containing deep closely-set punctures, the intervals plane, as broad as the striæ near the suture, but those between the third and fourth striæ and between the fifth and sixth are very narrow and uneven, so that the punctures in these striæ are respectively approximated and often irregular or even more or less confused together (TYPE form); the broader intervals have each a row of small but distinct and close punctures bearing minute depressed white setæ; colour dull black. *Legs* punctate, with scattered depressed white setæ, piceous, with the tarsi ferruginous.

PORTUGUESE E. AFRICA: Beira (P. A. Sheppard).

TYPE in the British Museum.

Allied to *C. abscissus*, Boh., from which it differs, however, in many characters. Its nearest ally is *C. torridus*, Boh., from Senegal, but the latter, which is a more robust insect, has its rostrum very strongly and quadrangularly dilated at the apex and with a low central carina; the thoracic constriction is similar, but the basal margin is more deeply bisinuate, and the intervals on the elytra are much more coarsely punctured.

I have much pleasure in dedicating this species to Mr. P. A. Sheppard, of Beira, to whom I am indebted for much valuable material from that hitherto unworked locality.

3. *Cossonus carinicollis*, Fähr.

Cossonus carinicollis, Fähr. Öfv. K. Vet.-Akad. Förh. 1871, p. 284.

Long. 5-8, lat. $1\frac{1}{2}$ - $2\frac{1}{2}$ mm.

Head subconical, closely and strongly punctured; forehead with a deep central fovea; eyes slightly prominent. *Rostrum* rather longer than head, parallel-sided to about middle, thence abruptly and quadrangularly dilated; upper surface plane, closely and distinctly punctured, but with a variable impunctate median line or patch; antennæ inserted near apex. *Prothorax* scarcely longer than broad, apex truncate and much narrower than base, which is slightly bisinuate, sides moderately rounded, broadest at middle, slightly constricted at apex, posterior angles with a very small acute projection; upper surface almost plane, closely and distinctly punctured throughout, and with a smooth central carina, which has a broad shallow impression on each side at base; colour black

or ferruginous, with carina and margins black. *Elytra* a little broader than prothorax at shoulders, which are sloping, base subtruncate, sides parallel to beyond middle; upper surface slightly convex, with ten complete broad striæ containing rows of large deep punctures, the intervals narrow, subconvex, minutely punctulate; colour either black or ferruginous, with the suture and margins black or entirely ferruginous. *Legs* comparatively long, closely punctulate and sparsely pubescent, varying in colour from black to ferruginous.

NATAL: Durban.

TYPE in the Stockholm Museum.

Much the largest of our South-African species and with no near ally.

4. *Cossonus africanus*, Boh.

Cossonus africanus, Boh. Schön. Gen. Curc. viii. 2, p. 272 (1845).

Long. $4-4\frac{1}{2}$, lat. $1\frac{1}{4}-1\frac{1}{2}$ mm.

Head subconical, vertex impunctate, forehead finely punctured and with a distinct fovea; eyes slightly prominent. *Rostrum* scarcely longer than head, narrow and subcylindrical at base, strongly and quadrangularly dilated in the apical half; upper surface smooth, flattened towards apex, with fine scattered punctuation; antennæ stout, ferruginous. *Prothorax* about as long as broad, apex truncate, much narrower than base, which is lightly bisinuate, sides slightly rounded, and gradually dilated from apex to just behind middle, apex with a slight constriction; upper surface somewhat convex, with a distinct central carina and a shallow longitudinal impression on each side of it; the punctures are close and deep near the carina, becoming finer on the disk and stronger again towards the sides; colour black, shining. *Elytra* separately rounded at base, a little broader than prothorax at shoulders, which are roundedly prominent, sides parallel to beyond middle; upper surface slightly convex, with 9 complete fine striæ containing rows of small closely-set punctures, the intervals comparatively broad, almost plane, impunctate, but faintly coriaceous; colour black, moderately shining. *Legs* piceous, bare, finely punctate; tibiæ and tarsi ferruginous.

CAPE OF GOOD HOPE (*Wahlberg*), Cape Town (*A. Raffray*).

TYPE in the Stockholm Museum.

The punctuation of the discal areas of the prothorax is variable, being much closer and more distinct in some specimens. These latter are thus not unlike very small

examples of *C. elongatulus*, F., in general appearance; but the rostral structure of that species is very different and the elytra are more deeply striate.

5. *Cossonus incivilis*, Fähr.

Cossonus incivilis, Fähr. Öfv. K. Vet.-Akad. Förh. 1871, p. 286.

Long. $4-4\frac{2}{3}$, lat. $1\frac{1}{5}-1\frac{2}{5}$ mm.

Head subconical, impunctate on vertex, forehead punctulate and with a variable central fovea; eyes rather large, slightly prominent. *Rostrum* about as long as head, narrowing gradually from base to middle, thence broadly and quadrangularly dilated to apex; upper surface even, closely and finely punctured; antennæ short and stout, ferruginous, inserted in front of middle. *Prothorax* rather longer than broad, apex truncate and much narrower than base, which is strongly bisinuate, sides slightly rounded, broadest about middle, faintly constricted at apex; upper surface slightly convex, with a strong central impression, narrow from near apex to middle, thence broadly and triangularly dilated to base, the anterior part being usually shallow; the impression is strongly punctured and contains a very narrow undulating carina, the disk smooth and with very fine sparse punctuation, beyond which the sides are deeply and coarsely punctured; colour black, shining. *Elytra* separately rounded at base, very little broader than prothorax at shoulders, which are sloping, sides parallel to beyond middle; upper surface moderately convex, with nine complete strongly punctured striæ, which are very deep near the suture, but become shallower laterally, intervals almost as broad as striæ, convex and impunctate; colour black, shining. *Legs* short, piceous, bare, and absolutely punctured, tarsi paler.

NATAL: Verulam, Umgeni; MASHONALAND: Salisbury.

TYPE in the Stockholm Museum.

The typical specimens taken by Wahlberg in "Caffraria" are apparently immature, all my own examples being of a shining black colour. The species in general form and sculpture is allied to *suturalis*, Boh., and *transvaalensis*, Mshl., but it is distinctly more convex, the rostrum is much more dilated and more evidently punctured above, and the thoracic impression is of a different shape.

In Natal I found this insect in decaying Euphorbias, and at Salisbury under the rotting bark of what is locally known as the "cabbage-tree."

6. *Cossonus transvaalensis*, sp. n.

Long. $3\frac{3}{4}$, lat. 1 mm.

Head subconical, black, shining, impunctate, with a distinct shallow transverse impression behind the eyes; forehead with a small central fovea; eyes slightly prominent. *Rostrum* about as long as head, moderately curved, cylindrical at base, thence gradually dilated and flattened towards apex, upper surface with very fine faint punctuation, the sides coarsely punctured; antennæ ferruginous, inserted about middle. *Prothorax* a little longer than broad, sides slightly rounded, broadest about middle, constricted near apex, base bisinuate; upper surface plane, with a deep, sharply defined, V-shaped central impression, which is filled with coarse punctures and has no distinct central carina; discal area impunctate, the sides closely and deeply punctured; colour black, glabrous. *Elytra* rounded at base and scarcely broader than the thorax, shoulders rounded, sides parallel to beyond middle; upper surface slightly convex, scarcely striate except close to base, but with nine complete rows of deep separate punctures, which are smaller apically and laterally, the intervals plane and impunctate; colour black, shining, glabrous. *Legs* piceous, obsolete punctured.

TRANSVAAL.

TYPE in the British Museum.

Nearly allied structurally to *C. suturalis*, Boh., but the present species is a distinctly narrower and slightly more convex insect, and, in addition to the characters mentioned in the key, it may be distinguished by the coarser punctuation of the rostrum and the difference in the striation of the elytra.

7. *Cossonus suturalis*, Boh.

Cossonus suturalis, Boh. Schön. Gen. Curc. iv. p. 1033 (1838).

Long. 4-5, lat. $1-1\frac{3}{4}$ mm.

Head subconical, black, glabrous, minutely punctured, and with a deep oblong fovea on forehead; eyes slightly prominent. *Rostrum* about as long as head, very little curved, sides subparallel at base, apical half with a slight quadrangular dilatation; upper surface impunctate, the sides faintly punctured; antennæ ferruginous, inserted well in front of middle. *Prothorax* a little longer than broad, sides slightly rounded, broadest behind middle, apex distinctly constricted, base gently bisinuate; upper surface depressed, with a broad central impression, gradually dilated from near apex to base and filled throughout with large confluent punctures, except

for a smooth central line of variable width; discal area impunctate, the sides closely and strongly punctured; colour black, glabrous. *Elytra* subtruncate at base and scarcely broader than thorax, shoulders slightly prominent, the sides very gradually narrowed from base to apex; upper surface depressed, with nine complete strongly punctured striae, which are deep and crenato-punctate on disk, but very shallow laterally, the intervals plane but narrow and impunctate; colour ferruginous brown, with the suture and apex broadly, the lateral margins narrowly black. *Legs* black, shining, obsolete punctured, tarsi piceous.

NATAL: Durban, Verulam.

TYPE in the Stockholm Museum.

A common species occurring in some numbers under the rotting bark of several soft-wood trees, and especially the Kafir boom (*Erythrina caffra*). Also recorded from the Congo by Faust.

8. *Cossonus umzila*, sp. n.

Long. $3\frac{1}{2}$ -4, lat. $1-1\frac{1}{4}$ mm.

Head subconical, vertex impunctate; forehead closely and finely punctured, but without any central fovea; eyes prominent. *Rostrum* longer than head, subcylindrical at base, distinctly though not broadly dilated in the apical half; upper surface convex, shining black, with extremely fine punctuation; antennae inserted near apex, ferruginous. *Prothorax* scarcely longer than broad, apex truncate, base bisinuate, sides subparallel to about middle, thence rapidly narrowed to apex, where there is a slight constriction; upper surface plane, with a broad, deep, triangular impression extending from the apical constriction to base, the impression being rugosely punctured and containing a broad impunctate carina throughout; the portions of the disk adjoining the central impression are quite smooth and impunctate, but the sides are very coarsely punctured; shining black, bare. *Elytra* separately rounded at base, a trifle broader than prothorax at shoulders, which are sloping, sides subparallel to beyond middle; upper surface plane, subdepressed, with nine deep strongly punctured striae, the tenth stria being subhumeral and much abbreviated, the intervals narrow, carinate, and impunctate. *Legs* piceous black, shining, bare, impunctate; tarsi ferruginous.

S.E. MASHONALAND: Chirinda Forest.

TYPE in the British Museum.

9. *Cossonus chirindensis*, sp. n.

Long. $5-5\frac{3}{4}$, lat. $1\frac{1}{4}-1\frac{1}{2}$ mm.

Head subconical, impunctate on vertex; forehead finely punctured and with a deep elongate fovea; eyes prominent. *Rostrum* scarcely longer than head, sinuate laterally in the middle, broadly and subquadrangularly dilated at apex; upper surface closely and finely punctured, almost plane apically; antennæ ferruginous, inserted quite close to apex. *Prothorax* broader than long, apex truncate, much narrower than base, which is bisinuate; sides subparallel to about middle, then gradually narrowed to apex, where there is a slight constriction; upper surface almost plane, very finely punctured on the disk, but coarsely so towards the sides, with a shallow longitudinal impression close to apex containing an ill-defined central carina, with a few large punctures on each side of it, and a much deeper trapezoidal impression at base, which is rugosely punctured and contains a distinct narrow carina, the two impressions being separated by a narrow smooth space; colour uniform light testaceous brown. *Elytra* separately rounded at base, broader than the prothorax at shoulders, which are roundedly prominent, sides subparallel to beyond middle; upper surface plane, with ten complete, deep, and strongly punctured striae, the intervals being narrow, convex, and impunctate; colour uniform testaceous brown, a little darker than the prothorax. *Legs* testaceous, bare, and finely punctured.

S.E. MASHONALAND: Chirinda Forest.

TYPE in the British Museum.

This species, as also *C. unzila*, I captured flying in the daytime along shady paths in the dense forest.

10. *Cossonus elongatulus*, Fab.

Curculio elongatulus, Fab. Ent. Syst., Suppl. p. 168.

Cossonus elongatulus, Boh. Schön. Gen. Curc. iv. p. 1022 (1837).

Long. $3\frac{1}{2}-6\frac{1}{2}$, lat. 1-2 mm.

Head subconical, piceous, shining, impunctate on vertex; forehead with fine scattered punctures; eyes slightly prominent. *Rostrum* stout, a little shorter than head, broad and flattened; sides parallel in the basal half and with a slight quadrangular dilatation at apex, black or ferruginous, shining, deeply punctured, and with a broad central furrow, which ascends the forehead, but is abbreviated anteriorly; antennæ stout, ferruginous. *Prothorax* longer than broad, apex truncate, much narrower than base, which is subbisinuate,

sides gently rounded, broadest about middle, rapidly narrowing towards apex, where there is a slight constriction; upper surface almost plane, deeply and closely punctured, with a slightly raised smooth central line and a faint longitudinal impression on each side of it; colour entirely black or ferruginous, with the sides and under surface sometimes blackish. *Elytra* subtruncate at base, a little broader than the prothorax at shoulders, which are subrectangular, sides parallel to beyond middle; upper surface almost plane, with deep and strongly punctured striæ, the intervals narrow and impunctate; colour entirely black or ferruginous, the suture and lateral margins being more or less infuscate. *Legs* short, rather slender, with faint scattered punctuation, black or ferruginous, with the knees rather darker.

CAPE OF GOOD HOPE (*teste* Boheman); S.E. MASHONALAND: Chirinda Forest.

I am not aware of the existence of Fabricius's type of this species; but the specimens upon which Boheman founded his description are in the Stockholm Museum.

Boheman also records the insect from India and Mauritius.

With the exception of *C. abscissus*, Boh., which differs widely in other respects, this is the only South-African species with a furrow on the upper surface of the rostrum.

11. *Cossonus glabricollis*, Boh.

Cossonus glabricollis, Boh. *op. cit.* iv. p. 1034 (1838).

Long. 4, lat. $1\frac{1}{2}$ mm.

Head conical, shining, impunctate, with a minute fovea on forehead and slightly constricted behind the eyes, which are subdepressed. *Rostrum* longer than head, curved, subcylindrical at base, slightly and quadrangularly dilated apically; smooth, shining, and almost impunctate; antennæ comparatively long, ferruginous, inserted in front of middle. *Prothorax* broadest at base, gradually narrowed till close to apex, where there is a slight constriction, apex truncate, base bisinuate, posterior angles with a minute sharp projection; upper surface plane, smooth, shining black, impunctate, except for two irregular central rows of fine punctures (sometimes partly obsolete). *Elytra* separately rounded at base, a trifle broader than prothorax at shoulders, which are roundedly prominent, sides parallel to beyond middle; upper surface depressed, with nine complete fine shallow striæ containing regular rows of small distant punctures, which are faint near the suture and become gradually stronger laterally,

the intervals broad, plane, and impunctate; colour shining black. *Legs* black, shining, impunctate; tarsi ferruginous.

NATAL: Malvern.

TYPE in the Stockholm Museum.

This does not appear to be a common insect, and I have taken it only under the bark of rotten Kafir booms (*Erythrina caffra*).

12. *Cossonus complanatus*, sp. n.

Long. 5, lat. $1\frac{1}{2}$ mm.

Head elongate, subquadrate, constricted near base, with very fine scattered punctuation and a minute fovea on forehead; eyes somewhat prominent. *Rostrum* rather shorter than the head, strongly and quadrangularly dilated from middle to apex, upper surface almost plane and with the punctuation rather stronger and closer than on the head; antennæ ferruginous, inserted close to apex. *Prothorax* a trifle longer than broad, apex truncate and much narrower than base, which is bisinuate, sides slightly rounded, broadest behind middle, gradually narrowed anteriorly, and with a constriction at apex; upper surface plane, much depressed, with fine scattered punctuation, having an impunctate central line, on each side of which there is near the base a very faint longitudinal impression containing rather deeper punctures, posterior angles with a minute sharp projection; colour black, shining. *Elytra* strongly depressed, jointly rounded at base, a little broader than prothorax at the shoulders, which are roundedly prominent, sides parallel to far beyond middle; upper surface plane, with ten complete deep striæ containing rows of distinct closely-set punctures, the intervals narrow, plane, and impunctate; colour piceous black, shining. *Legs* black, bare, finely punctulate: tarsi piceous.

NATAL: Malvern.

TYPE in the British Museum.

I have seen only a single example of this very distinct species, which I captured flying at sundown in August 1897. Its extremely depressed form will at once distinguish it from all other South-African species, its nearest ally in this respect being *glabricollis*, Boh. These two species are the only ones in which the prothorax is smooth and without any distinct carina or other sculpturing. From *glabricollis* the present species may be further distinguished by its much shorter and broader rostrum, differently shaped head, and by the deeper and closer striation of the elytra.

13. *Cossonus immeritus*, Fähr.

Cossonus immeritus, Fähr. Öfv. Vet.-Ak. Förh. 1871, p. 286.

Long. $4\frac{3}{5}$ -5, lat. $1\frac{2}{5}$ - $1\frac{3}{5}$ mm.

Head shortly conical, impunctate; forehead with a central fovea; eyes slightly prominent. *Rostrum* nearly twice as long as head, stout, parallel-sided, slightly curved, punctate on the sides, but glabrous dorsally; antennæ stout, ferruginous. *Prothorax* about as long as broad, apex truncate, much narrower than base, which is bisinuate, sides subparallel from base to beyond middle, narrowed anteriorly, and with a faint constriction at apex; upper surface slightly convex, with deep subremote punctuation and a median basal impression; the central carina scarcely noticeable, except in the basal impression; colour black, bare, shining. *Elytra* a little broader than prothorax at the shoulders, which are roundedly prominent, sides parallel to beyond middle; upper surface slightly convex, with ten complete deep and strongly punctured striæ, the intervals convex and impunctate; colour black, glabrous. *Legs* black, impunctate, tarsi ferruginous.

CAFFRARIA (teste Fähræus).

TYPE in the Stockholm Museum.

14. *Cossonus scrobicollis*, sp. n.

Long. 4- $4\frac{1}{2}$, lat. $1\frac{3}{4}$ mm.

Head conical, vertex impunctate; forehead punctulate and with a central fovea; eyes subdepressed. *Rostrum* longer than head, curved, subcylindrical, and not dilated at apex; punctuation distinct at base, but becoming much finer apically; antennæ inserted at middle, short, stout, ferruginous. *Prothorax* as long as broad, apex truncate and much narrower than base, which is strongly bisinuate, sides but little rounded, slightly constricted behind apex, broadest about middle; upper surface somewhat convex, closely and very coarsely punctured throughout, and with a deep triangular central impression, broadening from apex to base, the impression itself rugosely punctured and containing a complete smooth carina. *Elytra* separately rounded at base, a little broader than prothorax at shoulders, which are obtusely prominent, sides parallel to beyond middle; upper surface moderately convex, with ten deep very strongly punctured striæ, which are hardly shallower laterally (except the tenth, which is faint), the intervals narrow, subcarinate, and impunctate. *Legs* piceous, shining, finely punctulate; tarsi ferruginous.

NATAL: Verulam; PORTUGUESE E. AFRICA: Beira (*P. A. Sheppard*).

TYPE in the British Museum.

In addition to the characters mentioned in the key, this species may be distinguished from its only near ally, *C. immeritus*, Fahr., by the following points:—the shorter rostrum; the closer punctuation of the thorax, which is often longitudinally serobiculate; the broader and more deeply punctured striæ on the elytra; and the narrower subcarinate intervals.

This species was found under the bark of rotten *Euphorbia* trees.

LIV.—*Ten-legged Pycnogonids, with Remarks on the Classification of the Pycnogonida*. By LEON J. COLE.

IN a recent paper published in this Journal by T. V. Hodgson (1904), Biologist to the National Antarctic Expedition, appears a description of a most interesting Pycnogonid taken during the stay of the 'Discovery' in winter-quarters in McMurdo Bay. It differs from the ordinary members of the group in possessing five pairs instead of the usual number of four pairs of walking or "ambulatory" legs. In other respects it is very close to the well-known genus *Nymphon*. Hodgson considers that this remarkable animal should be regarded as representing a new genus as well as a new species, and has proposed for it the name *Pentanympyon antarcticum*. That it is not a fortuitous or "freak" variation is pretty well shown by the fact that in all twenty-eight individuals were taken, both males and females. They were found inhabiting water from 12 to 125 fathoms in depth.

Hodgson believes that "the presence of a fifth pair of legs [is] a character which separates it from all Pycnogonids hitherto known"; but as early as 1837 Eights (1837) published a description of a Pycnogonid with a fifth pair of walking-legs from the South Shetland Islands, and gave to it the name *Decolopoda australis*—a fact which seems never to have come to the attention of workers on the group since that time. Eights gives a very good description and illustration of the species—much better than the average at that early date,—though the figures do not seem to agree in all details with the description. He states that the entire animal was of a bright scarlet colour, and so figures it; and

regarding their abundance says, "They are to be found in considerable numbers in connexion with the fuci, thrown up by the waves along the shores of the islands, after being detached by the motion of the large masses of ice, from the bottom of the sea." It appears that the specimens were collected by himself, and at least the one from which the description was made is recorded as in the "Cabinet of James Eights." About a year ago I attempted to secure information regarding Dr. James Eights and where he had lived, in the hope of locating these specimens, but was unsuccessful. Thinking they might have been deposited later in the collections of the Boston Society of Natural History, with the assistance of Mr. Johnston, the Curator, I made search there, but with like result.

An interesting question immediately arises as to the relationship of these unusual forms to the other Pycnogonida. It would be natural to expect that they would form a rather closely related and perhaps primitive group—possibly a distinct family—by themselves; but such does not appear to be the case. As has been stated, the only important feature in which *Pentanympyon* differs from *Nymphon* is in the possession of the extra pair of appendages. *Decolopoda*, on the other hand, resembles more closely in general appearance the genus *Chatonymphon* of G. O. Sars; but the possession of 10-jointed palpi throws it out of the family Nymphonidæ entirely if we accept the family as limited by Sars (1891, p. 54), though it might be included in the broader definitions given by Meinert (1899, p. 33) and Hoek (1881, p. 17). It still differs, however, from the other known forms in the family by the possession of so many (ten) palpal joints, and would seem to come intermediate between the Nymphonidæ and the Eurycydidæ (*Ascorhynchidæ*), leaving out of consideration for the present the extra pair of legs. There are two ways in which these forms might be related to the other Pycnogonids:—(1) The extra pair of appendages may indicate that they are more primitive and that this is an indication of their origin from a form which possessed a still larger number of segments, thus forming, perhaps, a connexion with the Crustacea; or (2) it may be a character which represents a later differentiation, though this latter does not to me seem at all probable. In this connexion the speculation of Eights in the paper mentioned above (1837, p. 205) is of interest. He says:—"I have placed this interesting animal in the class ARACHNIDÆ, in consequence of its close approximation to

Latreille's second family *Pycnogonides**, of his order TRACHEARIAE; it possesses all of the characters, besides which it has a segment supporting two additional legs, making in all *five perfect pairs*; this latter circumstance would doubtless bring it in the preceding class CRUSTACEA, being a character which strikingly distinguishes the animals that compose it; at all events, I think it will certainly form a connecting-link in the great chain of the animal kingdom, between these two classes, passing from the CRUSTACEA into the ARACHNIDES by the genera NYMPHON, PHOXICILLI, PYCNOGONUM, &c."

That the Pycnogonids form a remarkably homogeneous group has often been mentioned, and with the discovery of new forms the existing gaps are rapidly being filled. It is the existence of gaps in our series that enables us to designate species, genera, families, and other taxonomic groups, and as these gaps become gradually filled the demarcation of the groups becomes increasingly difficult. It leads at first either to putting narrower limits upon our various terms and splitting one genus into a number of genera, one species into a number of species, &c., or the formation of new subgroups as new subgenera, subspecies, &c. Both of these processes have been going on extensively in nearly all branches of the animal kingdom; but as the series becomes more and more complete it becomes more and more difficult to draw lines of distinction—in other words, to find gaps; and as any gap becomes filled our subspecies, species, or genus, or whatever it is, must expand to include all those forms to the next existing break in the series, or else an arbitrary artificial demarcation must be made. In the Pycnogonida the series of characters upon which the present classification depends is so nearly complete—the differences are so small—that the limitations, especially of the larger groups, such as the families, are admittedly arbitrary, and it is a matter upon which hardly two authors agree. But whereas this profusion of "connecting-links" is a source of much confusion to the taxonomist, it should enable us to trace very definitely the phylogenetic development. Whether this can be done on the basis of the characters at present in use we cannot say until a more careful examination has been made of the anatomical details of other organs, and probably not until the early embryonic and larval development of more of the species is better known, though I believe a thorough

* * Cuvier, Règne Animal."

PYCNOGONIDA.	Chelifori	Palpi	Ovigeræ.	Denticulate spines	Trunk-segmentation	Genital openings.	
						♂.	♀.
Order ПУСКОКОМОРИИ, ПУСКОК [ACHELATA, Sars].							
Phoxichilidae.	—	—	♂ only.	—	well marked.	4	4
Phoxichilidae.	—	—	♂ only.	—	well marked.	2, 3, 4	1, 2, 3, 4
[ACHELATA, Sars].							
Phoxichilidae.	well developed.	—	♂ only.	—	well marked.	1, 2, 3, 4	1, 2, 3, 4
<i>Hannonia</i> .	well developed.	—	♂ and ♀.	—	well marked.	3, 4*	1, 2, 3, 4
Pallenidae.	well developed.	— or rudimentary.	♂ and ♀.	present.	well marked.	(1, 2.) 3, 4	1, 2, 3, 4
Nymphonidae.	well developed.	well developed; 5 joints.	♂ and ♀.	present.	well marked.	2, 3, 4	1, 2, 3, 4
Order КОЛОССЕНДОМОРИИ, НОВ. [ORVITOCHELATA, Sars].							
Passitoidea (including <i>Colossendeis</i>).	—	well developed; 10 joints.	♂ and ♀.	—	—	3, 4	3, 4
Ammonoidea.	usually present, but not chelate, in adult.	well developed; 4-9 joints.	♂ and ♀.	present.	— or well marked.	3, 4	1, 2, 3, 4
Eurycythide (including <i>Ascorhynchus</i>).	present; chelæ rudimentary.	well developed; 10 joints.	♂ and ♀.	present.	well marked.	3, 4	1, 2, 3, 4
<i>Devlopoda</i> .	well developed.	well developed; 10 joints.	♂ and ♀ (?).	present.	well marked.	?	?

knowledge of the embryology is going to be of more importance in elucidating the question of the relationship of the Pycnogonida to the other Arthropoda.

In the following discussion I have used the families as adopted by Sars (1891), not because I consider them necessarily more true to a correct system than those given by some other authors, but because they are better adapted to my present purpose. I shall use them simply as milestones to mark certain points, or, perhaps better, stretches along the road of phylogenetic development, without intending to imply that these stretches might not consistently be fewer or greater in number, and with their limits at different points.

The systems given by most recent authors differ from that which I have temporarily adopted here for the most part only in the employment of different names, derived from other genera, or in being more or less inclusive. The number of families given by Sars (1891, p. 144) is larger than is generally recognized, and consequently his classification is more useful to me in showing the gradual stages of differentiation; and where, in one or two instances, this series has not been complete enough for my purpose, I have introduced generic names for greater completeness. In most cases the names of the families are derived from well-known genera; where another genus in the family is perhaps better known I have indicated the fact. I have retained the order of sequence as given by Sars, except for the transposition of the Pasithoidæ to a position next the Ammotheidæ instead of the Eurycydidæ, as they appear to be more nearly related to the former.

The character on which the families are chiefly based is the presence or absence or the state of development attained by the first three pairs of appendages—cheliferi, palpi, and ovigera. In general those forms which possess these appendages well developed are to be considered the more primitive, a fact shown by the ontogenetic development of those which do not possess them in the fully adult stage. The condition of these appendages (together with the presence or absence of denticulate spines on the ovigera, the degree of trunk-segmentation, and the number and position of the genital openings) is given for the various families in the table on p. 408.

It will be noticed from the table that there are two diverging series, each starting from a primitive condition, fairly well represented, seemingly, by *Decolopoda*. *Decolopoda* might well be the basis for a distinct family, the Decolopodidæ, if it were not for difficulties encountered in

disposing of *Pentanympyon*, which will be taken up again. These relationships are expressed more graphically in the following diagram:—

PYCNOGONOMORPHA.

Pycnogonidæ.

Phoxichilidæ.

Phoxichilidiidæ.

Hannonia.

Pallenidæ.

Nymphonidæ.

Pentanympyon.

COLOSSENDEOMORPHA.

Pasithoidæ.

Ammotheidæ.

Eurycydidæ.

Decolopoda.

In the table I have indicated the division of the families into orders as arranged by Sars. Lankester (1904) makes practically the same grouping, but employs different names. I can see no valid reason for a division into Achelata and Euchelata (or into Pycnogonomorpha and Nymphonomorpha, as given by Lankester), a distinction based on the absence of a single pair of organs (the chelifori) in the former group, since the palpi are absent or rudimentary in the Pallenidæ, and in the Phoxichilidiidæ the ovigera are present only in the male. A reference to the table will show that there is no place in this series where a line can be drawn based on a number of characters—in fact, not more than a single one of the characters given changes at any given point in the series. It therefore seems best to make but two orders, representing the two divergent series. These can well be designated by

names derived from their most specialized forms; for one I have therefore used the name *Pycnogonomorpha*, Pocock, given by Lankester (1904, p. 225), while for the sake of consistency I have proposed the term *Colossendeomorpha* for the other order.

In *Decolopoda*, of all known Pycnogonids, we have the most primitive conditions. Here the chelifori are well developed and strongly chelate, the palpi are present and made up of ten joints, the ovigera are present in both sexes* and are provided with denticulate spines, and the trunk-segmentation is distinct. In the *Pycnogonomorpha* we find that there is a gradual tendency to a reduction of the anterior appendages: the chelifori are lost in the *Phoxichilidæ*; in the palpi the joints are reduced one half in number at the beginning, and are lost entirely in some of the *Pallenidæ*; the females no longer bear ovigera in the *Phoxichilidiidæ*, and in *Hammonia* the denticulate spines are lacking from these appendages; the segmentation remains distinct and well marked throughout. In the *Colossendeomorpha* the chelifori have rather rudimentary chelæ in the *Eurycydidæ*, are present (usually) but not chelate in adult *Ammotheidæ*, and are lost entirely in the *Pasithoidæ*; the palpi remain well developed throughout, but are reduced as to the number of joints composing them in the *Ammotheidæ*, in which character they make a slight break in the gradation of the series†; the ovigera are retained in both sexes throughout, though the denticulate spines are lost in the *Pasithoidæ*; the trunk-segmentation shows a direct gradation from a well-marked condition in the *Eurycydidæ* to a complete coalition in the *Pasithoidæ*, both conditions being found in the intermediate family.

The most remarkable features in these two series are the directness of the two lines of differentiation and the similar tendency in both to a reduction of the parts. Each of the families is intermediate, in the characters commonly used for their distinction, between the one that precedes and the one that follows (with the minor exception in the case of the *Ammotheidæ*, as noted). This approaches the kind of "chain" that was looked for by some of the early evolu-

* "Of the many specimens that I obtained I saw none but such as were furnished with what are termed the egg-bearing organs, consequently if those are the females that are thus distinguished, they prove much more numerous than the males."—EIGHTS (1837, p. 205). It is probable that he had both sexes.

† This is indicated in the diagram by representing the *Ammotheidæ* as having branched off slightly from the direct line.

tionists, and I know of no other group where it is so direct and complete. The genera within the families will undoubtedly show much secondary branching from this direct line of descent.

While it is difficult to understand why so many characters should vary in common if such were the case, still it is possible that the utilization of these characters does not give us a true classification. This is suggested by the positions of the genital openings, as shown in the above table, as well as by the structure of the ovaries and possibly some of the other organs. The condition of the ovary in *Nymphon* has led Hoek (1881, p. 131) to remark:—"I perfectly believe, however, that the occurrence of a part of the ovary in the body of a Pycnogonid is rather rare, because, as a rule, only the lateral excrescences remain. No doubt this must be considered as a secondary condition; and seeing that, so far as I could ascertain, it is the rule in all the species of *Nymphon*, my original opinion, that the genus *Nymphon*, of all the genera of Pycnogonida, resembled most the hypothetical ancestors of our group, was severely shaken."

The system here brought out differs in many respects from that of Hoek (1881 A, p. 495), but it is interesting to note how closely the form *Decolopoda* agrees with his hypothetical genus *Archipycnogonum*, which he postulates as follows (*l. c.* p. 494):—" *Archipycnogonum* (genre hypothétique).—Pycnogonides de grandes dimensions, aux mandibules fortes de trois articles et armées d'une pince terminale, aux palpes longues de dix articles, aux pattes ovifères, également de dix articles, dont les quatre derniers sont pourvus de plusieurs rangées d'épines en forme de feuilles. Les pattes thoracique ont huit articles et se terminent par une griffe accompagnée de deux griffes accessoires." Eights's description of *Decolopoda* agrees in all particulars with this except that he does not mention the "accessory claws," which, however, it is fair to assume were present. Hodgson mentions and figures them in *Pentanympion*. Had Hoek but been aware of it there was no need for him to construct a hypothetical genus as the starting-point of the Pycnogonids—it had already been described just as he wanted it (except that it had one more pair of legs than he supposed) more than forty years earlier.

Pentanympion I have placed between *Decolopoda* and the Nymphonidae; but *Boreconymphon* and *Chetonympion*, with their compact bodies and closely approximated lateral processes, would much more nearly resemble *Decolopoda* in general appearance if they had but the fifth pair of legs. It would be expected that such a character as the possession

of an extra segment bearing a pair of legs would be more than sufficient for the establishment of a separate family in a group where family distinctions are based upon such minor characters as the extent of development or suppression of certain appendages, with no question of the loss of a segment; but *Pentanympyon* apparently resembles *Nymphon* so closely in all its minor details, even to the presence of a claw, denticulate on one border, terminating the oviger, that it is incomprehensible that these characters could have been developed independently. Except for the extra legs *Pentanympyon* is in all respects a true *Nymphon*, and this, did we not know of another ten legged form, would lead us to suppose that it represented the primitive stem of the Pycnogonida. Must we, then, conclude that the group has had two points of origin?

Hodgson (1904, p. 462) states that he understands Mr. W. S. Bruce, of the Scottish Antarctic Expedition, has taken several specimens of a ten-legged Pycnogonid from the Weddell Sea which may prove to be identical with *Pentanympyon antarcticum*. But since the Weddell Sea is on the opposite side of the Antarctic continent to McMurdo Bay, and not far from the South Shetland Islands, it would not be surprising if Mr. Bruce's specimens turned out to be identical with *Decalopoda australis**. Should they prove to be *Decalopoda* rediscovered, a careful study of them may add much of importance to our knowledge of the Pycnogonida. It is noteworthy that the two species of ten-legged Pycnogonids so far described both come from the Antarctic, though from opposite sides of the Polar area †.

The bearing of this extra appendiculate segment on the ancestry of the Pycnogonida and their relationship to the other Arthropods I shall not discuss at this time, except to call attention to the fact that it adds further difficulties to

* [Mr. C. V. Hodgson has kindly sent us the following note on this point:—Mr. W. S. Bruce's collection of Pycnogonida from the South Orkneys includes a single specimen of *Pentanympyon antarcticum* and several specimens of Eights's *Decalopoda australis*. This latter has been fully described in a paper communicated to the Royal Physical Society of Edinburgh on Jan. 23, 1905. With regard to the genital apertures, they exist in both sexes of *Decalopoda australis* on the second coxa of all the legs. In *Pentanympyon antarcticum* they are very difficult to observe, and at present I can only vouch for the female. They occur on all the segments also.—Eds.]

† South Shetland Islands, about lat. 63° S., long. 60° W.; McMurdo Bay, approximately lat. 78° S., long. 168° E. (From map showing work of National Antarctic Expedition, 'Geographical Journal,' vol. xxiv. no. 2, August 1904.)

the acceptance of the homologies of the metameres and appendages of the Pycnogonida as suggested by Lankester (1904), who believes that the whole portion of these animals anterior to the so-called abdomen corresponds to the prosoma of the Arachnids. The segment which bears the fourth pair of walking-legs he thinks represents the pregenital somite, and it is true that wherever else the genital openings may be wanting, they appear always to be present on this pair of legs. Neither Eights nor Hodgson mentions the genital openings in the ten-legged forms, and a knowledge of conditions there will be of considerable theoretical interest. It may be mentioned here that Lankester appears to have overlooked the two pairs of appendages present in the embryos of all Pycnogonids (possibly absent in *Pallene* and related species: Meinert, 1899), which are not represented in the appendages of any adult species. Lankester considers the Pycnogonida a subclass of the Arachnida, and Meinert, chiefly from his studies of the embryology, also relates them to that group, but differs entirely from Lankester in his conception of the homologies of the various appendages. Carpenter (1903) likewise classes them with the Arachnida and agrees more nearly with Lankester as to the homologies of the metameres; he believes, however, that the palps of the Pycnogonids are not represented by appendages in living Arachnids, and concludes that the present type of Arachnid head "was preceded by a head with four pairs" of appendages. More recently Meisenheimer (1902) has made a careful study of the early embryonic stages of *Ammothea echinata*, and has reached conclusions exactly opposed to those of Meinert. In a short paper giving his main results Meisenheimer (1902 A), after presenting his evidence, concludes (p. 64):—"Und somit hat uns die Larvenentwicklung der Pantopoden mit grosser Bestimmtheit auf eine nahe Verwandtschaft dieser Gruppe mit den Crustaceen hingeführt." It is thus obvious that naturalists are no nearer to agreeing to-day upon the systematic position of the Pycnogonida than they have been at any time in the past.

Cambridge, Mass., U.S.A.,
12th January, 1905.

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LV.—*Descriptions of new Species of Sphegidæ and Ceropalidæ from the Khasia Hills, Assam.* By P. CAMERON.

[Continued from p. 229.]

Ceropalidæ.

Ceropales pruinosa, sp. n.

Black, the scape of the antennæ broadly below, palpi, a narrow interrupted line on the pronotum, the apical half of

the antennal keel above, the inner orbits from the incision to the base of the mandibles, the outer orbits much more narrowly and the apex of the clypeus more broadly, especially on the sides, lemon-yellow. Legs black, thickly covered with a silvery pile, especially thick on the coxæ, where it has a golden hue; the calcaria and a mark on the upper side of the base of the hind tibiæ yellowish white; claws rufous. Wings hyaline, the apex from the base of the radial cellule slightly but distinctly infuscated, the apical nervures fuscous; the apical abscissa of radius obliquely turned upwards; the second cubital cellule at the top is twice the length of the third; both the recurrent nervures are received near the base of the apical third of the cellules; the accessory nervure in hind wings interstitial. ♀.

Length 11 mm.

Shining; the front and vertex sparsely covered with long hair; the face and clypeus with depressed silvery pubescence. Below the ocelli is a longish furrow, deep in the middle, widest at the base. Antennal keel stout, obliquely narrowed at the base and apex. Mandibular teeth ferruginous. Pro- and mesothorax covered with depressed silvery pubescence; the metanotum, especially at the apex, with long woolly hair. The scutellum and metanotum more distinctly punctured than the mesonotum. Abdomen covered with silky pubescence.

The Khasia species of *Pseudagenia* may be grouped as follows:—

- A. Body for the greater part fulvous.
 a. Thorax fulvous.
 Wings yellow, the apex violaceous *languida*.
 Wings fuscous hyaline or hyaline..... *excellens, pulchrifrons,*
lyrata, nigritibiis.
- b. Thorax for the greater part black *agitata*.
- B. Body for the greater part black; the legs more or less red; the wings hyaline or more or less fuscous..... *flavicollis, nigripalpis,*
arethusa, lacteipennis.
- C. Body black; the hind femora red; the wings hyaline, with a fuscous fascia *gnoma*.
- D. Body black; the thorax red; the wings hyaline, with one or more fasciæ *himalayensis* and *ægenia*, Sm.
- E. Body black or purple; hind femora red *prophetica, purpurea*.

Pseudagenia languida, sp. n.

Ferruginous, the head, thorax, apical five joints of the antennæ, and the basal three segments of the abdomen at

the base black. Wings bright yellowish hyaline, the apex from shortly behind the second transverse cubital nervure fuscous-violaceous. Head and thorax densely covered with golden pubescence. ♀.

Length 16 mm.

Eyes slightly converging above. Apex of clypeus rounded in the middle, the sides roundly curved. Mandibular teeth black. Legs uniformly ferruginous, except the apices of the four basal tarsal joints and the apical one entirely. Second cubital cellule scarcely shorter than the third; the first recurrent nervure is received shortly, but distinctly, in front of the basal third, the second very shortly behind the middle of the cellule.

Pseudagenia pulchrifrons, sp. n.

In Bingham's key on p. 107 this species would fit into "A. Wings yellowish, apex infuscated" and into a new section "c. Head, thorax, and abdomen ferruginous, the head thickly covered with bright golden pile."

Ferruginous, the mesosternum, the apical five antennal joints above and at the sides, the base of the first abdominal segment, base and apex of the second in the middle and the base of the third broadly, black. Wings hyaline, with a smoky fulvous tinge, the apical half slightly darker than the basal; the second cubital cellule slightly but distinctly longer than the third; the first recurrent nervure received shortly beyond the middle, the second in the basal third. Legs fulvous; the fore coxæ at the base behind, the middle broadly black behind, the posterior with a large mark at the base below, the base and apex of the second joint of the hind tarsi, the third joint above and the apical two entirely, black. ♀.

Length 14 mm.

Mandibles rufous, yellowish at the base, the tips black. Palpi rufous, paler at the base. Front thickly and the face and clypeus covered with golden pubescence and sparsely with long fuscous hair. Apical half of clypeus black; the middle broadly depressed. Median segment with a gradually rounded slope to the apex; faintly transversely striated, thickly covered with long fuscous hair and with no longitudinal furrow. Pleuræ smooth and shining, sparsely covered with long fuscous hair. Apical segments of the abdomen covered with fulvous pubescence and sparsely with long blackish hair; the abdomen is fully longer than the thorax. The sides and apex of the mesonotum are narrowly black.

Comes near to *P. deceptrix*, Bing., which is different apparently from *P. deceptor*, Sm., a Malay species. Smith's species is certainly different from the one I have described above.

Pseudagenia lyrata, sp. n.

Fulvous, the face, oral region, and inner orbits clear yellow; over the antennæ is a black transverse mark, broader than long; the ocellar region black, and on the occiput is a large black mark, uniting the eyes above and obliquely narrowed on the lower side; a line on the mesonotum at the tegulæ, a small mark on the pleuræ immediately beneath them, a larger mark on the base of the mesopleuræ over the coxæ, the base of the mesosternum, a somewhat triangular mark on the base of the median segment, and the lower half of the base of the metapleuræ, black. Legs fulvous, the anterior pair with a more yellowish hue in front; hinder tarsi black, the calcaria dark fuscous. Abdomen with the second segment with a narrow, the third to sixth with broader transverse black bands. ♂.

Length 10 mm.

The scape and basal joints of the flagellum fulvous, the middle joints black above, the apical entirely black. The mesonotum is of a darker tint than the pronotum and is minutely closely punctured. The median segment has an oblique, somewhat rounded slope and is closely transversely striated. The second cubital cellule, before and behind, is a little shorter than the third; the first recurrent nervure is received very shortly behind the middle, the second in the basal third of the cellule.

Pseudagenia nigriritibis, sp. n.

Fulvous; the head below the antennæ densely covered with bright golden pubescence, the mandibles and palpi pallid yellow; the keel along the sides of the mesonotum, a band at the base of the median segment, the meso- and metasternum, the base of the first abdominal segment, the base of the second narrowly, its apex more widely, and the greater part of the third, fourth, and fifth segments, above and beneath, black. Wings hyaline, iridescent, the stigma dark fuscous; the second and third cubital cellules equal in length in front; the first recurrent nervure received near the basal third, the second nearer the base of the cellule. ♂.

Length 10 mm.

Mandibles and palpi pallid yellow, the vertex sparsely covered

with longish black hair; the hind ocelli separated from each other by a less distance than they are from the eyes, which hardly converge below. Metanotum strongly transversely striated and sparsely covered with longish fuscous hair.

Closely related to *P. lyrata*, but may be separated from it by its larger size, black hind tibiæ, black vertex and front, by the first recurrent nervure not being received in the middle of the cellule, and by the apex of the abdomen being more widely and distinctly black.

Pseudagenia agitata, sp. n.

Black; the head and thorax densely covered with golden pubescence; the antennal scape reddish, the basal six joints of the flagellum brownish beneath; the clypeus, labrum, mandibles, and palpi yellow; the prothorax pale yellow; abdomen fulvous, the first segment black, the black mark becoming narrowed towards the apex, and the four apical segments broadly black. Legs rufo-fulvous; the fore coxæ pale yellow, the four posterior black at the base behind and covered with golden pile; the four hind trochanters black. Wings hyaline, the basal half with a faint fulvous tint; the apex with a narrow, faint, smoky cloud. ♂.

Length 12 mm.

Apex of clypeus slightly incised; the labrum slightly and broadly incised and fringed with golden hair. Mandibles covered with golden pile. Eyes slightly, but distinctly, converging below; the hind ocelli separated from the eyes by a distinctly greater distance than they are from each other. The second and third cubital cellules equal in length; the first recurrent nervure is received very shortly beyond, the second in, the basal third. The penultimate ventral segment is roundly incised in the middle; its apex at the sides bears a tooth which becomes gradually enlarged from the base to the apex, which is curved and hook-shaped at the top.

Comes near to *P. pulchrisrons*, from which it may be known by the greater part of the flagellum being black; the ground-colour of the thorax is black; the base of the petiole and the apical segments of the abdomen black.

Pseudagenia flavicollis, sp. n.

Length 17 mm. ♀.

Comes best into Bingham's section "F. Wings hyaline, the apex fuscous," but is very different from anything included in it; it agrees, apart from the wings, with group A.

Thorax black, thickly covered with golden pubescence; the

prothorax (except a black line above the middle), an irregular crown-shaped mark in the middle of the mesonotum near the apex, the scutellum (except at the apex), postscutellum, a large triangular oblique mark under the hind wings, one, longer than broad, behind the spiracles, and a square mark in the centre of the apex of the metanotum, pallid yellow. Legs rufous; the fore coxæ pallid yellow, the four hinder black marked with yellow behind; the fore trochanters black, pallid yellow in the middle, the four hinder black; the anterior femora, tibiæ, and tarsi pallid rufous; the base of the femora yellowish; the hind femora rufous, black at the base; the four hinder tibiæ and tarsi blackish; the middle tibiæ rufous, the hinder yellowish at the base; the calcaria yellowish; the tibial spines and claws rufous. The wings have a slight, but distinct, yellowish tint; the apex beyond the third transverse cubital nervure infuscated; at the top the third cubital cellule is shorter than the second; the first recurrent nervure is received shortly beyond the middle, the second at the apex of the basal third of the cellule. Abdomen black, covered with golden pile; on the second segment is a large pallid yellow mark, narrowed in the centre at the apex, its sides dilated, the middle at the apex triangularly incised.

Head thickly covered with depressed golden pile, which hides the texture. Hind ocelli separated from each other by a less distance than they are from the eyes, which are parallel. Apex of clypeus transverse; the labrum black, thickly covered with fulvous hair. Mandibles yellow, thickly covered with golden pile; the teeth black. Palpi bare, fulvous. Antennal scape fulvous; the flagellum of a duller reddish-fulvous colour, black above. Scutellum sparsely covered with short hair; the postscutellum more thickly with longer pale fuscous hair. Median segment opaque, obscurely transversely striated.

Pseudagenia nigripalpis, sp. n.

Length 10 mm. ♂.

Belongs to Bingham's section "C. Wings clear hyaline," and "b". Abdomen black, posterior margins of the segments narrowly white," which will now stand:—

The middle femora red, the palpi white *albilabris*.
 The middle femora black; the palpi black *nigripalpis*.

Black; the antennal scape below, the sides broadly, and the apex narrowly of the clypeus, labrum, the lower eye-orbits (broadly below, narrowly above), and the middle of the

mandibles, yellowish white. Legs black; the hinder femora (except at the base and apex) red; the four anterior coxæ, the fore femora broadly and the middle at the apex, all in front, yellowish white and thickly covered with silvery pile. Wings hyaline, with a distinct steely tinge; the stigma and nervures black; the second cubital cellule slightly shorter than the third before and behind; the first recurrent nervure received in the middle, the second near the basal third of the cellule. Abdomen black, the segments with a narrow band of yellow at the apex; the first also broadly on the sides behind and the last broadly on the sides white. ♂.

Lower part of front, face, and clypeus thickly covered with silvery pubescence; the vertex sparsely with longish black hair. Apex of clypeus transverse, the sides oblique. Median segment with a gradually rounded slope from the base to the apex, finely transversely striated; the striæ stronger towards the apex. Hypopygium broadly obliquely furrowed down the sides; the petiole becomes gradually distinctly widened towards the apex.

P. arethusa, Cam., is related to the present species; it may be known from it by the four front legs being reddish, by the head being entirely black in front, by the less clear wings, testaceous palpi, and non-striated metanotum.

Pseudagenia lacteipennis, sp. n.

Length 8 mm. ♂.

In Bingham's table, p. 108, this species would enter into "D. Wings clear hyaline, or hyaline with a yellowish tint, with one fuscous subapical fascia," and "b. Median segment not furrowed down the middle," which will now be subdivided:—

- | | |
|--|-------------------------|
| Wings hyaline, the fuscous cloud occupying the base of the radial cellule; abdomen black | <i>lavicula</i> , Bing. |
| Wings lacteous, not clear hyaline, the cloud occupying the base of the radial cellule; the sides of the petiole and the base of the second segment yellowish white | <i>lacteipennis</i> . |

Antennal scape black. Black; the sides of the first abdominal segment dark, the base and sides of the second and the apical segment pale, testaceous. Legs black; the apex of the fore femora below, the anterior tibiæ and tarsi, and the middle tibiæ (except a broad band at the base and a narrow one at the apex) rufo-testaceous; the hind femora broadly rufous below and the calcaria dark testaceous. Wings hyaline, with a milky tinge; below the stigma, at the

base of the radial cellule and in the second and third cubital cellules, is a pale brownish smoky cloud; the second and third cubital cellules in front are equal in length; behind, the second is distinctly shorter than the third.

Vertex and front finely and closely punctured; the face and clypeus thickly covered with silvery pubescence. Pronotum finely and closely transversely striated. Mesonotum closely punctured; the scutellum more coarsely punctured. Meso- and metapleuræ granular, covered thickly with white hair.

Pseudagenia purpurea, sp. n.

Purple; the thorax mixed with blue and micaceous shades; the coxæ blue, the rest of the legs black, except the hinder femora, which are red, with the base and apex narrowly black. Wings hyaline, the apical nervures fuscous, the cubital cellules about equal in length; the first recurrent nervure received near the middle, the second at the apex of the basal third of the cellule. ♀.

Length 12 mm.

Antennæ brownish, the scape black. Head closely punctured; the face and clypeus thickly covered with silvery pubescence, the front and vertex sparsely with fuscous. Mandibles thickly covered with silvery pubescence, the teeth dark rufous, the palpi dark fuscous. Hind ocelli separated from the eyes by double the distance they are from each other. Pronotum strongly, but not deeply or closely, punctured; the mesonotum much more closely punctured; on it, opposite the tegulæ, is a narrow shallow furrow; the scutellum is more closely and finely punctured and finely striated down the middle. Metanotum rather strongly and closely transversely striated, the striæ stronger towards the apex; down the middle is a shallow, but distinct, furrow. Pleuræ closely, but not strongly, punctured; on the propleuræ, in the middle, is a wide shallow V-shaped furrow; the metapleuræ below the fovea more finely and closely punctured than the rest. Abdomen pruinose, thickly so at the apex; smooth and shining; the pygidium very smooth, shining, and glabrous.

Pseudagenia prophetica, sp. n.

Blue; the antennæ, mandibles, palpi, and legs black; the mandibles obscure rufous at the apex; the coxæ with a distinct blue tint; the hind femora red, black at the base and apex. Wings clear hyaline, the nervures and stigma black. ♀.

Length 10–11 mm.

Antennæ black, the scape covered with pale pubescence; the third joint about one third longer than the fourth. Head closely punctured; below the antennæ thickly covered with silvery pubescence; there is a shallow furrow on the lower part of the front. Eyes curved on the inner side, not converging. Pronotum bearing shallow punctures (except on the apex, which is depressed). Mesonotum with scutellum closely punctured. Median segment coarsely transversely striated; the base with a shallow furrow in the middle. Mesopleuræ closely punctured; the punctures on the lower part of the metapleuræ run into striations. The second cubital cellule in front is slightly, but distinctly, shorter than the third; the first recurrent is received in the middle, the second at the basal third of the cellule. Tegulæ deep black.

Comes near to *P. blanda*; it may be known from that species by the head and thorax being closely and distinctly, rather strongly, punctured all over; the metanotum in particular is much more coarsely and irregularly transversely striated; it is more pubescent and not so thickly covered with white pile; the alar nervures and stigma are black, not piceous; and the propleuræ are more distinctly hollowed.

Pseudagenia himalayensis, sp. n.

Length 8 mm. ♂.

In Bingham's table, p. 108, this species is to be included in "E. Wings clear hyaline, or hyaline with a yellow tinge, with two fuscous fasciæ on the fore wings," and "b. Thorax red," which will now be divided:—

- | | |
|--|-----------------------|
| Anterior margin of clypeus toothed in the middle;
abdomen and legs entirely black | <i>ægina</i> . |
| Anterior margin of clypeus not toothed; the base of the
petiole and of the second abdominal segment
testaceous; the four anterior tibiæ and the front
tarsi pale testaceous | <i>himalayensis</i> . |

Head black; the face, cheeks, and clypeus thickly covered with silvery pubescence; the cheeks (the mark becoming wider towards the apex), the sides of the clypeus broadly and the sides of the apex, the middle of the mandibles, and the palpi, yellowish. Thorax rufous, the base and middle of the apex of mesosternum black; the pleuræ and breast thickly covered with silvery pubescence; the pro- and mesonotum closely punctured, somewhat opaque; the median segment opaque, its apex closely transversely striated, the base black and depressed in the middle. Legs black; the apex of fore

femora, tibiæ and tarsi, and the middle tibiæ (except at the apex) testaceous. Wings clear hyaline, the costa and nervures black; the stigma fuscous in the middle, a faint fuscous cloud occupies the basal three fourths and the whole of the second and third cubital cellules; the first recurrent nervure is received very shortly before the middle, the second in the basal fourth. Abdomen pruinose, the base and sides of the petiole rufo-, the base of the second segment yellowish, testaceous; the sides of the basal and the whole of the second ventral segments yellowish testaceous.

[To be continued.]

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

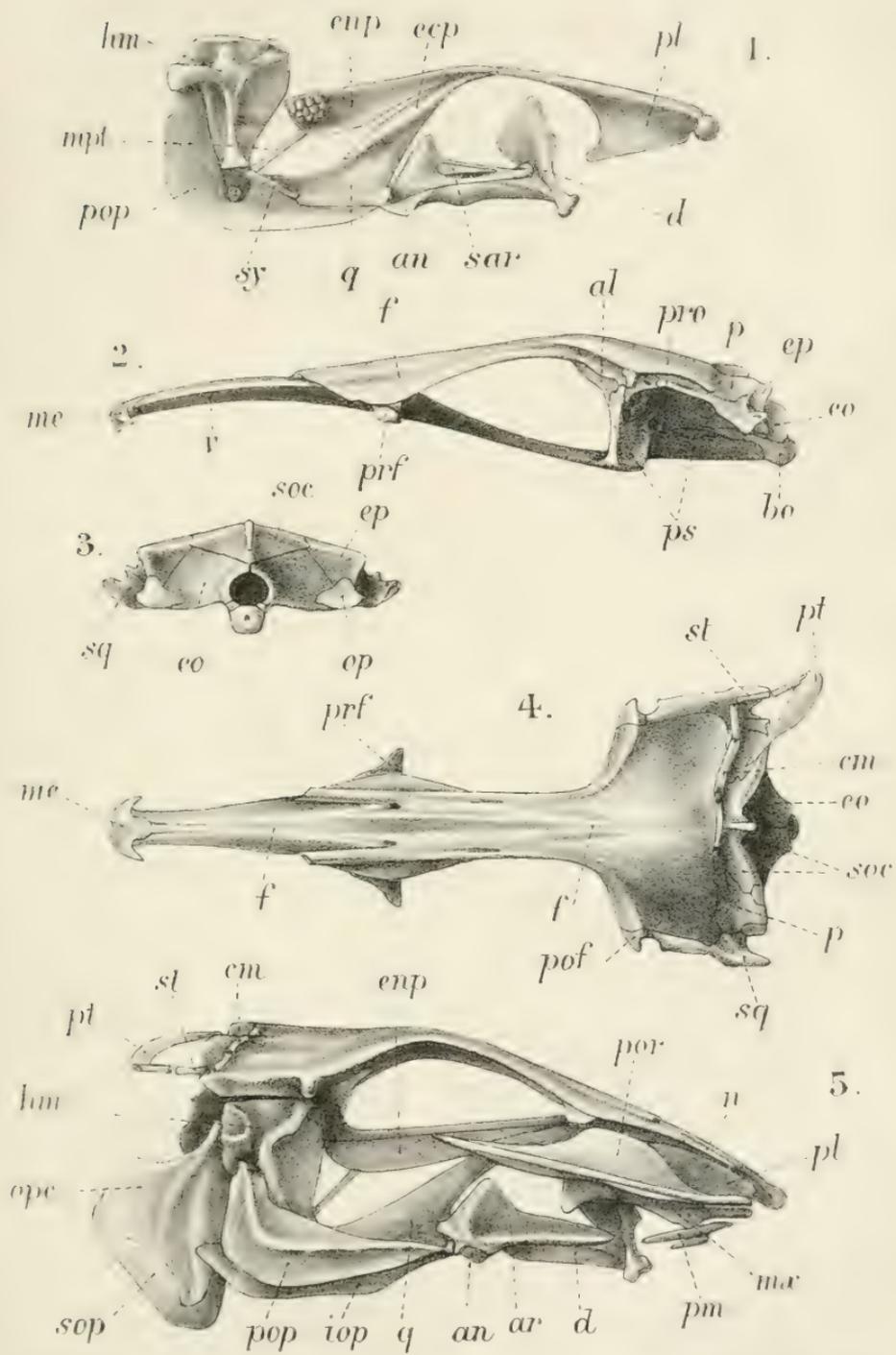
December 21st, 1904.—J. E. Marr, Sc.D., F.R.S.,
President, in the Chair.

The following communication was read:—

‘On Certain Genera and Species of *Lytoceratidæ*.’

By S. S. Buckman, F.G.S.

This paper deals with certain specimens sent by Mr. Beeby Thompson from the Northampton Sands, one of which is remarkable for its homœomorphy with *Phylloceras*. In order to classify the series of Toarcian-Aalenian *Lytoceratidæ* to which these species belong (*jurense* and allied groups), it is necessary to note that there is evidence of a definite sequence of phylogenetic stages. In ornament there is, at first, elaboration; but, later, simplification from a costate to a smooth stage. In whorl-shape there is a tendency to pass from the primitive evolute to the involute whorl, the umbilicus constantly contracting. Parallel with this there is a further tendency to pass from stout to more compressed whorls. While the *Lytoceratidæ* have a more primitive whorl-shape than the *Phylloceratidæ*, their lobe-line is more advanced; and hence, while the advance of the former produces a certain external homœomorphy with the latter, the more advanced lobe-line remains a feature of distinction. The successive stages of development may be indicated in terms of species, thus: (1) *Germaini*, (2) *torulosum*, (3) annulose species not yet named, (4) *jurense*, and (5) *phylloceratoidan*. Four new genera are described, and two new species; three new names are proposed, and one generic name revised.



J. Green lith.

Mintern Bros. imp

SKULL OF GONORHYNCHUS

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 89. MAY 1905.

LVI.—*Descriptions of new Genera and Species of Syntomidæ, Arctiadæ, Agaristidæ, and Noctuidæ.* By Sir GEORGE F. HAMPSON, Bart., F.Z.S.

THE following genera and species form a third supplement to the first five volumes of the 'Catalogue of Lepidoptera Phalænæ in the British Museum'—the first paper on the subject in the *Ann. & Mag. Nat. Hist.* ser. 7, vol. viii. pp. 165–186 (1901), and the second in the same series, vol. xi. pp. 337–351 (1903),—and the numbers before the species indicate the position of the species in the classification adopted in those volumes. The types are in the British Museum.

Syntomidæ. (Vol. I.)

Page 53. Genus SYMPHLEBOMIS, nov.

Type, *S. antipolo*, Semp. Schmett. Phil. ii. p. 418, pl. liii. fig. 2 (1898).

Proboscis fully developed; palpi porrect, not reaching beyond the frons; antennæ of male ciliated. Fore wing of female with vein 3 from angle of cell; 4, 5 strongly stalked; 6 from well below upper angle; 7, 8, and 11 stalked; 9, 10 absent: male with a fold below base of cell; vein 1 sinuous, 2 bent upwards near its base; the lower angle of cell bent up to upper angle, with the opening of a very large pouch above it. Hind wing with veins 3 and 5 from angle of cell, 4 absent, 6, 7 coincident.

Ann. & Mag. N. Hist. Ser. 7. Vol. xv.

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Page 114. Genus NEËRESSA, nov.

Type, *N. sagada*, Semp. Schmett. Phil. ii. p. 423 (1898).

Proboscis fully developed; palpi porrect, not reaching beyond the frons; antennæ of female simple; hind tibiæ with the medial spurs absent. Fore wing long and narrow; veins 3, 5 shortly stalked, 4 absent; 6 from well below upper angle; 7, 8, and 11 stalked; 9, 10 absent. Hind wing with vein 3 from angle of cell, 4 absent, 5 from well above angle; 6, 7 coincident.

288 a. *Metarctia hæmatricha*, sp. n.

♂. Fuscous brown; head, thorax, and abdomen clothed chiefly with blood-red hair. Fore wing with some blood-red hair at base. Hind wing with the inner area tinged with blood-red.

Hab. ABYSSINIA, Kutai Metha (*Degen*), 1 ♂ type. *Exp.* 44 mm.

298 a. *Pseudapiconoma melæna*, sp. n.

♀. Head and thorax deep olive-brown; abdomen deep olive-brown, dorsally suffused with green except first two segments, the lateral tufts orange at tips. Fore wing deep olive-brown; a triangular hyaline spot in end of cell; an oblique curved spot below base of vein 2, with a round spot below it and an elongate spot above inner margin, with its upper edge indented; a wedge-shaped spot above vein 7, a small triangular spot above base of vein 6 and a quadrate spot above its middle, a large quadrate spot above vein 5, an elongate spot above 4, quadrate spot above 3, very large elongate patch above 2, and quadrate patch above 1. Hind wing deep olive-brown, the cell and inner area thinly scaled; a small hyaline spot above vein 5 and small elongate spots from below 5 to before 2.

Hab. UGANDA, Masaka (*Christy*), 1 ♀ type. *Exp.* 54 mm.

312 a. *Sphecosoma metamela*, sp. n.

♂. Head and thorax yellow; antennæ and vertex of head black; tegulæ black at extremity; patagia edged with black; thorax with dorsal black stripe; abdomen fulvous, with two fine black streaks on first segment, and the three terminal segments black. Fore wing yellowish hyaline, the costal half slightly clouded with fulvous, the veins blackish;

fine fulvous streaks below costa and above inner margin. Hind wing yellowish hyaline, the veins blackish.

Hab. PARAGUAY, Sapucay (*Foster*), 1 ♂ type. *Exp.* 24 mm.

354 a. *Isanthrene fulvipuncta*, sp. n.

Isanthrene varia, Hmps. Cat. Lep. Phal. i. p. 176 (part.).

Head, thorax, and abdomen black-brown; antennæ fulvous, the shaft ringed with black and the branches partly black; frons, vertex of head, and tegulae with silvery-blue patches; patagia with obscure fulvous streaks; fore coxæ with blue patches, hind coxæ with orange spots, the base of femora with streak above tarsi and extremity of hind tibiae orange; abdomen with two orange dorsal points on first segment, followed by paired fulvous spots on the next two segments, subdorsal white points and yellow lateral spots on second segment, the other segments with leaden subdorsal fasciæ with blue spots on them, the ventral surface with white band at base, followed by sublateral white spots on next segment and blue spots on third segment. Fore wing hyaline, the costal half tinged with yellow; the veins brown and fulvous; two silvery-blue points at base; a fulvous streak, subcostal towards base, then becoming costal; the inner area dark, with fulvous streaks above and below vein 1 on basal half; a terminal dark band with slightly irregular inner edge, expanding somewhat towards apex and angled inwards at vein 2. Hind wing hyaline, the veins dark, a narrow terminal band slightly incurved at veins 2 and 1; the underside with the cell and costal area except costal edge fulvous.

Hab. PANAMA, Chiriqui (*Champion*), 1 ♀ type, Godman-Salvin Coll. *Exp.* 42 mm.

Page 179. For *Bombiliodes* read AUTOCHLORIS, Hübn. Verz. p. 125 (1827), which has precedence. Type *almon*, which will come next *enagrus*.

386. *Gymnelia pitthea*.—Dr. Staudinger has from two different collectors received specimens taken *in copulâ* with 940. *Pseudosphenopectera basalis*, and it seems probable that it is the male of that species, in which case *pitthea* and *cocho* should be removed to *Pseudosphenopectera*; the hind wing is so minute in the male that the neuration is not quite certain, and the specimens of *basalis* are all females.

429 a. *Loxophlebia cinctata*, sp. n.

♀. Head black; palpi in front, basal joint of antennæ in front, and gulæ yellow; frons white; thorax yellow, the patagia black except upper edge, a broad dorsal black stripe; abdomen yellow, a dorsal black stripe, the second and third segments with dorsal black bands, the three terminal segments blue-black. Fore wing hyaline, the veins and margins black; the base yellow, a yellow streak below costa to well beyond middle; veins 6, 5, 4 yellow from cell to the terminal black band, which expands widely on apical area and slightly below vein 2; a black discoidal bar. Hind wing hyaline, the base yellow; the cell with black spot in extremity; the veins yellow from cell to the terminal black band, which expands on apical area and on inner margin to near base.

Hab. VENEZUELA, Caura Valley (*Klages*), 2 ♀ type. *Exp.* 28 mm.

599. *Saurita attenuata*, n. n.,

tenuis being preoccupied, v. no. 613.

637 a. *Eurota xanthosoma*, sp. n.

♂. Head and thorax black-brown, the vertex of head, tegulæ, shoulders, and patches on fore coxæ and pectus orange-yellow; abdomen orange, the anal tuft black below. Fore wing black, the basal area orange-yellow; a semi-hyaline white patch in terminal half of cell and a quadrate patch below it; an irregular postmedial series of semihyaline spots between veins 7 and 2, those above veins 4, 3 extending to near termen, and the one above vein 2 minute. Hind wing black, the base irregularly orange; a semihyaline white patch beyond the cell between veins 7 and 2.

Hab. ARGENTINA, Gran Chaco, near Florenzia (*S. R. Wagner*), 1 ♂ type. *Exp.* 30 mm.

Page 326. For *Mydropastea* read PHAIO, Neum. Can. Ent. 1894, p. 335—type *longipennis*,—which has precedence.

768 a. *Æthria aner*, sp. n.

Æthria carnicauda, Hmps. Cat. Lep. Phal. i. p. 349 (♂), nec Butl.

♂. Head, thorax, and abdomen black; palpi in front, sides of frons, basal joint of antennæ below, and patches on shoulders and fore and hind coxæ white; abdomen with dorsal series of brilliant blue bands, the anal tuft crimson;

the ventral surface of first three segments white, followed by slight sublateral spots and a spot at base of anal tuft. Fore wing hyaline, the veins and margins black, the base metallic blue; the basal area black, with irregular oblique outer edge; a black discoidal bar; the terminal black band slightly expanding below vein 2. Hind wing hyaline, the veins black; the apical area black, broadly at costa, narrowing to a point at vein 1.

Hab. VENEZUELA, Caura Valley (*Klages*), 2 ♂ type.
Exp. 30 mm.

Page 361. *Gundlachia* being preoccupied (*Pfeiff. Moll.* 1849), *BURTIA* will stand.

Page 363. *Desmidocnemis* rename *HYALOMIS*, n. n., the former being a synonym of *HEREA* and *Prittwitzii* = *xanthogaster*.

847 a. *Teucer hypophcea*, sp. n.

♂. Head, thorax, and abdomen black; back of head with two yellow spots; patagia and prothorax with slight greyish streaks; metathorax with greyish patch; pectus and fore coxæ with whitish patches; abdomen with the anal tuft white at extremity, the ventral surface whitish at base. Fore wing black, suffused in parts with grey, especially on terminal area; discocellulars grey; a quadrate hyaline patch in end of cell, an elongate patch below the cell, a slight streak above base of vein 2, and four patches beyond the cell between veins 7 and 3. Hind wing black, with hyaline patches in and below cell; the underside with white patches in and below cell, the fold on inner area white, the rough hair on terminal area greyish.

Hab. VENEZUELA, Caura Valley (*Klages*), 1 ♂ type.
Exp. 26 mm.

906. *Napata euchloa*, n. n. for the Jamaican species, *N. chalybea* from Cuba being distinct.

Page 413. For *Patreliaura* read *TRICHROMIA*, *Hübner Verz.* p. 164 (1827)—type *capys*,—which has precedence.

948 a. *Ixylasia semivitreata*, n. n.

Autochloris almon, *Hmps. Cat. Lep. Phal. B. M. i. p. 432* (nec *Cram.*).

Hab. BRAZIL, Rio Janeiro (*Fry*), 1 ♂ type, Blumenau, 1 ♀.

Page 432. Delete *Autochloris*, Hübn. The genus will stand as *Schasiura*, Butl.

1001 a. *Trichodesma albicincta*, sp. n.

♂. Head, thorax, and abdomen black-brown; palpi in front and frons yellowish white; tegulæ in front and shoulders yellow; patagia with slight yellowish streaks; pectus and legs mostly white; abdomen with fine white segmental rings, the ventral surface white, except anal segment. Fore wing black-brown; the costa, veins, and submedian fold with fine pale streaks on basal half; an oblique yellow band across end of cell from below costa to vein 2. Hind wing black-brown, with some yellow suffusion in and below cell; a rather oblique yellow patch beyond the cell. Underside with slight white suffusion at base of both wings.

Hab. VENEZUELA, Caura Valley (*Klages*), 1 ♂ type. *Exp.* 30 mm.

Page 474. Insert AZATREPHEs, n. n., for *Zatrephes*, Hmpsn. (nec Hübn.).

1050. AZATREPHEs *paradisea*, insert *Halisidota* DISCALIS, Wlk. vii. 1706 (1856), which has precedence.

1051. *Zatrephes nitida* is an Arctid near *Premolis*.

Page 478. For *Neacerea* read DELPHYRE, Wlk. ii. 537 (1854)—type *hebes*; and insert *Nodoza*, Schaus, J. N.Y. Ent. Soc. iv. p. 150 (1896)—type *tristis*.

Delphyre hebes, Wlk. ii. 537 (1854), = *Nodoza tristis*, Schaus, J. N.Y. Ent. Soc. iv. p. 150 (1896).

1074. Rename *Eucereon metoidesis*, n. n., and delete *E. cinctum*, Schaus.

1086. *Eucereon* BALIUM. Transfer to HELIURA after *zonata*.

1087 a. *Eucereon dorsipuncta*, sp. n.

Head and thorax grey; palpi blackish; frons, vertex of head, and tegulæ with black spots, back of head with pair of yellow spots; patagia slightly streaked with black; legs fuscous and white, the coxæ tinged with crimson; abdomen

crimson, with dorsal series of small black spots and the anal segment black, lateral black stripes, and the ventral surface yellowish white. Fore wing white, the veins, costal and inner areas tinged with pale brown; subbasal black spots below costa and cell, the latter followed by a black streak above vein 1; antemedial black spots on costa, below cell, above and below vein 1, the spot above vein 1 displaced outwards; a spot in middle of cell with pale centre or divided by a pale streak; a spot on costa above end of cell and two beyond the cell, an oblique series from vein 5 to inner margin, the spots above and below vein 4 wedge-shaped; a postmedial series of irregular spots, wedge-shaped below costa and streak-like above inner margin; a subterminal series of spots and terminal series of points. Hind wing white, the terminal area fuscous, broad at costa, narrowing to a point near tornus.

Hab. VENEZUELA, Caura Valley (*Klages*), 1 ♂, 1 ♀; PARAGUAY, Sapucay (*Foster*), 3 ♀ type. *Exp.* 34 mm.

1119. *Eucereon ochrota*, n. n. for the Jamaican species, *E. guacolda* from Cuba being distinct.

1157 b. *Ctenucha nantana*.

Ammalo nantana, Wlk. xxxi. 232 (1864); *Butl. Ill. Het. B. M. i.* p. 54, pl. xix. fig. 2.

Ctenucha rubicunda, Dognin, *Le Nat.* 1905, p. 10.

Hab. BRAZIL, Amazons, Nauta; PERU.

1180 a. *Hyaleucerea phæosoma*, sp. n.

♂. Head and thorax olive-brown, tinged with fuscous; neck with crimson ring; palpi yellowish white at base; coxæ whitish, femora with whitish stripes, tarsi with pale rings; abdomen fuscous, with a bluish tinge, the ventral surface white. Fore wing black-brown, the veins streaked with olive; ill-defined olive streaks from base below costa and cell and a spot on costa before middle; a hyaline patch towards end of cell, divided by a dark streak in discal fold; hyaline patches below the cell before vein 2 and above its base; hyaline spots beyond the cell above and below vein 6 and further from base above and below vein 4; a waved olive subterminal line bent outwards to near tornus between veins 6 and 5; a slight apical spot. Hind wing hyaline; the veins black; the terminal area broadly blue-black, the hyaline

extending to near termen between veins 5 and 2; cilia whitish at tips.

Hab. PARAGUAY, Sapucay (*Foster*), 2 ♂ type. *Exp.* 30 mm.

Arctiadae.

NOLINÆ. (Vol. II.)

74 a. *Nola bicincta*, sp. n.

♂. Head and thorax white; palpi yellow-brown; pectus, legs, and abdomen fuscous. Fore wing white; the costa with irregular yellow-brown and fuscous fascia; an oblique yellow and black antemedial band, with a tuft of black scales on its outer edge in cell; a postmedial nearly erect yellow and black band, expanding to costa, and with its outer edge indented above vein 2; some fuscous on termen towards apex. Hind wing pale fuscous.

Hab. CAPE COLONY, Deelfontein (*Col. Sloggett*), 1 ♂ type. *Exp.* 18 mm.

157 a. *Zia hemiphæa*, sp. n.

♀. Head red-brown, with the vertex white and a white bar across frons; tegulæ red-brown and grey, white at sides; thorax white; abdomen grey and white. Fore wing with the basal area white to one third of costa and half of inner margin, and with some grey striæ on costa; the terminal area silvery grey, with some red-brown on medial part of costal and terminal areas, and a white patch with some grey spots on it from apex to middle of postmedial line; the white area bounded by a rufous line, slightly angled outwards in submedian fold; the postmedial line represented by some small dentate black marks between veins 7 and 2; subterminal line waved, white, interrupted, with some small patches of black scales before it at middle; a series of silvery striæ just before termen. Hind wing pale fuscous.

Hab. JAVA, Arjuno, 3000 feet (*Doherty*), 1 ♀ type. *Exp.* 20 mm.

Genus EURYNOLA, nov.

Type, *E. mesoleuca*, Lower, Tr. R. Soc. S. Austr. 1903, p. 39.

Proboscis fully developed; palpi obliquely upturned, rather thickly scaled; antennæ of male bipectinate, the apical third simple. Fore wing with veins 3 and 5 from near

angle of cell; 6, 7 from cell; 8, 9, 10 stalked; 11 curved. Hind wing with veins 3, 4 stalked; 5 from just below middle of discocellulars; 6, 7 shortly stalked.

LITHOSIANÆ.

229 b. *Phryganopsis unipuncta*, sp. n.

Antennæ of male bipectinate, of female minutely serrate.

Head and thorax brownish ochreous; fore and mid legs suffused with fuscous; abdomen yellowish white. Fore wing ochreous, suffused with brownish; a small round black discoidal spot. Hind wing yellowish white.

Hab. ALGERIA, Hammam-es-Salahin (*Walsingham*), 2 ♂, 4 ♀, type. *Exp.* 20 mm.

248 a. *Phæosia orientalis*, sp. n.

♂. Fore wing with the cell very narrow, with a fold in it and fringe of scales on upperside; the inner margin strongly lobed before middle.

Head, thorax, and abdomen fulvous yellow, the last greyish towards base. Fore wing orange-yellow, the area below the cell flesh-coloured; a small rather elongate blackish patch above end of cell. Hind wing orange yellow, the terminal area paler.

Hab. BORNEO, Kuching (*Shelford*), 1 ♂ type. *Exp.* 26 mm.

342 a. *Ilema fuscifrons*, sp. n.

♂. Head, tegulæ, and shoulders orange-yellow; palpi, frons, and antennæ fuscous; thorax grey; pectus and legs yellow, the fore legs and mid tibiæ in front grey; abdomen yellow. Fore wing grey, the costa narrowly fulvous yellow, the costal edge black towards base; cilia yellowish. Hind wing yellow. Underside of fore wing as on upperside, but the basal and inner areas yellower.

Hab. BR. N. GUINEA, Aroa R. (*Meek*), 1 ♂ type. *Exp.* 32 mm.

Page 219. Genus PARASHADA, nov.

Proboscis fully developed; palpi porrect, not reaching beyond the rounded frontal prominence, which has a small corneous plate below it; antennæ of male with cilia and bristles; tibiæ with the spurs moderate. Fore wing of male with large costal fold on underside fringed with hair; the

neuration extremely distorted; vein 2 from middle of cell, after vein 3 the median nervure is curved upwards and backwards to the lower edge of the very large areole before its extremity, from which arise veins 4, 5; 6 from areole; 7, 8, 9 stalked, 7 from beyond 9; 10, 11 from areole. Hind wing broad, the costal area highly arched; the cell very narrow; vein 2 from before middle; 3, 4 shortly stalked; 5 absent; 6, 7 coincident; 8 much curved.

457 a. *Parashada truncata*, sp. n.

♂. Head and thorax orange-yellow; abdomen fuscous brown, the ventral surface orange-yellow. Fore wing dull reddish brown. Hind wing with the costal half pale yellow, the inner half dull brown.

Hab. SULA MONGOLI (*Doherty*), 1 ♂ type. *Exp.* 24 mm.

521 a. *Cisthene triplaga*, sp. n.

Black; tegulae orange; abdomen with subdorsal orange patches on second segment and lateral and ventral stripes, except on terminal segment. Fore wing with rather broad orange fascia on median nervure, expanding somewhat at lower angle of cell, and with its lower edge somewhat diffused; a curved subterminal series of three spots. Hind wing with broad orange fascia in and below cell from base to well beyond cell.

Hab. PARAGUAY, Sapucay (*Foster*), 2 ♂, 1 ♀ type. *Exp.* 30 mm.

Page 258. For *Stictane* read MANOBA, Wlk. Journ. Linn. Soc., Zool. vii. p. 62 (1863)—type *implens*.

542. *Manoba implens*.

Manoba implens, Wlk. Journ. Linn. Soc., Zool. vii. p. 62 (1863);

Hmpsn. Cat. Lep. Phal. B. M. ii. p. 46, pl. xix. fig. 22.

Stictane junctilinea, Hmpsn. A. M. N. H. (7) viii. p. 183 (1901).

696. *Eurosia accepta*.

The male has simply ciliated antennae.

E. acanthocera, n. n., for the species from Sangir with the tooth and sinus to antennae.

Page 339. Genus CHRYSOCYMA, nov.

Type, *C. mesopotamia*.

Proboscis absent; palpi extending to just beyond frons and clothed with long hair; antennæ of male with very long rather widely separated branches; hind tibiæ with one pair of spurs and fringed with long hair on outer side. Fore wing short and broad, the apex rounded; veins 3 and 5 from near angle of cell; 6 from upper angle; 7, 8, 10 stalked; 9 absent; 10 from near apex, 11 from cell. Hind wing with veins 3, 4 from angle of cell; 5 from well above angle; 6, 7 stalked; 8 from towards end of cell.

714 a. *Chrysocyma mesopotamia*, sp. n.

Deep orange; antennæ with the branches blackish. Fore wing with two subbasal, two antemedial, and two postmedial pale waved lines; a small blackish discoidal spot.

Hab. ZANZIBAR, 1 ♂; BR. C. AFRICA, Chinde (*De Jersey*), 1 ♂; MASHONALAND, Salisbury (*Dobbie*), 3 ♂ type. *Exp.* 24 mm.

751 a. *Prepiella procridia*, sp. n.

♂. Head and thorax fuscous, shot with metallic green; abdomen fuscous, the tufts on third segment fulvous, the ventral surface shot with metallic green. Fore wing fuscous, the costal half and termen suffused with golden metallic green. Hind wing fuscous brown, the hair on tornal lobe fulvous.

Hab. PARAGUAY, Sapucay (*Foster*), 1 ♂ type. *Exp.* 20 mm.

754 a. *Prepiella radicans*, sp. n.

♂. Head and thorax yellow; antennæ black except at base; fore and mid tibiæ with black bands; abdomen yellow, slightly tinged with crimson. Fore wing bright yellow, with slight crimson streaks in discal and submedian folds; the terminal area tinged with crimson; a black spot at base of costa, followed by a black streak below costa; short black streaks on the veins before the antemedial line, which is oblique from costa to submedian fold, then incurved; postmedial line irregular, oblique from costa to subterminal line at vein 4, and emitting short streaks on the veins, then finer, retracted along vein 3 to below end of cell near antemedial line, and giving off a fine streak on vein 2, then excurved

below submedian fold; a curved subterminal line; cilia fuscous. Hind wing yellow, tinged with crimson.

Hab. BR. GUIANA, Bartica (*W. J. Kaye*), 1 ♂ type.
Exp. 16 mm.

769 a. *Illice triplaga*, sp. n.

♂. Head yellow, the third joint of palpi, frons, and antennæ (except basal joint) black; tegulæ and patagia yellow, thorax fuscous; pectus yellow; legs fuscous and yellow; abdomen crimson. Fore wing fuscous; a yellow patch on basal half of inner margin; a postmedial conical patch from costa to discal fold and another from vein 2 to inner margin, becoming crimson at margin. Hind wing crimson, with fuscous terminal band from apex, narrowing to a point at vein 2. Underside of fore wing with the patches crimson and confluent.

Hab. PARAGUAY, Sapucay (*Foster*), 1 ♂ type. *Exp.* 20 mm.

777 b. *Illice roseiceps*, sp. n.

♂. Head, tegulæ, and patagia crimson; frons, antennæ, and thorax fuscous; legs crimson and fuscous; abdomen crimson. Fore wing greyish fuscous; a yellow fascia on inner margin from base to a postmedial triangular patch extending to above vein 2; a postmedial wedge-shaped patch from costa to lower angle of cell. Hind wing crimson, becoming yellow near the terminal fuscous band, which is wide at costa, narrowing to a point at tornus. Underside of fore wing with the postmedial patches confluent.

Hab. PARAGUAY, Sapucay (*Foster*), 1 ♂ type. *Exp.* 24 mm.

778 a. *Illice rhodocraspis*, sp. n.

♂. Head and thorax grey-brown; palpi (except at tips), tegulæ, pectus, femora, and whole of hind legs crimson; abdomen crimson. Fore wing grey-brown, the costal edge crimson. Hind wing crimson, with rather narrow terminal fuscous band, expanding towards apex and narrowing to a point at tornus.

Hab. ARGENTINA, Sta. F , Ocampo (*Wagner*), 1 ♂ type.
Exp. 16 mm.

829 a. *Cincia nephelistis*, sp. n.

Antennæ of male bipectinate, with moderate branches; hind wing with veins 6, 7 from cell. Head and thorax pale

pinkish mixed with black; palpi black; vertex of head and metathorax with black patches; antennæ yellowish white, with the basal joint black in front; abdomen pink, suffused with fuscous, the base whitish. Fore wing pale pink, thickly irrorated and in places suffused with black; the veins black; the costal area pinker. Hind wing of male white, the costal and apical areas suffused with fuscous, of female wholly suffused with fuscous.

Hab. CUBA, Santiago, 1 ♀; Mutijas, 1 ♂ (*Schaus*) type.
Exp., ♂ 24, ♀ 26 mm.

Page 414. Genus MICROHYLE, nov.

Type, *M. fadella*, Mab. Le Nat. ii. p. 100 (1882).

Proboscis moderate; palpi upturned, hardly reaching vertex of head, the third joint acuminate; antennæ of male bipectinate, with very long branches; tibiæ with the spurs long. Fore wing with vein 2 from middle of cell, 3 from before angle, 5 from above angle, 6 from upper angle; 7, 8, 10 stalked from before angle; 9 absent; 11 free. Hind wing with vein 2 from middle of cell; 3, 4 coincident; 5 from well above angle; 6, 7 on a long stalk; 8 from middle of cell.

Page 421. Genus OPSAROA, nov.

Type, *O. fulvinota*.

Proboscis absent; palpi porrect, not reaching beyond frons, and clothed with long hair; frons with long hair; antennæ of male with very long branches, ending in two bristles and decreasing rather suddenly to apex; fore tibiæ with long process arising from base; hind tibiæ with one pair of spurs; abdomen clothed with long hair. Fore wing with vein 3 from long before angle of cell; 5 from above angle; 6, 7, 8 stalked; 9 absent; 10, 11 from cell. Hind wing with veins 3, 4 from angle of cell; 5 from well above angle; 6, 7 coincident; 8 from close to end of cell.

891 a. *Opsaroa fulvinota*, sp. n.

♂. Head and thorax clothed with greyish-brown hair; patagia with some fulvous hair at extremity; abdomen clothed with orange hair, greyish at base. Fore wing sparsely clothed with red-brown hair; an elongate fulvous-yellow mark in and beyond end of cell, with a prominent black discoidal spot on it; an elongate fulvous-yellow patch in submedian interspace from below origin of vein 2 to near

termen. Hind wing fulvous orange, the costa, termen, and cilia (except towards tornus) reddish brown.

Hab. CAPE COLONY, Triangle, 2 ♂ type. *Exp.* 22-24 mm.

915 a. *Asura chrysomela*, sp. n.

♂. Fore wing with the costa highly arched just beyond middle, the upper angle of cell much produced.

Black; head, greater part of tegulæ, shoulders, front of pectus, fore legs (except part of tibiæ), extremity of mid and hind femora, hind coxæ, and anal tuft orange. Fore wing with broad orange medial band from subcostal nervure to inner margin, its inner side extending to costa and sinuous, its outer angled outwards at vein 4. Hind wing with orange medial patch on costal area.

♀. Fore wing with the orange band very broad from costa to inner margin, its outer edge angled at veins 6 and 4. Hind wing with very broad orange-yellow band from medial part of costa to tornus.

Hab. SOLOMON IS., Choiseul (*Meek*), 1 ♂, 1 ♀ type. *Exp.*, ♂ 30, ♀ 36 mm.

928 a. *Asura hæmachroa*, sp. n.

♂. Head, thorax, and abdomen crimson; vertex of head, tegulæ, patagia, metathorax, and extremity of fore tibiæ with fuscous points. Fore wing crimson; three black points at base, followed by a slight streak in submedian fold; the lines rather broad, fuscous slightly defined on each side by ochreous; the antemedial line acutely angled outwards in cell, then oblique and sinuous; the medial line strongly angled outwards on median nervure, then incurved; the postmedial line very oblique from costa to vein 4, where it is angled outwards, then strongly angled inwards in submedian fold; a subterminal series of fuscous spots on an ochreous ground, slightly angled outwards at veins 6 and 4. Hind wing paler crimson.

Hab. SOLOMON IS., Bougainville (*Meek*), 2 ♂ type. *Exp.* 18 mm.

929 a. *Asura metascota*, sp. n.

Head and thorax orange-scarlet, with slight fuscous spots on vertex of head, tegulæ, patagia, thorax, and extremity of tibiæ and tarsi; abdomen fuscous, with the extremity scarlet. Fore wing scarlet, with three black points at base and fuscous

subbasal patches below costa and cell; an incomplete ante-medial line, angled strongly outwards in cell, then oblique and slightly angled inwards in submedian fold, more or less connected by fuscous suffusion with the similar somewhat waved and diffused medial line; postmedial line oblique from costa to vein 3, then inwardly oblique and angled inwards in submedian fold, and more or less connected by fuscous streaks with the diffused subterminal line, which is angled outwards on veins 6 and 4 and inwards in submedian fold; cilia fuscous. Hind wing uniform fuscous; the underside with some red suffusion on basal half of costal area.

Ab. 1.—Fore wing suffused with fuscous, leaving some red at base, some ante- and postmedial points, three medial spots, and some irregular terminal marks.—Bougainville.

Hab. SOLOMON IS., Choiseul I. (*Meek*), 1 ♂, 1 ♀ type; Bougainville (*Meek*), 1 ♂. *Exp.*, ♂ 30, ♀ 36 mm.

1064 a. *Eutane nivea*, sp. n.

♀. Frons orange; vertex of head and thorax pure white; legs tinged with fulvous; abdomen white, tinged with yellow towards extremity. Fore wing pure white, the costa narrowly orange; a black point on discocellulars; the termen and cilia orange, with a series of black striæ before the former, expanding into a spot at vein 2, and a series of black and silver striæ at base of latter. Hind wing white, the cilia tinged with yellow. Underside of fore wing with the costal area tinged with yellow, the disk with fuscous.

Hab. PULO LAUT (*Doherty*), 1 ♀ type. *Exp.* 20 mm.

Page 538. Genus MELASTROTA, nov.

Type, *M. nigrisquamata*, Swinh. A. M. N. H. (7) vii. p. 467 (1901).

Proboscis fully developed; palpi porrect to just beyond frons; antennæ of male ciliated; hind tibiæ with the spurs long. Fore wing rather short and broad; vein 2 from towards angle of cell oblique, 3 from before angle, 5 absent, 6 from below upper angle; 7, 8 and 9, 10 stalked, 11 anastomosing with 12; male with the subcostal area to end of cell and upper part of cell clothed with black scales on underside. Hind wing with vein 2 from before middle of cell; 3, 5 absent; 6, 7 stalked; 8 from middle of cell.

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1214 a. *Aphyle cuneata*, sp. n.

♂. Antennæ serrate, the apical third simple; hind wing

with veins 3, 5 from cell. Head and thorax white, tinged in parts with buff; palpi black behind; tegulæ with blackish line near base, incomplete at middle, a brown medial line and blackish line at tips; patagia with two blackish bars; meso- and metathorax with paired fuscous spots; abdomen vermilion, the anal tuft and ventral surface white. Fore wing white, the base, costal and terminal areas tinged with buff; the veins buff, with dark streaks on veins 4, 5, 6; some vermilion on basal inner area; a blue-grey band at base from costa to vein 1; an oblique subbasal band from below costa to vein 1, followed by a black point in cell and brown line from cell to vein 1, then a black bar from cell to vein 1; a black streak on middle of inner margin, narrowing towards base; a black point in middle of cell and short black streaks above and below base of vein 2; a black discoidal bar; a subterminal series of small black spots, excurved from below costa to termen below vein 4, and the spots above veins 4 and 5 connected with termen by short streaks, the series then incurved and represented by an oblique striga above vein 3, a spot above vein 2, one nearer termen below vein 2, and two conjoined spots at tornus. Hind wing hyaline white, the inner area suffused with vermilion, the cilia yellowish.

Hab. BR. GUIANA, Potaro R. (*Roberts*), 1 ♂ type. *Exp.* 36 mm.

Page 27. Genus ZATREPHEs.

Zatrephes, Hübn. Verz. p. 171 (1827). Type, *nitida*.

Proboscis well developed; palpi upturned to near vertex of head and rather thickly scaled; antennæ of male bipectinate with moderate branches, of female with shorter branches; tibiæ fringed with hair, the tarsal joints with slight tufts of hair. Fore wing with veins 3, 4 from angle of cell, or 3 from just before angle; 5 from above angle; 6 from upper angle; 7, 8, 9, 10 stalked, 7 from beyond 10; 11 from cell. Hind wing with vein 2 from towards angle of cell; 3, 5 from angle; 4 coincident with 5 or abnormally given off just before termen; 6, 7 coincident or forking near termen; 8 arising free, then anastomosing with cell.

SECT. I.—Fore wing with the termen evenly curved.

1227 a. *Zatrephes nitida*, Stoll.

1227 b. *Zatrephes dithyris*, sp. n.

♂. Head and thorax pale flesh-brown, irrorated with crimson;

abdomen crimson, with whitish dorsal streak on basal segments and slight segmental lines on terminal, the ventral surface whitish. Fore wing flesh-colour, irrorated with crimson; a nearly straight, erect, pale brown antemedial line; a broad medial band and black discoidal point; traces of a fine irregular postmedial line with hyaline points on it above and below vein 4; an indistinct subterminal line, incurved and diffused below vein 5. Hind wing crimson, the costa and cilia pale yellow. Underside yellowish white, with slight crimson irroration and suffusion; hind wing with veins 6, 7 forking before termen.

Hab. CAYENNE, St. Jean Maroni (*Schaus*), 1 ♂ type.
Exp. 34 mm.

SECT. II.—Fore wing with the termen produced to an angle at vein 5, then excised in male.

1227 c. *Zatrephes flavida*, sp. n.

♂. Head and thorax yellowish white, the head, metathorax, and fore tibiae irrorated with crimson; mid and hind tibiae and tarsi with brown spots; abdomen pale yellow, with slight crimson irroration towards extremity, the ventral surface white. Fore wing very pale greenish yellow; costal edge crimson; some faint striae on terminal area; a pale greenish antemedial line, slightly excurved below costa, then oblique; a similar postmedial line, incurved below vein 4, with a bifid, crimson-edged, hyaline spot beyond it between veins 5 and 3; a similar minute spot sometimes present above middle of vein 6; cilia irrorated with crimson and tipped with pure white below the angle. Hind wing ochreous yellow, the termen and cilia brown; the underside white, the inner area tinged with yellow.

Hab. CAYENNE, St. Jean Maroni (*Schaus*), 1 ♂ type.
Exp. 34 mm.

1227 d. *Zatrephes trilineata*, sp. n.

♂. Head and thorax brownish ochreous, slightly irrorated with crimson; metathorax with brown crest; pectus and legs white; fore tibiae brown, irrorated with crimson; abdomen brownish ochreous, slightly irrorated with crimson towards extremity, the ventral surface white. Fore wing ochreous, irrorated with crimson, the terminal area striated with greenish brown; a slight greenish subbasal line; three prominent oblique greenish lines on medial area; two hyaline bidentate postmedial spots between veins 5 and 3, with some blackish

on their outer side and slight greenish line from them to inner margin, a pair of points above 5 and a small spot above 6 with point above it; cilia intersected with white towards apex and white-tipped below the angle. Hind wing pale yellow, the medial terminal area tinged with crimson, the cilia brownish; the underside white, with the inner area tinged with yellow.

♀. Fore wing with the termen not excised below the angle, more thickly irrorated with crimson, the outer of the three lines slightly excurved below costa and vein 5; the hyaline spots reduced to those above veins 6 and 4.

Hind wing with veins 6, 7 forking just before termen; female with veins 4, 5 forking just before termen on left side only.

Hab. CAYENNE, St. Jean Maroni (*Schaus*), 1 ♂ type; SURINAM R., Geldersland, type ♀ in Coll. *Schaus*. *Exp.*, ♂ 34, ♀ 42 mm.

1245 a. *Aræomolis sanguinea*, sp. n.

Antennæ of male serrate and fasciculate; hind wing with the tornus produced to a very large lobe clothed with rough hair and scales above and below, the termen excised before it; veins 6, 7 shortly stalked, 8 from before middle of cell, sinuous; of female, 6, 7 coincident and 8 stalked with them to near apex.

♂. Head and thorax scarlet, mixed with yellow; palpi with the first joint white in front, the second and third ochreous; pectus and legs white; fore coxæ, extremity of femora, tibiæ, and first joint of tarsus on inner side scarlet, the rest of femora on inner side brown, the other tarsal joints scarlet, with white rings; mid tibiæ (except at base) and tarsi on outer side scarlet; hind tibiæ at extremity on outer side and rings on tarsal joints scarlet; abdomen crimson, the second, third, and fourth segments dorsally brown, the ventral surface white. Fore wing scarlet, striated with yellow, and the interspaces beyond the cell streaked with yellow, the costal edge white; an antemedial series of four indistinct purplish-tinged spots; a medial maculate purplish band from below costa to above inner margin, towards which it narrows, edged by yellow lines and angled outwards below vein 3; a curved series of small purplish yellow-edged spots from below costa to vein 3 near the medial band; cilia yellow at tips. Hind wing crimson; the area covered by fore wing pale brownish, the inner margin brownish yellow.

♀. Wholly crimson above; fore wing with the costal area

suffused with fuscous, prominent interrupted yellow streaks in the interspaces, the maculate bands more distinct, the antemedial bent round to base below cell and the spot in cell separate, the medial more broken up and irregular, the spots towards inner margin elongate; a terminal series of brown streaks on the veins. Hind wing wholly crimson.

Hab. CAYENNE, St. Jean Maroni (*Schaus*), 1 ♂ type, type ♀ in Coll. *Schaus*. *Exp.*, ♂ 36, ♀ 40 mm.

1246 a. *Parevia metachryseis*, sp. n.

Antennæ of male with very short branches, ending in a bristle; hind wing with veins 6, 7 coincident.

Head yellow; palpi tinged with crimson; antennæ brownish; thorax brown, pectus and legs yellow; abdomen yellow, dorsally crimson except at base and extremity, some dorsal black points on basal segments and a bar on anal segment. Fore wing purple-brown; the base of inner area yellow; small crimson-ringed yellow spots before middle above vein 1, at middle above inner margin, and beyond middle above and below vein 1; a truncate triangular yellow patch from middle of costa to median nervure; postmedial and subterminal yellow spots on costa and a triangular patch on termen from above vein 4 to vein 1, its apex pointing towards the postmedial costal spot; apical half of cilia brown, with some crimson points. Hind wing yellow, the terminal area fuscous from middle of costa narrowing to a point at tornus.

Hab. SURINAM, Maroni R., St. Laurent, type ♀ in Coll. *Schaus*; Surinam R., Geldersland (*Schaus*), 1 ♂ type. *Exp.* 22 mm.

1386. *Elysius pyrosticta*, n. n.

Elysius hermia, Hmps. Cat. Lep. Phal. B. M. iii. p. 110 (1901).

The South Brazilian species is distinct from Cramer's.

1543. *Neritos macrosticta*, n. n., for the male described and figured; female similar except for sexual characters.

1543 a. *Neritos onytes* ♀ = *psamas* ♂ has the antennæ pectinated and the structural characters as in *repanda* except that the brand is elongate.

♂ with the yellow patches on costa and termen confluent or separate; hind wing in both sexes brown.

1544 a. *Neritos discobola*, sp. n.

Antennæ of male serrate and fasciculate; fore wing with the fovea elongate, veins 10, 11 from cell; hind wing with the costa strongly lobed.

Head yellow; thorax brown; pectus and legs yellow; abdomen scarlet, the base, anal tuft, and ventral surface yellow. Fore wing with the basal area purple-brown from one third of costa to tornus, its outer edge angled at lower angle of cell and vein 3; some crimson at base of inner margin; the apical half yellow, with large round purple-brown subapical patch, with some crimson above it on costa, its outer edge waved. Hind wing crimson.

Hab. VENEZUELA, Aroa, 1 ♂, 1 ♀ type. *Exp.*, ♂ 24, ♀ 26 mm.

1544 b. *Neritos leucoplaga*, sp. n.

Antennæ of male bipectinate with short branches, the apical third serrate, of female serrate; fore wing with veins 10, 11 stalked, the fovea of male elongate; hind wing with the costa strongly lobed and extending to three fourths of wing; veins 3, 5 very shortly stalked.

Pale ochreous brown; vertex of head orange-yellow; fore coxæ yellow; abdomen with ^{1st} segmental yellow lines on terminal segments, the anal tuft yellow, the ventral surface pale. Fore wing with pale rounded patch beyond the cell between veins 6 and 3; the veins slightly darker. Hind wing paler; underside of fore wing with the basal area pale, a yellowish fascia below costa, a slight discoidal lunule.

Hab. CAYENNE, St. Laurent Maroni (*Schaus*), 1 ♂ type, type ♀ in Coll. *Schaus*. *Exp.*, ♂ 36, ♀ 38 mm.

1544 c. *Neritos holophæa*, sp. n.

Antennæ in both sexes pectinate with short branches, the apical third serrate; fore wing with veins 10, 11 stalked; male with elongate fovea below cell; hind wing with the costa strongly lobed and extending to three fourths of wing.

Head, thorax, and fore wing uniform dark purple-grey; abdomen and hind wing bluish fuscous, the tuft in fovea of male pure white.

Hab. CAYENNE, St. Laurent Maroni (*Schaus*), 1 ♂ type, type ♀ in Coll. *Schaus*. *Exp.* 34 mm.

1546 a. *Neritos phaeoplaga*, sp. n.

Antennæ of male with bristles and cilia; fore wing with veins 10, 11 stalked, the fovea elongate; hind wing with the costa moderately lobed.

♂. Head yellow; frons brown; thorax dark brown; pectus and legs white, the fore coxæ yellow in front; abdomen crimson, the anal tuft yellow, the ventral surface white. Fore wing with the basal area purple-brown from one third of costa to termen above tornus, its outer edge sinuous and angled at lower angle of cell and vein 3; a yellow spot edged with scarlet on inner margin before middle; apical area yellow, with rounded purple-brown subapical patch, with scarlet streak on costa above it and bidentate outer edge. Hind wing crimson, with fuscous patch on middle of termen.

♀. Fore wing with the subapical patch joined to the brown area by an oblique subterminal bar.

Hab. CAYENNE, St. Laurent Maroni (*Schaus*), 1 ♂ type, type ♀ in Coll. *Schaus*. *Exp.* 22 mm.

1550 a. *Neritos albicollis*, sp. n.

♀. Palpi yellow at base, brownish in front, crimson behind; frons brown; vertex of head yellow, with crimson line behind; antennæ brown, the basal joint yellow, followed by some crimson; tegulæ pure white; thorax violaceous brown, with small crimson spot on metathorax; pectus, legs, and abdomen yellow, the last dorsally crimson, with some brown at base. Fore wing with the basal area brownish, suffused with purple and white, extending on costa to near middle and thence to termen above tornus, and bounded by a crimson line; a crimson streak just below costa, with an elliptical white patch below it; a crimson point at base and small crimson and yellow subbasal spots on median nervure and inner margin; the apical half of wing yellow, with large rounded white-suffused purple patch from apex to vein 3, edged by brown and crimson and with its outer edge rather waved. Hind wing yellow, suffused with crimson, especially towards apex.

Hab. BR. GUIANA, Rockstone (*Kaye*), 1 ♀ type. *Exp.* 28 mm.

1552 a. *Neritos steniptera*, sp. n.

Antennæ of male serrate and fasciculate; fore wing long and narrow, especially in male; hind wing with veins 6, 7 coincident in male, strongly stalked in female.

Head and thorax red-brown; palpi with some scarlet above; vertex of head yellow, with some scarlet round it; tegulae scarlet at tips; vertex of thorax yellow, edged with scarlet; pectus and legs yellow, marked with brown and scarlet; abdomen yellow, dorsally suffused with scarlet. Fore wing red-brown, with yellow spots, edged with scarlet on fulvous-orange patches; a spot at base; an antemedial series of three conjoined spots forming a band from subcostal nervure to vein 1, excurved at middle; a similar excurved band from middle of costa to median nervure; a series of three spots from vein 5 before termen to vein 2 at termen; cilia with scarlet points towards apex. Hind wing orange-yellow, with fuscous terminal area extending on costa to near middle, narrowing to a point above tornus.

Hab. CAYENNE, St. Jean Maroni (*Schaus*), 1 ♀ type, type ♂ in Coll. *Schaus*. *Exp.* 30 mm.

1552 b. *Neritos cyclopera*, sp. n.

Antennæ of male serrate and fasciculate; fore wing with the apex produced, the termen oblique; hind wing with vein 7 from before end of cell.

♂. Palpi yellow, tinged with scarlet behind and with brown spot at extremity of second joint in front; frons brown; vertex of head yellow; thorax purple-brown; pectus and legs yellow, fore femora crimson in front; abdomen yellow, dorsally scarlet, except at extremity. Fore wing with the base dark purple-brown from costa before middle to termen above tornus, its outer edge somewhat angled at lower angle of cell and vein 3; the apical area yellow, with large, elliptical, purple-brown, subapical patch, with a little scarlet above it on costa and its outer edges waved. Hind wing orange-yellow, with fuscous terminal band, extending on costa to middle, then sinuous to tornus.

Hab. CAYENNE, St. Jean Maroni (*Schaus*), 1 ♂ type. *Exp.* 30 mm.

1686 a. *Mænas Fosteri*, sp. n.

♂. Head and thorax fulvous; sides of palpi and frons, tibiæ, and tarsi grey-brown; abdomen whitish, the basal half of dorsum fulvous. Fore wing pale brownish ochreous; the costal area rather more fulvous; the cilia white. Hind wing white, with slight fulvous hair at base.

Hab. PARAGUAY, Sapucay (*W. Foster*), 2 ♂ type. *Exp.* 34 mm.

1743 a. *Diacrisia metaleuca*, sp. n.

♂. Head and thorax orange-yellow; abdomen orange-yellow, white at base and with ill-defined dorsal fuscous bands. Fore wing uniform orange-yellow. Hind wing pure white.

Hab. W. AFRICA, Niger R., Anambra, 1 ♂ type. *Exp.* 28 mm.

1766 a. *Diacrisia pulverea*, sp. n.

♀. Head and thorax orange-yellow; palpi, frons, antennæ, tibiæ, and tarsi fuscous black; abdomen orange, dorsal and lateral series of black spots on first and terminal segments. Fore wing orange-yellow, finely powdered with brown scales. Hind wing orange-yellow.

Hab. PARAGUAY, Sapucay (*Foster*), 2 ♀ type. *Exp.* 38-42 mm.

1844 a. *Amsacta seminigra*, sp. n.

♂. Antennæ serrate; head and thorax clothed with rather rough hair; fore tibiæ very short, the claws conjoined by a curved corneous membrane, so as to form a triangular process.

Head and thorax black; femora scarlet above; abdomen orange, tinged with red towards base; a subdorsal series of blackish spots, becoming bands on terminal segments; a series of lateral spots; the ventral surface black. Fore wing black; an indistinct darker discoidal lunule and traces of antemedial, medial, postmedial, and subterminal bands. Hind wing white, the marginal areas tinged with yellow and the base of inner margin slightly with red; a small discoidal black spot and two small subterminal spots above tornus.

Hab. ABYSSINIA, Zegi Tsana (*Degen*), 1 ♂ type. *Exp.* 40 mm.

1859 a. *Estigmene unipuncta*, sp. n.

♀. Orange-yellow; palpi, pectus, and legs grey-brown; abdomen with dorsal black spots on second, third, and fourth segments; a lateral series and the ventral surface grey-brown. Fore wing with black point at lower angle of cell.

Hab. GERM. E. AFRICA, Dar-es-Salem, 1 ♀ type. *Exp.* 38 mm.

1866 a. *Estigmene internigralis*, sp. n.

♂. Head and thorax dirty ochreous; palpi and frons mostly brown; tegulæ, stripes on patagia, and dorsum brown;

pectus mostly brown; femora orange above, the tibiæ and tarsi streaked with brown; abdomen orange, with some brown hair at base and dorsal series of black bands, the ventral surface ochreous. Fore wing ochreous white, more ochreous on costal area; the interspaces from subcostal nervure to submedian fold fuscous black, leaving ochreous streaks on the veins. Hind wing ochreous white, with the interspaces fuscous black except towards base.

Hab. NATAL, 1 ♂ type. *Exp.* 44 mm.

2036 a. *Antarctia fulvicollis*, sp. n.

♂. Head and thorax fuscous; tegulæ edged with fulvous, thorax with dorsal fulvous stripe; pectus fulvous; legs fulvous and fuscous; abdomen fulvous, a dorsal stripe and the ventral surface fuscous. Fore wing fuscous, with some white hairs and some yellowish hair at base. Hind wing yellowish white, the veins and terminal area slightly suffused with fuscous; cilia fuscous.

Hab. CHILE, Llanquihoe (*Elwes*), 1 ♂ type. *Exp.* 36 mm.

2037 a. *Antarctia phæocera*, sp. n.

♂. Head and thorax dark reddish brown; basal joint of antennæ and a tuft of hair on shoulders orange; abdomen orange, the ventral surface brown. Fore wing reddish brown, with some orange hair at base of inner margin. Hind wing orange-yellow, the terminal area brown, widely so at costa and narrowing to a point at tornus.

♀. Abdomen with diffused dorsal brown bands; hind wing with the orange-yellow area more restricted.

Hab. PARAGUAY, Sapucay (*Foster*), 2 ♂, 1 ♀ type. *Exp.*, ♂ 42, ♀ 54 mm.

Genus GERARCTIA, nov.

Type, *G. poliotis*.

Proboscis fully developed; palpi short, upturned, the second joint moderately fringed with scales in front; frons with rounded prominence; antennæ of female with bristles and cilia; ccelli present; tibiæ with the inner spurs rather long; build slender. Fore wing long and narrow; the cell long; vein 2 from towards end of cell; 3 and 5 from near angle; 6 from below angle; 7 from angle; 8, 9 stalked; 10, 11 from cell. Hind wing with vein 2 from towards end of cell; 3, 4 stalked; 5 from above angle; 6, 7 from angle; 8 coincident with cell to middle.

2127 a. *Gerarctia poliotis*, sp. n.

♀. Head, thorax, and abdomen grey, tinged with fuscous. Fore wing grey, suffused and irrorated with fuscous; the veins with slight dark streaks; the antemedial line very oblique, only defined by the area beyond it being suffused with fuscous; a slight dark streak beyond it in submedian fold; a slight dark discoidal lunule; postmedial line whitish, defined on inner side by fuscous streaks on the veins below costa and at middle, bent outwards below costa, then oblique and somewhat angled inwards in submedian fold; a slight oblique dark streak from apex; a terminal series of black points. Hind wing grey, with rather darker terminal line; the cilia paler; the underside with dark discoidal lunule.

Hab. CANARIES, Teneriffe (*W. White*), 1 ♀ type. *Exp.* 30 mm.

Agaristidæ.

Genus APÆGOCERA, nov.

Type, *A. argyrogramma*.

Proboscis fully developed; palpi upturned, the second joint fringed with long hair in front, forming a pointed tuft at extremity, the third long, porrect, dilated at extremity; frons with truncate conical prominence, with raised rim; antennæ moderately dilated towards extremity; eyes smooth; tibiæ nearly smooth and without spines; abdomen with dorsal crests on basal segments. Fore wing with vein 3 from towards angle of cell; 5 from well above angle; 6 from upper angle; 9, 10 anastomosing with 8 to form the areole; 11 from cell. Hind wing with vein 2 from near angle of cell; 3, 4 from angle; 5 obsolescent from middle of discocellulars; 6, 7 from upper angle; 8 anastomosing with the cell near base only.

111 a. *Apægocera argyrogramma*, sp. n.

♂. Head and thorax black; palpi with some white at extremity of first and second joints; sides of frons white; back of head, tegulæ, patagia, pro-, meso-, and metathorax with paired white spots, patagia fringed with fulvous; abdomen black, with white segmental lines, the first three segments fulvous, with the dorsal crests blue-black; pectus and femora fulvous, the tibiæ and tarsi fuscous, ringed with white. Fore wing with small black and white patch at base of costal area, then fulvous suffused with fuscous, extending on costa to

middle and on inner margin to near tornus, the outer edge of this area very oblique and sinuous; a small round white spot at upper angle of cell placed between the arms of a silvery-blue Y-shaped mark; an oblique postmedial band of five white spots from vein 7 to below 3, the three upper spots conjoined. Hind wing bright fulvous red, with rather broad terminal black band, expanding slightly at vein 2 and tapering to a point on inner margin beyond middle; cilia chequered black and white.

Hab. ASHANTI, Obuassi (*Bergman*), 1 ♂ type. *Exp.* 62 mm.

Noctuidæ.

AGROTINÆ. (Vol. IV.)

Page 10.—*Ala* being preoccupied (*Lock. Crust.* 1877), TRICHANARTA will stand.

197 a. *Timora albida*, sp. n.

Head and thorax white, tinged with pale brown; abdomen white. Fore wing pale yellow-brown; the costal area whitish; a pure white fascia in discal fold from middle of cell to termen, and another in submedian fold; the interspaces of terminal area with white streaks. Hind wing white, the veins and termen suffused with yellow-brown.

Hab. ALGERIA, Hammam-es-Salahin (*Walsingham*), 1 ♂, 1 ♀ type. *Exp.* 32 mm.

320. *Euxoa emolliens*, n. n. for *E. mollis*, *Staud.* (1891), nec *Wlk.* (1856).

848 a. *Episilia gaudens*, sp. n.

♂. Antennæ strongly serrate. Head and thorax brownish grey; basal joint of antennæ and thorax pale rufous; palpi black-brown, except at tips; pectus and legs dark brown and purplish red; abdomen grey-brown, the anal tuft rufous. Fore wing grey, tinged with ochreous to beyond middle, then with purple; traces of a double waved subbasal line from costa to submedian fold; an indistinct double waved ante-medial line; claviform represented by a black point at its extremity; orbicular and reniform with grey annuli slightly defined by brown, the former round, the latter with some fuscous in its lower part; a medial shade, oblique from costa to lower angle of cell; postmedial line double, filled in with

grey, bent outwards below costa and incurved below vein 4; subterminal line whitish, defined on inner side by slight dentate dark marks and a brown patch at costa, slightly angled outwards at vein 7 and excurved at middle; a terminal brown line. Hind wing whitish, tinged with brown, especially on the veins and terminal area; the underside paler, the costal area suffused and irrorated with purplish brown.

♀. Fore wing without ochreous suffusion, the medial shade much stronger.

Hab. JAVA, Preanger, 1 ♂ type, ♀ in Coll. Snellen.
Exp., ♂ 30, ♀ 34 mm.

911 a. *Lycophotia strigigrapha*, sp. n.

Head and thorax dark brown mixed with grey; abdomen grey, dorsally tinged with fuscous, ventrally irrorated with brown. Fore wing brownish grey, irrorated with brown; the veins dark, defined by grey streaks; a black streak in submedian fold from base to termen, strongest near base; a black streak in lower part of cell from before middle; the orbicular minute, round, with black centre and grey annulus undefined above; reniform a small black spot very indistinctly defined by grey; black-brown streaks in the interspaces beyond the cell; some pale points on costa towards apex; a terminal series of slight black points. Hind wing white, the costa and termen tinged with brown, more strongly in female; the underside with the costal area irrorated with brown, a discoidal point and some points on termen.

Hab. PATAGONIAN ANDES, Val de Lago Blanco, 4 ♂, 2 ♀ type. *Exp.* 36 mm.

Page 610. Genus TRICHEUROIS, nov.

Type, *T. nigrocuprea*, Moore, P. Z. S. 1867, p. 52; Hmps. Moths Ind. ii. p. 199.

Proboscis fully developed; palpi upturned, fringed with hair in front; frons obliquely rounded; eyes large, hairy; head and thorax clothed with hair only and without distinct crests; mid and hind tibiæ spined. Fore wing with veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hind wing with veins 3, 4 from angle of cell; 5 obsolescent from middle of discocellulars; 6, 7 shortly stalked.

1126. *PROTAGROTIS viralis*, insert *Agrotis NIVEIVENOSA*, Grote, Bull. Geol. Surv. v. p. 206 (1879); Smith, Cat. Noct. N. Am. p. 131, which has precedence.

HADENINÆ. (Vol. V.)

1668 a. *Morrisonia chryserythra*, sp. n.

♀. Antennæ minutely serrate; head and thorax bright ferruginous red mixed with ochreous; abdomen ochreous, suffused with ferruginous. Fore wing ochreous, almost entirely suffused with bright ferruginous red; subbasal line whitish, angled outwards in submedian fold and ending at vein 1; antemedial line double, filled in with whitish, oblique, angled inwards on median nervure and vein 1; claviform with its extremity defined by whitish; orbicular and reniform large, with whitish annuli, the former rather oblique, elliptical, open above, the latter incomplete below; postmedial line defined by whitish on outer side, minutely dentate, strongly bent outwards below costa and oblique below vein 4; subterminal line minutely dentate, angled outwards at vein 7, dentate to termen at veins 4, 3, and bent outwards to tornus. Hind wing ferruginous red; the underside paler, with ferruginous spot and traces of curved postmedial line.

♂. Head and thorax purplish red; abdomen suffused with red; fore wing purplish red, the markings all indistinct; hind wing pale reddish.

Hab. NEW ZEALAND, Middle I., Orepuki (*Dunlop*), 1 ♂ type. ♀ in Coll. Dunlop. *Exp.* 42 mm.

1685 a. *Morrisonia chlorograptæ*, sp. n.

♀. Head, thorax, and abdomen deep purple-brown; tegulæ with some red-brown before the slight black medial line; patagia mostly red-brown; pectus clothed with purple-grey hair, tipped with white. Fore wing deep purple-brown, with some red-brown in submedian fold, between the stigmata, and on veins of postmedial area; subbasal line double, filled in with golden green, waved, from costa to submedian fold; antemedial line double, filled in with golden green, waved, oblique from below costa to below cell; orbicular and reniform large, the former oblique elliptical, defined by black and red-brown, and with traces of golden-green annulus, especially below, the latter defined by black and red-brown and with incomplete golden-green annulus below and on outer side, where it is developed into a prominent lunule; postmedial line double, dentate, filled in with golden-green dentate marks from vein 6 to inner margin, bent outwards below costa and incurved below vein 4; subterminal line represented by a series of dentate golden-green marks on black patches, connected with a terminal

series of black spots. Hind wing deep purplish red-brown; the underside whitish, the costal and terminal areas suffused and irrorated with brown; a discoidal lunule and sinuous postmedial line.

Hab. NEW ZEALAND, Middle I., Orepuiki (*Dunlop*), 1 ♀ type. *Exp.* 56 mm.

LVII.—*Descriptions of new Snakes in the Collection of the British Museum.* By G. A. BOULENGER, F.R.S.

Nothopsis affinis.

Rostral twice as broad as deep, not visible from above, its upper angle truncate and narrowly separating the nasals; a pair of internasals, followed by a pair of præfrontals, the latter separated from the frontal by three series of small scales; frontal large, cordiform, a little broader than long, with a median cleft in its anterior half; parietals nearly twice as long as the frontal and separated from it by one or two series of granular scales; two small supraoculars; temporal scales small, granular, keeled; two series of small scales between the eye and the upper labials, which are ten in number; a pair of very small chin-shields. Scales in 27 rows, obtusely keeled, laterals much narrower than dorsals. Ventrals 162; anal entire; subcaudals 98. Greyish yellow above, with a median series of rhomboidal or quadrangular black spots and a lateral series of Λ -shaped black markings more or less confluent into a zigzag band; head black above; upper lip and lower parts yellowish, dotted with black.

Total length 320 mm.; tail 100.

A single female specimen from Salidero, N.W. Ecuador, 350 feet.

This species is very nearly related to *N. rugosa* of Cope, to which I had referred the specimen when it was received in 1901. But the British Museum having now acquired an example which I take to be a true *N. rugosa*, from Carriablanca, Costa Rica, I find the Ecuador snake to differ in the feebly keeled scales, the presence of a pair of præfrontal shields, the larger frontal and parietals, and the more feebly angulate ventral shields.

PHRYDOPS, gen. nov.

Maxillary teeth 22, small, equal; mandibular teeth subequal. Head distinct from neck, moderately elongate, with

vertical sides and projecting edge to the supraocular shield; eye large, with round pupil; a single nasal; no loreal. Body elongate, slightly compressed; scales smooth, with apical pits, in 17 rows; ventrals rounded. Tail rather long; subcaudals in two rows.

This genus appears to be related to *Synchalinus*, Cope, which is only known to me from the description.

Phrydops melas.

Snout subtruncate, scarcely longer than the eye, with sharp canthus and vertical loreal region. Rostral broader than deep, scarcely visible from above; nasal large, in contact with the præocular; internasals shorter than the præfrontals; frontal nearly twice and a half as long as broad, a little narrower than the supraocular, longer than its distance from the end of the snout, shorter than the parietals; one præocular, not extending to the upper surface of the head; two postoculars, both in contact with the parietal, which in front is very narrowly separated from the fifth upper labial; temporals 1+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 17 rows. Ventrals 135; anal divided; subcaudals 69. Black above and beneath, head and anterior part of body minutely speckled with brown.

Total length 380 mm.; tail 105.

A single female specimen from Carriblanco, Costa Rica, collected by Mr. C. H. Lankester.

Rhadinea Steinbachi.

Rostral broader than deep, just visible from above; internasals broader than long, shorter than the præfrontals; frontal once and two thirds to nearly twice as long as broad, as long as or a little longer than its distance from the end of the snout, shorter than the parietals; loreal as long as deep or a little deeper than long; one præ- and two postoculars; temporals 1+2; eight upper labials, third, fourth, and fifth entering the eye; five or six lower labials in contact with the anterior chin-shields, which are as long as the posterior. Scales in 15 rows. Ventrals 142; anal divided; subcaudals 67-69. Grey above; anterior part of body with a broad dark brown or black vertebral band and a narrower lateral band; head dark brown or black above, with an oblique white spot in front of the eye, another behind the eye, and a third behind the parietals; upper lip and lower parts white.

Total length 540 mm. ; tail 150.

Two specimens, female and young, from the Province Sara, Department Santa Cruz de la Sierra, collected by Hr. J. Steinbach.

Liophis oligolepis.

Eye large. Rostral broader than deep, visible from above; internasals a little broader than long, shorter than the præfrontals; frontal twice as long as broad, much longer than its distance from the end of the snout, a little shorter than the parietals; loreal deeper than long; one præ- and two postoculars; temporals 1+2; eight upper labials, fourth and fifth entering the eye; four lower labials in contact with the anterior chin-shields, which are a little longer than the posterior. Scales in 15 rows. Ventrals 152; anal divided; subcaudals 61. Olive-brown above, the scales dark-edged; upper lip and lower parts white; a black streak behind the eye, above the posterior upper labials; a black streak along each side of the tail.

Total length 320 mm. ; tail 73.

A single female specimen from Igapé-Assu, Pará, Brazil, collected by M. A. Robert.

Atractus ventrimaculatus.

Snout obtuse. Rostral small, nearly as deep as broad, just visible from above; internasals very small; præfrontals as long as broad; frontal as broad as long or a little longer than broad, as long as its distance from the end of the snout, much shorter than the parietals; loreal twice to twice and a half as long as deep; two postoculars; temporals 1+2; eight upper labials (exceptionally seven), fourth and fifth (or third and fourth) entering the eye; four lower labials in contact with the single pair of chin-shields, which are moderately large and separated from the symphysial. Scales in 15 rows. Ventrals 145-157 in males, 158-159 in females; anal entire; subcaudals 19-20 in males, 14-15 in females. Olive to blackish brown above, uniform or with dark and light spots; a black vertebral stripe sometimes present; lower parts whitish, much speckled and spotted with black.

Total length 430 mm. ; tail 30.

Several specimens from Merida (1630 m.) and Fuqueros (2500 m.), Venezuela, collected by Señor Briceño.

Calamaria Gimlettii.

Rostral as deep as broad, the portion visible from above as long as its distance from the frontal, which is as broad as long and three times as broad as the supraocular; parietals much longer than the frontal; no præocular; one post-ocular; diameter of the eye two thirds its distance from the mouth; four upper labials, second and third entering the eye; first pair of lower labials forming a suture with its fellow behind the symphysial; both pairs of chin-shields in contact with each other. Scales in 13 rows. Ventrals 239; anal entire; subcaudals 11. Brown above, finely speckled with yellowish; scales of the two outer rows brown in front and white behind; a pair of yellowish spots on the upper surface of the tail, near its base; upper lip and lower parts white; a brown spot at the outer end of each ventral shield; a brown longitudinal line between the subcaudal shields.

Total length 265 mm.; tail 8.

A single female specimen from Kelantan, Malay Peninsula, collected by Dr. Gimlette.

Elaps princeps.

Eye measuring three fifths to two thirds its distance from the mouth. Rostral broader than deep; frontal broader than the supraocular, once and one third to once and a half as long as broad, shorter than its distance from the end of the snout; parietals longer than the frontal, as long as their distance from the internasals; one præ- and two postoculars; temporals 1 + 2; posterior nasal separated from the præocular by the præfrontal; seven upper labials, third much longer than fourth and in contact with the præfrontal, 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 220-228; anal divided; subcaudals 19-22 (3 to 5 of the anterior entire). Body with black annuli disposed in threes, subequal in width and separated by wider yellow interspaces; 7 or 8 sets of annuli, separated by red interspaces, which are about twice as broad as the yellow ones; the yellow and red scales brown behind, the former tipped with black; snout yellow, spotted with black; a narrow black cross-band traversing the eyes, across third upper labials, supraoculars, and frontal; back of the head, including posterior part of frontal and supraoculars, red, the shields edged with brown.

Total length 1220 mm.; tail 65.

Four specimens from the Province Sara, Department Santa Cruz de la Sierra, Bolivia, collected by Hr. J. Steinbach.

LVIII.—*Description of a new Mormyrid Fish from the White Nile.* By G. A. BOULENGER, F.R.S.

Marcusenius Harringtoni.

Depth of body $3\frac{1}{3}$ times in total length, length of head $5\frac{1}{3}$. Head as long as deep; snout rounded, $\frac{2}{7}$ length of head; mouth below nostrils, its width $\frac{1}{4}$ length of head; anterior nostril on a line with lower border of eye, posterior a little lower down; the distance between the anterior nostril and the end of the snout equals that between the posterior and the eye; latter moderate, its diameter $\frac{2}{3}$ length of snout and $\frac{1}{2}$ interocular width. Dorsal 31, its origin corresponding to that of anal, its length nearly $\frac{2}{3}$ its distance from head. Anal 33, equally distant from base of ventral and from base of caudal. Pectoral pointed, a little shorter than head, not quite twice as long as ventral. Caudal scaly, with pointed lobes. Caudal peduncle $3\frac{1}{2}$ times as long as deep, as long as head. 87 scales in the lateral line, $\frac{15}{16}$ in a transverse series on the body, $\frac{14}{14}$ in a transverse series between dorsal and anal, 12 round caudal peduncle. Brown above, white below; dorsal and anal fins blackish, white at the base; a blackish streak along each lobe of the caudal fin.

Total length 305 mm.

A single male specimen.

This well-marked species is named after Sir John Harrington.

LIX.—*Descriptions of Four new Freshwater Fishes discovered by Dr. W. J. Ansorge in Angola.* By G. A. BOULENGER, F.R.S.

Marcusenius Ansorgii.

Depth of body equal to length of head, $4\frac{1}{2}$ to 5 times in total length. Head once and $\frac{1}{3}$ as long as deep; snout rounded, $\frac{1}{4}$ length of head; mouth small, terminal, but situated below the level of the eyes; a feeble mental swelling; teeth small, notched, 7 in the upper jaw, 10 in the lower; eye shorter than the snout; anterior nostril on a level with centre of eye, posterior lower down and separated

from the eye by a space equal to its distance from the anterior. Dorsal 19, originating above 5th or 6th ray of anal, its length about $2\frac{1}{2}$ times in its distance from head. Anal 24-26, equally distant from base of caudal and from base of ventral, or a little nearer the former. Pectoral obtusely pointed, $\frac{2}{3}$ length of head, once and $\frac{2}{3}$ as long as ventral, not quite reaching base of latter. Caudal with rounded lobes. Caudal peduncle $2\frac{1}{2}$ or 3 times as long as deep, $\frac{2}{3}$ or $\frac{1}{3}$ length of head. 67-72 scales in the lateral line, $\frac{13-14}{17-18}$ in a transverse series on the body, $\frac{11}{10}$ between dorsal and anal, 16 round caudal peduncle. Brownish; a blackish vertical bar between origin of dorsal and anal.

Total length 110 mm.

Two specimens from between Benguella and Bihé.

This species is intermediate between *M. Lhuysii*, Stdr., and *M. pauciradiatus*, Stdr.

Gnathonemus angolensis.

Depth of body $3\frac{1}{2}$ times in total length, length of head 5 times. Head as long as deep, with curved upper profile; snout $\frac{1}{4}$ length of head; mouth small, on a line with lower border of eye; a feeble mental swelling; teeth small, conical, 5 in the upper jaw, 6 in the lower; eye $\frac{3}{4}$ length of snout. Dorsal 26, originating above 8th ray of anal, its length $2\frac{1}{3}$ times in its distance from head. Anal 33, nearer base of caudal than base of ventral. Pectoral pointed, a little shorter than head, twice as long as ventral, reaching base of latter. Caudal scaled in its basal half, with pointed lobes. Caudal peduncle $2\frac{1}{2}$ times as long as deep, $\frac{3}{4}$ length of head. 53 scales in the lateral line, $\frac{12}{16}$ in a transverse series on the body, $\frac{8}{8}$ between dorsal and anal, 12 round caudal peduncle. Brown above, silvery white beneath; a few irregular dark brown blotches on the body; fins dark brown.

Total length 135 mm.

A single specimen from the Quanza River.

Allied to *G. senegalensis*, Stdr.; distinguished by larger scales.

Alestes humilis.

Depth of body $3\frac{1}{2}$ times in total length, length of head 4 times. Head longer than deep, $2\frac{1}{2}$ times as long as broad; snout rounded, shorter than diameter of eye, which is $2\frac{3}{4}$ times in length of head and equals interorbital width; adipose

eyelid not much developed; maxillary not quite extending to below anterior border of eye; length of lower border of second suborbital equalling diameter of eye. Gill-rakers moderately long, 20 on lower part of anterior arch. Dorsal II 7, originating above ventrals and at equal distance between anterior border of eye and root of caudal. Anal III 14. Pectoral fin a little shorter than head, nearly reaching ventral. Caudal forked. Caudal peduncle twice as long as deep. Scales $30 \frac{11}{32}$, 2 between lateral line and ventral. Olive above, silvery beneath; a black spot on the caudal peduncle, extending on the median caudal rays.

Total length 70 mm.

A single specimen from the Quanza River.

Most nearly related to *A. Imberi*, Peters. Distinguished by a more elongate body with a greater number of scales in the lateral line.

Mastacembelus Ansorgii.

Depth of body 26 times in total length, length of head $8 \frac{1}{2}$ times. Vent halfway between end of snout and root of caudal. Rostral appendage trifid and as long as the eye, which is $3 \frac{1}{2}$ times in length of snout; cleft of mouth extending to below centre of eye; no præorbital spine; præoperculum with two or three strong spines. Dorsal XXXIV 128, anal II 120, both confluent with caudal, which is rounded; the distance between the first dorsal spine and the head is 3 times in the length of the latter. Pectoral $\frac{1}{2}$ length of head. 20 scales between the origin of the soft dorsal and the lateral line. Olive-brown above, yellow beneath, with dark brown spots and marblings; three series of large spots on the back, the lateral series confluent into a wavy band on the tail; below these spots a straight band along the body, disappearing a little in advance of the vent; a band on each side of the head, and a vertical bar below the eye; fins yellow, with dark brown spots and oblique streaks.

Total length 445 mm.

A single specimen from the Quanza River.

The nearest ally of this new species is *M. marmoratus*, Perugia, from the Congo.

This is the first *Mastacembelus* recorded from south of the Congo.

LX.—*Descriptions of some new Species of Syntomidæ and Arctiadæ from Tropical South America.* By HERBERT DRUCE, F.L.S. &c.

Fam. Syntomidæ.

Mesothen endoleuca, sp. n.

Male.—Head, antennæ, collar, tegulæ, thorax, abdomen, and legs black; abdomen with two greyish-blue lines from the base to the anus. Primaries and secondaries hyaline; costal margin, apex, outer and inner margins, and veins all black; the apex of the secondaries edged with black.—*Female* the same as the male, but with simple antennæ.

Expanse 1 inch.

Hab. Venezuela, Caura Valley (*T. M. Klages, Mus. Druce*).

Mesothen Ockendeni, sp. n.

Male.—Head, antennæ, and palpi black, front of head white; collar, tegulæ, thorax, and abdomen orange-yellow; a black spot at the base of the thorax and one on each segment, the anal segment black; underside of the thorax and legs black. Primaries and secondaries hyaline, the veins all black, the apex broadly black, the outer and inner margins edged with black; the apex of the secondaries black.—*Female* identical with the male.

Expanse $1\frac{3}{4}$ inch.

Hab. S.E. Peru, Santo Domingo, 6000 feet (*Mus. Druce*).

Cosmosoma anoxanthia, sp. n.

Male.—Head metallic blue; antennæ black, tipped with white; the front of the thorax orange, spotted with metallic blue; the tegulæ orange; thorax and abdomen black, the base of the thorax and sides of the abdomen spotted with bright metallic blue; legs black. Primaries hyaline, the apex and a band crossing the wing from the end of the cell to the anal angle black, veins black: secondaries hyaline, broadly edged with black. Underside as above.

Expanse $1\frac{1}{4}$ inch.

Hab. Venezuela, Corosita, Caura Valley (*T. M. Klages, Mus. Druce*).

Cosmosoma apennina, sp. n.

Male.—Head, antennæ, and palpi black; collar and tegulæ

yellow, thorax black; abdomen yellow, banded with black; anus and legs black. Primaries hyaline, the apex black; a wide yellow hyaline band crosses the wing between the end of the cell and the apex: secondaries hyaline, the apex black.—*Female* identical with the male.

Expanse 1 inch.

Hab. S.E. Peru, Santo Domingo, 6000 feet (*Mus. Druce*).

Argyroeides flavicincta, sp. n.

Male.—Head, antennæ, collar, tegulæ, thorax, and abdomen black, tegulæ edged with yellowish brown, abdomen banded with yellow on the upper and underside; legs black. Primaries and secondaries brownish hyaline, the costal, outer, and inner margins and veins black. The underside the same as the upperside.

Expanse 1 inch.

Hab. Venezuela, Caura Valley (*T. M. Klages, Mus. Druce*).

Hypocladia elongata, sp. n.

Male.—Head, tegulæ, and thorax brown, antennæ black, collar yellow; abdomen yellow at the base, the sides and underside bright red; a wide brown band down the middle from the base to the apex, spotted with darker brown on each side of the band. Primaries dark brown, the veins light brown; a large brownish-white spot beyond the cell crossing the wing from the costal almost to the outer margin; a greyish-white streak at the base of the cell and two small greyish spots near the middle: secondaries hyaline white, the apex, outer and inner margins bordered with dark brown. Underside: primaries brownish black, the light markings much more distinct: secondaries same as above.—*Female* almost identical with the male, but with simple antennæ.

Expanse $1\frac{3}{4}$ inch.

Hab. Venezuela, Caura Valley (*T. M. Klages, Mus. Druce*).

Hypocladia albipuncta, sp. n.

Female.—Head, antennæ, tegulæ, and thorax brown; collar red; abdomen dark brown, with a wide red band on each side extending from the base to the anus; legs brown. Primaries brown; three white spots beyond the cell, the third quite small; a white dot on the inner margin nearest the base: secondaries white, broadly bordered with brown from the apex to the inner margin. Underside as above.

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

Hab. S.E. Peru, Santo Domingo, 6000 feet (*Mus. Druce*).

Diptilon proleuca, sp. n.

Male.—Head, antennæ, palpi, tegulæ, thorax, and legs black; abdomen black, the two segments at the base yellowish white. Primaries yellowish hyaline, the veins and margins black: secondaries black, with a few yellowish-white hairs on the inner margin.

Expanse 1 inch.

Hab. Venezuela, Corosita, Caura Valley (*T. M. Klages*, *Mus. Druce*).

Urolasia albipuncta, sp. n.

Male.—Head, antennæ, palpi, tegulæ, and thorax blue-black, the front of the head white; abdomen blue-black, the base, a row of small spots down the middle, and two rows on the underside all white; legs black. Primaries yellowish hyaline, the veins, apex, outer and inner margins black: secondaries hyaline, the apex black.

Expanse $1\frac{1}{4}$ inch.

Hab. Venezuela, Corosita, Caura Valley (*T. M. Klages*, *Mus. Druce*).

Ceramidia chloroplegia, sp. n.

Male.—Head, antennæ, collar, tegulæ, and thorax black, the collar and tegulæ spotted with metallic green; abdomen metallic green, with two black bands (one on each side) extending from the base to the anus; the underside of the abdomen black, with a white line on each side. Primaries and secondaries black, shot with dark green.

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

Hab. Venezuela, Corosita, Caura Valley (*T. M. Klages*, *Mus. Druce*).

Ixylasia pyroproctis, sp. n.

Male.—Head, antennæ, collar, tegulæ, and thorax black, the collar and tegulæ spotted with bluish white; the abdomen black, the anal segments brick-red, the base, the sides, and underside spotted with white; legs black. Primaries hyaline, the costal, outer, and inner margins and veins all black; a large square-shaped black spot at the end of the cell: secondaries hyaline, the apex and outer margin black; the veins black. Underside as above, excepting a small white streak on the costal margin of the secondaries.

Expanse $1\frac{3}{4}$ inch.

Hab. Venezuela, Caura Valley (*T. M. Klages*, *Mus. Druce*).

Neacerea pyrozona, sp. n.

Male.—Head, antennæ, collar, tegulæ, thorax, and abdomen black, the base of the thorax yellow, the fourth, fifth, and sixth segments of the abdomen bright red; the underside of the thorax and abdomen pink. Primaries blackish brown, the veins yellowish; a spot in the cell and four spots nearer the apex greyish white, in some specimens these spots are much more distinct than others: secondaries hyaline at the base, broadly bordered with black at the apex and round the outer margin. The underside of both wings much blacker than the upperside, and the greyish-white marking much more distinct.

Expanse $1\frac{1}{4}$ inch.

Hab. Venezuela, Corosita, Caura Valley (*T. M. Klages, Mus. Druce*).

Neacerea rhodocrypta, sp. n.

Male.—Head, palpi, antennæ, collar, tegulæ, and thorax greyish brown, the collar and tegulæ spotted with black; abdomen and legs black; the underside of the thorax and abdomen yellowish white. Primaries dark brown, spotted with greyish white in the cell and near the apex: secondaries hyaline, broadly bordered with black. The underside of both wings very similar to the upperside.—The *female* almost identical with the male.

Expanse $1\frac{1}{4}$ inch.

Hab. Venezuela, Corosita, Caura Valley (*T. M. Klages, Mus. Druce*).

Neacerea discalis, sp. n.

Male.—Head, antennæ, palpi, collar, tegulæ, thorax, abdomen, and legs all black, the tegulæ spotted with red at the base, the underside of the thorax and abdomen white. Primaries dusky hyaline, the veins, a large spot at the end of the cell, the apex, outer and inner margins black: secondaries hyaline, broadly edged with black.

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

Hab. Venezuela, Corosita, Caura Valley (*T. M. Klages, Mus. Druce*).

Neacerea flaviceps, sp. n.

Male.—Head yellow; antennæ and palpi black, palpi yellow at the base; collar, tegulæ, thorax, and abdomen greyish black, underside of the abdomen yellow; legs greyish

black. Primaries brownish black; a semihyaline streak from the base partly along the inner margin; a white band crosses the wing beyond the cell from the costal to the outer margin: secondaries hyaline, broadly bordered with black, shot with dark blue. Underside very similar to the upper-side.

Expanse $1\frac{3}{4}$ inch.

Hab. Venezuela, Corosita, Caura Valley (*T. M. Klages, Mus. Druce*).

Heliura phaeosoma, sp. n.

Male.—Head, antennæ, palpi, collar, and tegulæ dark brown, the back of the head and collar reddish brown; abdomen black, white on the underside; legs black. Primaries brown; a white spot in the cell, a streak below the cell near the base, and four spots crossing the wing near the apex all semihyaline white; the veins all red: secondaries hyaline, broadly bordered with black, the veins black.

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

Hab. Venezuela, Corosita, Caura Valley (*T. M. Klages, Mus. Druce*).

Heliura zonata, sp. n.

Male.—Head, antennæ, and palpi black, back of the head yellow; collar, tegulæ, and thorax grey, edged with black, the base of the thorax yellow; abdomen red, the underside reddish white; the anus and a line on each side of the abdomen black; legs black. Primaries yellowish white; a brown band crosses the wing close to the base; a wide brown band crosses the wing beyond the middle from the costal margin to the anal angle; the apex brown; the veins all brown: secondaries white, with the apex and outer margin dusky brown.

Expanse $1\frac{1}{4}$ inch.

Hab. Venezuela, Corosita, Caura Valley (*T. M. Klages, Mus. Druce*).

Eucereon atrigutta, sp. n.

Male.—Head, thorax, and tegulæ greyish white; antennæ black, collar red, tegulæ with black spot at the base; abdomen pinkish red, the anal segment black, underside yellowish white; legs blackish. Primaries greyish white, thickly spotted with black; a row of black spots crosses the wing beyond the cell from the costal margin to the apex; four or

five small black spots close to the apex and several along the outer and inner margins: secondaries white, the apex and outer margin black. Underside: primaries dark grey; a white spot in the cell and a row of small white dots beyond the cell, those close to the costal margin the largest: secondaries the same as above.—The *female* is identical with the male.

Expanse $1\frac{3}{10}$ inch.

Hab. Venezuela, Caura Valley (*T. M. Klages, Mus. Druce*).

Eucereon leprota, sp. n.

Female.—Antennæ blackish brown; head, collar, tegulæ, and front part of thorax greyish; base of the thorax and upperside of the abdomen to beyond the middle blackish brown; the sides and lower segments bright red, the anal segment black; the underside of the thorax and abdomen yellowish white; the legs greyish; a row of black dots on each side of the abdomen from the base to the anus. Primaries grey, the base, a round spot in the cell, a broken band at the end of the cell, and a row of spots near the apex all greyish brown; a series of small greyish-brown spots along the inner margin; a marginal row of small spots extends from the apex to the anal angle: secondaries greyish white, the apex and outer margin broadly bordered with greyish brown. Underside: primaries blackish brown, the pale markings more distinct than above; the secondaries the same as above.

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

Hab. Venezuela, Caura Valley (*T. M. Klages, Mus. Druce*).

Correbia minima, sp. n.

Male.—Head, collar, and tegulæ yellowish brown; antennæ, thorax, and abdomen black; legs brownish black; the base of the abdomen on the underside yellowish brown. Primaries black; the base and a wide band crossing the wing from the costal margin to the anal angle pale yellowish brown; the fringe black: secondaries semihyaline black, darkest at the apex and round the outer margin. Underside very similar to the upperside, but the brown markings brighter in colour; secondaries with a small brownish-yellow spot on the costal margin.

Expanse 1 inch.

Hab. Venezuela, Caura Valley (*T. M. Klages, Mus. Druce*).

Hyaleucerea leucosticta, sp. n.

Male.—Head, palpi, antennæ, thorax, tegulæ, and abdomen black; two white spots at the back of the head and two large white spots on the thorax; the sides of the abdomen and a small spot on the anus white; legs black and white. Primaries black, greyish in the middle and near the apex: secondaries hyaline, broadly bordered with black from the apex to the anal angle.

Expanse $1\frac{3}{4}$ inch.

Hab. Venezuela, Corosita, Caura Valley (*T. M. Klages, Mus. Druce*).

Fam. Arctiadæ.

Ischnocampa deceptura, sp. n.

Male.—Head, antennæ, palpi, collar, tegulæ, thorax, abdomen, and legs brown. Primaries brown, thickly irrorated with minute black scales; a very indistinct submarginal band extends from the apex to the anal angle: secondaries yellowish white, slightly dusky at the apex.

Expanse $1\frac{1}{4}$ inch.

Hab. S.E. Peru, Santo Domingo, 6000 feet (*Mus. Druce*).

Ischnocampa flavicosta, sp. n.

Male.—Head yellow; antennæ and palpi black; collar, tegulæ, and thorax fawn-colour, the base of the tegulæ yellow; abdomen blackish brown, the underside yellow; legs brown. Primaries fawn-colour, the costal margin from the base to the apex yellow; a yellowish indistinct round spot at the end of the cell: secondaries semihyaline white, the costal margin and the apex edged with fawn-colour.

Expanse $1\frac{1}{4}$ inch.

Hab. S.E. Peru, Santo Domingo, 6000 feet (*Mus. Druce*).

Ischnocampa barbata, sp. n.

Male.—Head, antennæ, palpi, collar, tegulæ, and thorax pale grey-brown; abdomen and legs brown; anus yellow. Primaries pale greyish brown, with a darker brown band down the middle of the wing extending from the apex to the base; a small brown spot about the middle of the cell: secondaries greyish, clouded with darker brown at the apex.

Expanse $1\frac{3}{4}$ inch.

Hab. S.E. Peru, Santo Domingo, 6000 feet (*Mus. Druce*).

Metoxanthia threnodes, sp. n.

Male.—Head, antennæ, palpi, collar, tegulæ, thorax, abdomen, and legs black; underside of the thorax, base of the abdomen, and anus yellowish white. Primaries black, becoming hyaline from the end of the cell to the apex: secondaries hyaline, the apex and veins black.

Expanse 1 inch.

Hab. Venezuela, Corosita, Caura Valley (*T. M. Klages, Mus. Druce*).

Stidzæras strigifera, sp. n.

Male.—Head and collar chrome-yellow; two black dots on each side of the collar; antennæ, palpi, and thorax brown; abdomen yellow, banded with black near the anus; legs brown. Primaries pale brown, thickly striated with fine yellow lines; secondaries pale yellow, broadly bordered from the apex to the anal angle with blackish brown. The underside of the primaries dark brown, the secondaries similar to the upperside.

Expanse 2 inches.

Hab. Venezuela, Corosita, Caura Valley (*T. M. Klages, Mus. Druce*).

LXI.—*Descriptions of new Species of Sphegidæ and Ceropalidæ from the Khasia Hills, Assam.* By P. CAMERON.

[Concluded from p. 424.]

Anoplius palades, sp. n.

Black; the lower part of the front, clypeus, and face densely covered with silvery pubescence. Thorax, legs, and abdomen densely pruinose; the apical segment of the abdomen densely covered with long black hair. Wings hyaline; the radial, cubital, and the lower part from the top of the first recurrent nervure smoky; the first cubital cellule in front is about one third longer than the second; the first transverse cubital nervure roundly curved, the third almost straight and oblique, as is also the second; the first recurrent nervure received at the base of the apical third, the second shortly behind the middle of the cellule; the transverse basal nervure interstitial. Spines and calcaria black. ♀.

Length 9 mm.

Anoplius reconditus, sp. n.

Black; the head below the antennæ densely covered with silvery pubescence; the hinder ocelli separated from the eyes by double the distance they are from each other. Apex of clypeus and labrum transverse in the middle. Mandibles at base thickly covered with silvery pubescence, the apex smooth and shining; the teeth piceous. Thorax densely pruinose, the median segment with a gradually rounded slope without furrows. Furrows on the meso- and metapleuræ narrow, but distinct. Wings almost hyaline at the base, the middle fuscous suffused with hyaline, the apex uniformly smoky; the apical abscissa of the radius long and with a gradually rounded curve; the first cubital cellule in front fully three times the length of the second; the first transverse cubital nervure with a gradually rounded slope above the middle, the lower part being oblique; the third has the lower part rounded and oblique, the upper straight; the recurrent nervures received shortly beyond the middle. Legs pruinose; their spurs black. Base of abdominal segments with broad pruinose bands; the apical segment densely covered with black hair. ♀.

Length 8 mm.

Anoplius ædilis, sp. n.

Black; the front and vertex sparsely covered with long fuscous hair, the face and clypeus densely with silvery pile; the eyes parallel, only very slightly converging above; the clypeus transverse, with the sides rounded. Thorax pruinose, shining; the metanotum with a gradually rounded slope and bearing a few long black hairs in the middle. Legs thickly pruinose, the calcaria black. Wings hyaline; the apex from the base of the radial cellule, from the first transverse cubital nervure, and, below, from the end of the first recurrent nervure, smoky. Apical segments of abdomen thickly covered with long black hair. ♀.

Length 10 mm.

In front the first cubital cellule is slightly longer than the second, below slightly shorter than it; the first recurrent nervure is received near the base of the apical fourth of the cellule, the second almost in the middle; first transverse cubital nervure straight, oblique, the second roundly curved, the third obliquely curved in front.

Anoplius stimulatus, sp. n.

Black; the inner orbits from shortly above the antennæ

and the sides of the clypeus broadly white; mandibles (except at the apex) and the coxæ on lower side yellowish white; the apical half of middle femora (except at the base and apex) red; the apical two thirds of the first abdominal segment, the whole of the second and the base of the third, narrowly in the middle, more broadly at the sides, ferruginous; the fourth and fifth segments have the sides at the base obscure testaceous. Wings fuscous-violaceous, paler at the base; the stigma and nervures black. ♂.

Length 15 mm.

Head densely covered with silvery pile; the eyes distinctly converging above; the hinder ocelli separated from the eyes by a distinctly greater distance than they are from each other. Palpi black. Clypeus broadly roundly convex, its apex transverse, the sides rounded. Thorax densely covered with silvery pubescence; a narrow shining line down the middle of the scutellum; median segment closely, but not very strongly transversely striated. Abdomen pruinose. Second cubital cellule in front shorter than the third; the first and third transverse cubital nervures roundly curved; the second straight, oblique; the first recurrent received shortly beyond the middle, the second at the base of the basal third of the cellule.

Anoplius ardescens, sp. n.

Black; the front and vertex sparsely covered with long black hair, the face and clypeus with silvery pubescence, the hinder ocelli separated from the eyes by double the distance they are from each other; clypeus transverse, the sides rounded. Mandibles at base thickly covered with silvery pubescence, the apex rufous. Palpi black. Median segment obliquely sloped at the apex, thickly covered (especially the apex) with silvery pubescence; there is a short curved furrow on the sides at the base. Legs densely pruinose; the claws have the basal tooth shorter and much stouter than the apical. Wings fuscous-hyaline, the nervures and stigma fuscous. ♂.

Length 10 mm.

Pronotum longish, the sides behind oblique. Abdominal segments plumbeous grey at the base, smooth and shining; the fourth and fifth ventral segments thickly covered with long black hair; second cubital cellule almost longer than the third in front; the first and third transverse cubital nervures are roundly curved; the second straight, oblique; both the recurrent nervures are received shortly beyond the middle of the cellules.

Anoplius lictor, sp. n.

Length 10 mm. ♀.

Agrees in size and coloration of the wings and body with *A. ardescens*, but may readily be separated from it since the third cubital cellule, instead of being almost equal in length with the second, is scarcely half its length.

Front and vertex sparsely covered with long fuscous hair, the lower orbits and clypeus thickly with silvery pubescence. Eyes parallel; the hinder ocelli separated from the eyes by double the distance they are from each other. Apex of clypeus transverse, its sides broadly rounded. Base of mandibles covered with greyish pubescence and with longish hair. Palpi black, the apical joints covered with white pubescence. Thorax pruinose. Pronotum large, its apex with oblique sides. Metanotum with a gradually rounded slope: the pubescence is much thicker on the apex. Wings uniformly fuscous hyaline, with a slight violaceous tint; the first cubital cellule in front fully twice the length of the third; the first and third transverse cubital nervures roundly curved; the second straight, oblique; the first recurrent is received near the base of the apical third, the second shortly beyond the middle. Legs pruinose; the lower tooth of the claws shorter, thicker, and blunter than the upper. Abdomen pruinose, densely at the apex.

Anoplius tyres, sp. n.

Black; the wings fuscous-violaceous, paler on the lower part of the radial, in the cubital cellules, and at the base of the hind wings; the second cubital cellule is nearly twice the length of the third in front, behind not much more than half its length. ♀.

Length 11 mm.

Eyes obliquely converging above. Front and vertex slightly shining, sparsely covered with black hairs; there is a furrow below the ocelli and a deeper one above the antennae. Apex of clypeus distinctly margined, depressed; its sides broadly rounded. Thorax alutaceous; the metanotum thickly covered with a white pile; its apex oblique, broadly rounded above. Legs pruinose, their spines long, stout. The first transverse cubital nervure is obliquely bent at the top, the second straight, oblique, the third roundly curved; both the recurrent nervures are received shortly beyond the middle.

Anoplius fortinatus, sp. n.

Length 11 mm.

Similar in coloration to *A. tyres*, but is not so stoutly built; may be known from it by the first transverse cubital nervure being roundly, not obliquely curved at the top, by the second cubital cellule in front being more than twice the length of the third, by the front not having two furrows, and by the median segment being more gradually rounded on the apical half.

Front and vertex with a few long hairs, the face and clypeus thickly covered with silvery pubescence. Sides of clypeus rounded. Median segment with a gradually rounded slope on the apex, on the end of which are two deep foveæ. Wings fuscous with a violaceous tinge, paler at the base and below the stigma. The second cubital cellule behind is not much more than half the length of the third; first transverse cubital nervure roundly curved, the second oblique; the recurrent nervures are received shortly beyond the middle; the subdiscoidal nervure is obliquely turned upwards at the base. Abdomen pruinose.

Anoplius delphus, sp. n.

Black; the basal four joints of the antennæ rufous; the inner and outer orbits, apex of clypeus, and middle of mandibles ferruginous yellow, the yellow line on the hinder orbits extending on to the vertex near to the hinder ocelli; a line on the pronotum behind, the lower side of the propleuræ, and a mark, broader than long, with straight sides, on the apex of the mesonotum, fulvous yellow; a line, narrowed on the inner side, on the sides of the second segment at the base, a broader, uninterrupted one on the third, and a still broader one on the fifth and sixth, yellow. Legs pruinose, the apical half of the fore femora below and of the four hinder entirely, the base of the front tibiæ, the four hinder (except at the base and apex), and the basal two thirds of the basal joints of the four hinder tarsi, red; the calcaria white; the tibial and tarsal spines red. Wings smoky hyaline, the apex from the second transverse cubital nervure dark smoky. ♀.

Length 11 mm.

Head smooth. Eyes converging above; the hind ocelli are separated from each other by a distinctly greater distance than they are from the eyes. Apex of clypeus semicircular; there is a narrow furrow above the antennæ; the vertex

sparsely covered with long fuscous, the orbits and clypeus with silvery, pubescence. Thorax sparsely covered with longish black hair and, more sparsely, with a greenish pile. Median segment with a gradually rounded slope. The second cubital cellule at the top is twice the length of the third, at the bottom the space bounded by the first transverse cubital and the first recurrent nervures is as long as the lower side of the third cubital cellule; the first recurrent nervure is received shortly beyond the basal third of the cellule, the second shortly beyond the middle.

The ♂ has only the third to fifth joints red beneath, the third is slightly shorter than the fourth, and the yellow line on the outer orbits is narrower.

Anoplus addendus, sp. n.

Length 10 mm. ♂.

This species so closely resembles *P. delphus* that it might be expected to be its ♂; it may, however, be readily separated from it by the vertex being wider at the top through the eyes not converging so much there; there is consequently a wider space between the hinder ocelli and the eyes; the apex of the median segment has an oblique, not a rounded, slope; the first recurrent nervure is received at the base of the basal third, not near the middle, the second is received nearer the middle, the top of the third transverse cubital nervure is not obliquely angled, and the four hinder tarsi are entirely black.

Antennæ stout, tapering a little towards the apex, as long as the head and thorax united; the scape thickly covered with long white hair; the third, fourth, and fifth joints rufous beneath; the third and fourth joints are equal in length. Head smooth and shining; the clypeus thickly covered with silvery pubescence, the front and vertex with fuscous hair. Eyes not converging above; the ocelli separated from them by the same distance they are from each other. Apex of clypeus transverse, its sides rounded; labrum large, triangularly incised in the middle. Mandibles reddish in the middle; the palpi testaceous, black at the base. Thorax pruinose, shining, smooth; the edge of the pronotum broadly behind and a mark, broader than long, on the apex of the mesonotum rufo-testaceous; the base of the pronotum with a broad band of reddish-bronzy pubescence; the apex of the median segment has an oblique slope and is thickly covered with pale golden, mixed with bronzy, pubescence. Legs black; the knees and the tarsi rufous, as

is also the base of the front tarsi; the spines and calcaria are rufous; the base of the fore tarsi incised. Wings hyaline; the apex and the radial and cubital cellules smoky; the second cubital cellule at the top is only a little longer than the third; the first transverse cubital nervure is roundly curved, the other two are straight, oblique; the first recurrent nervure is received shortly beyond the middle, the second near the base of the basal third. Abdomen pruinose; the base of the second and third segments distinctly, the fourth and fifth indistinctly, and the whole of the sixth, reddish fulvous; the last ventral segment is roundly raised in the middle and has an oblique depression on either side of the middle near the apex.

Anoplius funebranus, sp. n.

Black; the face, cheeks, and clypeus thickly covered with silvery pubescence, the front and vertex sparsely with long black hair. Wings uniformly fuscous-violaceous, the apical nervures fuscous; abdomen shining, pruinose. ♀.

Length 14 mm.

Eyes distinctly converging above. Middle of clypeus transverse, the sides rounded. Mandibles rufous before the apex; the palpi black, thickly covered with white pubescence. Thorax pruinose; the sides of pronotum oblique behind; the median segment has a gradually rounded slope. The fovea on propleuræ is long, deep, pyriform. The first cubital cellule at the top is, if anything, longer than the second; the first transverse cubital nervure is obliquely curved in front, the second straight, oblique, the third slightly curved; the first recurrent nervure is received at the base of the apical fourth, the second shortly before the middle.

Anoplius lanatus, sp. n.

Black, densely pruinose, the apex of the pronotum with a pale yellow band, the apex of the abdomen white. Legs (especially the underside of the coxæ and trochanters) thickly covered with silvery pubescence; the apex of the hind femora and the hinder tibiæ, except at the apex, dark rufous. Wings hyaline, the apex from the end of the stigma smoky. ♂.

Length almost 8 mm.

Antennæ short, thick, the basal joints rufous below; the scape pallid yellow below and covered with white hair. Front and vertex covered with long fuscous hair, the inner

orbits, face, and clypeus thickly covered with silvery pile. An indistinct furrow on the middle of the front; the apex of clypeus slightly roundly incised; labrum pilose, its apex rounded. Mandibular teeth rufous. Apical joints of palpi testaceous, darker above. Postscutellum thickly covered with long pale hair. Base of median segment pruinose, the base in the middle with a semicircular depression; its apex obliquely rounded and thickly covered all over with long woolly hair. Abdomen densely pruinose, slaty grey. First and second transverse cubital nervures roundly curved; the third has the upper half straight, oblique; the second cubital cellule in front is about one third of the length of the third, below not much shorter than it; the first recurrent nervure is received at the base of the apical third, the second in the middle of the cellule.

Salix fluctuatus, sp. n.

Black, densely covered with golden pubescence; the basal three joints of the antennæ entirely, and the fourth and fifth beneath, ferruginous: legs rufo-fulvous; the coxæ and trochanters black; densely covered with golden pile; the tips of the tarsi and the apices of their basal joints black. Wings hyaline, with a slight, but distinct, fulvous tint; the stigma and nervures pallid yellow; the second cubital cellule in front slightly longer than the first; the first transverse cubital nervure straight, obliquely bent at the top, the others roundly curved outwardly; both the recurrent nervures are received before the middle of the cellule. ♂.

Length 14 mm.

Claws with one median tooth. Front and vertex sparsely covered with long fuscous hair. Clypeus fulvous, as seen through the golden pile; its apex almost transverse, the sides of the middle part very slightly dilated; laterally it is oblique. Mandibles and palpi fulvous yellow; the teeth picceous. Hind ocelli separated from the eyes by double the distance they are from each other. Apex of pronotum rounded. Scutellums roundly convex. Median segment with a gradually rounded slope; alutaceous, not transversely striated, and indistinctly furrowed down the middle. Tegule rufous.

Allied to the Ceylonese *S. crinitus*.

Salix Frederici, sp. n.

Length 17 mm. ♂.

Belongs to the section with the claws bidentate, and in

Bingham's table comes into "b. Wings fuscous or fuscous black, with a purple effulgence," and nearest to "c'. The entire abdomen ferruginous red, only the extreme base narrowly black," represented by *S. Smithii*, Bing., = *ferrida*, Sm., which is very different, it having the head and thorax black.

Reddish brown; the anterior legs reddish yellow; the four hind coxæ largely black on the inner side; the basal joints of the hind tarsi slightly black at the base. Base of abdomen black; the apices of the middle segments broadly infuscated; the apical thickly covered with long stiff black hair; the apex of the penultimate segment depressed and armed with a stout, curved, claw-like tooth, which is broadly black at the apex. Wings dark brownish, with a distinct violaceous effulgence, the base with a yellowish tinge; the first recurrent nervure is received close to the second transverse cubital, the second shortly beyond the basal third of the cellule. Antennæ dark ferruginous; the scape thickly covered with a pale down. Face and clypeus thickly covered with bright golden down; the sides of clypeus oblique, the middle transverse. Apex of mandibles black. Front and vertex opaque, granular, sparsely covered with long black hair; the front furrowed. Apex of pronotum rounded at the apex. Scutellum not much raised; the postscutellum large, pyramidal, narrowed on the top, the sides behind margined. Middle of metanotum black, depressed, the apex with an oblique slope; on the basal three fourths are some transverse striæ. Pleural sutures black, crenulated. In front of the hind coxæ is a large deep depression, bordered by a stout, somewhat triangular keel.

Salus saturnalis, sp. n.

Black; the antennæ (except the apical five joints), head, pronotum, base of mesonotum, apex of femora, tibiæ, and tarsi ferruginous; the apex of the tarsi black; wings violaceous. ♂.

Length 17 mm.

Head ferruginous, the occiput broadly in the centre, the greater part of the vertex and the front broadly in the middle, black; thickly covered with depressed golden pile, the front and vertex sparsely with long black hair. Apex of clypeus almost transverse; in the centre below the antennæ is a raised triangular space, bordered by shallow furrows. Labrum fringed with long golden hair. Apex of mandibles black. The pronotum above is bright ferruginous, the

mesonotum and base of scutellum dark brown and thickly covered with depressed golden pile. Sides of pronotum roundly projecting, its centre furrowed, narrowly below, broadly above. Scutellum raised, flat on the top. Post-scutellum tuberculate, narrowed towards the top, which rises near to the summit of the scutellum; the apices of both are thickly covered with long black hairs. Median segment deep velvety black, transversely striated, sparsely covered with long fuscous hair; the base behind the spiracles tuberculate. Tegulae ferruginous. Abdomen deep black; the apical segments thickly covered with long black hair.

This species has the scutellum tuberculate as in *S. zelotypus*, Bing., but is very distinct otherwise; in coloration it agrees closely with *S. peregrinus*, Sm., but that has the pronotum rounded at the base and not tuberculate laterally. The basal tooth of the claw is stout, bluntly rounded at the apex, and shorter than the apical.

Salix tempestivus, sp. n.

Black, densely covered with pale golden pubescence; legs black, all the femora (except at the apex and the base of the anterior), the four posterior tibiae (except narrowly at the apex), and the apex of the front tibiae narrowly, ferruginous. Wings fuscous-violaceous, the stigma and nervures black; the base from the transverse basal nervure almost hyaline; the second cubital cellule is slightly, but distinctly, shorter than the third; the first transverse cubital nervure is straight, oblique, its top obliquely angled; the first recurrent nervure is received shortly beyond, the second at the apex of the basal third of the cellule, the transverse median widely separated from the basal. Abdomen pruinose; the pygidial area smooth; its basal half obscurely keeled in the middle; its sides densely fringed with long fuscous hair. ♀.

Length 17 mm.

Antennae black, bare. Head densely covered with depressed pale golden pubescence, which hides the sculpture. The eyes converge slightly above; the hind ocelli are separated from the eyes by a slightly greater distance than they are from each other. Apex of clypeus smooth, shining, bare, depressed; the sides slightly, roundly, obliquely curved. Apical half of mandibles rufous; the palpi black, densely covered with white pile. Median segment irregularly, transversely striated. Mesosternum smooth, the furrow narrow, the apex with a transverse keel.

Salix præcursor, sp. n.

Length 12 mm. ♀.

Belongs to Bingham's section "A. Tarsal claws bidentate. a. Wings some shade of fulvous yellow. a'. Head and thorax black," in which it will form a new section "Abdomen ferruginous." It has a great resemblance to *Pseudagenia pulchrifrons*, Cam.

Basal six joints of antennæ rufo-fulvous; the eighth to tenth black above, dark rufous below, the rest entirely black. Head black, densely covered with golden pile, the clypeus with a more rufous tinge, its middle at the apex with a short tooth; labrum piceous, the apex waved. Mandibles rufous yellow, the apex deep black; the base with a down and some long golden hairs. Palpi yellowish. Thorax densely covered with golden pile, which in fresh examples hides the black colour; the prothorax rufous, a semicircular black mark on the base above, and the middle of the pronotum is black, its lower part with golden pubescence. The median segment with a gradually rounded slope and no furrow; in addition to the golden pile it is covered rather thickly with long fuscous hair. Propleuræ dilated above, divided into two beyond the middle by a furrow; in the middle is a narrow oblique furrow. Wings yellowish hyaline, the apex with a faint fuscous cloud; the stigma dark testaceous; the first cubital cellule at the top and bottom slightly, but distinctly, shorter than the third. Legs rufo-fulvous; the coxæ black at the base above, the anterior with a distinct yellowish tinge; the extreme base of the second joint of tarsi and the following black. Abdomen dark ferruginous; the base and apex of the basal segment, the second segment broadly, and the base of the third irregularly black.

I have referred this species to the section with bidentate claws; but practically there are three teeth, there being a small tooth behind the two larger ones.

The species described in this paper are in the collection of Mr. G. A. James Rothney.

LXII.—*Rhynchotal Notes*.—XXXII. By W. L. DISTANT.

Fam. Cicadidæ (continued).

Subfam. *TIBICININÆ*.

Division HYANTIARIA.

In this division the lateral margins of the pronotum are oblique, not dilated; the abdomen is broad and robust, its dorsal surface centrally obtusely longitudinally ridged, its lateral areas obliquely depressed on each side, its apex narrowed; the tympana are completely exposed, the tympanal coverings being entirely absent; the opercula in the male are short, transverse, not extending beyond the base of abdomen; the metasternum is centrally globosely elevated and posteriorly terminates in two spinous prolongations placed between the posterior coxæ; the anterior femora are spined beneath; the tegmina and wings are hyaline and usually more or less maculate.

At present the Hyantiaria comprises three Neotropical genera.

Synopsis of Genera.

- A. Posterior pronotal angles dilated.
- a. Head with the front long and prominent; longer than vertex.
 - b. Basal cell of tegmina scarcely longer than broad . . . *Quesada*.
 - aa. Head with the front not prominent, much shorter than vertex.
 - bb. Basal cell of tegmina considerably longer than broad. *Mura*.
- B. Posterior pronotal angles not dilated.
- aaa. Head with the front not prominent, a little shorter than vertex.
 - bbb. Basal cell of tegmina a little longer than broad. . . . *Hyantia*.

QUESADA, gen. nov.

Body broad and robust; head (including eyes) about as wide as base of mesonotum and about as long as pronotum without its posterior margin, front broad and prominent, longer than vertex; pronotum about as long as mesonotum, its lateral margins oblique, the posterior angles moderately dilated; mesonotum a little convex; abdomen short, broad, very little longer, sometimes only as long as space between apex of head and base of cruciform elevation, its apex more or less attenuated; tympanal orifices entirely exposed, tympanal flaps altogether absent; abdomen beneath a little

convex to lateral margins, which are flat and at right angles to disk; opercula in male very small, situate widely apart, and not extending beyond base of abdomen; anterior femora spined beneath; rostrum reaching base of posterior coxæ; metasternum centrally elevated, the process posteriorly triangularly produced between the posterior coxæ; tegmina and wings hyaline, the first long, somewhat narrow, greatest breadth not quite one third of length, venation normal, apical areas eight, basal cell almost as broad as long.

Type, *Q. gigas*, Oliv. (*Cicada*).

Genus MURA.

Mura, Dist. Biol. Centr.-Amer., Rhynch. Hom. i. p. 143 (1905).

Type, *M. elegantula*, Dist.

Genus HYANTIA.

Hyantia, Stål, Hem. Afr. iv. p. 2 (1866).

Type, *H. honesta*, Walk. (*Cyclochila*).

Division TETTIGADESARIA.

Lateral margins of the pronotum dilated and usually medially angulate; head varying in breadth and size; tympana completely exposed, the tympanal coverings entirely absent; tegmina and wings either hyaline or semiopaque.

This division is primarily founded on the character of the dilated pronotal margins, and holds a similar position in the Tibicininae as the division Polyneuraria does in the Cicadinae and the division Zammararia in the Gæaninae.

Synopsis of Genera.

- A. Lateral margins of pronotum dilated and medially angulate.
- a. Head (including eyes) narrower than base of mesonotum.
 - b. Space between pronotal dilatations less than width of abdomen.
 - c. Basal cell of tegmina distinctly longer than broad; tegmina and wings hyaline *Collina*.
 - bb. Space between pronotal dilatations considerably wider than breadth of abdomen.
 - cc. Basal cell of tegmina slightly longer than broad; tegmina and wings semiopaque. *Orapa*.
 - aa. Head (including eyes) as wide as base of mesonotum.
 - bbb. Space between pronotal dilatations equal to greatest width of abdomen.
 - ccc. Basal cell of tegmina twice as long as broad . . . *Daza*.

B. Lateral margins of pronotum dilated, but not medially angulate.

- d.* Head (including eyes) about as wide as base of mesonotum, its margins moderately convex, the front scarcely projecting, and about as long as vertex at area of ocelli *Tettigades.*
- dd.* Head (including eyes) much wider than base of mesonotum, its margins sinuately oblique, the front strongly projecting, and longer than vertex at area of ocelli *Chonosia.*

Genus COLLINA.

Collina, Dist. Biol. Centr.-Amer., Rhynch. Hom. i. p. 142 (1905).

Type, *C. Biolleyi*, Dist. (*Odopœa*).

ORAPA, gen. nov.

Head (including eyes) about two thirds the width of base of mesonotum, its length about equal to space between eyes, front shorter than vertex; pronotum almost as long as mesonotum, its lateral margins amplified and medially angulate; abdomen in male short, not longer than space between apex of head and base of cruciform elevation; tympanal orifices completely exposed; opercula in male short, transverse, not quite reaching base of abdomen; rostrum passing posterior coxæ; posterior tibiæ finely spined on apical half; tegmina and wings semiopaque, the first with eight apical areas and with the basal cell very slightly longer than broad; wings with six apical areas.

Type, *O. numa*, Dist. (*Pyena*).

In describing what proves to be the type of this genus I stated that I based my diagnosis on a single female specimen only, which I had kept in my possession for some years, hoping to receive an example of the male. This I have now seen, which enables me to recognize it from its tympanal characters as representing a new genus of the subfamily Tibicinæ.

DAZA, gen. nov.

Head (including eyes) about as wide as base of mesonotum, in length as long as pronotum (excluding posterior margin), front broad but narrow, not prominent, inserted somewhat deeply in vertex; pronotum shorter than mesonotum, its lateral margins amplify and medially angulate; mesonotum a little convex; abdomen broad, robust, longer than space between apex of head and base of cruciform elevation; tympanal orifices entirely exposed, tympanal flaps altogether

absent; abdomen beneath with the disk moderately convex, the lateral margins distinct and slightly oblique; opercula in male small, transverse, well separated internally, not extending beyond base of abdomen, between them there is a flat, transverse, metasternal process; disk of metasternum elevated, posteriorly triangularly produced between the posterior coxæ; rostrum reaching the posterior coxæ; anterior femora spined beneath; tegmina and wings hyaline, venation normal, basal cell of tegmina much longer than broad.

Type, *D. montezuma*, Walk. (*Zammara*).

Genus TETTIGADES.

Tettigades, Amy. & Serv. Hist. Hém. p. 469 (1843).

Type, *T. chilensis*, Amy. & Serv.

CHONOSIA, gen. nov.

Head (including eyes) much wider than base of mesonotum, its lateral margins obliquely sinuate, the front strongly projecting and longer than vertex at area of ocelli; pronotum only slightly longer than head, its lateral margins dilated but not angulate, posteriorly oblique; abdomen short, not quite so long as space between apex of head and base of cruciform elevation; tympana completely exposed, tympanal coverings entirely absent; opercula in male moderately well developed, but not extending beyond the basal segment of abdomen; anterior femora spined beneath; tegmina and wings semi-hyaline, tegmina more than twice as broad as long; venation similar to that in genus *Tettigades*.

Type, *C. crassipennis*, Walk. (*Fidicina*).

Division HUECHYSARIA.

Tegmina and wings opaque or semiopaque; lateral margins of the pronotum neither ampliate nor dentate; abdomen moderately robust, but not transverse, longer than space between apex of head and base of cruciform elevation; tympana completely exposed, tympanal coverings entirely absent; tegmina with the apical areas variable in number, either eight or ten, or variably fluctuating between those numbers.

Synopsis of Genera.

A. Head with the face longitudinally sulcate.

a. Head (including eyes) not so wide as base of mesonotum.

- b. Tegmina with ten apical areas, in some varieties only nine.
- c. Head longer than pronotum, front produced but not excavate.
- d. Mesonotum (including cruciform elevation) longer than pronotum *Graptotettix*.
- cc. Head shorter than pronotum, the front concavely excavate.
- dd. Mesonotum (including cruciform elevation) scarcely longer than pronotum *Parvittya*.
- aa. Head (including eyes) as wide as base of mesonotum.
- bb. Tegmina with eight apical areas, in some varieties nine or ten.
- ccc. Head about as long as pronotum.
- ddd. Mesonotum (including cruciform elevation) longer than pronotum *Huechys*.
- B. Head with the face not sulcate. *Sciéroptera*.

Genus GRAPTOTETTIX.

Graptotettix, Stål, Mem. Afr. iv. p. 4 (1866); Berl. ent. Zeit. x. p. 170 (1866).

Type, *G. guttatus*, Stål.

Graptotettix rubromaculatus, sp. n.

Body black; front of head and face, a large oblique spot on each lateral area of mesonotum, a central longitudinal fascia to abdomen above and the segmental margins, and the abdomen beneath sanguineous, the last with central segmental and lateral segmental piceous spots, apex black; tegmina shining piceous, wings shining fuscous; head (including eyes) not so wide as base of mesonotum, its length a little more than that of pronotum; mesonotum (including cruciform elevation) longer than pronotum; tegmina with ten apical areas.

Long., excl. tegm., ♂ 26 mm.; exp. tegm. 60 mm.

Hab. North Celebes; Toli-Toli (Brit. Mus.).

PARVITYA, gen. nov.

Head (including eyes) not quite so wide as base of mesonotum, shorter than pronotum, the front slightly produced and concavely excavate, the face centrally prominently longitudinally sulcate for about half its length; pronotum almost as long as mesonotum (including cruciform elevation), its anterior angles rounded, lateral margins sublunate and nearly straight, posterior lateral angles moderately produced; abdomen subglobose, dorsally ridged and posteriorly attenuated; tympanal orifices entirely exposed, tympanal flaps

altogether absent; anterior femora spined beneath; rostrum just passing the intermediate coxæ; opercula in male short, transverse, not passing base of abdomen; tegmina semi-opaque, with ten apical areas, the basal cell longer than broad.

Type, *P. samara*, Dist.

Parvittya samara, sp. n.

Head and pronotum black, greyishly pilose; mesonotum ochraceous, with two central anterior obconical spots, a broad sublateral fascia on each side, and two small rounded spots in front of the basal cruciform elevation, black; cruciform elevation, abdomen above and beneath, opercula, and lateral margins and apical half of face, ochraceous; head beneath, sternum, and legs black, ochraceously pilose; abdomen beneath with small lateral segmental piceous spots; tegmina fuscous brown, venation piceous, its basal area with longitudinal pale fuscous streaks; wings shining pale fuscous.

Long., excl. tegm., ♂ 24 mm.; exp. tegm. 63 mm.

Hab. Philippines: Samar (Brit. Mus.).

Genus HUECHYS.

Huechys, Amy. & Serv. Hist. Hém. p. 464 (1843).

Type, *H. sanguinea*, De Geer (*Cicada*).

Genus SCIEROPTERA.

Scieroptera, Stål, Hem. Afr. iv. p. 4 (1866); Berl. ent. Zeit. x. p. 169 (1866).

Type, *S. splendidula*, Fabr. (*Tettigonia*).

Division CARINETARIA.

In this division the pronotum is distinctly narrowed anteriorly, never longer than the mesonotum, sometimes much shorter; the lateral pronotal margins are oblique, not ampliate; the body is more or less robust, narrowed towards head and apex of abdomen, which is sometimes very short; tegmina and wings hyaline, the first in a few cases semi-opaque, but usually clear, and frequently unspotted.

The Carinetaria are found in both hemispheres.

Synopsis of Genera.

- A. Head (including eyes) more or less narrower than base of mesonotum; front about as long or a little longer than vertex.
- a. Pronotum considerably shorter than mesonotum.
- b. Greatest width of tegmina about one third their length.
- c. Abdomen about as long as space between apex of head and base of cruciform elevation *Carineta.*
- B. Head (including eyes) a little narrower than base of mesonotum; front about as long as vertex.
- aa. Pronotum not much more than half the length of mesonotum, including basal cruciform elevation.
- bb. Greatest width of tegmina less than one third of their length.
- cc. Abdomen very short, shorter than pronotum and mesonotum together, including basal cruciform elevation *Karenia*.*
- C. Head (including eyes) as wide as base of mesonotum; vertex a little longer than front.
- aaa. Pronotum about as long as mesonotum.
- bbb. Greatest width of tegmina little more than half their length *Herrera.*
- D. Head (including eyes) about half the width of base of mesonotum; vertex a little longer than front.
- aaaa. Pronotum about as long as mesonotum, including cruciform elevation.
- bbbb. Greatest width of tegmina a little more than one third their length *Tympanistria.*

Genus *CARINETA.*

Carineta, Amy. & Serv. Hist. Hém. p. 482 (1843).

Type, *C. formosa*, Germ. (*Cicada*).

Carineta boliviana, sp. n.

Body above and beneath fuscous brown, somewhat thickly greyishly pilose; face, a spot between face and eyes, and the femora pale castaneous; anterior femora beneath, tibiæ, and tarsi dark castaneous; coxæ, trochanters, extreme apices of femora, and bases of tibiæ pale ochraceous; pronotum with a small spot at centre of inner edge of posterior margin and two short, discal, diverging fasciæ, piccous; mesonotum with two central, piccously margined, obconical spots, a transverse spot in front of cruciform elevation, with a short curved spot on each side, piccous; tegmina and wings hyaline, with a

* Another character of this genus is found in the venation of the tegmina, the bases of the radial area and the lower ulnar area being contiguous at lower apical angle of basal cell.

bronzy tint, the venation brownish ochraceous, tegmina with the outer margins very broadly and wings with the outer margins less broadly fuscous; costal membrane of tegmina reddish brown; rostrum almost reaching posterior coxæ; opercula in male short, narrow, transverse, not completely covering the cavities; face profoundly longitudinally sulcate.

Long., excl. tegm., ♂ 25-28 mm.; exp. tegm. 73-81 mm.

Hab. Bolivia: St. Paulo (*P. O. Simons*) and Toungas de la Paz (Brit. Mus.).

By the outer fuscous shadings of the tegmina and wings this species is allied to *C. formosa*, Germ.

Carineta illustris, sp. n.

Body and legs umber-brown; head with a large spot on each side of front, the area of the ocelli, and a spot on each lateral margin of vertex, black; pronotum with a broad central discal fascia, widened anteriorly and attenuated posteriorly, where it is connected with a central, transverse, curved, linear fascia, and the lateral margins black; mesonotum with four black-margined obconical spots, the outermost largest, and a lanceolate spot in front of cruciform elevation, black; abdomen above with a subobsolete, central, longitudinal, pale fascia, and with a prominent patch of grey pile on each basal lateral area; sternum thickly greyishly pilose; face ochraceous, with two central longitudinal black fasciæ; a spot at inner margins of eyes, a subapical annulation to anterior femora, intermediate and posterior femora (excluding apices), bases and apices of anterior and intermediate tibiæ, posterior tibiæ (excluding base), the tarsi, and apex of rostrum, shining piceous; tegmina and wings glossy hyaline, the venation umber-brown, tegmina with the costal membrane and a basal patch extending to nearly middle of radial area and occupying the whole of lower ulnar area, and wings with a basal patch which does not reach the middle of radial area and is broadly continued along the margins of anal area, rich deep umber-brown; transverse veins at bases of first and second ulnar areas darkly infusate, the colour linearly continued across third ulnar area; rostrum reaching the posterior coxæ; head (including eyes) much narrower than base of mesonotum; abdomen in male as long as space between apex of head and base of cruciform elevation.

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

Hab. Amazons; Iquitos (Stockholm Mus.).

Carineta peruviana, sp. n.

♀. Body above olivaceous green; ocelli carmine-red; mesonotum with two black-margined obconical spots on anterior margin; lateral margins of metanotum narrowly dull ochraceous; body beneath and legs pale virescent; apex of rostrum and the tarsi more or less piceous; spines to anterior femora and posterior tibiæ fuscous; tegmina and wings hyaline, venation mostly fuscous; tegmina unspotted, the costal membrane pale olivaceous; head (including eyes) much narrower than base of mesonotum, the front about as long as vertex; pronotum shorter than mesonotum; greatest width of tegmina about one third their length; face globose, with a pronounced, very narrow, central, longitudinal sulcation; margins of head, sternum, and legs thickly, somewhat longly, greyishly pilose; abdomen above and beneath a little more shortly and darkly pilose; rostrum just passing the posterior coxæ.

Long., excl. tegm., ♀ 20 mm.; exp. tegm. 64 mm.

Hab. Peru: Chandramayo (Brit. Mus.).

HERRERA, gen. nov.

Head (including eyes) as wide as base of mesonotum, vertex a little longer than front; pronotum about as long as mesonotum, its lateral margins slightly convex, its posterior angles moderately dilated; abdomen short, about as long as space between apex of head and base of cruciform elevation, tympana completely exposed; opercula in male small, narrow, transverse, well separated internally; metasternum posteriorly lobately produced from between the posterior coxæ; rostrum about reaching the posterior coxæ; anterior femora strongly and longly spined beneath, spines apparently three in number; tegmina and wings hyaline; tegmina broad, their greatest width little more than half their length, apical areas eight; wings with six apical areas.

Type, *H. marginella*, Walk. (*Cicada*).

Genus KARENIA.

Karenia, Dist. Ann. Mus. Civ. Genoa, (2^a) vi. p. 458 (1888).

Type, *K. ravidata*, Dist.

Genus TYMPANISTRIA.

Tympanistrina, Stål, Ann. Soc. Ent. Fr. (4) i. p. 619 (1861).

Type, *T. villosa*, Fabr. (*Tettigonia*).

LXIII.—*On some new Japanese Mammals presented to the British Museum by Mr. R. Gordon Smith.* By OLDFIELD THOMAS, F.R.S.

THE National Museum owes to the kindness of Mr. R. Gordon Smith an interesting collection of small mammals obtained by him in Japan. The majority are from Kobe, but he has also sent a number collected at Misaki, near Yokohama, by a Japanese, Mr. H. Tsuchida.

Most of the species are, of course, described in Temminck and Schlegel's 'Fauna Japonica,' but the following seem to represent new species or subspecies, and include a vole which, although allied to the red-backed voles (*Evotomys*), is so distinct that I have had to make a new subgenus for it. It forms, therefore, a most interesting discovery.

Mogera wogura kobecæ, subsp. n.

Similar in colour and other characters to typical *M. wogura*, but markedly larger.

Dimensions of the type (measured on a spirit-specimen):—

Head and body 143 mm.; tail 20; hind foot, s. u. 21, c. u. 24; fore foot, length (c. u.) 26, breadth 20.

Skull: greatest length 39; basal length 34; greatest breadth 18.7; front of canine to back of m^3 14.7; front of lower cariniform premolar to back of m_3 12.8.

Hab. Kobe, Hondo. Altitude about 60 m.

Type. Adult female. B.M. no. 82. 7. 27. 12. Collected 2nd June, 1875, during the cruise of H.M.S. 'Challenger.' Five specimens examined.

While the fine series of the ordinary Japanese mole, *M. wogura*, from Misaki, near Yokohama, sent home by Mr. Gordon Smith are all very uniform in size (skulls 34–35 mm.; hind foot, s. u., about 18 mm.), the four he has sent from Kobe are all markedly larger, and it is evident that we have here to do with two local forms, though they will probably prove to pass one into another in the intermediate districts.

No typical locality is given in Temminck's original description of *Talpa wogura**, but an example sent in 1843 from the Leyden Museum as representing that form agrees in size with the Yokohama race, and I have therefore taken that as the typical one. The original figure of the skull is 35 mm. in length.

* 'Fauna Japonica,' Mamm. p. 19 (1842).

The 'Challenger' also obtained three specimens of true *wagura* from Yokohama, besides the example of *M. w. kobee* which I have selected as the type.

Although much larger than true *M. wagura*, this mole falls far short of the large form from Vladivostok named by Dr. Nehring *M. robusta* *.

Petaurista leucogenys and its subspecies.

Mr. Gordon Smith has sent several specimens of the large Japanese flying-squirrel, and I have carefully examined these and the specimens already in the Museum collection.

The original locality of Temminck's *Pteromys leucogenys* was the mountains of Figo (= Higo) and Fiuga, in the island of Kiusiu, so that specimens sent from Nagasaki, in the same island, may be provisionally treated as typical.

These are very dark above, with their under surface white or nearly white, not or scarcely washed with buffy, their lips with but little greyish white on them, a well-marked blackish patch below the eye and another below the ear, the characteristic light cheek-patch greyish and not sharply contrasted.

From this Kiusiu animal there may be distinguished the following three subspecies:—

P. l. nikkonis, subsp. n.

Fur particularly long and tail bushy. General colour paler, more greyish brown or drab. Under surface white. Muzzle whitish. Below eye greyish brown. Light cheek-patches snowy white, very prominent.

Nikko, central mountainous region of Hondo.

P. l. oreas, subsp. n.

Colour above rich brown, warmer than in the Kiusiu form, and suffused with rufous on the head. Under surface washed with buffy. Patch below eye dark rufous, like forehead. Light cheek-patch dull greyish, inconspicuous, washed with buffy.

Wakayama, southern peninsula of Hondo.

P. l. tosa, subsp. n.

Colour above an intermediate brown. Hairs of under surface slaty at base, washed with buffy terminally. Lips whitish. Patch below eye greyish brown, not blackish,

* SB, Ges. nat. Fr. Berl. 1891, p. 96.

succeeded behind by a fairly prominent light cheek-patch, and a dull fulvous one below and behind the ear. Hinder end of nasals squarely truncated.

Tosa, island of Sikoku.

Detailed descriptions of the new forms:—

Petaurista leucogenys nikkonis.

Fur very long, soft, and thick; hairs of back 50–60 mm. in length, the underfur about 40–45. General colour above comparatively pale, a greyish drab, rather paler than Ridgway's "drab." Individually the longer hairs are greyish basally, with a broad whitish or buffy whitish subterminal band and a fine black tip; the abundant underfur slaty, with about 5 mm. at the tip clay-colour. Laterally the hairs are shorter and the colour becomes more buffy brownish; a broad patch at the end of the patagial cartilage deep ochraceous buff. Under surface either pure white or faintly washed with buffy; no slaty bases to the hairs; a small blackish spot on the chin. Head coloured above like back or a little more buffy, becoming greyish on the nose and whitish round the mouth; cheeks below eyes broccoli-brown; light check-patch very conspicuous, pure white, most of the hairs white to their roots, extending up on to the crown in front of the ears and downwards nearly to meet the white of the throat. Ears surrounded by a buffy area, with scarcely a trace of a black patch at their posterior bases. Forearms dark grey, little mixed with the buffy rings on the longer hairs; hands dark brown. Hind limbs with the dull buffy of the sides extending on to the middle of the metatarsus, its sides and the digits brownish black. Tail short, thick, very bushy, its breadth across the outstretched hairs about 150 mm.; in colour above and below it is of about the same greyish drab as the back.

Skull as in typical *leucogenys*, the nasals similarly projecting backwards behind the premaxillary processes.

Measurements of the type:—

Head and body 420 mm.; tail 280; hind foot (s. u.) 67.

Skull: greatest length 68·5; basilar length 54; nasals, length 23; length of upper tooth series without anterior premolar 14·5.

Hab. Nikko, Central Hondo.

Type. Male. B.M. no. 5. 1. 4. 50. Original number 31. Collected by H. Ogawa, and presented by R. Gordon Smith, Esq. Six specimens examined.

A young specimen sent by Mr. Maries to the Museum in 1880 lived in captivity from May to August 1879, when it died. It has well developed the peculiar greyness of the back, which cannot therefore be a mark of the winter coat.

Besides one example of the normal colour, a beautiful semialbinistic specimen of a creamy buffy tone was obtained from Mr. Alan Owston in 1900.

Petaurista leucogenys oreas.

General colour dark, between "vandyke-brown" and bistre, the subterminal rings on the hairs dull buffy; outer part of parachute black, sparsely lined with buffy, the forearms and hands deep black; patch at end of patagial cartilage dark buffy. Hairs of under surface of body dull whitish tipped with buffy, slightly plumbeous at their bases, those of underside of patagium bright buffy throughout except on a patch just behind the carpus, where they are black. Head on muzzle and crown more rufous than back, near "burnt umber." Lips and light cheek-patch dull greyish, little conspicuous, the hairs slaty basally, greyish white terminally. Area below eye dull reddish brown, continuous with the rufous, which passes downwards on to the sides and front of the neck. Chin with a black spot. Upper surface of feet black, with a slight trace of buffy tipping on the centre of the metatarsus. Tail long, not unusually broad, breadth across outstretched hairs about 125 mm.; its general colour dull cinnamon, the hairs slaty at base.

Skull with its nasals as in true *leucogenys*.

Dimensions of the type (measured in skin):—

Head and body 450 mm.; tail 380; hind foot (s. u.) 73; ear 29.

Skull: length of nasals 25, of tooth-row without p^3 14.5.

Hab. Wakayama, Southern Peninsula of Hondo.

Type. Female. B.M. no. 3. 5. 18. 1. Collected and presented by R. Gordon Smith, Esq.

Petaurista leucogenys toæ.

General colour above intermediate between the dark *leucogenys* and the light *nikkonis*, about matching Ridgway's "hair-brown," subterminal bands on hairs cream-buff; ends of underfur drab-brown. Under surface dingy whitish, the hairs slaty at their bases and washed with buffy terminally. Head brown, not reddish, the top of the muzzle inclined to buffy. Lips and light cheek-patch greyish white, the hairs slaty at base, the cheek-patch not extending up on to the

crown and not very conspicuous. Area below eye broccoli-brown, not blackish. Forearms and hands dark brown, a small patch of buffy-tipped hairs on the metacarpus. Hind feet only blackish along the edges and on the digits, the metatarsal hairs being largely tipped with dull buffy. Tail fairly similar to the body, but rather more tinged with clay-colour.

Skull distinguished from that of the other forms by the nasals being abruptly and squarely truncated behind at a level with the tips of the premaxillary processes.

Dimensions of the type (measured in the flesh):—

Head and body 382 mm.; tail 280; hind foot 66.

Skull: greatest length 66; basilar length 51.7; length of nasals 23; upper tooth-row without p^3 14.6.

Hab. Tosa, island of Sikoku. Alt. 300 m.

Type. Female. B.M. no. 5. 3. 3. 17. Collected 4th December, 1904, and presented by R. Gordon Smith, Esq. Two specimens.

Micromys geisha, sp. n.

A delicate species, about equal in size to one of the smaller forms of *Mus sylvaticus*, though with more the build and look of a large harvest-mouse.

Size small, form slender. Fur soft and fine, without spines, hair of back about 6 mm. in length. General colour above pale reddish brown, rather warmer and redder than Ridgway's "wood-brown," the head and forehead slightly paler than the rump. Under surface white, sharply defined laterally, the basal two thirds of the hairs dark slaty. Ears rather short, pale brown, with a fine white edging. Outer side of upper arms and hips reddish grey; inner sides, wrists, hands, and feet white. Soles wholly naked, last foot-pad elongated; fifth hind toe (s. u.) reaching nearly to the end of the first phalanx of the fourth. Tail of medium length, thinly haired, coarsely scaled, the scales not alternated, but forming distinct rings, averaging about twelve to the centimetre; both scales and hairs brown above and white beneath, but the contrast not conspicuous. Mammaræ apparently 2—2=8, but this numeration is not absolutely certain.

Skull very smooth, light, and delicate, rounded and without ridges, the supraorbital edges hardly squared even in the oldest example. Anteorbital plate straight-edged in front, scarcely projected forwards in advance of the upper bridge. Palatal foramina of medium length, not extending backwards to the front of m^1 . Mesopterygoid fossa wide and rounded in front, narrowing posteriorly. Bullæ normal. Molars small,

of normal structure, a well-marked antero-external secondary cusp on m^2 , as well as the usual large antero-internal.

Dimensions of the type:—

Head and body (c.) 85 mm. ; tail 95 ; hind foot (s. u.) 19 ; ear 12.5.

Skull: greatest length 24 ; basilar length 17.5 ; zygomatic breadth 12 ; nasals 8 ; interorbital breadth 3.7 ; breadth of brain-case 11 ; palate length 10.4 ; diastema 6.5 ; palatal foramina 4.7×1.7 ; length of upper molar series 3.4.

Hab. Kobe, Hondo. Alt. 300–400 m.

Type. Male. B.M. no. 5. 3. 3. 37. Collected May 1904. Presented by R. Gordon Smith, Esq.

This pretty little mouse is quite unlike any Eastern Asian species with which I am acquainted. *Mus argenteus*, Temm., whose description might have been thought to apply to it, is a larger animal, with a hind foot of 22 mm., and many differences in the detailed measurements of the skull, *e. g.* interorbital constriction 4.9 mm., palatal foramen 5.8.

With regard to the use of the generic name *Micromys* for this animal, I have come to the conclusion that the correct and natural division of the European species of "*Mus*" published by Hensel in 1856*, and supported by Forsyth Major † in 1884, should be followed, and that while *Mus rattus*, *norvegicus*, and *musculus* should remain in *Mus*, the others should be placed in a separate genus, for which the name *Micromys* is available.

In this genus the posterior laminae of the first and second upper molars have each an additional internal cusp beyond the number present in *Mus* ; so that, counting along the inner side of the tooth-row, there are three cusps on the first molar and three on the second, while in *Mus* the posterior lamina is not continued inwards beyond the centre, and there are therefore only two inner cusps on each of the two teeth.

The following species, with their respective near allies, show this character:—

Micromys sylvaticus, L.

— *speciosus*, Temm.

— *minutus*, Pall. (Type of genus ‡)

— *mystacinus*, Danf. & Alst.

— *agrarius*, Pall.

— *Harti*, Thos.

— *geisha*, Thos.

* Zeitschr. deutsch. geol. Gesellsch. 1856, p. 281.

† Atti Soc. Tosc. Proc. Verb. iv. p. 129 (1884).

‡ Dehne, 1841.

In no Oriental or Australian species are the molars of this character, but among the African forms, although in the great majority as in typical *Mus*, those of *Mus arbonarius*, Peters, and *M. rutilans*, Peters, are almost precisely as in *Micromys* and appear to indicate a real relationship to that genus.

In view of the immense number of species of *Mus* known and the difficulty of dividing them into natural groups, it is of great value to be able to separate off any section of them by essential characters, however slight these may appear to be.

Evotomys (*Phaulomys*) *Smithii*, subgen. et sp. nn.

PHAULOMYS *, subgen. nov.

External proportions and other characters as in *Evotomys*, although the colour tends more towards brown than the usual red of *Evotomys*.

Skull with the smooth non-angular brain-case characteristic of *Evotomys*; zygomata more widely splayed; posterior palate typical; bullæ unusually small.

Teeth not rooted in the only specimen, which is fully adult; therefore if rooted at all they must only become so very late in life, as in *Craseomys*. Base of second upper molar in a distinct capsule at the bottom of the orbital fossa and that of the last lower molar similarly encapsuled on the inner side of the incisor-root, both as in *Craseomys* and *Microtus*, not as in *Evotomys*. Molars very weak and narrow (breadth of m^2 barely more than half its length, 0.8 mm. as against 1.5), the few closed triangles not or scarcely broader than long. General structure of teeth showing an exaggeration of the *Evotomys* characters of rounded cement-areas and coalescence of opposite spaces (see figure, p. 494). Last upper molar more simple than in *Evotomys*, its second and third spaces coalesced into one. Below the anterior molar is also remarkably simple, and in all three teeth the outer re-entrant angles are nearly as deep as the inner.

This interesting form adds another to the considerable number of aberrant Asiatic voles, and, as with *Antheliomys* and *Eothenomys*, the exact value that should be given to it is by no means clear. While it has the rounded skull, round-angled teeth, and external form of true *Evotomys*, it has the encapsuled m^2 and m_3 of *Craseomys*, *Antheliomys*, and normal

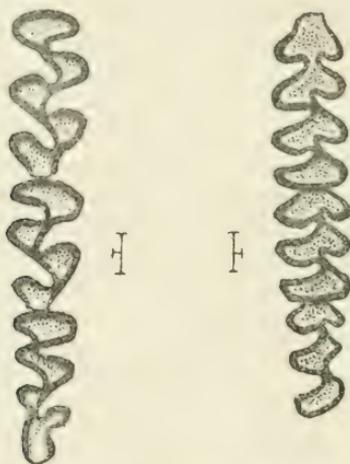
* φαῦλος = weak.

voles, while its molar pattern and narrow teeth are peculiar to itself. On the whole, it may best be called a subgenus of *Evotomys* until such time as the whole group is again revised, when it will very probably receive with others the dignity of full generic rank.

The species may be described as follows:—

Size about as in *Evotomys glareolus*. Fur soft and loose; hairs of back about 10 mm. in length. General colour above a light brown, not far from "russet" of Ridgway, without the warmer and more reddish tone of true *Evotomys*. Sides and rump not conspicuously or abruptly greyer than the back. Under surface cream-buff, not sharply defined, and mixed with the slaty of the hair-bases; throat grey. Ears about as long as the fur, well-haired, brown. Upper surface of hands and feet dull greyish; soles hairy from the heel to the pads. Tail about two thirds of the trunk-length, well-haired, the terminal pencil about 3 mm. in length; dark brown above, pale greyish below.

Skull as described above.



Evotomys (Phaulomys) Smithii. Upper and lower molars, right side.
× 10.

Teeth (see figure).—First and second upper molars with the usual five and four cement-spaces respectively. Third molar with the normal anterior space, and the second and third half opposite to each other and combined in one; then follows a terminal Y, the antero-external corner of it almost separated into a distinct space; this tooth has three prominent angles and one additional indistinct one on each side. Anterior

lower molar with only four simple spaces, one in front of the others, the anterior representing the front triangle, the second the normal second and third, and the third the normal fourth and fifth triangles, here opposite and coalesced with each other. Outer and inner re-entrant angles about equally deep, as they are in the second molar, which has the usual *Ecotomys* pattern. Last molar with its outer re-entrants much deeper than usual, nearly as deep as the inner ones.

Dimensions of the type (measured in the flesh by Mr. Gordon Smith):—

Head and body 79 mm. ; tail 54 ; hind foot 17.5 ; ear 10.

Skull : greatest length 24.3 ; basilar length 20.7 ; zygomatic breadth 14.6 ; nasals 7.2 × 3.3 ; interorbital breadth 3.9 ; breadth of brain-case 10.3 ; height of brain-case from basion 6.5 ; palate length 11 ; diastema 6.8 ; palatal foramina 4.2 × 1.4 ; antero-posterior length of bullæ 5 ; length of upper molar series (crowns) 5, of m^3 1.6.

Hab. Kobe, Hondo. Alt. 650 m.

Type. Male. B.M. no. 5. 3. 3. 49. Collected 24th February, 1904. One specimen only.

“Under pine-trees, in bamboo-grass.”—*R. G. S.*

This vole, representing a new subgenus, forms a most interesting addition to the known fauna of Japan, and I have much pleasure in connecting its donor's name with it.

LXIV.—*Notes on Eastern Heterocera, with Descriptions of new Genera and Species.* By Colonel CHARLES SWINHOE, M.A., F.L.S., &c.

Family Syntomidæ.

Euchromia plagosa, nov.

♀. Frons white, tegulae orange ; patagia and band at base of abdomen greyish yellow, next segment black, the third metallic blue with a white spot in the middle, the next two orange, intersected by a black line, the last two black with blue bands in them : fore wings with some metallic-blue marks at the base, both wings with similar marks at the ends of the cells ; spots white, a short longitudinal mark below the cell near the base, two spots in and below middle of cell (the latter the larger), two between veins 3 and 5, and one below vein 6 : hind wings with a short subcostal white

streak near the base and a discal band divided by the veins into three white spots.

Expanse of wings $1\frac{8}{10}$ inch.

Neu Pommern, Kinigunang; one example.

Nearest to *E. cyantis*, Meyrick, Trans. Ent. Soc. 1889, p. 457, from N. Guinea.

Euchromia shortlandica, nov.

♀. Black; frons and first segment of abdomen greyish yellow, the latter with a blue spot in the middle; head and thorax with metallic-blue marks; second and third segments of abdomen metallic blue with black bands, the remaining segments crimson with black bands; fore wings with some blue marks at the base; both wings with blue marks at the ends of the cells, white semihyaline spots as in *E. creusa*, Linn.

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

Shortland Island, Salomons.

Euchromia salomonis, nov.

♀. Head and body very similar to the preceding species, but the first segment of the abdomen has two brown patches, and is without the metallic-blue middle spot; the spots on the fore wings are larger, there is a white streak below the upper discal spot, the lower middle spot joins the subbasal streak and runs in broadly nearly to the base; on the hind wings the basal hyaline band is divided into three spots by the veins as usual, but the upper one is much the longest and the outer discal band is very large.

Expanse of wings 2 inches.

Isabel Island, Salomons.

Euchromia collaris, nov.

♂. Black; frons white and coxæ white; tegulæ scarlet-orange; head and thorax black with metallic-blue markings; abdomen with the first segment half black and half scarlet-orange, next two metallic blue with black bands, the fourth black, and the remainder crimson with black bands; fore wing with blue markings at the base, a wedge-shaped hyaline white spot in the middle of the cell, a thicker and larger spot below it, the upper portion of it running thickly to near the base of the wing; four longitudinal spots on the disk, two between veins 3 and 5, a narrow one below these which nearly reaches the lower middle spot, and the usual

spot below vein 6: hind wings with the basal and discal bands joined together, making nearly the whole wing hyaline, leaving a square black spot at the end of the cell, and an outer marginal black band which is thickened at the apex and at the anal angle of the wing.

Expanse of wings 2 inches.

Shortland Island, Salomons.

Family Lithosiidæ.

Phaosia brunnea, nov.

♂ ♀. Head, thorax, and abdomen dark brown, anal tuft of abdomen yellow: fore wings with the ground-colour pinkish grey, covered with brown suffusion in parts and several brown longitudinal streaks, the most prominent being two short streaks following each other beyond the cell, one at the apex and another on the costa before the apex: hind wings uniform brown, yellowish at the tips, no markings. Underside of a uniform pale slaty brown: fore wings with short pale streak on the costa beyond the middle and another along the hinder margin: body below white; legs smeared with white, tarsi with white rings.

Expanse of wings, ♂ $\frac{8}{10}$, ♀ 1 inch.

♂, Sarawak, Borneo (*Moore Coll.*). In B. M.

♀, Padang, W. Sumatra.

Genus CTENANE, nov.*

Proboscis fully developed; palpi porrect, extending about the length of head, the second joint thickly scaled; antennæ of male bipectinate, the apical third ciliated; hind tibiæ with two pairs of spurs: fore wing short and broad, vein 2 strongly curved from angle of cell, 3 from before angle, 4 and 5 from angle, 6 from below upper angle, 7, 8, 9, and 10 stalked, 10 from beyond 7; 11 from cell, oblique: hind wings with veins 3 and 4 stalked, 5 from well above angle, 6 and 7 stalked, 8 from middle of cell.

Ctenane labuana, nov.

♂. Head, thorax, and abdomen greyish white tinged with brown; palpi blackish except at the tips: fore wings grey-white irrorated with brown and blackish; a subbasal black point below costa, antemedial black points below costa and above vein 1; a diffused medial fuscous-brown band,

* I owe the diagnosis of this genus to Sir George Hampson.

attenuated at the middle and broadening to costa and hinder margin; an ill-defined postmedial line, oblique from costa to vein 4, then incurved, with black points on it below costa and above and below vein 2; outer area diffused with brown, except at apex, and with traces of a sinuous submarginal line: hind wings very pale fuscous.

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

Labuan, Borneo.

Family Limacodidæ.

Ceratonema fusca, nov.

♀. Head and collar dark brown; body and fore wings pale brown with a slight pinkish tinge; abdomen with brown segmental bands: fore wings with the central upper area suffused with dark brown, forming a large suffused patch; a transverse, recurved, sinuous brown line beyond the middle, running through the outer limit of the brown suffusion; a submarginal paler line with indistinct pale brown streaks running from it to the outer margin: hind wings pale greyish brown without markings. Underside of a uniform pale greyish brown without markings, but with a blackish-brown suffused space in the central upper area of the fore wings.

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

Khasia Hills.

There are two examples from the Khasia Hills in the B. M., Limacod drawer no. 15, unnamed.

Family Lasiocampidæ.

Crostogastria pruni.

Bombyx pruni, Linn. Syst. Nat. i. p. 498 (1758).

Odonestis pruni, Kirby, Cat. Moths, p. 811 (1892).

1 ♂, Khasia Hills.

1 ♀, Jaintia Hills.

Differ in no way from the European insect, except in being rather duller in colour.

Arguda vita.

Odonestis vita, Moore, Cat. Lep. E. I. C. ii. p. 424, pl. xii. a, fig. 4 (1859).

1 ♂, 1 ♀, Calcutta, October 1889.

The type came from Java. These examples stood in my collection as *O. bheroba*, Moore, but I have now examined

them with the types in the B. M.: the latter is a very different insect with straight transverse lines and seems to be very rare; the type is in Coll. Staudinger and the co-type in the B. M. My Calcutta examples of *vita* do not differ in any way from the Javan type.

Stenophyllodes khasiana, nov.

♂. Palpi much shorter than in *S. sikkima*, Moore, colour of a nearly uniform brownish fawn with a tinge of pink; branches of antennæ pale blackish; collar pale and somewhat ochreous; body without markings: fore wings pale towards outer margins and less well clothed; hind wings slightly darker than the fore wings; both crossed by numerous indistinct waved lines slightly darker than the ground-colour; a black dot at the end of cell of fore wings. Underside paler, the fore wings more pink tinged and without markings; the hind wings with two short brown lines running down from the costa near the base, and three indistinct sinuous lines across the disk.

Expanse of wings 2 inches.

Khasia Hills.

A smaller insect than *S. sikkima*, with the outer margin more deeply crenulate.

Family Trifidæ.

Euplexia fasciata.

Xylophasia fasciata, Leech, Trans. Ent. Soc. 1900, p. 68.

Khasia Hills; common.

The type from Western China is in the B. M. and is identical with the Assam examples.

Euplexia repetita.

Apamea repetita, Butler, Cist. Ent. iii. p. 133 (1855).

Khasia Hills; one example.

The type came from Yokohama.

Radinacra albosignata.

Curadrina albosignata, Oberth. Etud. d'Ent. v. p. 72, pl. iv. fig. 1 (1880).

Khasia Hills, 1 ♂.

† The type came from Amurland; there are several examples in the B. M. from Central and Western China; it is closely

allied to *R. lineosa*, Moore, a common Indian insect, but the transverse lines on the fore wings are closer together and the reniform is of a different nature.

Family Acontiidæ.

Metachrostis brunneiplaga, nov.

♂ ♀. Palpi, head, and thorax dark pinkish brown, palpi with the last joint pale: fore wings pale pinkish brown, a brown patch at the base with nearly upright outer margin, a large brown costal patch extending from beyond the middle nearly to the apex, some brown spots on the costa; indications of a medial double line, also of three sinuous lines below the patch, and three large pale brown spots on the outer margin; marginal line very thin and interrupted by the veins; cilia with a pale brown interline: hind wings pale pinkish brown, paler than the fore wings, with an indistinct pale brown marginal line.

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

Khasia Hills; many examples.

Not unlike *M. brunnea*, Lecch, Trans. Ent. Soc. 1900, p. 157, from Central China, but that form has no basal band.

Motina æqualis.

Motina æqualis, Walker, xxvii. 12 (1863).

Khasia Hills.

The type from Sarawak, Borneo, is in the B. M.

Family Quadrifidæ.

Blasticorhinus rivulosa.

Thermesia rivulosa, Walk. xxxiii. 1060 (1865).

Acantholipes quadripuncta, Swinhoe, Ann. & Mag. Nat. Hist. (7) ix. p. 423 (1892).

The type from Moulmein is in the B. M. The type of *quadripuncta*, also in the B. M., is from Palawan. I have it also from the Nilgiri Hills, and there are examples in the B. M. from Ceylon and from Java.

Family Focillidæ.

Avitta surrigens.

Oroba surrigens, Walker, Journ. Linn. Soc., Zool. vii. p. 81 (1864).

Andaman Islands (*Bingham*).

The type from Sarawak is in Mus. Oxon.; in Cat. Het.

Mus. Oxon. ii. p. 194, I made it a synonym of *A. subsignans*, Walker, but I wrongly identified that species; the fore wings are rounder, it is paler in colour, the transverse markings are entirely absent, and there is a large round blackish spot at the end of each cell. I have *subsignans* from Sumba, Perak, Queensland, Andamans, Bombay, and the Nilgiris; I have *surrigens* from Gilolo, and it is in Mus. Oxon. from Sarawak, Flores, Sula, and Aru.

GENUS BÆTHANTHA, Walker.

Bæthantha, Walker, xxxiii. 982 (1865).

Seneratia, Moore, Lep. Ceylon, iii. p. 202 (1885).

Bæthantha bisignata.

Bæthantha bisignata, Walker, xxxiii. 983.

Ctypansa bocanidia, Butler, Ann. & Mag. Nat. Hist. (5) x. p. 231 (1882).

Ceylon, Nilgiri Hills.

Walker's type from Timor is in Mus. Oxon., also an example from Ceylon; the type of *bocanidia*, from Duke of York Island, is in the B. M. I have it in my collection from Saparæa, New Guinea, Kina Balu, Mouklek Mountains (Siam), Nilgiri Hills, and Ceylon. It is not mentioned in Hampson's 'Moths of India.'

Adrapsa atratalis, nov.

♂ ♀. Dark brownish black, very uniform in colour: fore wings with a white dot at the end of the cell; transverse lines white, sinuous, antemedial, postmedial, and submarginal; the first bends inwards close to the hinder margin, the second bends outwards, the submarginal line runs from the costa into the inner side of a very large subapical, pure white, almost square patch, and is continued in a row of white dots to the hinder margin; outside the patch on the margin are four pure white lunules, and the black cilia have white spots: hind wings with a medial line which does not reach the costa, a submarginal row of white dots, and indications of a marginal white line. The underside is paler, having some white suffused scales on the wings: on the fore wings the cell-spot and postmedial line are bordered inwardly with black, and some white suffusion in place of the subapical patch; on the hind wings are three transverse white lines—antemedial, medial, and discal—the first two rather close together, all inwardly bordered with black; both

wings with whitish marginal lunules and white spots on the cilia.

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

Khasia Hills. In B. M.

At page 162 of this vol. by mistake I described the female of this insect as the female of *A. curiosalis*, but I have found both sexes of this form from the Khasia Hills in the B. M., the antennæ of the male differing from the antennæ of *curiosalis*, with large scale-tooth on outer side just beyond basal joint, the shaft then curved, with small scale-tufts on the joints and fascicles of cilia; at one fourth from base the shaft is dilated into a large knot.

There is also an example in the B. M. from Western China (Leech Coll.).

Family Hypenidæ.

Bomolocha obductalis.

Hypena obductalis, Walker, xvi. 56 (1858).

Bomolocha obductalis, Swinh. Cat. Het. Mus. Oxon. ii. p. 212 (1900).

Hypena vestita, Moore, Lep. Ceylon, iii. p. 221, pl. clxxvi. fig. 10 (1885).

Khasia Hills; fairly common.

The type, marked "India," is in Mus. Oxon., the type of *vestita* from Ceylon is in the B. M.; they cannot be separated. It is also in the B. M. from Sikkim. The allied form *eductalis*, Hmps., the type of which from Sikkim is in Coll. Elwes, is the commonest form in the Khasia Hills: *flexuosa*, Moore, which Sir George Hampson puts as a synonym of *obductalis*, is in my opinion quite distinct; I have it from Simla, Darjiling, and Kulu.

Genus ANEPA, nov.

Palpi oblique; third joint smooth, a little more than half the length of the second: fore wing long and narrow, excavated from apex to vein 4, where there is a rather prominent angle; antennæ ciliated and abdomen with dorsal tufts, as in the genus *Hypena*, but the shape of the wings and upturned palpi clearly separate it from that genus and all its subdivisions.

Type, *oxydata*, Hmps. (*Hypena oxydata*), Journ. Bombay N. H. Soc. xi. (4) p. 707 (1898).

Anepa doda.

Hypena doda, Swinhoe, Ann. & Mag. Nat. Hist. (7) ix. p. 180 (1902).

Khasia Hills.

The type from Goping, Perak, is in the B. M.; also examples from Penang, Formosa, and Sikkim.

Family Geometridæ.

Medasina leledaria, nov.

♂. With the ground-colour ochreous grey, irrorated with olive-brown atoms, and spots, bands, and markings all olive-brown; antennæ, palpi, frons, head, and thorax dark olive-brown; abdomen paler: wings with a rather large spot at the end of each cell; subbasal, medial, and discal transverse bands, all more or less duplex and incomplete, showing best towards the costal and hinder margins; the last band curved outwards below the costa and inwards before the hinder margin, and dentated in the middle on both wings; a sub-marginal white dentated line and a marginal black crenulated line. Underside pale grey, nearly white, with darker grey irrorations, blackish cell-spots, and a broad blackish discal band, attenuated hindwards on both wings; tarsi with white bands.

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

Khasia Hills.

There is an example from Bhutan in the B. M. in Boarmid drawer no. 127.

Boarmia properata.

Boarmia properata, Walker, xxi. 376, ♂ (1860).

Boarmia acaciaria, Hmps. (part.), Moths India, iii. p. 264 (1895).

Boarmia cornaria, Swinh. (part.), Cat. Het. Mus. Oxon. ii. p. 290 (1900).

Thyetmyo, Burma.

The type (a male, said to be from North Hindustan) is in the B. M. I have both sexes from Burma and Perak, and find that it is quite distinct from either *acaciaria* or *cornaria*; the former has the antennæ of the female almost simple, whereas in the female of *properata* the antennæ are strongly pectinated for three fifths the length, as in the male, but the pectinations not so strongly pubescent; it comes under Warren's subgenus *Carecomotis* (Nov. Zool. iii. p. 402); the female of *cornaria* has also pectinated antennæ. I have examples from Ceylon and South India; the pectinations are, however, much shorter, and it is smaller and differently coloured.

Heterabraxas rufonotaria.

Metabraxas rufonotaria, Leech, Ann. & Mag. Nat. Hist. (6) xix. p. 451 (1897).

2 ♂, Khasia Hills.

The type came from Western China; the markings on the Khasia Hill examples are darker black, otherwise there is no difference.

Family Thyrididæ.

Rhodoneura candidatalis, nov.

♂. Frons white; head and thorax brown, the latter white hindwards; abdomen and wings white, the former with indistinct chocolate-grey bands: fore wings with the costal space smeared with pale chocolate-brown, with many striations of the same colour, these striations extending to the base of the wing and on the basal half of the hinder margin; two duplex discal lines of the same colour, intertwined, near each other on the costa near the apex, gradually separating to the hinder margin, where the first is a little beyond the middle and the other near the angle: hind wings with three similar duplex lines, the first near the base, the second across the middle, and the third across the disk. Underside same as upperside, the lines more pronounced.

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

Silchar, Cachar.

Rhodoneura mollicellalis, nov.

♂. Palpi, frons, head, and collar bright chestnut-red; body and wings of a uniform ochreous fawn-colour; abdomen with the penultimate segment white, the ultimate black, the anal tuft white: both wings evenly irrorated and striated with minute pale black marks; a pale subapical mark on the costa of fore wings, with two pure white spots obliquely below it, these black dots in a line near the outer margin above vein 5; some black dots in the centre and near outer margin of hind wings; cilia of both wings dull chestnut-red. Underside paler and more ochreous, the white costal subapical spots on the fore wings confluent, forming a little white patch, the striations and irrorations more sparse, but both wings have many larger black dots; legs white beneath.

Expanse of wings $1\frac{3}{10}$ inch.

Khasia Hills; a fine series.

The three black dots above vein 5 near the outer margin of the fore wings are not always constant—in one example there are only two and in another they are all absent.

Rhodoneura turbatalis, nov.

♂. Palpi, frons, head, and collar chestnut-red; body and wings pale pinkish grey; abdomen with a brown dorsal band and a prominent blackish-brown spot on the penultimate segment, ultimate segment and anal tuft concolorous with the body: wings rather sparsely covered with brown even striations; fore wings with the outer half suffused with brown, except for a small space on the hinder margin beyond the middle; hind wings with a broad suffused brown medial band; a triangular ochreous-white patch on the costa near the apex, including two small brown costal spots; a black dot above vein 5 near the outer margin; marginal line brown; cilia on fore wings ochreous, with brown patches; cilia on the hind wings ochreous brown, without patches. Underside as above, but the ground-colour is nearly white and there is no band on the hind wings; legs concolorous with the body, without markings.

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

Khasia Hills; a fine series.

Both the above are allied to *R. atripunctalis*, Walker, from Java, but are quite distinct.

Family Hydrocampidæ.

Piletocera chrysorycta.

Semioceros chrysorycta, Meyrick, Trans. Ent. Soc. 1884, p. 320.

Nacoleia contingens, Moore, Lep. Ceylon, iii. p. 273, pl. clxxix. fig. 8 (1885).

Meyrick's type came from Duaringa, Queensland, Moore's from Ceylon: I have it from both localities and also from Sarawak, and I cannot see how they can be separated; they have not a character which is not common to both.

LXV.—Notes on Subspecies of European Shrews (*Sorex* and *Neomys*). By G. E. H. BARRETT-HAMILTON.

IN continuation of my studies of European and British Mammalia in the British Museum of Natural History I find amongst the shrews two very distinct subspecific forms, the extremes of which are very clearly marked. The one a water, the other a common shrew, were trapped by Mr. C. G. Danford in the same region in the Southern Carpathians at

altitudes varying from 1500 to 5500 feet. They may be described as follows:—

Sorex araneus carpathicus, subsp. n.

Size.—The collector's measurements indicate an animal slightly smaller, but with relatively longer tail, than *S. araneus typicus* of Britain.

Colour in winter above from base of tail to occiput nearly black, the face and sometimes the upper surface of the head lighter, gradually becoming brown on the flanks; below, including inner surfaces of all four legs, dirty light yellow or brown, the colour of the upperside encroaching considerably upon the belly. Line of demarcation moderately distinct, running on each side from a point between angle of mouth and nose to the shoulders, thence to the thighs and base of the tail, dividing inner and outer surfaces of all four legs to the wrists and ankles. Hidden portions of the hair everywhere blackish slate.

Tail bicoloured, the upper surface near "bistre"*, the lower between "isabella color" and "drab."

Feet between "prout's brown" and "hair-brown."

A single specimen in partial summer coat is near grizzled "mummy-brown" above, below yellower than specimens in winter coat.

Dimensions in millimetres of nine Specimens.

	Head and body.	Tail.	Hind foot.	Ear.
Maximum	70	47	14	7
Mean	67.1	45.2	12.66	5.33
Minimum	56	41	11	..
Mean of 162 British specimens.	72	38.75	12.8	7.6

I am unable to distinguish the *skull* from that of British shrews.

Hab. Hatzeg, Transylvania, Southern Carpathians, at altitudes of 1500-5500 feet.

Type (a female), no. 3. 2. 2. 4 of British Museum Collection, taken at Hatzeg, 30th November, 1902, altitude 5500 feet. Dimensions:—Head and body 64 mm., tail 46, hind foot 13, ear 7.

This is an interesting mountain-form of "saturated"

* Names of colours placed in inverted commas are taken from Mr. Robert Ridgway's 'Nomenclature of Colors,' 1886.

coloration, conspicuously darker than British or Scandinavian forms of *S. araneus*, and lacking the markedly tricoloured arrangement prevalent in specimens from the continental plain.

Neomys fodiens naias, subsp. n.

Size.—The collector's measurements indicate an animal of about the same size as the British form, but with slightly longer tail and larger ears and feet.

Colour above near black, sometimes with a tuft of whitish hairs just behind each ear; below glossy or silvery "cream," sometimes almost white; line of demarcation distinct, its course as in the *Sorex* described above. Hidden portions of the hairs above "blackish slate," below lighter and almost approaching "plumbeous."

Tail bicoloured similarly to the body and with inferior "keel" of whitish hairs.

Feet dusky to silvery grey, the inner surfaces darker: soles nearly black, thickly fringed with whitish hairs.

Dimensions in millimetres of ten Specimens.

	Head and body.	Tail.	Hind foot.	Ear.
Maximum	84	66	20	7
Mean	77.1	60.7	18.8	6.6
Minimum	68	56	18	5
Mean of 11 British specimens.	85.4	53.27	17.1	8.4

The *skull* has a basilar length of 18 to 20 mm.; as compared with skulls of British specimens, the rostral region is somewhat more attenuated and the upper canine somewhat more conspicuous.

Hab. Hatzeg, Transylvania, Southern Carpathians, at altitudes of 1500 to 2000 feet.

Type (a female), no. 3. 11. 8. 11 of British Museum Collection, taken at Nechesh Galben, Hatzeg, 3rd November, 1902, altitude 2000 feet. Dimensions:—Head and body 79 mm., tail 66, hind foot 19, ear 7.

This beautiful water-shrew far excels the British form in brilliancy and contrast of coloration. Nearly all the continental water-shrews which I have been able to examine are of more silvery-white tints on the under surface than the British, but the Transylvanian seems to present an extreme of the series.

The specimens in the British Museum indicate that the

common shrew of the continental plain is subspecifically distinct from the representatives of the species occurring in Britain, Scandinavia, or in the mountain-ranges of Europe. The latter are dully coloured forms, whereas the shrew of the plain is a large brilliantly tricoloured form, having a band of intermediate colour interposed on the flanks between the colours of the upper and under surfaces. The appropriate subspecific name for the shrew of the plains would appear to be *S. tetragonurus*, Zimmermann (Geog. Gesch. &c. ii. p. 383, 1780), while Mr. Miller has bestowed on two mountain forms the subspecific names of *alticola* (from Switzerland) and *euronotus* (from the Pyrenean foot-hills)—see Proc. Biol. Soc. Wash., April 25, 1901, pp. 41-45.

Since the dull coloration of the British water-shrew entitles it to subspecific rank, it should be known as *Neomys fodiens ciliatus* (Sowerby), Brit. Misc. t. xlix. p. 103 (1805).

LXVI.—Notes on European Species of the Subgenus *Pitymys* (Genus *Microtus*). By DR. C. I. FORSYTH MAJOR.

1. *Microtus (Pitymys) duodecimcostatus* (Selys).

Arvicola duodecimcostatus, De Selys-Longchamps, Rev. Zool., Année 1839, p. 8; id. Etudes de Micromammalogie (Liège, 1839), p. 110, pl. iii. fig. 4 bis.

This species rests on two skeletons, both presenting the anomaly of twelve (instead of thirteen) ribs, which De Selys considered to be a specific character. One of the skeletons is from the neighbourhood of Geneva ("des environs de Genève"); De Selys had received it from the well-known Geneva palæontologist Professor Pictet de la Rive: the second skeleton, in the Paris Museum, is from the neighbourhood of Montpellier. The former, being the first mentioned in both the above-quoted papers, must be considered the type of "*Arvicola duodecimcostatus*."

The specimen from Montpellier was, in 1854, identified by Z. Gerbe as the "*Arvicola incertus*, Selys," from Southern France, and is therefore a *Pitymys*. "Il y a, sous tous les rapports, une si parfaite similitude entre la tête osseuse de l'*A. incertus* et celle du squelette à douze paires de côtes, que le Muséum d'histoire naturelle de Paris tient de M. Olivier, sous le nom de *Mus (Arvicola) œconomus*, que je n'hésite pas à identifier ce prétendu *Mus œconomus*

à l'*A. incertus*; or, comme ce squelette est rapporté par M. de Selys-Longchamps à son *A. duodecimcostatus*, il s'ensuit que cette espèce, dont on ne connaissait que la charpente osseuse, n'est qu'un *A. incertus*, offrant la singulière anomalie de n'avoir que douze paires de côtes et douze vertèbres dorsales au lieu de treize . . ."*

The Geneva skeleton agreeing, according to what De Selys had originally asserted, in every respect with the one from Montpellier, Gerbe concluded further that "*A. incertus*" occurs also in the neighbourhood of Geneva; in a postscriptum to his memoir, however, he states as follows:—"M. de Selys-Longchamps, dans une lettre en date du 24 juillet dernier, me dit avoir reconnu que le squelette d'*A. duodecimcostatus* qui lui vient de Genève se rapporte à l'*A. Baillonii*, et n'est par conséquent point semblable, comme il l'avait avancé dans ses *Etudes de Micromammalogie*, à celui du Muséum d'histoire naturelle de Paris. Dès que cette similitude n'existe pas, il n'y a plus lieu de supposer que le Campagnol incertain doive se trouver dans les environs de Genève" †.

What, in 1854, De Selys may have meant by "*Arvicola Baillonii*" it is difficult to guess, but it does not matter much. Blasius has "*Arvicola duodecimcostatus*" as a synonym of the *Microtus arvalis* ‡, and is herein followed by V. Fatio §.

The upper and side views of the skull of the Geneva skeleton are represented in the figure 4 *bis* (pl. iii.) of the 'Micromammalogie.' In the great depth of the skull, backward from the rostrum, its longitudinal arching, and the subcylindrical shape of the brain-case it shows so unmistakably the characteristic form of the skull of *Microtus "incertus"* from Southern France, so well described by Gerbe ||, that we may safely consider the skeleton to be that of a species of *Pitymys*, either identical with the *M. "incertus"* as described and figured by Gerbe, or else very nearly related to it; so that the two skeletons of "*Arvicola duodecimcostatus*" may, after all, be one and the same species.

In Fatio's 'Campagnols du Bassin du Léman' no *Pitymys* is recorded; in the same writer's 'Faune des Vertébrés de la Suisse' the only *Pitymys* mentioned from Switzerland is

* Rev. et Mag. de Zool. (2) vi. pp. 370, 371 (1854).

† *Op. cit.* p. 608.

‡ J. H. Blasius, 'Naturgesch. d. Säugethiere Deutschlands . . .,' p. 379 (1857).

§ V. Fatio, 'Faune des Vertébrés de la Suisse,' i. p. 234 (1869).

|| Rev. et Mag. de Zool. (2) vi. pp. 368, 369, pl. xi. figs. 1 & 2 (1854).

the *Microtus (Pitymys) Savii*, discovered by Pavesi above Lugano in the Canton Tessin*.

When series of complete specimens of both the *Microtus duodecimcostatus* and the "*Arvicola incertus*" of Southern France are to hand a direct comparison will be possible. According to Gerbe the habitat of "*A. incertus*" is the whole of Provence and Languedoc, part of the Roussillon and of the Dauphiné †. In the Basses-Alpes, according to the same writer, it is common in the natural meadows with southern exposure up to a height of almost 2000 metres ‡. Gerbe does not state in what part of this extensive region the specimen or specimens described by him were obtained.

Concerning the specific name "*incertus*": even if the Geneva specimen proved to be different specifically from the Southern France form described by Gerbe, the name cannot be retained for the latter unless it could be shown to be identical with a species from the St. Gothard (Switzerland), for which it was originally used by De Selys. At the Second Congress of Italian Scientists convened in Turin in Sept. 1840, De Selys declared "*Arvicola incertus*" to be a species provisionally founded on two specimens from the summit of St. Gothard, which are said to differ from *A. Savii* by larger size, more robust feet, and more yellowish coloration of the skin §. He is more explicit in a communication made at

* V. Fatio, Faune Vert. Suisse, iii. App. pp. vii-ix.—Quite recently (Arch. Sc. Phys. et Nat. (4) xix. pp. 188-198, 1905) Dr. Fatio has made remarks upon *Microtus (Pitymys) subterraneus*, De Selys, from Switzerland. The specimens from the majority of Swiss localities are somewhat hesitatingly referred to a new subspecies or variety, *multiplex*. I shall have to take this paper more fully into consideration in a future note, and wish only to mention here that I find myself in disagreement with Dr. Fatio in what he considers to be the cranial characters of typical *M. subterraneus* in specimens from "France":—"Face supérieure de la boîte crânienne subarrondie et assez large en arrière, avec recouvrement plutôt étroit de l'occipital." This applies well to the members of the *duodecimcostatus* group (in which, however, the *m*³ has invariably three internal angles), whereas typical *subterraneus* skulls from Belgium, at my disposal, agreeing with the fig. 2 bis, pl. iii. of the 'Micromammalogie,' have precisely the characters assigned to the new subspecies. Unless Dr. Fatio had before him a new, and as yet undescribed form from some part of France, his supposed typical *subterraneus* may be specimens of a species of the *duodecimcostatus* group in which, for one reason or other, the pattern of the *m*³ cannot be made out.

† Rev. et Mag. de Zool. (2) vi. pp. 607, 608 (1854).

‡ *Ibid.* (2) iv. p. 309 (1852).

§ Atti Seconda Riunione degli Scienziati Italiani tenuta in Torino nel Settembre del 1840, p. 225 (Turin, 1841).

Zurich in the following year:—" *Arvicola incertus* (Selys). Campagnol incertain.—Je signalerai cette espèce nouvelle sur un individu du musée de Zurich, pris dans son nid par monsieur le prof. Schinz, près de l'hospice du St. Gothard, à plus de 6000 pieds d'élévation. Elle y avait formé un magasin composé de racines du saule des Alpes. Il ressemble, par ses oreilles excessivement courtes, à l'*Arvicola Savii* (Selys), espèce qui se trouve dans toute l'Italie; mais il est d'un pelage jaunâtre, à peu près comme l'*arvalis*. Ses pieds à ongles robustes et ses oreilles sont notablement velus, et sa taille est comme celle des grands exemplaires de *Parvalis*. Si ce n'est pas une espèce distincte, c'est l'*Arvicola Savii* qu'il faudrait alors inscrire dans la faune helvétique.—Monsieur Baillon (d'Abbeville) possède un exemplaire de l'*Arvicola incertus*, provenant des environs de Toulon. Il est semblable à celui du musée de Zurich" *.

The specimen from the St. Gothard described by De Selys was applied to by Schinz himself in 1837 as a *Microtus arvalis*:—" *Hypudæus arvalis*.—Sie legt auf Ebenen und Bergen Magazine an. Schinz fing diese Maus auf der höchsten Höhe des Gotthardtpasses in den ersten Tagen des August.—Hier legen sie für ihre Grösse beträchtliche Magazine von verschiedenen Wurzelarten an, welche man im Frühling oft noch in grossen runden Haufen angehäuft findet. Diese Wurzeln, von denen man wenigstens drei Arten unterscheiden kann, sind mit Grashalmen vermischt. Auf dem Gotthardt suchen arme Kinder sie begierig auf und essen diese Wurzeln" †.

In his 'Synopsis' Schinz expressly states that this specimen is distinct from his "*Hypudæus rufescens fuscus*, syn. *H. rufo-fuscus*, Schinz," discovered by Nager lower down, in the Urserenthal ‡.

The specimen from the St. Gothard is again mentioned by De Selys as *Arvicola incertus* in 1843, together with specimens from Saint-Zacharie (Var) and from Montpellier §. In his writings of the following years the St. Gothard gradually drops out from the habitat of the "*A. incertus*," and in 1847 the name *Arvicola Baillonii*, which had already done service twice and had been twice relegated to synonymy

* Edm. de Selys-Longchamps, "Note sur les Campagnols (*Arvicola*) de la Suisse," Verh. Schweiz. nat. Ges. 26te Vers. Zürich, p. 188 (1841).

† "Fauna Helvetica. Wirbelthiere von Prof. Schinz," Neue Denkschr. allg. Schweiz. Ges. f. d. ges. Naturw. i. pp. 21, 22 (1837).

‡ H. Schinz, Syn. Mammalium, ii. p. 240, footn. (1845).

§ Rev. Zool. vi. pp. 130, 131 (1843).

—of *M. agrestis** and of *M. arvalis* †,—is revived for the St. Gothard form ‡, and, as stated above, in 1854 is applied to the type of *M. duodecimcostatus*.

To sum up: both the specimens on which rests the "*Arvicola duodecimcostatus*, De Selys," are to be assigned—the type on the strength of the figured skull, the Montpellier specimen on the authority of Gerbe—to a characteristic group of the subgenus *Pitymys*, represented by various species from Southern France (also from the Pyrenean Peninsula and from Montenegro). If the type specimen of *Microtus duodecimcostatus* is not forthcoming, we must await the rediscovery of this species in the neighbourhood of Geneva before deciding whether it is or is not specifically identical with the one from Montpellier. In any case the name *duodecimcostatus* (1839) antedates the name *incertus* (1840), the latter, moreover, referring originally to some specimen from St. Gothard, considered by De Selys to be nearly related to *M. Savii*, but which from its size seems rather to be some form of the *M. arvalis* group.

2. *Microtus (Pitymys) lusitanicus* (Gerbe).

Arvicola (Microtus) lusitanicus, Z. Gerbe, Rev. Mag. Zool. (3) vii. pp. 44, 46, 47 (1879); id. Bull. Soc. Zool. France, v. p. 56 (1880).

There would be some justification for ignoring the above specific name proposed by Gerbe, since, according to his own declaration, the species has not been described, but only "signalée"; moreover, the two characters which were made known, viz. small size of the animal—"taille inférieure à celle de toutes les espèces qui vivent en France" §—and reduced condition of the middle outer triangle of *m*³, apply equally well to two distinct species of the Western Pyrenean Peninsula, the one from Galicia, the other from Cintra and presumably other parts of Portugal. Since the former may or may not occur likewise in the northern districts of Portugal, whereas the skull on which the species *M. lusitanicus* rests is from Portugal, I adopt this name for a species

* De Selys-Longchamps, Faune Belge, i. (Liège, 1842) p. 36.

† De Selys-Longchamps, in 'Atti Sesta Riun. Scienz. Ital. tenuta in Milano,' 1844, p. 319 (Milan, 1845).

‡ Rev. Zool. x. pp. 308, 309 (1847). When alluding to the name *A. Baillonii* and to "the Swiss specimen of Schinz" ('Säugethiere Deutschlands,' p. 384) Blasius was not aware that at the Congress of Turin and in the 'Faune Belge' this name was applied to a specimen from the Canton Zurich, and in 1847 to quite another specimen (the one from the St. Gothard), both collected by Prof. Schinz.

§ Rev. Mag. Zool. (3) vii. p. 44, footnote 1 (1879).

represented in the Natural History Museum by fourteen specimens collected at Cintra by Mrs. Mary and Mr. Oldfield Thomas. Mrs. Thomas not only assists her husband during his collecting-trips, but science is further indebted to her for helping in the arrangement of the collections of skulls of small mammals in the Natural History Museum; I have therefore associated her name with the species from Galicia described further on.

Microtus lusitanicus belongs to the same group as *M. duodecimcostatus*, as revealed by the arched upper contour of its skull, its deep, subcylindrical brain-case, the backward shelving of its occipital, its protruding upper incisors, and the absence of closed triangles in m^3 , the middle outer triangle of which is much reduced. The characters of the skull and of the incisors are somewhat less pronounced than in the larger species of the group. Those of m^3 conversely are very well marked: out of the fourteen specimens only in three is the reduction of the middle triangle not so marked as usual—in one (no. 98. 2. 2. 49) this occurs on both sides, in two (nos. 98. 2. 2. 41 and 47) on the right side only. The fusion of the two middle (outer and inner) triangles, leading to the formation of a transverse loop and consequently to the absence of any closed triangle in this tooth, is constant in all the fourteen specimens.

The development of a supplemental triangle on m^2 , more rarely on m^1 also, which is a characteristic feature in adult specimens of several species of the subgenus, is of rather exceptional occurrence in the members of the *duodecimcostatus* group. Out of the fourteen specimens of the present species only two exhibit this pentamerodont character. In one (no. 98. 2. 2. 37) the supplemental triangle is moderately developed on both the m^2 , in the other (no. 98. 2. 2. 47) it is more conspicuous and a beginning of a similar development is visible also on the right m^1 .

Coloration.—Above "bistre"*; some specimens approaching more to "broccoli-brown." The bistre-coloured are "smoke-grey" below, with a more or less admixture of "buff" in those approaching to "broccoli-brown" in the upper parts. (All the specimens from Cintra are of a decidedly darker coloration above than that exhibited in another species of the *M. duodecimcostatus* group from the neighbourhood of Seville. The largest of these, represented by numerous specimens in the Natural History Museum,

* For names of colours placed in inverted commas see R. Ridgway, 'A Nomenclature of Colors for Naturalists' (Boston, 1886).

Collector's Dimensions (in millim.) of the fourteen specimens (nos. 98. 2. 2. 37-50), taken in the flesh.

..37.	..38.	..39.	..40.	..41.	..42.	..43.	..44.	..45.	..46.	..47.	..48.	..49.	..50.
♂.	♂.	♂.	♂.	♂.	♂.	♂.	♀ jun.	♀ jun.	♀.	♀.	♀.	♀.	♀.
85	92	98	90	92	87	90	83	81	87	87	93	98	96
27	22	24.2	22	24	26	21	23	22	25	24.5	27	24	25
14.5	14.7	15	15	15.7	15.3	15.3	15	13.8	15	15.1	14.5	15	14.8
7.5	8.6	8.2	8	8	8	8.4	8.2	7.7	8.5	8.1	8.5	8.5	8.5

Cranial Dimensions of eleven specimens, the Skull of which is complete.

..37.	..40.	..43.	..41.	..42.	..47.	..50.	..48.	..45.	..44.
♂.	♂.	♂.	♂.	♂.	♀.	♀.	♀.	♀ jun.	♀ jun.
21.5	23	22.9	23	22	22	23	22	23	20.5
19.7	20.5	20	20.2	20	19.2	20.7	20	17.5	18.8
6	7	7	6.8	6	6	6	6	5.2	5.8
6	5.9	6.2	6	5.8	5.9	5.8	5.9	5.6	5.3
5.8	6	6	5.9	6.2	5.8	5.9	6.2	5.6	5.1
13.2	14	14	14	13.8	13.8	14	13.7	13	5.1
11.2	11.8	11.7	11.8	11.7	11.2	11.2	11.4	11	10.3
6	6	6.8	7	6.2	6	6.8	6.5	6	6
9	9	9	9	8	8	8.8	8.9	8.5	8.6
8.8	8.8	9	8.8	8.6	8.1	8.3	8	8.5	7.3

attain the dimensions of *M. ibericus* (Gerbe). Their coloration is above "bistre," with a tinge of "isabella colour," below grey with a strong admixture of "buff."

Four inguinal mammæ (two on each side) and five foot-pads on the hind sole were noted in the fresh specimens by the collector.

3. *Microtus (Pitymys) Thomasi*, Barrett-Ham.*

The skull of this large species, from Montenegro, bears little resemblance to that of *M. Savii*, and is the very converse of the very low skull of *M. subterraneus*; it agrees in its general features with the members of the *M. duodecimcostatus* group, and likewise in the character of the protruding upper incisors. In the pattern of m^3 there is a tendency towards formation of closed triangles, and the middle outer triangle, with the exception of one specimen (no. 1), is scarcely reduced. Taking the specimens one by one, m^3 exhibits the following characters:—

Collector's no. 85, ad. ♀.—No closed triangles; middle outer triangle scarcely reduced.

Collector's no. 16, ad. ♀.—Outer and inner middle triangles almost closed.

Collector's no. 1, ad. ♂.—The outer and inner middle triangles are closed on the right side; on the left they are confluent, forming a transverse loop. Middle outer triangle reduced.

Collector's no. 86, young ad. ♂.—No closed triangles.

4. *Microtus (Pitymys) Mariæ*, sp. n.

This delicate species is represented in the Natural History Museum by seven spirit-specimens (B.M. nos. 94.1.1.16 and 17; 94.3.19.6–8; 95.4.29.4 and 5) from Viilalva, Prov. Lugo, Galicia, presented by the late Dr. V. L. Seoane.

Coloration.—The specimens, which have been nine years in spirit, show in the adult the upper parts of a brown tinged with "raw umber"; the lower parts are of a shining "buff."

Compared with the members of the *duodecimcostatus* group this form has a narrower, more elongate, rather flattened, low brain-case; zygomata less spreading; upper incisors not protruding. Apart from its smaller size, the skull resembles that of *Microtus Savii*, exaggerating somewhat the latter's characteristic outline; the upper contour represents an even straighter line, with more abruptly

* Ann. & Mag. Nat. Hist. (7) xi. p. 306 (1903).

shelving nasals. The lateral palatal grooves are deep in the adult. Third upper molar without any closed triangles and with the middle outer triangle much reduced; this tooth shows therefore the characteristic pattern of the *duodecim-costatus* group.

Four inguinal mammae.—Five foot-pads on the hind sole.

Dimensions (in millim.), taken from spirit-specimens.

	Head and body.	Tail.	Hind foot.	Ear.
B.M. no. 95.4.29.5 (adult ♂)	84	25	14.5	7.5
B.M. no. 94.3.19.8 (young ♂) ..	73	24	13	7.5

Dimensions of the Skull.

	94.1.1.16. yg. ad. ♀.	94.1.1.17. ♀ jun.	94.3.19.7. ♀ jun.	94.3.19.8. ♂ jun.
Greatest length	22.9	20.5	20.4	21
Basilar length	19.8	..	17.7	18
Length of nasals	6	6	5.5	5.8
" upper molar series .	6	5.5	5.3	5.5
" lower " " .	5.9	5.4	5.7	5.4
Zygomatic breadth	14	12.6	12.4	12.5
Mastoid breadth	10	..	9.7	10.2
Height at occipital	6	..	5.3	5.5
Height between bulla and occipital	8	7	7.5	8.7
Fronto-palatal height	8	6.8	7	7.5

Type specimen, B.M. no. 94. 1. 1. 16, young adult ♀ (spirit-specimen). Villalva, Lugo, Galicia (N.W. Spain).

LXVII.—*On the Preorbital Pit in the Skulls of Domestic Horses and Quaggas.* By R. I. Pocock, F.L.S., F.Z.S., Superintendent of the Zoological Society's Gardens.

In the 'Annals' for last November (p. 317), when criticising Mr. Lydekker's statements and opinions with regard to the presence of a preorbital pit upon the skulls of horses and quaggas and the systematic value claimed for it, I remarked that its known occurrence in two true quaggas' skulls would to a certain extent justify a provisional generalisation as to its constancy in that animal, were it not that this pit belongs to the category of characters which are likely to appear sporadically as atavisms and are therefore, from the systematic standpoint, open to suspicion on the score of inconstancy; and I added that "such characters are of

doubtful value as a basis for the formation of natural groups, for functionless vestiges have seldom much importance in taxonomy." This was written on the assumption of the correctness of the claim that the depression is the remains or vestige of the much larger pit which, in more archaic forms, e. g. *Hipparion*, lodged, it is held, a facial gland comparable to that of Cervidæ. My conclusion as to the systematic value of the character in question was, and still remains, I believe, quite sound, although I do not think the hypothesis that has been put forward as to its significance can be accepted as substantiated by the facts; and, until we get further evidence on the point, I incline to the view that Sir William Flower was probably right in saying that no trace of the preorbital depression seen in the skull of *Hipparion* is to be found [in the adults] of any of the existing species of Equidæ.

For the purpose of testing the frequency of the presence of this depression in horses and of ascertaining, if possible, by rough dissection, if any gland be discoverable over the spot, I examined this area of the skull in several horses slaughtered in the Zoological Society's Gardens for food.

My methods of investigation were not precise enough to justify a denial of the existence of a vestige of a gland; but I failed to detect any difference between the subcutaneous tissue overlying the depression when it was present and that overlying the corresponding area of the skull when it was absent. As for the depression itself, it is sometimes present, but more often absent: it exhibits, indeed, every gradation between a hollow perceptible to the eye and touch and a perfectly flat bony surface. From this hollow or from the corresponding area of the skull arises a long muscle which passes forwards to supply the upper lip and nose; and I believe that its sole significance is to give an increase of surface for the attachment of muscular fibres. If this be so, variation in the extent to which the depression may be developed is exactly what would be expected.

It is possible, but hardly, I think, probable, that the very large preorbital pit in *Hipparion* was also an area for muscular attachment. Its appearance and structure suggest no such function; and there is practically nothing in the formation of the naso-premaxillary region of the skull pointing to the possession by this extinct equine of a larger or more flexible upper lip, requiring an increased muscular supply, than is found in recent members of the family.

On the other hand, a comparison between casts of the skulls of *Hipparion* and *Onohippidium* forcibly suggests that

the facial pits in these two genera are homologous structures, despite their difference in position. The pit of *Onohippidium* is larger even than that of *Hipparion* and lies higher on the face, in correlation with the extremely elevated fronto-nasal region of the skull. But in both the casts of the skull of the former genus that I have seen there may be noticed, a little below and in front of the orbit, an additional, quite shallow depression, forcibly recalling, both in position and development, the preorbital muscular depression that exists in some skulls of recent Equidæ.

This pit is well developed in the skull of the quagga in the British Museum, and is also shown, as Dr. Forsyth Major has pointed out, in the drawing of a quagga's skull published by de Blainville. From these two data Mr. Lydekker felt justified in concluding that it is a constant characteristic of quaggas' skulls; and, believing in its absence from the skulls of Burchell's Zebras, he went a step further and used the character as a basis for separating specifically the Quaggas from the Burchell Zebras. This latter opinion was easily refuted by the demonstration of the presence of the pit in a skull of a specimen of Grant's race of Burchell's Zebra: and I am now in a position to state that the conclusion as to the constancy of the occurrence of the pit in quaggas' skulls was also too hastily established; for in the Museum of the Royal College of Surgeons there are skulls of two stallion quaggas, and in neither of them is a trace of the depression perceptible*.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

January 4th, 1905.—J. E. Marr, Sc.D., F.R.S.,
President, in the Chair.

The following communication was read:—

'The Marine Beds in the Coal-Measures of North Staffordshire.' By John T. Stobbs, Esq., F.G.S. With Notes on their Palæontology by Wheelton Hind, M.D., B.S., F.R.C.S., F.G.S.

Owing to the disposition of the rocks and other causes, the stratigraphical position of the marine beds can be located with exactness *in situ*, and a large quantity of material can be obtained for examination. The horizons can be utilized for the identification of coal-seams and for the subdivision of the Coal-Measures, as they are remarkably persistent, and can be frequently traced not only

* I am indebted to Mr. R. H. Burne for the opportunity of examining these two skulls and also casts of the skulls of *Hipparion* and *Onohippidium*.

over the North Staffordshire field but in adjacent coalfields. The known horizons at which marine fossils have been obtained are the following, given in descending order:—

11. The roof of the Bay or Lady Coal.
10. The Priorsfield Ironstone-Measures.
9. The Speedwell and Nettlebank Bed. } Below the Twist or
8. The Florence Colliery-Band. } Gin-Mine Coal.
7. Above the Moss Coal.
6. The roof of the Moss Cannel or Single 2-foot Coal.
5. Above the 7-foot Banbury Coal.
4. Beneath the 4-foot Coal of Cheadle.
3. The Knyppersley Band.
2. Near the Crabtree Coal (three horizons).

And also 1. The Weston-Sprink Bed.

A map of the distribution of these beds is given, each one is described in detail, and a list of fossils found from the various exposures is tabulated. The Speedwell and Nettlebank Bed appears to be the most important marine bed in the coalfield; it is remarkably rich in species and individuals, and occurs in the upper portion of the true Coal-Measures. Further, it proves the identity of the Twist coal of the Norton area with the Gin Mine of Longton. Lithologically, the marine beds are undistinguishable from the beds with which they are interstratified; but the fossils are usually in a good state of preservation and not confined to one particular bedding-plane; the individuals are likewise numerous. The marine mollusca are, however, sharply separated from the freshwater forms, and no intermingling occurs. It is remarkable that several of the marine shales immediately succeed the coal-seams. A detailed table of the beds in North Staffordshire is given, to show the exact position of the marine beds; and then several of the seams are traced into the Yorkshire, Lancashire, South Staffordshire, and Coalbrookdale fields. This tracing confirms the conclusion that the Hard Bed of Yorkshire is to be correlated with the Bullion coal of Lancashire and the Crabtree coal of North Staffordshire. Again, 'Green's marine bed' at Ashton-under-Lyme coincides with the Gin-Mine horizon of North Staffordshire; and this, again, with the Pennystone of South Staffordshire and Shropshire. Further, the marine beds indicate the approximate identity of the Silkstone, Arley-Mine, and Cockshead seams. A bibliography is appended.

Dr. Hind, in his Notes on the Palaeontology, remarks that from the base of the Pendleside Series to the top of the Coal-Measures there is an unbroken succession of beds—at one time marine, at another estuarine, without unconformity. The two faunas—one with *Carbonicola*, *Anthracomya*, and *Naiadites*, the other with *Pterinopecten papyraceus* and cephalopoda—occur in irregular alternations, the two faunas never mingling. The Author proceeds to give notes on the occurrence of many of the species, and descriptions of some of them, including examples not hitherto known from Britain and one new to science. A table indicating the distribution of the species throughout the chief English Coal-fields concludes the paper.

MISCELLANEOUS.

An overlooked Work.

IN 1871 or 1872 there was published, by authority of the Lords Commissioners of Her Majesty's Treasury, at Southampton, a work entitled 'Ordnance Survey of the Peninsula of Sinai. In three parts.' Part I. is a folio of iv + 323 pp. and 20 plates, and contains zoological matter which has apparently been overlooked, or at any rate has not been referred to, in any Record or Catalogue of Zoology that I am acquainted with, viz. :—

"XI. Zoology: Part I. Notes on the Mammals and Avifauna of the Peninsula." By CLAUDE W. WYATT. Pp. 251–262, plates xiv.–xx.

"Part 2. List of the Coleoptera found during the Progress of the Survey." By G. R. CROUCH. Pp. 263–268.

"Part 3. Notes on Diatomaceæ." By EDWARD T. WILSON. Pp. 269–272.

There are other interesting subjects in the work, *e. g.* "X. Plants of the Peninsula." By Dr. J. D. HOOKER.

As regards the Zoology, I am informed by Professor Newton that a list entitled "Notes on the Birds of the Peninsula of Sinai" was published by Mr. Wyatt in 'The Ibis' for 1870, pp. 1–18. On reference I find that this paper makes no allusion to the author's larger work on the subject nor to the plates therein.

Mr. Crouch's contribution is a list of 128 species of Coleoptera, of which the following are new:—*Saprinus sinaiticus*; *Pachydema sinaitica*, *israelitica*, and *nocturna*: p. 266. *P. ? sancta*; *Erodium sinaiticus* and *ecostatus*; *Adesmia Drakii*, *sinaitica*; *Tentyria Palmeri*: p. 267. *Sepidium korah*, *dathan*, and *abiram*; *Tychius sinaiticus*; *Chrysomela sanguineo-cincta*: p. 268.

I have found the types of all these species in Mr. Crouch's collection, now in the University Museum of Zoology, Cambridge.

Mr. Wilson's notes on the Diatomaceæ do not include any new species.

The titlepage of this work bears date 1869, but the preface is dated Oct. 31st, 1871, and this Zoology was therefore probably not published till 1872.

A copy of the work was presented to the University Library, Cambridge, by the Rt. Hon. the First Commissioner of H.M. Works; and I am much indebted to our University Librarian, Dr. F. J. H. Jenkinson, for finding it for me, when the only clue I could give him was a reference about Mr. Crouch's types contained in the archives of our Museum.

D. SHARP.

University Museum of Zoology, Cambridge,
March 22nd, 1905.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 90. JUNE 1905.

LXVIII.—*Some Bees of the Genus Melissodes from the Rocky Mountain Region.* By T. D. A. COCKERELL.

THE following table separates a series of comparatively large females, all 12 mm. or more in length:—

Hair on inner side of basal joint of hind tarsi black or almost	1.	
Hair on inner side of basal joint of hind tarsi red.	4.	
1. Smaller, with more convex, black, very shiny abdomen; hair of labrum pale reddish; middle of thorax above naked; eyes pale greenish grey		<i>glenwoodensis</i> , Ckll.
Larger, with flatter, less conspicuously shining abdomen; pubescence of thorax more ochreous	2.	-
2. Hair on labrum pale; thorax hairy, or overlapped with hairs, in middle above; eyes pale reddish; abdomen conspicuously banded.		<i>Mizeæ</i> , Ckll.
Hair of labrum dark or brownish	3.	
3. Smaller, hair of pleura all light		<i>blakei</i> , Ckll.
Larger, hair of lower part of pleura dark		<i>chrysothamni</i> , Ckll.
4. Size very large; facial quadrangle not broader than long		<i>helianthelli</i> , Ckll.*.

* The following characters are also useful:—

Wings strongly yellowish; stigma entirely ferruginous.

Second submarginal cell much broader above than its height. *helianthelli*.

Second submarginal cell much narrower above than its height. *Martini*.

Wings not strongly or not yellowish; stigma with at least the lower part darkened all the other species in the table

- Size smaller; facial quadrangle broader than long 5.
5. Hair of thorax above bright orange-fulvous .. 6.
 Hair of thorax above not orange-fulvous;
 abdominal bands narrow and white; eyes
 pale green..... *Martini*, Ckll.
6. Hair on middle abdominal segments white .. *thelypodii*, Ckll.
 Hair on middle abdominal segments fulvous .. *Hewetti*, Ckll.

Melissodes glenwoodensis, sp. n.

♀.—Length about 12 mm.

Shining black, with greyish-white pubescence (not at all fulvous or ochraceous) on head and thorax; middle of thorax nude, without black hair; flagellum dark, obscurely reddened beneath; hair of apex and venter of abdomen black or sooty; the abundant scopa on outside of hind tibiae and tarsi whitish, with a strong reddish tinge. This is a species of the group of *M. desponsa*, and is very closely allied to *M. mysops*, Ckll., from which it is distinguished by the shorter abdomen, and particularly by the eyes distinctly diverging above (in *mysops* they are practically parallel); also by the larger and therefore less numerous punctures of the clypeus, the redder tegulae, and the largely pale hair on the four anterior legs. The hind femora are clothed with black hair in *mysops*, but with light hair in *glenwoodensis*. From *M. enici*, Rob., the new species differs at once by the conspicuous white abdominal bands, narrow and widely interrupted on the second segment, broader and very narrowly interrupted on the third, and very broad and not or very slightly interrupted on the fourth; it also differs by the more shining surface, the colour of the eyes, &c.

Hab. Glenwood Springs, Colorado, Sept. 15, 1903, "only a few specimens seen"; collected by Prof. C. P. Gillette.

This is so close to *M. mysops* that I should be inclined to ascribe the various little differences to variation, were it not for the evidently different set of the eyes. The abdomen appears more globose and convex, but this is no doubt largely due to retraction.

Melissodes Mizea, sp. n.

♀.—Length a little over 15 mm.

Black, robust, with a broad and rather flat abdomen; hair of head and thorax long and rather silky, pale ochreous (quite without black) on vertex, occiput, and thoracic dorsum, white on face, cheeks, and under part of thorax; eyes pale reddish, becoming grey or blackish posteriorly; head broad,

facial quadrangle broader than long; front and vertex shining; flagellum beyond the first joint deep ferruginous beneath; clypeus densely punctured; *labrum densely covered with very pale ochreous hair*; mandibles stout, with a large orange subapical patch; mesothorax shining, with large well-separated punctures posteriorly, and small closer ones anteriorly; tegulae very dark brown. Wings rather dusky, nervures dark; first recurrent nervure entering second submarginal cell *near the beginning of its last fourth*. Legs black, with the small joints of tarsi mainly ferruginous; pubescence of legs mainly pale, black on inner side of basal joint of middle and hind tarsi, shining more or less orange or reddish on inner side of anterior and middle tibiae and anterior tarsi, grey on outer side of anterior tarsi; scopa of hind legs large, in the type full of orange pollen. Abdomen shining; the first segment with the usual ochreous hair, the second with basal and median hair-bands, the third with a broad band, and the fourth with a broader one, covering its apical margin, but giving way to some black basally; these abdominal bands all yellowish white; the two apical segments covered with purplish-black hair; hair of venter grey-brown, light at extreme sides. The absence of black hair on vertex and thorax separates it from *M. montana*, *confusa*, *grindeliae*, &c. The black hair on inner side of hind tarsi separates it from *M. menuacha*, *gilensis*, &c.

Hab. Las Vegas, New Mexico, Aug. 11, 1899, at flowers of *Grindelia inornata*, Greene; collected by Miss S. L. Mize.

Melissodes blakei, sp. n.

♀.—Length about 14 mm.

The abdomen narrower, and with much narrower bands, than that of *M. Mizeæ*; vertex, occiput, and thoracic dorsum with very pale ochreous pubescence, without any black; face, cheeks, and under part of thorax with white or nearly white hair; head broad, facial quadrangle broader than long; *eyes pale grey with a faint greenish tinge*; flagellum, except at base, deep chestnut-red beneath; *labrum covered with pale greyish-brown (as if dirty) hair*; mandibles shining, *apically rather slender*, with an orange subapical streak; posterior middle of mesothorax nude, shining, with large widely separated punctures; middle of scutellum also nude, with smaller, closer punctures; tegulae piceous, reddish posteriorly. Wings slightly dusky; first recurrent nervure entering second submarginal cell *about or before the beginning of its last third*. Legs black, the tarsi becoming reddish apically; hair of legs

mostly pale, but black or dark fuscous on inner side of middle and hind tarsi, shining fulvous on inner side of anterior tarsi; scopa of hind legs abundant, in the type full of orange pollen. Abdomen shining, but not excessively so, with narrow median white hair-bands on segments 2 to 4, and indications of a second (basal) band on 2; the two apical segments with dark fuscous hair; hair of venter dark reddish fuscous. By the colour of the hair on the legs and thorax &c. this resembles *M. Mizeæ*, but it is evidently a distinct species. In addition to the characters cited, the third antennal joint is shorter than that of *Mizeæ*. Compared with *M. pallidicincta*, the abdominal bands of *blakei* are narrower, the vertex is not so broad, and the black hair on the scutellum is lacking. The insect is considerably larger than *M. grindeliæ*, and otherwise different.

Hab. Beulah, New Mexico, end of August (*Cockerell*).

The name commemorates the Blake ranch, the entomological headquarters at Beulah during several seasons. The width of the abdomen of *blakei* is 5 mm., of *Mizeæ* nearly 6. The locality of *M. Mizeæ* is in the Upper Austral zone, that of *M. blakei* in the Canadian zone.

Melissodes chrysothamni, sp. n.

♀.—Length almost 18 mm.

Large and robust, black, with pale ochreous pubescence, tinged with fulvous on scutellum and anterior part of mesothorax; *without black on thoracic dorsum* or vertex, or with a few black hairs at each extreme side of vertex, above top of eye; *hair of labrum, lower part of pleura, base of legs, and ventral surface of thorax generally, black or sooty*, perhaps best described as brown-black; hair of venter of abdomen, of middle tarsi and inner side of hind ones black; hair of legs generally dark, but the middle femora, anterior femora behind, and basal half of anterior tibiae on outer side have light hair in considerable quantity; the anterior tibiae have dark red hair on inner side; the copious scopa of the hind legs (in the specimens seen filled with orange pollen) is light. Abdomen dullish, broadened towards the apex; apical margin of first segment rather broadly reddened in one specimen, but not in the other; first two segments not obviously banded; third and fourth with dull yellowish-white hair-bands, that on third inclined to be interrupted, that on fourth very broad and entire; bases of third and fourth segments with black hairs; the two apical segments with black hair. Eyes silver-grey; facial quadrangle broader than long, but

not very greatly so; mandibles stout, simple, more or less reddened, the orange streak minute; clypeus densely and confluent punctured; tegulae very dark red-brown. Wings moderately dusky; first recurrent nervure joining second submarginal cell about the beginning of its apical fourth; flagellum dark, only slightly reddened beneath. Of the general build and appearance of *M. macharathera*, but easily distinguished by the black legs, dark antennae, &c. It is also related to *M. Smithii* (D. T.).

Hab. Embudo, on the Rio Grande, New Mexico, Sept. 26, at flowers of *Chrysothamnus*, two specimens (*Cockerell*).

M. comptoides, Rob., also has the pubescence of thorax with no black dorsally, but fuscous or black beneath; it is a much smaller species (12-13 mm.) and occurs in Illinois.

Melissodes helianthelli, sp. n.

♀.—Length almost 18 mm.

Even more robust than *M. chrysothamni*, the thorax being larger, and the abdomen broader basally; pubescence of head and thorax dense, erect, pale fulvous, quite bright orange-fulvous on vertex (where there is no black) and anterior part of mesothorax, white on face and cheeks, pale orange on labrum and underside of mandibles; pallid, but by no means white, on lower part of pleura and metathorax; hind part of mesothorax with a rather small, strongly punctured exposed area, having a few black hairs; *scutellum*, *except the margins exposed, dull and densely punctured, this area fringed with coarse black hair; hair of legs pale fulvous, without any black*; the pale fulvous scopa of posterior legs very strongly plumose; hair on inner side of tarsi and of hind tibiae bright ferruginous; small joints of tarsi ferruginous. Abdomen dullish; hair on first segment whitish and rather short, without any black (in *M. chrysothamni* the hair at the base of the first segment is strongly mixed with black); second, third, and fourth segments with the portions overlapped by the segment before covered with dense tomentum, which on the second is white, on the third pale ferruginous, on the fourth dark purplish fuscous; basal part of second segment, narrowing medially, with appressed white hair, apical part glittering with microscopic golden hairs; third and fourth segments with broad white hair-bands, faintly stained with yellowish, that on third more or less failing in the middle, these bands separated from the basal tomentum in each case by a stripe of dark fuscous; apical segments with the hair reddish chocolate, extreme base of fifth black; venter with dark reddish hair.

Facial quadrangle about square, perhaps a trifle longer than broad; eyes light yellowish green; flagellum, except at base, deep red beneath; mandibles stout, with a large orange stripe; tegulae light ferruginous. Wings strongly yellowish on basal half, nervures ferruginous; second submarginal cell very broad, receiving the first recurrent nerve a considerable distance from its end. Differs from *M. comanche*, Cresson, by the duller abdomen, with white bands, the light (apricot-coloured) tegulae, &c. It is a stouter insect than *M. macheranthæ*, and differs in the colour of the eyes (pale blue-green in ♀ *macheranthæ*), the dark (not red) scape, femora, &c.; it is, however, closely allied.

Hab. Mesilla, New Mexico, at flowers of the small sunflower *Helianthus ciliaris*, June 26 (Cockerell).

Melissodes Martini, sp. n.

♀.—Length about $13\frac{1}{2}$ mm.

Black, with a broad but convex abdomen, which has a dullish surface; pubescence of head and thorax pale, dull whitish below, more ochreous above, but nowhere bright-coloured; posterior part of mesothorax, and scutellum except hind margin, bare, these bare areas fringed with black hair, most abundant on scutellum laterally; bare area of mesothorax shining, with large well-separated punctures, that of scutellum closely punctured; clypeus very densely punctured; hair of labrum pale reddish; mandibles reddish in middle, the subapical orange streak minute; vertex with a few black hairs, directed forwards and easily overlooked; eyes light sea-green; facial quadrangle considerably broader than long; flagellum, except at base, dark red beneath; tegulae dark, posterior part reddened. Wings strongly yellowish smoky throughout; first recurrent nerve joining second submarginal cell (which is comparatively narrow) near the beginning of its last third. Hair of legs mainly pale, ferruginous on inner sides of tarsi, sooty on outer side of anterior tarsi and the apex of their tibiae, and more or less sooty or brown on outer side of middle tarsi; tuft on hind knees fuscous; scopa of hind legs (in type full of creamy-white pollen) yellowish white. Hind margin of first abdominal segment narrowly white; base of first segment with erect white hair (no black intermixed); extreme base of second with white hair; median narrow snow-white hair-bands on segments 2 to 4, that on 2 linear and interrupted in the middle, those on 3 and 4 slightly angled in the middle, or that on 4 may extend to the hind margin of the segment, thus becoming

very broad; basal part of fourth segment with a few long black bristles; the two apical segments and the venter, clothed with black hair. Easily known from *M. gilensis* by the black abdomen with narrow white bands; from *M. petulca* by hair on occiput not fulvous, the dark tegulæ, the short second submarginal cell, &c.; from *M. communis* by the yellowish wings, the light scopa of hind legs, the larger size, &c.

Hab. Gallinas River at Las Valles, New Mexico, Aug. 6, two specimens (*T. D. A.* & *W. P. Ckll.*).

Named after my little son, who accompanied me on the expedition that led to its discovery.

Melissodes thelypodii, sp. n.

♀.—Length about 15 mm.

General appearance and markings of abdomen like *M. Martini*, but differing as follows:—*Pubescence of thorax above bright fulvous, without any black*, and covering more of mesothorax; black hairs of vertex more conspicuous, being long and erect; eyes not so green, the lower part perhaps reddish in life; face more hairy, the hair faintly yellowish; clypeus more closely punctured; flagellum brighter red beneath; *tegulæ apricot-colour*. Wings larger, more dusky, and less yellow; first recurrent nervure joining second submarginal cell near its end; outer side of third submarginal cell rounded (angled in *Martini*); hair on first abdominal segment pale fulvous, that at base of second more or less of the same colour. In both species, the small joints of the middle and hind tarsi are red.

Hab. La Cueva, Organ Mts., New Mexico, about 5300 ft., at flowers of *Thelypodium linearifolium*, Sept. 4 (*C. H. T. Townsend*).

A pretty species, from the contrast between the black of the abdomen, with whitish bands, and the red of the thorax and hind tarsi.

Melissodes Hewetti, sp. n.

♀.—Length about or nearly 15 mm.

Of robust build, with a broad abdomen; vertex and thorax above with bright fulvous hair; posterior part of mesothorax and scutellum except hind margin bare, these bare areas not surrounded by black hairs, except that there are a very few at sides of scutellum; bare area of mesothorax shining, with strong rather close punctures (closer and rather smaller than

in *Martini*); sides of vertex with erect dark hairs, not very numerous; face and cheeks with rather dull white hair; facial quadrangle broader than long, but not very greatly so; eyes very pale greenish; flagellum, except at base, dark red beneath; tegulae dark red-brown. Wings very little dusky, much clearer than in *M. thelypodii*; first recurrent nervure joining second submarginal cell about the beginning of its last third; second submarginal cell nearly as broad above as high. Hair of legs pale; dark grey on outer side of anterior tibiae; tuft on hind knees rufo-fulvous; scopa of hind legs fulvous, hair on inner side of their tarsi bright ferruginous; small joints of tarsi ferruginous. Abdomen broad (broader than in *thelypodii*), with the hair on the first four segments ochreous tinged with fulvous, the arrangement of the hair as in *thelypodii*; hair of two apical segments very dark purplish brown; hair of venter fulvous (in *thelypodii* less abundant, and black, with some dull white laterally). By the colour and appearance of the abdominal bands this resembles *M. gilensis*, but it is larger, and the pubescence of the thorax is quite different, much more resembling that of *M. menuacha*. In many respects, *M. Hewetti* resembles *M. texana*, but it differs in having the hair on the face white and the abdominal bands fulvo-ochraceous.

Hab. Santa Fé, New Mexico, Aug. 2, 1894, at flowers of *Cleome serrulata*; collected by myself. It was accompanied on the flowers by *Nomia Fovii*, D. T.

Named after Mr. E. L. Hewett, in recognition of his educational and scientific work in New Mexico.

Melissodes parosetae, sp. n.

♂.—Length about 9 mm.

Antennae very long (about $8\frac{1}{2}$ mm.), flagellum bright fulvo-ferruginous beneath; clypeus, labrum, and a large patch on mandibles lemon-yellow; second joint of maxillary palpi swollen, third long and cylindrical, last minute; facial quadrangle longer than broad, narrowing below; hair of face and cheeks white, of vertex and occiput ochraceous; eyes silver-grey with a green tint; hair of mesothorax fulvous; scutellum with much black hair; tegulae dark brown, hairy. Wings almost clear, stigma and nervures dark ferruginous; second submarginal cell large, receiving first recurrent nervure about the beginning of its last fourth. Hair of legs white, orange-fulvous on inner side of tarsi, which are red; abdominal bands creamy white; hair of venter pale. Looks much like a small ♂ of *M. grindeliae*, but easily separated

by the much longer antennæ, red tarsi, &c. From *M. agilis* it is known by the black hair on scutellum, red tarsi, &c. ; from *M. floris* by the longer antennæ, wings not yellowish, &c. ; from *M. montana* by the much smaller size, abdomen less covered with hair, &c.

Hab. Mesilla, New Mexico, at flowers of *Parosela scoparia*, July 25 (Cockerell).

University of Colorado,
Boulder, Colorado, U.S.A.,
March 16, 1905.

LXIX.—*The Systematic Arrangement of the Fishes of the Genus Arges.* By C. TATE REGAN, B.A.

IN my monograph* of the Loricariidæ I included nineteen species in the genus *Arges*. Messrs Evermann and Kendall †, who have received some fishes of this genus from Ecuador, have written a short paper in which they consider the characters which I have used for the distinction and arrangement of the species as of very little value.

With regard to the structure of the adipose fin, Messrs. Evermann and Kendall, describing the specimens they have received, write: "When first received these examples revealed no trace of an adipose fin excepting what was soon discovered to be a short spine, sometimes naked but in most cases concealed under the skin, evidenced only by a slight elevation, which was at first regarded as a 'short adipose fin'; but in alcohol there gradually appeared on the back a low, thick, fleshy fold which increased in resemblance to a thick adipose fin with their continuance in the preservative, and, in the smaller individuals, became thin and very much like an adipose fin in appearance." They proceed to quote Steindachner's descriptions of the adipose fin in *Arges sabalo*, *A. longifilis*, *A. prenadilla*, and *A. peruanus*, and they then state: "These descriptions show conclusively that what has been so regarded is not a true adipose fin, which conclusion our specimens substantiate. It is evident that the presence of the supposed adipose fin on the different species is simply due to the action of the preservative and that there is no true adipose; and the smaller the individual and the longer

* Trans. Zool. Soc. xvii. pt. iii. pp. 191-324, pls. ix.-xxi. (1904).

† Proc. Biol. Soc. Washington, xviii. pp. 91-106 (1905).

its stay in the preservative, the more like an adipose fin the fold may become."

Sufficient has been said to show that Messrs. Evermann and Kendall regard the structure of the adipose fin as of little value for the distinction of species. They state that their specimens undoubtedly belong to one species and yet that individuals fall respectively into several of my main divisions (based on the structure of the adipose fin), the only condition unrepresented being that of a well-developed adipose fin without trace of a spine, which they would hardly expect to find in specimens which have been only so recently submitted to the action of alcohol.

The position of the ventral fins is a character to which I have attached considerable importance for the distinction of species, but the authors quoted above state that in the males the ventrals are inserted farther forward than in the females, and they give figures of a male fish in which the insertion of the ventrals is below the origin of the dorsal, and of a female with the ventrals inserted below the middle of the dorsal. They continue: "In the males, as already remarked, the ventrals are inserted farther forward than in the females; therefore, comparison of extent of pectorals with ventrals or ventrals with proximity to vent is of no value. In fact, there is such a range of variation in these characters, regarded by Regan as showing specific differences, that there arises a serious distrust of the value of any of them for that purpose."

They conclude that the number of species should be considerably reduced, suggesting that the five alleged Peruvian species may be one, or at the most two. They consider *A. prenadilla* and *A. Eigenmanni* to be synonyms of *A. cyclopus*, suggest that *A. homodon* may be the male of *A. Guentheri*, and think that the characters given for the distinction of *A. Whymperi*, *A. fissidens*, *A. sabalo*, *A. Taczanowskii*, and *A. Vaillanti* are scarcely sufficient.

On receiving Messrs. Evermann and Kendall's surprising paper I at once proceeded to re-examine all the specimens of *Arges* * in the British Museum Collection, with the result that I must entirely adhere to my original arrangement, Messrs. Evermann and Kendall's views being evidently the result of a hasty study of insufficient material.

I maintain my grouping of the species according to the structure of the adipose fin. The first division, to which the *Pimelodus cyclopus* of Humboldt most certainly

* 85 specimens, representing 16 or 17 species, from Peru, Ecuador, Colombia, and Venezuela.

belongs, is characterized by the presence of a well-developed, freely movable spine, as represented in my figures of *Arges homodon* and *A. Guentheri*, and in Boulenger's of *A. Boulengeri*. In the three specimens of *A. Boulengeri* and the eight of *A. Guentheri* which I have examined this feature is constant. The next group, comprising *A. Eigenmanni*, *A. Whymperi*, and *A. Vaillanti*, is characterized by a weak or moderate, sometimes scarcely distinct, rather elongate adipose fin, with a small but distinct spine constantly present*, more or less projecting in very young specimens and completely imbedded in the adult. This description applies to the single specimen of *A. Whymperi*, the three of *A. Vaillanti*, and the nineteen of *A. Eigenmanni*, varying in length from 33 to 100 mm., which I have examined. From these *A. orientalis* and *A. brachycephalus* differ in the absence of the spine, although what appears to be a nodule-like rudiment may rarely be present in the former. I have examined ten specimens of each of the two last-mentioned species.

I am quite unable to see any discrepancy between Steindachner's descriptions of *A. sabalo* and *A. longifilis* and his figures of those species, which are both described and represented as having an elongate and well-developed adipose fin. Such an adipose fin is also characteristic of other species allied to these and represented in the British Museum Collection.

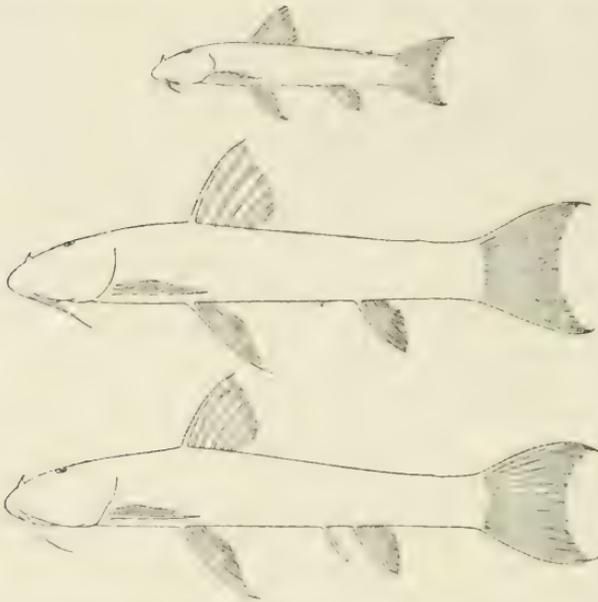
With regard to the structure of the adipose fin, then, it may be said that, making due allowance for slight differences due to size, individual variation, and state of preservation, there is a remarkable uniformity in members of the same species, whilst between the various members of the genus considerable differences exist, which form a convenient basis for the arrangement of the species.

I have been able to examine and compare male and female examples in each of the following species:—*A. Guentheri*, *Boulengeri*, *Eigenmanni*, *orientalis*, *brachycephalus*, *festæ*, and *peruanus*. In none of them can I find the slightest difference between the sexes in the position of the ventral fins, which vary only slightly as to their point of insertion in individuals of the same species, but without regard to sex. Consequently I still attach considerable importance to the position of the ventral fins for the distinction of the species of this genus, whilst the other characters which I have

* It can always be detected by running the finger-nail along the adipose fin from the tail towards the head.

regarded as specific still appear to me to have the same value as before.

With regard to the suggested reduction in the number of species: I have never seen an *Arges* with the ventral fins inserted under the middle of the dorsal, as in the fish figured by Evermann and Kendall * and as in Steindachner's figure of *Arges prenadilla*. In nearly all the specimens I have seen of *A. Eigenmanni* the insertion of the ventral fins may fairly be described as exactly opposite to the origin of the dorsal, in a few it is slightly in advance of the origin



Arges Eigenmanni: male, female, and immature examples.

of the dorsal, and in one specimen (a male) it falls in the vertical from between the bases of the first and second dorsal rays. Consequently I am quite unable, at any rate until I have seen examples corresponding to *Arges prenadilla*, to accept the view of the specific identity of *A. Eigenmanni* and *A. prenadilla*.

A comparison of the figures given here of *A. Eigenmanni*

* The female fish described and figured by Messrs. Evermann and Kendall may be a specimen of *Arges prenadilla*. If their statement that there is no slit behind the last gill be correct, this fish is certainly very different from *A. Eigenmanni*, in which there is a well-developed slit behind the fourth gill. If their description of the relative proportions of interorbital width, distance from eye to nostril, &c. be correct, their figure of the upper surface of the head must be hopelessly inaccurate.

with those published of *A. homodon*, *Guentheri*, and *Boulengeri* and with that of Humboldt's *Pimelodus cycloptum*, will show with sufficient clearness that the first-named species differs very considerably from the others in the structure of the adipose fin and that there cannot be the least doubt that *A. Eigenmanni* is not identical with Humboldt's fish. *A. homodon* is most certainly not a male example of *A. Guentheri*, from males of which species it differs not only in the much more anterior insertion of the ventrals, but also in the much more posterior position of the vent, the more posterior situation of the spine of the adipose fin, and in other characters also.

The suggestion that the Peruvian species, viz. *A. longifilis*, *sabalo*, *Taczanowskii*, *peruanus*, and *Simonsii*, in reality represent only one or two, cannot be entertained. *A. peruanus* and *A. Simonsii* present so peculiar a dentition that I was in doubt as to whether they ought not to constitute a distinct genus, and as the latter species is represented by larger specimens (5 in number) in which the barbel is nearly twice as long as in the smaller examples of *A. peruanus*, there can be no question as to the validity of these two species. The other three differ from each other so widely that there can be no excuse for confounding them, and I need only refer to my synopsis of the species and to the published descriptions and figures.

In the whole genus the only point as to which I entertain some doubt is as to whether *A. Eigenmanni* is distinct from *A. Whymperi*. The latter is based on a single specimen and it is probable that the somewhat shorter ventral and more posterior vent may be due only to individual variation. *A. Vaillanti*, based on three specimens (not one only as stated by Messrs. Evermann and Kendall) with a much shorter caudal peduncle ($6-6\frac{1}{2}$ in the length of the fish, instead of $4\frac{2}{3}-5$ as in *A. Eigenmanni*), is certainly distinct.

Some other points in Messrs. Evermann and Kendall's paper call for comment. They consider that the elongate anal papilla of the male fish represents the first anal ray of the female. This view is completely negatived by the structure of the papilla, by the fact that it is constantly present in the female, although smaller, and by the obvious homology between the first subspinous ray of the anal fin in the two sexes. Moreover, difference in the number of anal rays is either individual or specific, not sexual.

The American authors prefer the generic name *Cycloptium* to *Arges*, whatever the objections which may be urged against it on the ground of its formation. This, of course, is

a matter of opinion, but they afterwards state: "But whatever view may be held on this ground, Mr. Regan's contention does not hold in the case under consideration. *Cyclopium* is not the genitive plural of *Cyclops*, as he imagines, but the neuter form of the adjective *cyclopius*." I do not know what reasons Messrs. Evermann and Kendall may have for this assertion, but Swainson's * own words, as quoted by me (and not as misquoted by them), seem to establish beyond any doubt that he merely took the specific name, without alteration, and used it for his new genus.

The statement that I object to the family name Argiidae of Gill is hardly correct. On the contrary, I should consider it a most excellent name for the group if it is to be regarded as a distinct family. Provided that they be correctly defined and their relations made clear, it appears to me to be a point of comparatively small importance whether the Argiinae or Argiidae be regarded as a specialized group of Loricariidae or as a distinct family. I am inclined to believe, however, that the practice of making every somewhat abnormal or peculiar genus the type of a family tends to obscure its relationships.

LXX.—On some Oriental Aphodiid Coleoptera of the Rhyparus Group, with Description of a new Genus. By GILBERT J. ARROW.

THE British Museum having recently received from Mr. George Lewis a very remarkable minute beetle having no close ally among known genera, I have founded for it a new genus which can only be associated with *Rhyparus*. In the course of studying its affinities I have made a few notes upon certain other species of this peculiar group which I publish at the same time.

STEREOMERA, gen. nov.

Corpus breviter rectangulum, depressum; caput magnum, clypeo late arenato; antennae 9-articulatae, articulo primo longo, lunato, in fossa profunde volvente, secundo breviter cylindrico, tertio fere ad tria sequentes conjuncta aequale, his inter se aequalibus, tribus ultimis clavam brevem formantibus; palpi maxillares longi, graciles; oculi elongati; coxae anteriores quatuor laminibus

* Swainson, of course, misquoted Humboldt, substituting *Pimelodus cyclopium* for *Pimelodus cyclopius*.

angustis separatae, posticae contiguae, prosterno antice et postice valde producto; pedes omnes breves, tibiis sine dentibus vel carinis, tarsis omnibus 3-articulatis, articulis brevibus, crassis; elytrorum epipleurae latae; abdomen valde contractum, segmenta in medio solidati; pygidium ventrale.

Stereomera pusilla, sp. n.

Lata, valde depressa, rufo-picea; capite lato, plano, prothoracis atque elytrorum lateribus exacte coadaptatis, fere rectis et parallelis; prothorace antice leviter angustato, angulis omnibus acutis, parte mediana antice et postice valde elevata ibique breviter longitudinaliter costata, margine postico valde sinuato; elytris brevibus, epipleuris latis, lateribus parteque postica abrupte verticalibus, singulo elytro costis tribus internis pluribusque transversis ornato.

Long. 2.5 mm.

Hab. SINGAPORE.

A single specimen of this minute beetle, found by M. Raffray in November 1889, has been kindly given to the National Collection by Mr. George Lewis. Although having no superficial resemblance to any other genus of Aphodiidae, such of its structural features as are not entirely peculiar point clearly, in my opinion, to a place in that family. The 3-jointed tarsi, much-reduced abdomen, and the form of the thorax and elytra isolate it from all known genera, but in its general anatomy it shows many points of relationship with *Rhypparus*.

The head is large and unarmed, the thorax short and broad, with a deep transverse furrow about the middle which interrupts a series of longitudinal costae continuous with similar costae upon the elytra. These are also obliterated in front of the scutellum by a sharply elevated boss. The elytra exactly fit against the prothorax behind, and at two thirds of their length become rather abruptly perpendicular. The sides are also abruptly perpendicular, and broad folds wrap the abdomen beneath, the elytra being immovable and the suture entirely obliterated. There are three longitudinal costae on each side in addition to the lateral carina, and the last interval is about twice the width of the others. The intervals are crossed by fine transverse ridges, which produce a reticulated appearance. The angles formed by the lateral carinae at the declivity are somewhat turned inwards.

The head in the contracted position fits against the front femora, entirely enclosing the eyes and antennae, the latter fitting into deep fossae in the lower face of the clypeus. There is a very long and slender anterior prosternal process

and a rather long tapering postcoxal process. The middle coxæ are separated by a thin lamina and the hind coxæ are contiguous. Between middle and hind coxæ the metasternum is raised, forming a trapezoidal area. The pygidium is completely ventral, and between it and the metasternum only two ventral segments are distinguishable in the middle, but five or six immovably united can be counted at the sides. The ventral surface is coarsely punctured.

The most remarkable feature of all is found in the tarsi of three joints only, any less number than the coleopterous maximum of five being of extreme rarity among the Lamellicornia. Another abnormal genus of Aphodiidæ (*Phycochus*) has, however, tarsi of only two visible joints. The articulations in *Stereomera* are very close, and can allow very little, if any, movement. Similarly modified tarsi are found in a few Cetoniidæ (*Trichoplus* and *Callinomes*) living in ants' nests. *Stereomera* has in all probability the same habit, for the domestic animals of ants, like those of man, are great violators of the proprieties of systematics.

Although the species of this little group first described was placed by Westwood among the Aphodiidæ, subsequent writers—Harold and Fairmaire—have treated them as Copridæ. There is no justification for this view except Pascoe's inaccurate description of one of the species, called by him *Antrisis Saundersi*, although congeneric with *Rhypparus*, Westwood, and, I believe, identical with the later-described *R. approximans*, Fairmaire. Pascoe described the hind coxæ as widely separated, being evidently deceived by the separation of the femora, which are inserted at a distance from the tips of the coxæ, the latter being really contiguous. Mistaking the inturned pygidium for a ventral segment, he called the abdomen six-jointed, whereas there are only five joints. His figure is also misleading, representing the insect as much too short. In my opinion these forms constitute a link between the Aphodiidæ and Trogidæ. The abdomen of five visible segments, the simple legs without teeth or spines, and the conformation and sculpture of the surface connect them with the Trogidæ, the dilatation of the clypeus, the prominence of the abdomen, the position of the pygidium, &c., exclude them from that family, and the closely approximated coxæ and 9-jointed antennæ are features common to both those families but foreign to the Copridæ.

The list of *Rhyppari* at present described amounts to a dozen, but it will no doubt become very much longer. A third of the number are from Borneo, but the distribution is very wide, extending from Sud-Est Island (Louisiade

Archipelago) in the east to Mauritius in the west, and I have even seen (in M. René Oberthür's collection) a species from West Africa. The only mainland species yet recorded is *R. birmanicus*, Fairm.; but *R. sumatrensis*, Fairm., was found by Doherty at Perak, and I describe here another form occurring in the same locality.

Rhyparus peninsularis, sp. n.

Niger, opacus, griseo-indutus, modice elongatus; capite lato, 6-cristato; prothorace antice valde dilatato, angulis rotundatis, lateribus medio sat dilatatis, deinde contractis, angulis posticis obtusis, disco 6-carinato, carinis duobus internis leviter sinuatis, medio paulo approximatis, duobus intermediis late interruptis, externis integris, intervallis medio et externis sparse grosse punctatis, intermediis lævibus; elytris acute costatis, costis suturalibus paulo latioribus, postice regulariter arcuatis, discoidalibus postice abbreviatis, valde incrassatis, callis apicalibus prominentissimis, intervallis grosse biserialim punctatis, lateribus laud parallelis, postice distincte contractis; pygidio longitudinaliter carinato; corpore subtus sat crebre punctato; tibiis quatuor anterioribus apice valde incurvatis, femoribus intermediis subtus bidentatis.

Long. 6-7 mm.

Hab. MALAY PENINSULA, Penang (*Lamb*), Perak (*Doherty*).

I have seen three specimens, of which that from Perak is in M. Oberthür's collection.

The species resembles *R. Saundersi*, Pascoe, and still more another Bornean form which I have seen identified by M. Fairmaire as his *R. approximans*, but which more nearly agrees with the description of *R. denticollis*, and may be distinct from both. *R. peninsularis* is rather larger than either and relatively broader, with its elytra tapering more behind. It differs most obviously in its puncturation, the inner lateral interstices of the pronotum being smooth and the middle and outer interstices thinly strewn with large punctures, whereas the other species named have the pronotum evenly and densely punctured. The punctures upon the elytral interstices are also very large and arranged in not closely serried rows. The elytra are not angulated behind at the suture, as in *R. Saundersi*. *R. sumatrensis*, Fairm., is also a nearly related form, but it is still larger and the pronotum is almost entirely impunctate.

Rhyparus philippinensis, sp. n.

Niger, opacus, elongatus, parallelus; capite lato, 6-cristato, cristis duabus frontalibus exiguis; prothorace modice transverso, 6-costato, costis sat crassis, intervallis sat grosse punctatis, costis duabus mediis antice et postice leviter divergentibus, intermediis interruptis, laterum angulis anticis mediisque arcuatim productis; elytrorum costis suturalibus latis, postice regulariter arcuatis, discoidalibus postice interruptis, incrassatis, callis apicalibus prominentibus, interstitiis omnibus sat grosse biserialiter punctatis; pygidio longitudinaliter carinato; corpore subtus sat crebre punctato; femoribus simplicibus, tibiis quatuor anterioribus apice incurvatis.

Long. 5-6.5 mm.

Hab. PHILIPPINE ISLANDS.

Four specimens of this species have been in the British Museum since 1845, and M. Oberthür possesses another example. They are almost destitute of the earthy covering usually found in these beetles, but this is probably only due to local or accidental circumstances. The species is similar to the preceding one except in matters of detail. It is rather smaller and more slender, and the prothorax is everywhere rather coarsely punctured, a few punctures being traceable even upon the costæ, which are rather thick. The rows of punctures upon the elytra are rather less coarse than in *R. peninsularis*. The pygidium and underside are as in that species, but the middle femora are not toothed.

Rhyparus gracilis, sp. n.

Niger, opacus, elongatus, parallelus; capite modice lato, punctato, medio tumido, minute bituberculato, postice 4-cristato, clypeo obtuse biangulato, medio recto; prothorace postice latitudine ad longitudinem æquali, lateribus antice et medio arcuatim dilatatis, carinis duabus medianis postice lato divergentibus, intermediis vestigiis anticis et posticis ostensis, externis valde sinuatis, intervallis grosse punctatis; elytris ut in *R. philippinense*, sed paulo longioribus, callis apicalibus modice prominentibus; pygidio apice longitudinaliter carinato; corpore subtus crebre punctato; femoribus quatuor anterioribus subtus angulatis, tibiis omnibus apice fortiter incurvatis.

Long. 6.5 mm.

Hab. LOUISIADE ARCHIPELAGO, Sud-Est Island.

Three specimens were collected by Mr. Meek in April 1898, one of which has been presented by M. Oberthür to the Museum.

The species closely resembles *R. philippinensis*, but is

larger and still more slenderly proportioned, the thorax, exclusive of the anterior projections, being nearly quadrate. The head is less transverse and less angular than in most of the species, and the frontal tubercles are widely separated from those on the vertex. The thorax is coarsely punctured all over, and its central carinæ are close together in front, begin to diverge before the middle, and are wide apart behind. The second carina on each side is very broadly interrupted. The front and middle femora are broadly but sharply angulated beneath.

The genus *Sybacodes* is closely related to *Rhyparus*, but its form is more normal and, except for the thoracic ridges, almost that of *Atenius*. The only known species, *S. lutulentus*, Fairm., originally described from Burma, has a wide distribution, and I have seen it also from Siam, Kanara, and the Panjab. M. René Oberthür has kindly enabled me to compare our series with the types, and as M. Fairmaire's description is ambiguous and in some respects inaccurate, I have thought it desirable to give a redescription, based upon the fuller materials at my disposal.

Sybacodes lutulentus, Fairm.

(‘Notes from the Leyden Museum,’ 1896, pp. 84-85.)

Robustus, griseo-indumentus, subtiliter auropiliferus, clypeo obtuse biangulato, fronte fasciculis duabus aureis ornata; prothorace sat lato, angulis anticis fere rotundatis, posticis excisis, lateribus ante medium lævissime contractis, disco longitudinaliter 6-costato, costis internis duabus fere rectis, externis valde sinuatis, intermediis medio intus fossa parva deflectis, haud interruptis, omnibus breviter auropiliferis; prothorace capiteque irregulariter haud dense punctatis; elytris ad humeros quam prothorace latioribus, deinde lateribus leviter sat regulariter arcuatis, sutura costisque tribus fortiter, intermediisque quatuor minus elevatis, auropiliferis, interstitiis uniseriatim sat grosse punctatis; pygidio quam longitudinem multo latiore, crebre et grosse punctato, carina longitudinale pilifera; tibiis anticis bidentatis, spina apicale breve ac robusta, tarsis sat brevibus.

Long. 7 mm.

Hab. PANJAB, Kangra Valley; S.W. INDIA, Kanara; BURMA, Carin Cheba, Ruby Mines; SIAM, Renong.

This genus has an obvious affinity with *Rhyparus*, but seems to represent a less extreme degree of specialization. The general contour of the head and thorax are the same, but all the elevated portions of the surface are clothed with

fine silky yellow hair. The elytral costæ are twice as numerous as in *Rhypparus*, a secondary series, less elevated, alternating with the primary series. M. Fairmaire's comparison of the elytral sculpture with that of *Sybae impressicollis* seems to be due to a misconception, for that genus is very different in every respect and has very broad and flat intervals between the costæ. There are no elytral pits or callosities in *Sybaecodes*, the head is relatively smaller than in *Rhypparus*, the metasternum shorter, and the last abdominal segment longer. M. Fairmaire has described the front tibiæ as three-toothed, but he has evidently mistaken the strong terminal spine for the apical tooth.

LXXI.—*Descriptions of Seven new Species of Notodontidæ from Tropical South America.* By HERBERT DRUCE, F.L.S. &c.

Hippia undulata, sp. n.

Male.—Head, antennæ, collar, tegulæ, and thorax yellowish brown; thorax and abdomen brown; anal tuft yellowish white; legs yellowish brown. Primaries dark fawn-colour, crossed from the costal margin to the inner margin by a number of fine undulating blackish-brown lines, some of which are broken into small spots; beyond the cell a rather large brown spot: secondaries blackish brown, palest at the base and along the inner margin; the fringe fawn-colour.—*Female* very similar to the male, but paler in colour and with all the markings more distinct.

Expanse, ♂ $1\frac{1}{2}$, ♀ $1\frac{3}{4}$ inch.

Hab. Colombia, Minca, 2000 feet (H. H. Smith, Mus. Druce).

Blera argentata, sp. n.

Male.—Head, antennæ, and palpi black; collar and thorax dark brown; tegulæ silvery grey; abdomen pale greyish brown; the anal segments clothed with black hairs; under-side of thorax and abdomen yellowish brown; the legs dark brown. Primaries dark silvery brown; a line crossing the base of the wing and the discal spot yellowish brown; two narrow waved black lines cross the wing from the costal to the inner margin, the first about the middle, the second

beyond the cell; the outer margin broadly silvery grey; a marginal row of black streaks extends from the apex to the anal angle: secondaries pale greyish brown, slightly yellowish along the inner margin.

Expanse $1\frac{3}{4}$ inch.

Hab. S.E. Peru, Santo Domingo, 6000 feet (*Mus. Druce*).

Meragisa Garlepi, sp. n.

Male.—Head, collar, tegulæ, and thorax pale olive-green; antennæ brown; abdomen above dark brown, the sides and underside yellow, the anal segment yellowish brown thickly irrorated with small brown scales; underside of thorax and legs yellow. Primaries pale olive-green, crossed from the costal to the inner margin by three narrow fawn-coloured bands, edged with black, the first near the base, the second before the middle of the cell, the third beyond the cell; the orbicular spot white; a greyish-white waved submarginal line extends from the apex to the anal angle; a marginal row of black dots from the apex to the anal angle; the fringe alternately yellow and brown: secondaries blackish brown, the base, inner margin, and the fringe pale yellow. Underside of both wings pale yellow, shaded with dark brown, the outer margins yellow.

Expanse $2\frac{3}{4}$ inches.

Hab. Bolivia, Songo (*Garlep, Mus. Druce*).

Meragisa semifulva, sp. n.

Male.—Head and thorax grey, thickly clothed with reddish-brown hairs; palpi black, the third joint small, clothed with yellow hairs; collar and tegulæ reddish brown; antennæ brown; abdomen blackish brown, the basal segment yellow, the anal segment greyish brown; underside of the thorax and abdomen yellow; legs yellow. Primaries greyish white, crossed from the costal margin to the inner margin by a series of lunule-shaped reddish-brown lines; orbicular spot yellow; the base and centre of the wing shaded with yellow; a marginal row of black spots extends from the apex to the anal angle; the fringe alternately reddish brown and yellow: secondaries brownish black, the inner margin broadly banded with pale yellow, the fringe yellow. Underside pale yellowish white, clouded with blackish brown.

Expanse $2\frac{1}{4}$ inches.

Hab. S.E. Peru, Santo Domingo, 6000 feet (*Mus. Druce*).

Lobeza Smithi, sp. n.

Female.—Head, palpi, collar, tegulæ, and thorax grey; abdomen yellowish white, the sides thickly clothed with white hairs; antennæ reddish brown; underside of the thorax, abdomen, and legs white. Primaries greyish white, thickly irrorated with reddish scales; a reddish-brown band crosses the wing near the base: secondaries greyish white; the fringes of both wings grey. Underside of both wings sordid white.

Expanse $2\frac{1}{4}$ inches.

Hab. Colombia, Don Amo, 2000 feet (*H. H. Smith, Mus. Druce*).

Hemiceras affinis, sp. n.

Male.—Head, collar, and tegulæ reddish fawn-colour, back of the head white; antennæ dark brown; thorax and abdomen dark brown; underside of thorax black; legs and underside of the abdomen greyish fawn-colour. Primaries fawn-colour, crossed beyond the middle from the apex to the middle of the inner margin by a dark brown line, palest on the outer edge; a straight brown line crosses the wing near the base, but does not reach either margin; the fringe dark brown: secondaries white, the outer margin shaded with fawn-colour, and no opaque spot near the anal angle; fringe white. Underside of both wings cream-colour, the primaries shaded with fawn-colour along the costal margin and at the apex.—The *female* very similar to the male, but larger.

Expanse, ♂ 2, ♀ $2\frac{1}{4}$ inches.

Hab. N. Peru, Huancabamba, 6000–10,000 feet; S.E. Peru, Santo Domingo, 6000 feet (*Mus. Druce*).

Hemiceras Buckleyi, sp. n.

Male.—Head, collar, tegulæ, and thorax brown, thickly irrorated with greyish scales; antennæ and palpi dark brown; abdomen above greyish brown, underside almost white. Primaries dark fawn-colour, irrorated with brown scales; the orbicular spot dark brown; a submarginal dark brown line extends from the apex to the inner margin: secondaries pale reddish brown. Underside of both wings brownish white.

Expanse $2\frac{1}{4}$ inches.

Hab. Ecuador, Sarayacu (*C. Buckley, Mus. Druce*).

LXXII.—*Descriptions of a new Genus and Four Species of Coleoptera from New Zealand.* By Capt. T. BROWN, F.E.S.

Group *Cnemacanthidæ*.

Metaglymma Doullii, sp. n.

Elongate, nitid, black; antennæ, legs, and labrum picco-rufous.

Head narrowed anteriorly, not constricted behind the small but very prominent eyes, with irregular rugæ near these; epistome truncate, with three or four wrinkles; labrum medially incurved, with five punctures. *Antennæ* of moderate length, the last six joints sparingly pubescent. *Thorax* rather narrow, 2 lines long by $2\frac{1}{2}$ broad, its sides very gently rounded and a good deal, but not abruptly, narrowed behind, posterior angles obtuse; its surface smooth, with the usual groove along the middle, basal foveæ small, not transverse, and placed close to the angles; lateral rims not explanate. *Elytra* oblong-oval, their striæ deep, even near the suture; the punctures are coarse and the transverse intervals between them rarely attain the level of the longitudinal interstices; the inner three interstices are moderately wide, the others become narrower; the apical sculpture is also deep, but more irregular. *Pygidium* smooth.

Tibiæ stout; the outer angle of the anterior does not reach the apex of the basal tarsal joint, that of the intermediate is moderately, the posterior but little expanded.

Underside almost quite smooth and shining, with three punctures at each side, at the extremity, of the last ventral segment.

In *M. monilifer* the lateral margins of the thorax are flattened, with well-marked transverse fovea-like sculpture.

Although I have not seen Dr. Sharp's *M. sulcatum* (no. 1764), I consider the present species its nearest ally; it is, however, distinct therefrom, as in the former the head is without sculpture and the hind body is parallel-sided.

♂. Length $8\frac{1}{2}$, breadth 3 lines.

North Canterbury.

One example from the Rev. Alexander Doull, in whose honour it has been named.

Metaglymma minor, sp. n.

Piccous black, rather dull; legs and antennæ pitchy red.

Head smooth; labrum rounded and punctate in front;

eyes prominent. *Antennæ* all but nude and shining, bearing only a few slender outstanding hairs. *Thorax* much contracted near the base, $2\frac{1}{2}$ lines broad by $1\frac{3}{4}$ long, very slightly rounded laterally; apex truncate, a little emarginate medially at the base, the sides (margins) expanded and somewhat flattened, but narrow at the basal angles, which are obtuse; its surface is smooth, having only the common median sulcus and moderately long fossæ. *Elytra* oblong-oval, narrower at the shoulders than on top of the hind slope; moderately punctate-striate; the discoidal striæ and punctures are rather shallow, those near the sides are coarser, but not deep; the interstices are simple.

Legs stout, the outer apical prolongation of the anterior tibia does not extend beyond the middle of the first tarsal joint, the intermediate tibiæ are moderately and the hind pair slightly thickened at the extremity.

Underside nearly smooth and as red as the femora. Terminal ventral segment with two punctures on each side of the middle at the apex, the intermediate with four punctures at the middle.

This species looks like a small *M. monilifer*, which, however, has a series of about twelve punctures across the extremity of the penultimate ventral segment, with stouter legs and more strongly developed tibial angles, larger but less convex eyes, and slight differences of sculpture.

♂. Length 7, breadth $2\frac{1}{2}$ lines.

North Canterbury.

One from the Rev. A. Doull's collection.

Group **Heleidæ**.

Cilibe costella, sp. n.

Opaque, fuscous black; antennæ, palpi, and tarsi pitchy red; oblong, only slightly oviform, moderately convex.

Head densely, moderately coarsely, and irregularly punctured, most coarsely on the lateral spaces before the eyes; vertex convex; epistome emarginate, but less so than in *C. opacula*. *Thorax* $3\frac{1}{2}$ lines broad by $2\frac{1}{4}$ long, including the front angles, distinctly marginate at the sides, these only slightly curved, almost straight behind the middle, narrowed anteriorly, with a feeble sinuosity near each front angle; this latter is prominent and its tip appears incurved, the base is bisinuate, with rectangular angles; disk moderately convex, the sides somewhat flattened but not obviously concave, the whole surface coarsely and reticulately punc-

tured, interstices rather narrow. *Scutellum* curvilinearly triangular, punctate. *Elytra* rather wider than the thorax at the base and becoming gradually wider towards the hind thighs, from thence much narrowed apically; the sides, as far as these thighs, are evidently concave, but behind that point they are quite flat or depressed, with transverse foveæ and punctures; the suture is plane, but on each elytron there are three more or less distinct discoidal costæ, the two outer become convergent behind, there are also indications of other longitudinal interrupted lines between the costæ; the surface is irregularly and coarsely punctured, with narrow and apparently raised intervals as far as the second costæ, but outside that area the sculpture is intermingled with numerous small granular elevations, some of which almost form regular series towards the hind slope, so that the general sculpture in certain lights seems somewhat linear; the lateral margins are reflexed and minutely sculptured.

Legs and *tarsi* normal, closely and rugosely punctured, with fine flavescens pubescence. *Antennæ* punctate, second joint rather longer than broad, third not twice the length of the following one; joints 4 to 8 longer than broad, 9 to 11 more rufescent and more finely pubescent, 11 oval.

Underside a little nitid, distinctly punctate, with a very minute seta in each puncture; prosternum more coarsely and rugosely punctured.

The stature is that of *C. opacula*, but the sculpture bears more resemblance to that of the smaller *C. granulosa* and *C. rugosa*, thus rendering this species unusually distinct.

Length $8\frac{1}{2}$, breadth $4\frac{1}{2}$ lines.

I am indebted to the Rev. Alexander Doull for the specimens found by him in North Canterbury.

Group Rhyparosomidæ.

HYCANUS, gen. nov.

Rostrum rather shorter than thorax, stout, broadest and pterygiate at the point of antennal insertion, so that it appears contracted behind; its apical portion smooth and shining, the remainder rugose-punctate. *Scrobes* quite open above in front, directed towards but not quite reaching the eyes. *Mandibles* prominent, laminate. *Eyes* almost rotundate, flat, distinctly faceted, just free from thorax and widely distant from each other. *Antennæ* implanted before the middle. *Scape* stout, clavate, attaining the back part of the eye. *Funiculus* obviously longer than scape, basal joint only

one third the length of the scape, second distinctly shorter, joints 3-7 slightly decrease in length, 4-7 moniliform and hardly at all longer than broad. *Club* oval, triarticulate. *Thorax* subcylindric. *Scutellum* obsolete. *Elytra* oblong-oval, wider than thorax at the base.

Legs of moderate length. *Femora* clavate. *Tibiae* simple, their inner angles not prolonged and acuminate. *Tarsi* rather short, with finely pilose soles, their third joint bilobed; the lobes, however, are quite short.

Prosternum moderately incurved. Ocular lobes obsolete. Anterior *cavae* prominent and contiguous, intermediate moderately separated, the posterior widely. *Abdomen* elongate, the basal segment at the sides but little longer than the second, the suture medially incurved; the third and fourth about a third shorter than second (these and the second with straight sutures), fifth rather long.

With some slight modifications the only exponent of this genus might be transformed into a *Clypeorhynchus*. This latter, however, has more slender and much longer antennæ; the eyes, instead of being rotundate, are transverse, their greatest length being from above downwards; their third tarsal joint is formed of very elongate and distinctly separated lobes; the prosternum is more deeply and abruptly emarginate; the elytra are closely adapted to the thorax and at the base do not exceed it in width; the rostrum is nearly cylindrical throughout, whereas in *Hycanus* the anterior two thirds is of oviform outline, and the smooth apical portion is not limited by any definite suture.

Hycanus Cockaynei, sp. n.

Subovate, slightly convex, opaque; fuscous, apex of thorax, elytral suture, and legs castaneous, tarsi testaceous, antennæ rufescent; very sparingly clothed with rather fine short grey setæ, on the hind body, however, many longer erect ones occur.

Rostrum rather coarsely punctate, but smooth, shining, and reddish near the extremity; this part bears a few slender white hairs, but is not apparently marked off from the asperate portion by any basal suture; on the head there is a feeble longitudinal interocular furrow. *Thorax* slightly longer than broad, widest near the front, slightly constricted at apex, gradually narrowed backwards; it is not uneven, there being only a short groove in front; its whole surface is densely and minutely sculptured, and the visible punctures

are only moderately coarse. *Elytra* oblong-oval, much narrowed posteriorly; they are punctate-striate on the disk; towards the base and sides the punctures are distinct, but the striæ are not; the interstices are plane and minutely and closely sculptured. *Antennæ* sparsely pubescent.

Underside with a few small grey setæ; the prosternum with some coarse shallow punctures, the ventral segments finely sculptured.

Length (rostr. incl.) $2\frac{3}{4}$, breadth $\frac{7}{8}$ line.

Auckland Islands.

Described from one example found amongst moss in July 1903 by Mr. L. Cockayne, in whose honour it has been named. The specimen was forwarded to me by Professor Chilton.

Auckland,
17th March, 1905.

LXXIII.—*Natural History Notes from the R.I.M.S. Ship 'Investigator,' Capt. T. H. Heming, R.N., commanding.*—Series III., No. 7. *Preliminary Report on the Deep-Sea Aleyonaria collected in the Indian Ocean.* By Prof. J. ARTHUR THOMSON, M.A., and W. D. HENDERSON, M.A., Carnegie Scholar, University of Aberdeen.

A RICH and interesting collection of Deep-Sea Aleyonarians dredged in the Indian Ocean by the 'Investigator' was entrusted to us for examination and report by Prof. A. Alcock, LL.D., F.R.S., of the Indian Museum, Calcutta. As a second consignment received this year has more than doubled the original collection, it has seemed advisable to publish a brief preliminary notice of those forms which we have been able to examine. We have not in this communication given anything like full diagnoses of the new forms or more than a few measurements; we have merely indicated the general nature of the first consignment of the collection. We hope to complete the report in the course of this year.

Provisional List of Species.

Symphodium indicum, sp. n.
— *incrustans*, sp. n.
Clavularia decipiens, sp. n.

Sarcophytum parvum, sp. n.
— *fungiforme*, sp. n.
Spongodes rosca, *Kükenthal*.

- Spongodes rakayæ*, *Hickson & Hiles*.
Chironophthya variabilis, *Hickson*.
Dasygorgia ramosa, sp. n.
 — *aurea*, sp. n.
Strophogorgia Verrilli, *Wright & Studer*.
Herophila gracilis, sp. n.
Ceratoisis palmæ, *Wright & Studer*.
Acanella rigida, *Wright & Studer*.
Primnois alba, sp. n.
Primnoa Ellisii, *von Koch*.
Calypterinus Allmani, *Wright & Studer*.
Stenella sp.
Thouarella sp.
Paramuricea sp.
Muricella bengalensis, sp. n.
 — sp.
Callistephanus Koreni, *Wright & Studer*.
- Scirpearella moniliforme*, *Wright & Studer*.
 — *alba*, sp. n.
Juncella elongata (*Pallas*).
Telesto rubra, *Hickson*.
 — *Arthuri*, *Hickson & Hiles*.
Protocaulon indicum, sp. n.
Protoptilum medium, sp. n.
Juncoptilum Alcocki, gen. et sp. n.
Microptilum Willemoesi, *Kölliker*.
Leptoptilum sp.
Kophobelemnon Burgeri, *Herklots*.
 Several sp. of *Umbellula*.
Anthoptilum Murrayi, *Kölliker*.
Funiculina sp. ?
Stachytilum fuscum, sp. n.
Pennatula Murrayi, *Kölliker*.
 Three other species of *Pennatula*.
Pteroeides sp.

Order STOLONIFERA.

Family Cornulariidae.

Sympodium indicum, sp. n.

A specimen forming a complete tube round a hollow vegetable axis; the granular greyish-white cœnenchyma is thickly covered with large polyps irregularly arranged; the spicules are rough warty spindles and quadriradiate forms.

Locality. Andamans, 265 fath.

Sympodium incrustans, sp. n.

A large specimen encircling a fragment of the stem of a plant; the whole surface of the membranous stolon and of the large polyps is covered with warty spindles and rods, many of which are visible to the naked eye; the polyps are mostly in groups of two or three.

Locality. Andamans, 371 fath.

Clavularia decipiens, sp. n.

Two specimens of a remarkable and difficult form seem referable to the genus *Clavularia*. They envelop and almost conceal a straight siliceous axis (0.1–0.3 mm. in diameter, 70 and 110 mm. in length, probably the flinty fibre of a glass-rope sponge). The cœnenchyma is thin and consists mainly of a feltwork of spicules. The polyps, including the retracted tentacles, have a length of 3 mm., and are

separated by intervals of 1-7 mm. The calyx is ridged and abundantly spiculated. The spicules are warty spindles, the largest of which are 0.2-0.3 mm. in length, while many are very much smaller.

Locality. Andamans, 238-290 fath.

Order ALCYONACEA.

Family Alcyoniidæ.

Sarcophytum parvum, sp. n.

A small red colony attached to a piece of coral; the capitulum is slightly mushroom-shaped; the polyps are more numerous and smaller round the margin, vary from 4-18 mm. in length, and are thickly coated with spicules; the polyp-spicules are (1) long rod and spindles with very few and very small spines, (2) small clubs spinose at the broad end and interlocking to form a sort of feltwork, and (3) small double clubs.

Locality. Station 232, 430 fath.

Sarcophytum fungiforme, sp. n.

A mushroom-shaped colony, red-brown in colour except the retractile portions of the polyps, which are yellowish; the autozooids are uniformly distributed over the surface and the numerous siphonozooids fill up the gaps; the spicules are (1) slender spinules with few spines, (2) smaller clubs spinose at the thick end, (3) still smaller double clubs, and (4) very minute irregular forms.

Locality. Station 204, 180-217 fath.

Family Nephthyidæ.

Spongodes rosea, Kükenthal.

A specimen which approximates closely to this species, except that some of the spicules are twice as long as the longest described by Kükenthal, and that the coloration is slightly different.

Locality. Bay of Bengal, 88 faths.

Spongodes rakayæ, Hickson & Hiles.

A specimen which agrees almost thoroughly with this species except in a small detail concerning the projecting polyp-spicules.

Locality. Station 237, 90 fath.

Chironophthya variabilis, Hickson.

Numerous fragments, probably belonging to one large colony, seem referable to this variable species; the deep coral-red spicules of the anthocodine form a striking colour-contrast with the white or pale pink branches.

Locality. Bay of Bengal, 88 fath.

Order AXIFERA.

Family Dasygorgidæ.

Dasygorgia ramosa, sp. n.

A profusely branched colony, the fifth branch directly above the first; a long slender polyp on each node; the polyp-spicules are arranged longitudinally, except for two small portions on each side of the base, where they are obliquely transverse; the spicules are warty spindles or flat sword-like forms with serrated edges. This form approaches *D. spiculosa*, but has smaller polyps and larger spicules.

Locality. Station 202, 695 fath.

Dasygorgia aurea, sp. n.

Fragments of a colony with a beautiful golden-yellow axis, with helicoid branching—the fourth branch usually over the first; the polyps are bell-shaped, with eight projecting points, with spirally disposed spicules; the spicules are rods, spindles, and flat irregular forms mostly quite smooth. This form comes near *D. squarrosa*, but cannot be identified with it.

Locality. Station 202, 695 fath.

Strophogorgia Verrilli, Wright & Studer.

Three fragments seem referable to this species. In one the basal attachment is present and consists of a number of root-like processes very calcareous and translucent. The axis is hair-like, very calcareous, and brittle except at the tip; the spicules are irregular in shape, some of the spindles reach a length of 2 mm.

Locality. Andaman Sea, 375–490 fath.

Herophila gracilis, sp. n.

A delicate graceful colony with branches coming off on all sides; the basal attachment consists of very calcareous semi-transparent milk-white root-like processes; the axis is

yellowish and tapers to a thread-like fineness; the branches are disposed in a spiral and the axis is somewhat zigzag; the polyps are distant, usually only one on a node, in some parts all on one side, in other parts in an apparent spiral arrangement; the polyp-spicules lie parallel to the long axis of the polyp except at the base, where they take an oblique direction and finally run parallel to the stem; the superficial spicules are short rods, rounded at the ends, and bearing very minute rough points; besides these there are quadri-radiate spicules with an X-shaped marking, and a number of minute spherical spicules with relatively long projecting spines.

Locality. Station 241, 606 fath.

Family *Isidæ*.

Ceratoisis palmæ, Wright & Studer.

Two fragments which agree in every respect with the description given by Wright and Studer.

Locality. Andaman Sea, 500 fath.

Acanella rigida, Wright & Studer.

A complete bushy colony, with branches in verticels of two, three, or four, with prominent rigid polyps covered with fusiform spicules.

Locality. Laccadive Sea, 703 fath.

Primnoisis alba, sp. n.

The basal portion is a broad calcareous plate; the axis with its alternate horny and calcareous joints is longitudinally grooved; the branches are given off from the calcareous internodes and begin with a horny node; the cœnenchyma is thin and creamy white; the low roughly conical verrucæ occur in fours either in a spiral or in a whorl; the spicules are irregular flat disks and rods with numerous prominent warts.

Locality. Andamans, 270-45 fath.

Family *Primnoidæ*.

Primnoa Ellisii, von Koch.

This beautiful species, described by von Koch from near Naples, also found by Herdman off Ceylon, was obtained by the 'Investigator' at the Andaman Islands (270-45 fath.)—a wide and interesting geographical distribution.

Calypterinus Allmani, Wright & Studer.

The branches arise alternately on three sides of the main stem; the iridescent axis shines through the thin cœnenchyma; the polyps occur in verticels of four, but on one side a bare strip is left which is formed into a canal by the large flat polyp-spicules. The locality confirms the suggestion made by Wright and Studer that this is a deep-sea species.

Locality. Laccadive Sea, 703 fath.

Stenella sp.

The branching is fairly profuse and not confined to one plane; the axis is brown in colour and horny in texture, with a poor development of calcareous corpuscles; the spicules are flat scales, straight or curved spindles, spindles sharply bent at an angle, and irregular spinose forms. The specimen approaches *Stenella acanthina*, Wright & Studer.

Locality. Andaman Sea, 112 fath.

Thouarella sp.

The axis is very calcareous, iridescent, longitudinally grooved; the branches arise on the two lateral faces; the stiff rigid polyps occur in opposite pairs on the branches and singly on the sides of the main stem; they are covered with flat scale-like spicules and have eight projecting spines extending considerably beyond the opercular surface; the spicules are flat, irregular, multi-tuberculate scales, many with a long smooth projecting spine; they are very like those of a *Stenella*. The specimen approaches *Thouarella Moseleyi*, Wright & Studer.

Locality. Laccadive Sea, 703 fath.

Family **Muriceidæ**.*Paramuricea* sp.

A Muriceid consisting of a simple stalk with one clavate branch. The axis is dark brown, with a lighter core; the bluntly conical verrucæ arise from three surfaces, those in one row alternating with those in the others. Irregularly arranged spicules cover the polyps; crown and point spicules protect the tentacles; the whole cœnenchyma is rough with projecting spicules—straight or curved warty spindles, tri-, quadri-, sexradiate forms, spindles with a foliar expansion on one side, and irregular forms.

Locality. Andamans, 265 fath.

Muricella bengalensis, sp. n.

A much-branched almost bushy colony of a pinkish tint, with prominent verrucæ which usually arise on the lateral faces alternately and at right angles; the spicules of the verrucæ project at the bluntly conical apices and the colourless spicules of the tentacles are arranged longitudinally with a basal collaret of transverse rows; the spicules of the general cœnenchyma are straight or curved warty spindles, dark red, light pink, or colourless.

Locality. Bay of Bengal, 88 fath.

Muricella sp.

Another colony of a pink colour, with yellowish lateral verrucæ, has the branching confined to one plane; the dark brown axis shines through the thin translucent cœnenchyma.

Locality. Bay of Bengal, 88 fath.

Family Gorgonidæ.

Callistephanus Koreni, Wright & Studer.

This form differs from that described by Wright and Studer in not having the verrucæ confined to the lateral surfaces and in showing more profuse branching.

Locality. Andaman Sea, 238–290 fath.

Family Gorgonellidæ.

Scirpearella moniliforme, Wright & Studer.

An unbranched fragment may be referred to this species, with which it agrees as regards the shape of the spicules, the low verrucæ, the marked grooving of the axis, and so on. It differs in having more than ten grooves on the axis, and the measurements of the spicules are nearer *Sc. gracilis*, Wright & Studer.

Locality. Andamans, 270–45 fath.

Scirpearella alba, sp. n.

A long white colony differs from *Sc. moniliforme* in having only two rows of verrucæ, in not having a deeply grooved axis, in the size of the polyps, and so on. The spicules are spiny spindles, double clubs, and irregular stars.

Locality. Bay of Bengal, 88 fath.

Juncella elongata (Pallas).

Several brick-red fragments agree well with this species, but there is a trace of a longitudinal bare streak and ridge; the spicules are spiny spindles, double clubs, and double stars; no "triple stars" were found.

Locality. Bay of Bengal, 88 fath.

Order STELECHOTOKEA.

Section I. ASIPHONACEA.

Family Telestidæ.

Telesto rubra, Hickson.

A single specimen, apparently a complete young form, with a spreading base and one branch. The polyps, which measure 2.5 mm. in height, arise at right angles to the stem and are arranged on the four sides in such a way that they seem to form a spiral. In the ridges on the axis, in the minute quantity of horny matter, and otherwise the specimen agrees with Hickson's description.

Locality. Andamans, 120 fath.

Telesto Arthuri, Hickson & Hiles.

A white colony closely resembling *T. Arthuri*, e. g. in having no grooving, in there being no axis, in the arrangement of the polyps in short spirals or in whorls and singly, and in the shape of many of the spicules—spindles straight and curved, triradiate, and quadriradiate forms. It differs in not having the secondary polyps so closely crowded. It is evidently a young form.

Locality. Station 232, 430 fath.

Section II. PENNATULACEA.

Family Protocaulidæ.

Protocaulon indicum, sp. n.

Three complete specimens, with short thin stalk, long rachis, *opposite* biserial polyps, quadrangular axis, and no spicules. The larger zooids are sexually mature.

Locality. Station 239, 55 fath.

Family Protoptilidæ.

Protoptilum medium, sp. n.

An incomplete specimen, granular in texture, with spindle-shaped or rod-like, colourless, ribbed spicules, free from warts or spines. At the basal end there is a small globular swelling with very thin walls, above that there is a longer spindle-shaped swelling; from the upper end of the latter two grooves run up the rachis, one prorachidial, the other metarachidial. At the lower end of the rachis the immature polyps form a single row on each pararachidial surface, those on one side alternating with those on the other. As the polyps reach maturity they assume a more dorso-lateral position; they are large (4.5–5.5 mm.), closely apposed to the stem, abruptly truncated, and the retracted tentacles form an eight-rayed star.

The specimen seems intermediate between *P. aberrans*, Köll., and *P. Carpenteri*, Köll.

Locality. Station 151, 142–400 fath.

Juncoptilum Alcocki, gen. et sp. n.

Eight unbranched fragments of an interesting new form. The white axis is cylindrical and subcylindrical; the verrucæ are at first in short spirals, but alternate higher up, they contain abundant ova (0.15–0.2 mm. in diameter) and some flat circular *embryos* (0.52–0.55 mm. in diameter); the spicules are slender fluted rods from a very pale to a deep sherry colour. Above each verruca and a little to one side there are two small oval openings; if these represent rudimentary autozooids, the specimens approach *Leptoptilum*, but differ in having appressed verrucæ without projecting spines; if they represent siphonozoids, the specimens approach *Protoptilum*, but differ in not having the polyps in groups of three or two. The occurrence of viviparity, as in Hickson's *Gorgonia capensis*, is of interest.

Locality. Station 231, 836 fath.

Microptilum Willemoesi, Kölliker.

A complete specimen, with cylindrical axis, quadrangular to cylindrical stalk, alternate biserial zooids, needle-like spicules, and so on, is referable to this species.

Locality. Andaman Sea, 650 fath.

Leptoptilum sp.

Two fragments, with quadrangular grooved axis, with biserial alternate colourless polyps (7 mm. in length by 2 mm. in breadth, with eight projecting acicular points), approaches *L. gracilis*, but the polyps of that species are described as 3-4 mm. in length.

Locality. Bay of Bengal, 753 fath.

Family **Kophobelemnoidæ.**

Kophobelemnon Burgeri, Herklots.

A complete colony, slightly club-shaped, 57 mm. in height, agrees closely with the description given by Wright and Studer.

Locality. Station 169, 91 fath.

Family **Umbellulidæ.**

The collection includes representatives of five or six species of *Umbellula* which have not been adequately studied as yet.

Family **Anthoptilidæ.**

Anthoptilum Murrayi, Kölliker.

Two incomplete specimens with the polyps all rubbed off. The pit-like markings left show that the autozooids were arranged in oblique transverse rows of two or three. The prorachidial surface is marked by a deep broad groove, the metarachidial surface by a narrow groove, so that the polyp-bearing surface is divided into two strips.

The specimens differ from *A. Murrayi* in being altogether dull white, while the 'Challenger' specimen was pale red, with brown polyps and colourless stalk. Moreover, the axis in the present specimens is more or less quadrangular, not cylindrical.

Locality. Station 104, 1000 fath.

Family **Funiculinidæ.**

Funiculina sp. ?

Twelve specimens with quadrangular axis grooved on each side, with a basal club-shaped swelling, with dark-coloured autozooids with spicular calices in groups of four, with minute white prorachidial siphonozooids. The spicules are long smooth rods with ribs.

Locality. Station 197, 406 fath.

Stachyptilum fuscum, sp. n.

A club-shaped specimen, with autozooids arranged in ten oblique rows on each side, each row consisting of 3-4 polyps, with brown siphonozooids on the surface not occupied by the autozooids. The spicules are rod-like with jagged ends and 4- or 5-rayed forms, some vertebra-like. In several respects the specimen approaches *St. Macleari*.

Locality. Station 213, 137-131 fath.

Family Pennatulidæ.

The collection also includes *Pennatula Murrayi*, K  lliker, and three other species, and one species of *Pteroeides*.

LXXIV.—*Description of Acara subocularis*, Cope.

By C. TATE REGAN, B.A.

THE species described below has generally been placed in the genus *Geophagus*, no doubt on account of its resemblance to *Geophagus cupido*, Heck. This will explain its omission from my revision of the genus *Acara* in the April number of the 'Annals.' Mr. Rudolf von Ihering recently brought me an example for identification, and when I determined it as *Geophagus Thayeri* he pointed out that there was no lobe on the upper part of the anterior branchial arch. In none of the three specimens in the British Museum Collection is there any trace of a lobe on the upper part of the anterior branchial arch. Consequently this species falls in the genus *Acara*, and there can be no doubt that its position is next to *Acara Geayi*, Pellegr., which it resembles in many respects. It is worth notice that in most species of *Acara* the scales of the thoracic region are nearly as large as those on the side of the body, in *A. rivulata* they are smaller, in *A. Geayi* considerably smaller, and in *A. subocularis* very small.

Acara subocularis.

Geophagus (Mesops) Thayeri (non *Acara Thayeri*, Steind.), Steind. Sitzb.

Ak. Wien, lxxi. 1875, p. 108, pl. iii. fig. 2.

Acara subocularis, Cope, Proc. Am. Phil. Soc. xvii. 1878, p. 696.

Geophagus Thayeri, Pellegr. M  m. Soc. Zool. France, xvi. 1903, p. 189 (1904).

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

Snout $2\frac{1}{5}$ -3 in the length of head, diameter of eye $3-3\frac{1}{3}$, interorbital width $3\frac{1}{3}-3\frac{1}{2}$, depth of præorbital $3-3\frac{1}{2}$. Maxillary not extending to below the eye; jaws equal anteriorly; fold of the lower lip continuous; cheek with 5 to 7 series of scales; præoperculum scaleless; 2 or 3 gill-rakers on the upper part of the anterior arch, 7 to 9 on the lower. Scales $29-30_{10-11}^{4-4\frac{1}{2}}$, 2 between lateral line and anterior rays of soft dorsal, those of the thoracic region very small. Dorsal XIII-XIV 10-11 (12), commencing above the opercular cleft, the spines subequal from the fourth, the last $\frac{1}{2}$ the length of head or more. Anal III 8-9. Dorsal and anal fins scaleless. Pectoral longer than the head, extending to above the anal spines. Caudal slightly emarginate. Caudal peduncle longer than deep. Brownish; a blackish vertical stripe through the eye; sometimes a dark blotch on the middle of the side; membrane between first 4 or 5 dorsal spines blackish at the tip; middle of caudal with dark cross-bars.

R. Amazon.

1-3. (81-101 mm.)

3. (102 mm.)

Obidos.

L. Hyanuary.

Prof. A. Agassiz.

Mus. Comp. Zool.

LXXV.—*Descriptions of Four new Loricariid Fishes of the Genus Plecostomus from Brazil.* By RUDOLF VON IHERING.

THE fishes described below were brought by me from the Museo Paulista, São Paulo, Brazil, for comparison with the specimens preserved in the Natural History Museum. In writing these descriptions I have been helped by advice from Mr. C. Tate Regan, who has also kindly given me his authority that the species are distinct from those described by him in his Monograph of the Loricariidae.

Plecostomus Regani.

Depth of body $4\frac{1}{2}-4\frac{3}{4}$ in the length, length of head $3\frac{1}{3}$. Depth of head $1\frac{2}{3}$ in its length, breadth of head $1\frac{1}{6}$, length of snout $1\frac{3}{4}$, diameter of eye $5\frac{1}{2}-6$, interorbital width $2\frac{1}{2}-2\frac{3}{4}$. Length of mandibular ramus 2 in the interorbital width. Barbel $\frac{2}{4}$ the diameter of eye. Snout broad, rounded. Supraorbital margins not raised, supraoccipital with a very slight median elevation; temporal plates not carinate. Scutes spinulose, the anterior ones of the two upper series weakly

carinate; 29 in a longitudinal series, 7-8 between dorsal and adipose fin, 16 between anal and caudal. Supraoccipital entirely bordered posteriorly by a single scute. Lower surface of head and abdomen completely covered with small granular scales, except for a median naked area behind the lower lip. Dorsal I 7, the first ray nearly as long as the distance from its base to the tip of snout, when laid back extending to the adipose fin; last ray $\frac{1}{2}$ as long as the first. Length of base of dorsal equal to its distance from the posterior part of the spine of the adipose fin. Anal I 4. Pectoral spine extending to anterior $\frac{1}{3}$ of ventral or a little beyond. Caudal moderately emarginate, the lower lobe the longer. Caudal peduncle $2\frac{3}{4}$ -3 as long as deep. Some rather small light spots on the upper part of head and body; dorsal brownish, with light spots posteriorly.

Two specimens, 205 and 275 mm. in total length, from the Rio Piracicaba, São Paulo, Brazil. This species is allied to *P. alatus*, Casteln.

Plecostomus tietensis.

Depth of body $4\frac{2}{3}$ in the length, length of head $3\frac{1}{2}$. Depth of head $1\frac{2}{3}$ in its length, breadth of head 1, length of snout $1\frac{3}{4}$, diameter of eye $6\frac{2}{3}$, interorbital width $2\frac{2}{3}$. Length of mandibular ramus $2\frac{1}{2}$ in the interorbital width. Barbel $\frac{3}{4}$ the diameter of eye. Snout broad, rounded; supraorbital margins slightly raised; supraoccipital without median ridge, nearly flat; temporal plates not carinate. Scutes spinulose, not carinate, 27 in a longitudinal series, 7 between dorsal and adipose fin, 14 between anal and caudal. Supraoccipital bordered posteriorly by a median scute and by one on each side. Lower surface of head and abdomen naked, except for a granular strip between the bases of the pectorals. Dorsal I 7, the first ray $\frac{4}{5}$ the length of head, when laid back reaching a little beyond the base of the last ray, which is $\frac{2}{3}$ as long; length of base of dorsal equal to its distance from posterior part of spine of adipose fin. Anal I 4. Pectoral extending to anterior $\frac{1}{3}$ of ventral. Caudal slightly and obliquely emarginate. Caudal peduncle 3 times as long as deep. Upper part of head with dark stripes or vermiculations; body with dark spots; fins with dark cross-bars or series of spots.

One specimen, 160 mm. in total length, from the Rio Tiete, São Paulo, Brazil.

This species is nearest to *P. Vaillanti*, Steind., but is very distinct.

Plecostomus paulinus.

Depth of body $5\frac{1}{4}$ in the length, length of head $3\frac{1}{5}$. Depth of head $1\frac{1}{5}$ in its length, breadth of head nearly 1, length of snout $1\frac{1}{5}$, diameter of eye 6, interorbital width 3. Length of mandibular ramus $1\frac{2}{5}$ in the interorbital width. Barbel nearly $\frac{3}{4}$ the diameter of eye. Snout broad, obtuse; supraorbital edges slightly raised; supraoccipital with slight median elevation; temporal plates not carinate. Scutes spinulose, not carinate, 25 in a longitudinal series, 6 between dorsal and adipose fin, 13 between anal and caudal. Supraoccipital entirely bordered posteriorly by a single scute. Lower surface of head and abdomen partly covered with granular scales; a median naked area behind the mouth, and a large naked area at the base of each ventral, extending forwards and confluent anteriorly with that of the other side. Dorsal I 7, the first ray $\frac{5}{6}$ the length of head, when laid back extending slightly beyond the base of the last, which is $\frac{2}{3}$ as long; length of base of dorsal equal to its distance from posterior part of spine of adipose fin. Anal I 4. Pectoral spine extending to anterior $\frac{1}{3}$ of ventral. Caudal slightly and obliquely emarginate. Caudal peduncle 3 times as long as deep. Uniformly olivaceous, fins dusky.

A single specimen, 160 mm. in total length, from the Rio Piracicaba, São Paulo, Brazil.

Allied to *P. latirostris*, Regan.

Plecostomus Hermannii.

Depth of body about 5 in the length, length of head $3\frac{1}{5}$. Depth of head $1\frac{2}{3}$ in its length, breadth of head nearly 1, length of snout $1\frac{4}{5}$, diameter of eye about 6, interorbital width $2\frac{2}{3}$. Length of mandibular ramus $1\frac{5}{8}$ in the interorbital width. Barbel nearly equal to the diameter of eye. Snout moderately narrowed anteriorly; supraorbital edges not raised; supraoccipital nearly flat; temporal plates not carinate. Scutes spinulose, not carinate, 26 in a longitudinal series, 6 between dorsal and adipose fin, 13 between anal and caudal. Supraoccipital entirely bordered posteriorly by a single scute. Lower surface of head and abdomen in great part covered with small granular scales, with a naked area at the base of each ventral. Dorsal I 7, the first ray nearly equal to the length of head, when laid back extending a little beyond the base of the last, which is $\frac{1}{2}$ as long; length of base of dorsal equal to its distance from the tip of spine of adipose fin. Anal I 4. Pectoral spine bristly, extending to

anterior $\frac{1}{3}$ of ventral. Caudal slightly and obliquely emarginate. Caudal peduncle $2\frac{2}{3}$ as long as deep. Traces of dark spots on the upper surface of the head. Dorsal fin with the posterior part of each interradiial membrane dusky.

One specimen 240 mm. in total length, from the Rio Piracicaba, São Paulo, Brazil.

This species is closely allied to *P. Garmani*, Regan. I have named it after my father, Dr. H. von Ihering.

LXXVI.—*Description of a new Snake from Venezuela.*

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

Leptognathus latifrontalis.

Body strongly compressed. Eye large, its diameter once and a half its distance from the oral border. Rostral a little broader than deep, just visible from above; internasals two thirds the length of the præfrontals; frontal slightly broader than long, as long as its distance from the end of the snout, shorter than the parietals; nasal divided, the posterior part fused with the loreal, which enters the eye; a single præocular; two postoculars; temporals 2+3 or 2+4; eight or ten upper labials, third, fourth, and fifth, or fourth, fifth, and sixth entering the eye; first lower labial in contact with its fellow behind the symphysial; three pairs of chin-shields, anterior as long as broad. Scales in 15 rows, vertebrales enlarged and a little broader than long. Ventrals 19 $\frac{1}{2}$; anal entire; subcaudals 95. Reddish brown above, with darker cross-bands broader than the spaces between them; lower parts pale brown, speckled with whitish.

Total length 800 mm.; tail 220.

A single female specimen collected at Aricaqua, 1000 m. altitude, by Sr. Briceño.

LXXVII.—*A new Cavernularid from Ceylon.*

By JAMES J. SIMPSON, M.A., University of Aberdeen.

[Plate XVII.]

THE collection of Aleyonarians made by Professor W. A. Herdman, D.Sc., F.R.S., in Ceylon Seas (1902) included a small specimen of much interest which was overlooked in the report by Prof. J. Arthur Thomson and Mr. W. D. Henderson

(Ceylon Reports, Royal Society London, vol. iii. 1905). The specimen dredged off Ceylon is a Cavernularid with very distinctive characters and apparently quite new to science. I am indebted to Professors Herdman and Thomson for the opportunity of studying this interesting type.

The colony shows no trace of attachment, and consists of a polyp-bearing upper portion, somewhat ovoid in shape or like a compressed cylinder with hemispherical ends, separated by a constriction from a short, compressed, relatively slender, sterile stalk or trunk, the whole presenting the appearance of a thick club with a short handle (see Pl. XVII. fig. 1). A section of the stock, whether transverse or longitudinal, has the form of a broadly terminated ellipse.

The external measurements are the following:—

- (1) Total length 3·7, breadth 1·7, thickness 1 cm.
- (2) Stock: length 2·5, breadth 1·7, thickness 1 cm.
- (3) Trunk: length 1·2, breadth 0·6, thickness 0·45 cm.
- (4) Constriction 0·65 cm. in breadth.

The general colour of the colony is a dark brown approaching a chocolate-colour, but when seen through a lens it seems decidedly lighter. Some parts of the trunk appear quite whitish; this is due to the spicules shining through the slightly differentiated cortical layer. Over the whole surface of the stock there are pit-like depressions into which the polyps have been retracted. Under a low-power microscope the surface presents a peculiar warty appearance, due to small hemispherical structures (groups of spicules) which are lighter in colour than the general background.

The polyps are dimorphic, the smaller siphonozooids being scattered irregularly among the larger autozooids, which are separated by distances varying from 1 to 3 mm. The autozooids are all retracted except in one small depression. The walls of the polyp-cavities seem to contract over the retracted autozooids, the cavities measuring about 0·5 mm. across, those of the siphonozooids 0·15 to 0·2 mm. The fully expanded autozooid is about 0·75 to 1 mm. in length, and the tentacles measure 0·7 mm. (see fig. 2).

The coenenchyma is densely spiculate, the spicules varying greatly in form and size in the different parts. There are three distinct central canals in the stock which pass down to the very tip of the trunk (fig. 3). The spicules are arranged in bundles supporting the polyp-cavities. The larger polyps contain numerous ova measuring 0·01 to 0·025 mm. in diameter.

A summary description of the spicules is almost impossible because of the number of different forms presented in even a

small portion. They vary to a considerable extent in the different parts of the colony, but a few characteristic points may be noted as common to all. In certain respects they resemble sponge-spicules more than the typical Aleyonarian forms, especially in the fact that they are hyaline and smooth. Many, however, bear digitiform processes, though they could in no way be termed echinulate or warty. In many cases the terminal processes do not end bluntly, but present the appearance of attached cylinders. In the bifurcated forms they closely resemble a double-barrelled gun. Another noteworthy point is the characteristic annulated structure most prominent on the cylindrical forms or those with cylindrical terminations.

A detailed examination of the spicules reveals remarkable peculiarities; those of the cortical layer of the stock are arranged in small groups, which give the colony the warty appearance already referred to. They include the following types:—

- (a) Blunt spindles, 0.3×0.05 to 0.15×0.05 mm.
- (b) Sinuous cylinders, 0.3×0.025 mm.
- (c) Pyriform and elongated forms, 0.5×0.075 mm.
- (d) Double vases, 0.3×0.1 mm.
- (e) Club-shaped, with digitiform terminal processes, 0.3×0.05 mm.
- (f) Others approaching a palmate form, 0.25×0.075 mm. (fig. 4).

Those supporting the body-parenchyma of the stock include the following types:—

- (a) Cylinders with processes at both ends, 0.5×0.075 , 0.7×0.05 mm.
- (b) Sinuous, with digitiform terminations, 0.5×0.1 , 0.6×0.075 mm.
- (c) Club-shaped, with digitiform processes, 0.55×0.05 mm.
- (d) Double barrels, 0.5×0.05 , 0.7×0.05 mm.
- (e) Forms like a long bone bereft of epiphyses, 0.4×0.02 , 0.5×0.02 , 0.5×0.025 mm.
- (f) Irregular and sinuous forms, 0.45×0.05 mm. (fig. 5).

Those of the trunk, which are on the whole larger than those in the stock cœnenchyma, include:—

- (a) Spindles, 0.8×0.1 , 0.5×0.05 mm.
- (b) Palmate forms, 0.6×0.1 , 0.45×0.05 mm.
- (c) Clubs, 0.55×0.01 mm.
- (d) Cylindrical forms, 0.45×0.025 mm. (fig. 6).

An attempt to cut sections proved a failure, and it was thought undesirable to sacrifice much of the single specimen, which had already been cut into four pieces.

There seems no room for doubt that this remarkable form is related to "*Cavernularia*," e. g., in general club-like shape, distinction between stock and trunk, dimorphism of zooids, and in the absence of spicules from the polyp-tentacles. A tabular contrast between Kölliker's description of the genus and the characters of Herdman's specimen will show the distinctiveness of the latter:—

- | | |
|---|--|
| (a) Polyps 3-7 mm. in length. | (a) Not exceeding 1 mm. |
| (b) Axis small or absent. | (b) Axis absent. |
| (c) Spicules long and slender, also slightly flattened. | (c) Besides the long and slender forms, which show no trace of flattening, there are very numerous short broad forms of very diverse shapes. |
| (d) Stock and trunk cylindrical. | (d) Rather elliptical. |
| (e) Stock and trunk continuous. | (e) Separated by a constriction. |
| (f) Four canals in trunk and stock well developed. | (f) Three canals in the stock, which become less distinct, almost appearing as two in the trunk. |
| | (g) Zooids not so numerous as in Kölliker's description. |

Thus Herdman's specimen differs from *Cavernularia* in the length of the autozooids, in the frequency of the siphonozooids, in the shape and character of the stock and trunk, in the number of longitudinal canals, and in the details of spiculation. Although *Cavernularia obesa* is a variable form, none of the varieties present any close resemblance to our specimen. It also differs from *C. madeirensis* (Studer) both in the size and frequency of the zooids. The genera *Styloblemnon* (Kölliker) and *Styloblemnoides* (Thomson and Henderson) need not be considered.

• It seems necessary, therefore, to establish a new genus in the subfamily Cavernularidæ, and it is interesting to note that the Ceylon collection included another new genus (*Styloblemnoides*) also in the same subfamily. I propose to name the new form

Fusticularia Herdmani, gen. et sp. n. (Pl. XVII.)

A somewhat sponge-like Cavernularid with a flattened ovoid stock separated by a constriction from a comparatively slender sterile trunk; with dimorphic retractile polyps, the autozooids not exceeding 1 mm. in length, the much smaller siphonozooids scattered irregularly among the autozooids; with abundant densely spiculate cœnenchyma, traversed by three longitudinal central canals passing down into the

trunk; with smooth hyaline spicules bearing peculiar digitiform terminal processes and showing very characteristic annulations, especially near the ends.

Locality. Cheval Paar, S.E. of Ceylon, 6 fathoms.

EXPLANATION OF PLATE XVII.

Fig. 1. *Fusticularia Herdmani*, whole colony, natural size.

Fig. 2. Portion enlarged, showing the different stages of retraction of the autozooids.

Fig. 3. Transverse section of the stock, showing three central canals.

Fig. 4. Spicules of the cortical layer or cuticle.

Fig. 5. Spicules of the body-parenchyma.

Fig. 6. Spicules of the trunk.

LXXVIII.—*Natural History Notes from the R.I.M.S. Ship 'Investigator,' Capt. T. H. Heming, R.N., commanding.*—Series III., No. 9. *On a new Species of the Dorippoid Genus Cymonomus from the Andaman Sea, considered with reference to the Distribution of the Dorippidæ; with some Remarks on the allied Genus Cymonomops.* By A. ALCOCK, M.B., LL.D., F.R.S., Superintendent of the Indian Museum and Professor of Zoology in the Medical College of Bengal.

[Plate XVIII.]

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4. Remarks on the Genus *Cymonomops*.
5. List of the *Dorippidæ*.

1. *CYMONOMUS* AND THE *DORIPPIDÆ*.

The small blind deep-sea crabs of the genus *Cymonomus* have, in the 'Quarterly Journal of Microscopical Science' for December 1906, formed the subject of a paper, by Professor Ray Lankester, of much interest both biological and taxonomic; so that the discovery of a representative of the genus in the Andaman Sea may, perhaps, be thought worthy of independent notice, especially as it invites zoogeographical inquiries that seem to deserve consideration.

Cymonomus belongs to the Oxystome family *Dorippidæ*—a primitive family, in the typical members of which, as in

the still more primitive *Dromiacea*, the separation of the orbital and antennular fossæ is very incomplete, and the antenna is large and the elements of its peduncle are unusually distinct; and in which also, as in many of the *Dromides*, the last two pairs of thoracic appendages are subcheliform and reduced in size, have a strong dorsal elevation, and are often used for holding some kind of protective covering—such as a valve of a Lamellibranch shell, a worm-tube, a water-logged piece of drift vegetation, or sometimes an inert commensal—over the back, the habit indicating a passive disposition and a secluded life.

The family Dorippidæ at present embraces 10 genera and perhaps 50 recent species, many of which, in conformity with a well-established “law” applicable to primitive forms, have been driven into the depths of the sea.

[I must here remark that I do not include the genus *Palicus*, Philippi (= *Cymopolia*, Roux), with the Dorippidæ, although it was so placed by H. Milne-Edwards and is so retained by Bouvier. *Palicus* seems to me to be an aberrant Grapsoid. It may be added that this exclusion in no way affects the question here considered, since in the matter of geographical distribution *Palicus* presents no points of disagreement.]

2. *CYMONOMUS* CHARACTERIZED, AND *C. ANDAMANICUS* DISTINGUISHED AND DIFFERENTIATED.

CYMONOMUS, A. Milne-Edwards.

Cymonomus, A. Milne-Edwards, Bull. Mus. Comp. Zool. Harvard, viii. 1, 1880, p. 26; Milne-Edwards & Bouvier, Crust. Décap. ‘Hiron-delle’ (Monaco, 1894), p. 57, and Mem. Mus. Comp. Zool. Harvard, xxvii. 1, 1902, pp. 72, 80; Bouvier, Bull. Soc. Philom. Paris, (8) ix. 1898, p. 59; Young, Stalk-eyed Crust. W. Indies, &c. 1900, pp. 321, 323; Lankester, Quart. Journ. Micr. Sci., Dec. 1903, p. 435.

Carapace square or squarish, not concealing the anterior segments of the abdomen; with the regions faintly defined, except the cardiac and postgastric, which are very distinct.

The front forms a rostrum, and the orbito-antennal border is prominent beyond the antero-lateral angles of the carapace; apart from this there are no indications of orbits or antennular fossæ.

The eye-stalks are either fixed or have their mobility diminished, and the eyes are unpigmented and vestigial.

The antennules are large and unconcealed. The antennal peduncle is not hidden and its renal tubercle is particularly prominent.

The buccal cavern is large and square; its roof is high

and is not well differentiated from the receding epistome, so that in an end-on view it is widely open, although ventrally it is closed by the external maxillipeds. The efferent branchial channels are separated, so that the endopodite of the first maxillipeds (which is so much produced in typical Oxystomes, where the channels lie side by side in the middle line of the palate) is of no great length, being much shorter than the exopodite.

In the first maxillipeds the epipodite is well developed, in the second it is almost vestigial, and in the third (external maxillipeds) it is small.

The external maxillipeds, though the ischium and merus are rather narrow, almost cover the buccal cavern ventrally, extending beyond the base of the antennal peduncles. The merus is produced far beyond the carpal articulation, so that it is not much shorter than the ischium. The flagellum is large, coarse, and completely exposed. No afferent branchial fissure is apparent between the carapace and the base of the chelipeds, this area being completely closed by the coxa of the external maxillipeds.

The chelipeds are equal, much shorter, and in the male considerably stouter, than the true crawling-legs.

The first and second pair of true legs are very long, especially as to the dactylus, and are somewhat compressed; the third and fourth pair are short, and in claw-like dactyli, and have the dorsal elevation usual for the family.

The abdomen is large, its breadth, even in the male, corresponding with that of the thoracic sternum; all its segments are distinct, and the three anterior ones are visible in a dorsal view. In the male there are two pairs of large abdominal appendages modified for sexual purposes; in the female, according to Bouvier, there are only three pairs of abdominal appendages.

The oviducts, according to Bouvier, open on the coxæ of the second pair of true legs.

The branchial formula given by Bouvier for the European and West Indian species, to which also the Indian species conforms, is as follows:—

Somites and their appendages.	Podo-branchiæ.	Arthro-branchiæ.	Pleuro-branchiæ.	Total.
VII. (1st maxillipeds).	epip. (large).	..	..	epip.
VIII. (2nd „).	vestigial epip.	..	..	vest. epip.
IX. (3rd „).	epip. (small).	2	..	2+epip.
X. (chelipeds) . . . .	..	2	..	2
XI. (1st true legs) ..	..	..	1	1
	3 epip.	4	1	5+3 epip.

Cyonomus andamanicus, sp. n. (Plate XVIII.)

The entire surface of the body and of all the exposed parts of its appendages, except the terminal joint of the antennular peduncles, is finely frosted.

Carapace slightly, though manifestly, broader behind than in front, without any marginal spinules; the lateral borders are ill-defined posteriorly, and the posterior border is concave in the middle line; the usual regions and furrows are rather faintly indicated.

Rostrum triangular, acute, reaching to the middle of the eye-stalks: the frontal border on either side of it is advanced beyond the antero-lateral angles of the carapace, but the subantennal tooth, which is so conspicuous in *C. quadratus*, is small and quite invisible in a dorsal view, though plain enough in a side view.

The eye-stalks, which are rigidly fixed, divergent, and slightly curved, are devoid of hairs and enlarged spinules and do not reach the tip of the antepenultimate joint of the antennal peduncle; the eye is a small, smooth, unpigmented, subterminal patch.

The antennules are stout, and their peduncle is more than three-fourths the length of the carapace.

The antennæ are shorter and slenderer than the antennules; their peduncle does not reach the terminal third of the second joint of that of the antennules, and none of its joints are spinose; their lash is rather more than half the length of the carapace.

The gap between the epistome and the anterior end of the external maxillipeds is singularly wide and almost sub-tubular; on either side of the epistome is a spinule which may, perhaps, serve to separate the inhalant from the exhalant currents. The epipodite of the first maxillipeds is broadly foliaceous.

The chelipeds of the male are equal, about half again as long as the carapace, and not very massive; a spinule at the inner angle of the wrist and a few on the upper border and outer surface of the hand are enlarged; the hand is longer than the ischium and merus combined, the fingers are slightly longer than the palm and their cutting-edge is entire.

The first pair of true legs are about 3 times, the second pair about $3\frac{3}{4}$ times the length of the carapace; their dactyli are subfalcate, that of the first pair contributing decidedly less, and that of the third pair a little more, than one third the total length of the appendage. The third pair of legs

are about once and a half, the fourth pair about once and a quarter, the length of the carapace, the dactylus in both having the form of a small claw.

The length of the carapace is 8.5 millim., the breadth posteriorly 8 millim., and the breadth across the antero-lateral angles 7 millim.

A single specimen was taken just inside the Andaman basin, at 'Investigator' Station 322: lat. $11^{\circ} 26' 30''$, long. $92^{\circ} 53' 45''$, depth 378 fathoms; bottom green mud with Foraminifera. Unfortunately the bottom-temperature was not recorded, but from previous observations we can infer that it was between 47° and 48° Fahr.

The chief differences between *C. andamanicus* on the one hand and the Atlantic species *C. granulatus* and *C. quadratus* on the other are as follows:—

The carapace is less square, its lateral borders being distinctly, if slightly, convergent anteriorly; its cervical and branchial grooves are somewhat fainter dorsally; and there are no spines at its antero-lateral angles. The rostrum also is broader and much less prominent.

The eye-stalks are quite immovable, and, though microscopically granulose, are not at all spinous.

The cutting-edges of the fingers of the chelipods are not serrated, but, to the naked eye, are quite entire.

From *C. granulatus* the present species is further distinguished by the much smaller subantennal tooth at the outer angle of the buccal cavern; and from *C. quadratus* by the fact that the outer border of the antepenultimate joint of the antennal peduncle is not sharply serrated.

3. GEOGRAPHICAL DISTRIBUTION OF *CYMONOMUS* AND OTHER DORIPPOID GENERA.

The singular sort of residual distribution of *Cymonomus* requires to be explained, but as it fairly well exemplifies that of the family, it may be considered with that of all the other genera of the group, in the way that the subject has already been presented by Professor Bouvier, in his paper on the classification, origin, and distribution of the family, published in the 'Bulletin de la Société Philomathique de Paris' for 1896-1897, pp. 67-69.

1. DORIPPE, Fabr.—This genus, which is composed of 12 or 13 recent species, belongs to the fauna of the shallow water, not having hitherto been found outside the 60-fathom line. Its headquarters appear to be in South-eastern and

Eastern Asia, from the Bay of Bengal to Japan and Australia. On the other hand, two species occur in the Mediterranean, and one off the West Coast of Africa (Cape Verde to the Congo). One of the commonest Indo-Pacific species (*D. dorsipes*, L.) is also met with off the east coast of Africa.

2. *ETHUSA*, Roux.—This genus consists of 14 species, and though found in the Mediterranean and in some parts of the Western Hemisphere, in quite shallow water (13-26 fathoms), commonly lives far down the submarine slopes between 200 and 1200 fathoms. The species are found off the west coast of Tropical America, from the Gulf of California to the Cocos Islands (Panama); in the region of the Gulf of Mexico, from Florida to the Antilles, and also further north off the south coast of New England; in the Eastern Atlantic in the neighbourhood of the Azores and Canaries; in the Mediterranean Sea and its Atlantic gate; and in Oriental Seas, from the Arabian Sea to Fiji.

3. *ETHUSINA*, S. I. Smith.—Seven (or six) species are included in this genus and, among crabs, they are the deepest dwellers of any known, going down to abysses of nearly 2200 fathoms, although one—*E. Smithiana*, Faxon—has been taken in 134 fathoms. They have been dredged off the tropical Pacific coast of America, between the Galapagos and Cocos and the mainland; off the east coast of the Northern United States of America, as far as 38° 53' N.; in the neighbourhood of the Azores, of the western coast of Morocco, and of the Cape Verde Islands; in the Arabian and Andaman Seas, and in the depths of the land-bound basins of the East Indian Archipelago; and off Japan, in 34° 37' N. According to Faxon, two of the Eastern Pacific species are identical with two from the western confines of the same ocean.

4. *TYMOLUS*, Stimpson, is represented by a single species found in shallow water off Japan, about lat. 42° N. The genus is imperfectly known, but it appears to connect *Dorippe* and *Ethusa* with *Cyclodorippe* and *Cymonomops*.

5. *CYCLODORIPPE*, A. Milne-Edwards.—This genus for the present embraces five sublittoral species, of which three occur in the West Indian region, from Florida to Trinidad, in 50 to 357 fathoms, while the other two are found in Japan between 35 and 200 fathoms. According to Bouvier, two of

the species referred by their authors to this genus—namely, *C. dromioides*, Ortmann, from Japan, and *C. granulata*, Rathbun, from off the island of Trinidad—may possibly belong to the next.

6. *CLYTHROCERUS*, Bouvier, at present stands for two species from the West Indies and adjoining coast of North America as far as 32° N., and inhabiting the sublittoral zone at a depth of 50 to 262 fathoms.

7. *CYMONOMUS*, A. Milne-Edwards.—Perhaps six species may be assigned to this genus, their bathymetrical range being from 101 to 1380 fathoms. Their area of distribution includes the Caribbean Sea, the eastern part of the North Atlantic from Iceland to the Arguin Bank off the Sahara (about 21° N.), the western part of the Mediterranean Sea, the east coast of Equatorial Africa, and the Andaman Sea.

8. *CYMOPLUS*, A. Milne-Edwards, includes two species, one from 75 fathoms off the coast of Florida, the other from the West Indies (Montserrat), 148 fathoms.

9. *CORYCODUS*, A. Milne-Edwards, receives a single species from the West-Indian region and dredged in 175–250 fathoms.

10. *CYMONOMOPS*, Alcock, rests upon a single species found in the land-locked basin of the Andaman Sea at 265 and 405 fathoms.

The foregoing summary of the facts of distribution seems to me to support the opinion of Bouvier that the family Dorippidæ “appears to have had its centre of origin and dispersal in the Caribbean region.” It further seems to suggest an answer to the question whether the dispersion has been westwards by way of the Pacific or eastwards by way of the Atlantic. Of any emigration westwards through the Pacific we find very little evidence, while in the other direction the grouping of the family, on the one hand, in what may roughly be called the Panama and West-Indian region, and, on the other hand, in the seas of the Oriental region (India to Japan and Australia), with a halfway-house in the eastern part of the North Atlantic and the Western Mediterranean, seems capable of only one interpretation—namely, an open-sea connexion in the direction indicated by

the half-way-house at a time when the primitive crabs, which are now represented by a furtive remnant, were a more flourishing stock.

I may mention that this interpretation is confirmed by the distribution (tabulated in my 'Catalogue of Brachyura Primigenia in the Indian Museum') of three other families of primitive crabs, namely the Homolodromidæ, the Homolidæ, and the Latreillidæ; and though I must add that it finds no particular corroboration in the distribution of the Dynomenidæ and Dromidæ (which are also primitive groups related to the Homolidæ), I may suggest, as a necessary explanation, that the Dynomenidæ and Dromidæ are very largely shallow-water and littoral forms, whose distribution may have since been influenced by causes which would not affect species that had become adapted to deep-sea conditions.

I may also refer for corroborative evidence in this connexion to my paper in the 'Annals' for October 1904 on the distribution of the Amphibians of the family Cæciliidæ, in which also the suggestive geographical relations of the Indian sublittoral Paguridæ are tabulated.

4. REMARKS ON THE GENUS *CYMONOMOPS*.

In the 'Bulletin de la Société Philomathique de Paris,' 8 sér. tom. ix. (1896-1897), and again in the Report on the Dromiacea and Oxystomes dredged by the 'Blake,' published in 1902, Professor Bouvier, who could not have seen my paper on Indian Oxystomata, published in the 'Journal of the Asiatic Society of Bengal' for 1896, complains that the affinities of *Cymonomops* have not been made clear; so I take this opportunity of re-characterizing this genus and of adding the necessary information regarding the structure of its mouth-parts, the distribution of its gills, and the position of the openings of the oviducts.

CYMONOMOPS, Alcock.

Cymonomops, Alcock, Ann. & Mag. Nat. Hist., May 1894, p. 406, and Journ. Asiatic Soc. Bengal, vol. lxx. pt. 2, no. 2, 1896, p. 286; Bouvier, *loc. cit.*

Carapace almost semicircular in outline, not concealing the anterior abdominal terga, its grooves and regions fairly well defined.

The front consists of a narrow rostrum, not much breaking the general contour of the carapace and ending in two teeth,

between and beyond which can be seen, in a dorsal view, the roof of the much-produced efferent branchial canal. On either side of the rostrum are two teeth which form the dorso-lateral walls of the common orbito-antennular fossæ.

The eye-stalks are slender and freely movable; the eyes are almost without pigment.

The antennules, which are larger than the antennæ, are not entirely concealed in flexion.

The buccal cavern is of great length, its median efferent branchial canal, which is remarkably well defined, being prolonged anteriorly over the epistome and beyond the rostrum; it is closed ventrally and anteriorly, except as regards the tip of the branchial canal, by the long narrow external maxillipeds.

In the external maxillipeds the merus is about three fourths the length of the ischium, the flagellum (which is completely exposed) articulates near the middle of the merus and well inside its edge, the exopodite (which is broad and non-flagellate) is hardly longer than the ischium, and the epipodite is absent or minutely vestigial.

In the first maxillipeds the endopodite is nearly twice as long as the exopodite and is produced as far as the end of the efferent branchial canal, to which it forms a floor, as in typical Oxystomes; and the epipodite is large and foliaceous.

In the second maxillipeds the exopodite has the form of a lash and is much longer than the endopodite, and the epipodite also is of great length.

No afferent branchial fissure is visible between the carapace and the base of the chelipeds.

The chelipeds are equal and are much shorter, and in both sexes much stouter, than the legs.

The first and second pairs of true legs are stoutish and are of very great length, especially as regards the merus. The third and fourth pairs of legs are short, almost filamentous, and have the usual dorsal elevation.

The abdomen in the male is small, is not so broad as the corresponding part of the thoracic sternum, and carries two pairs of large appendages modified for sexual purposes; in the female it is large and broad and carries four pairs of appendages; in both sexes only six segments are distinguishable.

The oviducts open on the coxæ of the second pair of true legs.

The branchial formula is as follows:— ,

Somites and their appendages.	Podo-branchiæ.	Arthro-branchiæ.	Pleuro-branchiæ.	Total.
VII. (1st maxillipeds).	epip. (large)	..	..	epip.
VIII. (2nd „ „).	epip. (large)	..	..	epip.
IX. (3rd „ „).	..	2	..	2
X. (chelipeds) . . . .	..	2	..	2
XI. (1st true legs) ..	..	..	1	1
XII. (2nd „ „) ..	..	..	1	1
	2 epip.	4	2	6+2 epip.

In addition there are two microscopic filaments, probably the vestiges of a podobranch and arthrobranch, on somite VIII.

The genus is represented by a single species (which has been described in the 'Annals' and 'Journal' above cited, and figured on plate xiv. of the "Illustrations of the Zoology of the 'Investigator'") from the Andaman Sea, 265-405 fathoms.

5. LIST OF THE DORIPPIDÆ.

I. DORIPPE, Fabricius, Entomol. Syst. Suppl. p. 361 (1798);
M.-Edw. Hist. Nat. Crust. ii. 154.

- affinis*, Desmarest, Consid. Gén. Crust. p. 135 (1825) (?=*lanata*, Linn.).—Mediterranean.
- armata*, White, Miers, Ann. & Mag. Nat. Hist. (5) viii. 1881, p. 269, pl. xv. fig. 4.—Cape Verde to Congo.
- astuta*, Fabricius, *op. cit.* p. 361, *vide* Alcock, J. A. S. B. lxxv. pt. 2, 1896, p. 280.—Oriental and Australian.
- australiensis*, Miers, Zool. H.M.S. 'Alert,' pp. 185, 258, pl. xxvi. fig. D.—Australian.
- callida*, Fabricius, *op. cit.* p. 362; M.-Edw. Hist. Nat. Crust. ii. 157.—Mediterranean.
- dorsipes* (Linn.), Miers (Alcock, J. A. S. B. lxxv. pt. 2, 1896, p. 277; =*frascone*, Herbst, =*quadridens*, Fabr., =*quadridentata*, Edw., =*atropos*, Lam., =*nodulosa*, Lam.).—E. Africa to Japan and Australia.
- facchino* (Herbst), De Haan (Alcock, *l. c.* p. 278; =*sima*, M.-Edw.).—India to China.
- granulata*, De Haan, Faun. Japon., Crust. p. 122, pl. xxi. fig. 2 (1850).—China and Japan.
- histris*, Nobili, Boll. Mus. Zool. Torino, Dec. 1903, p. 24, and plate.—Singapore.
- japonica*, v. Siebold, De Haan, *l. c.* pl. xxxi. fig. 1.—Japan.
- lanata* (Linn.), Milne-Edwards, Hist. Nat. Crust. ii. 155.—Mediterranean and Atlantic Gate.
- polita*, Alcock & Anderson, J. A. S. B. lxxiii. pt. 2, 1894, p. 208, and Ill. Zool. 'Investigator,' Crust. pl. xxiv. fig. 4.—India.
- severdentata*, Stimpson, Proc. Acad. Nat. Sci. Philad. (1858) 1859, p. 163.—Japan.

- II. ETHUSA, Roux, Crust. Médit. 1828, pl. xviii.; M.-Edw. Hist. Nat. Crust. ii. 161.
1. *americana*, A. Milne-Edwards, Bull. Mus. C. Z. Harvard, viii. 1880, no. 1, p. 30; Milne-Edwards & Bouvier, Mem. Mus. C. Z. Harvard, xxvii. no. 1, 1902, p. 67, pl. xiii. figs. 1-4.—California, Florida.
 2. *andamanica*, Alcock, Ann. & Mag. Nat. Hist. (6) xiii. 1894, p. 405, and Ill. Zool. 'Investigator,' Crust. pl. xiv. fig. 8.—Andaman Sea.
 3. *ciliatifrons*, Faxon, 1893, *vide* Mem. Mus. C. Z. Harvard, xviii. 1895, p. 34, pl. v. fig. 3.—Gulf of Panama.
 4. *hirsuta*, McArdle, Ann. & Mag. Nat. Hist. (7) vi. 1900, p. 474, and Ill. Zool. 'Investigator,' Crust. pl. lxxii. fig. 1.—Arabian Sea.
 5. *indica*, Alcock, Ann. & Mag. l. c., and Ill. Zool. 'Investigator,' Crust. pl. xiv. fig. 2.—Indian Seas.
 6. *lata*, Rathbun, 1893, *vide* Faxon, l. c. p. 35, pl. vi. fig. 1 (= *pubescens*, Fax.).—Gulf of California; Cocos Island (Panama).
 7. *mascarone* (Herbst), M.-Edw. Hist. Nat. Crust. ii. 162.—Mediterranean; Canary Islands.
 8. *microphthalma*, S. I. Smith, Proc. U.S. Nat. Mus. iii. 1881, p. 418.—New England; Azores.
 9. *orientalis*, Miers, 'Challenger' Brachyura, 1886, p. 330, pl. xxviii. fig. 1.—Fiji.
 10. *pygmæa*, Alcock, Ann. & Mag. l. c. p. 406, and Ill. Zool. 'Investigator,' Crust. pl. xiv. fig. 5.—Andaman Sea.
 11. *rosacea*, M.-Edw. & Bouv. 1897, *vide* A. Milne-Edwards & Bouvier, Crust. Décap., Exp. Sci. 'Travailleur' et 'Talisman,' pt. i. 1900, p. 26, pl. iii. fig. 5, pl. x. figs. 5-8.—Canary Islands and N.W. Africa.
 12. *rugulosa*, M.-Edw. & Bouv. 1897, *vide* A. Milne-Edwards & Bouvier, *op. cit.* p. 24, pl. x. figs. 1-4.—W. Africa.
 13. *tenuipes*, Rathbun, Proc. Biol. Soc. Washington, xi. 1897, pp. 109, 110.—Florida.
 14. *truncata*, M.-Edw. & Bouv. 1899, *vide* A. Milne-Edwards & Bouvier, Mem. Mus. C. Z. Harvard, xxvii. no. 1, 1902, p. 69, pl. xiii. figs. 5-8.—West Indian region.
- III. ETHUSINA, S. I. Smith, Ann. Rep. Comm. Fish. for 1882, Decapod Crust. of the 'Albatross,' Washington, 1884, p. 349.
1. *abyssicola*, S. I. Smith, l. c. pl. ii. fig. 1.—E. coast of U.S.A.; Azores, Cape Verde.
 2. *challengeri*, Miers, 'Challenger' Brachyura, 1886, p. 331, pl. xxviii. fig. 2.—Japan; Galapagos.
 3. *desciscens*, Alcock, J. A. S. B. lxxv. pt. 2, 1896, p. 286, and Ill. Zool. 'Investigator,' Crust. pl. lxxii. fig. 2.—Indian Seas.
 4. *gracilipes*, Miers, *op. cit.* p. 332, pl. xxviii. fig. 3.—Oriental; W. coast Tropical America.
 5. *investigatoris*, Alcock, *tom. cit.* p. 285, and Ill. Zool. 'Investigator,' Crust. pl. lxxii. fig. 3.—Arabian Sea.
 6. *Smithiana*, Faxon, 1893, *vide* Mem. Mus. C. Z. Harvard, xviii. 1895, p. 37, pl. vi. figs. 2, 2a.—Cocos Island (W. coast Tropical America).
 7. *talismiæni*, M.-Edw. & Bouv. 1897, *vide* A. Milne-Edwards & Bouvier, Crust. Décap. 'Travailleur' et 'Talisman,' pt. i. 1900, p. 30, pl. iii. fig. 6, pl. x. figs. 9, 10.—Azores; W. coast Morocco.

IV. TYMOLUS, Stimpson, Proc. Acad. Nat. Sci. Philad. (1858) 1859, p. 163.

1. *japonicus*, Stimpson, *l. c.*—N. Japan.

V. CYMOPOLUS, A. Milne-Edwards, Bull. Mus. C. Z. Harvard, viii. 1880, p. 27.

1. *asper*, A. Milne-Edwards, 1880, *vide* A. Milne-Edwards & Bouvier, Mem. Mus. Comp. Zool. xxvii. no. 1, 1902, p. 74, pl. xiv. figs. 1-6, pl. xv. fig. 7.—Antilles.

2. *Agassizii*, M.-Edw. & Bouv. 1899, *vide* A. Milne-Edwards & Bouvier, *tom. cit.* p. 78, pl. xiv. figs. 7-9, pl. xv. figs. 1-6.—Florida.

VI. CYMONOMUS, A. Milne-Edwards, Bull. Mus. C. Z. Harvard, viii. 1880, p. 26.

1. *granulatus* (Norman), *vide* A. Milne-Edwards & Bouvier, Crust. Décap. Exp. Sci. 'Travailleur' et 'Talisman,' pt. i. 1900, p. 34, pl. xi. figs. 5-9.—Ireland to Sahara; W. Mediterranean.

2. *Normani*, Lankester, Q. J. M. S. vol. xlvii., Dec. 1903, p. 456, pl. xxxiii. fig. 1, pl. xxxiv. figs. 8, 10.—Eastern N. Atlantic.

3. *quadratus*, A. M.-Edw. 1880, *vide* A. Milne-Edwards & Bouvier, Mem. Mus. C. Z. Harvard, xxvii. no. 1, 1902, p. 81, pl. xvi.—West Indian region.

4. 'Valdivia' sp., Lankester, *t. c.* p. 458.—E. coast Africa.

5. 'Ingolf' sp., Lankester, *t. c.* p. 459.—S.W. coast of Iceland.

6. *andamanicus*, Alcock, *ante*, p. 468.—Andaman Sea.

VII. CORYCODUS, A. Milne-Edwards, 1880, *vide* A. Milne-Edwards & Bouvier, Mem. Mus. C. Z. Harvard, xxvii. no. 1, 1902, p. 86.

1. *bullatus*, A. M.-Edw. 1880, A. M.-Edw. & Bouv. *ibid.* pl. x:ii.—W. Indian region.

VIII. CYCLODORIPPE, A. M.-Edw. 1880, *vide* A. Milne-Edwards & Bouvier, Mem. Mus. C. Z. Harvard, xxvii. no. 1, 1902, p. 94.

1. *Agassizii*, A. M.-Edw. 1880; M.-Edw. & Bouv. *ibid.* pl. xix. figs. 1-7, pl. xx. figs. 1-3.—Havana.

2. *antennaria*, A. M.-Edw. 1880; M.-Edw. & Bouv. *t. c.* p. 99, pl. xix. fig. 8, pl. xx. figs. 4-12.—Antilles.

3. *dromioides*, Ortmann, Zool. Jahrb., Syst. & c. Abth. vi. 1892, p. 559, pl. xxvi. fig. 5 (? *Clythrocerus dromioides* ex Bouvier).—Japan.

4. *granulata*, Rathbun, Bull. Nat. Hist. Iowa. 1898, p. 293, pl. ix. fig. 1 (? *Clythrocerus granulatus* ex Bouvier).—Trinidad.

5. *uncifera*, Ortmann, *t. c.* p. 560, pl. xxvi. fig. 6.—Japan.

IX. CLYTHROCERUS, A. M.-Edw. & Bouv. 1899, *vide* A. Milne-Edwards & Bouvier, Mem. Mus. C. Z. Harvard, xxvii. no. 1, 1902, p. 90.

1. *nitidus*, A. M.-Edw. & Bouv. 1899; *id. ibid.* pl. xviii.—S.E. coast U.S.A.; Antilles.

2. *perpusillus*, Mary Rathbun, Bull. U.S. Fish. Comm. ii. 1900, p. 90.—Porto Rico.

X. CYMONOMOPS, Alcock, 1894, *vide* J. A. S. B. lxxv. pt. 2, 1896, p. 286.

1. *glaucomma*. Alcock, 1894. *ibid.*, and Ill. Zool. 'Investigator,' Coast. pl. xiv. fig. 9.—Andaman Sta.

EXPLANATION OF PLATE XVIII.

Fig. 1. *Cyonomopus andamanicus*, male; enlarged three times.

Fig. 1 a. The same; ventral view of anterior part of cephalothorax and carapace, showing the buccal cavity almost completely closed by the external maxillipeds and the absence of any afferent branchial opening between the carapace and the base of the chelipeds; enlarged four times.

Fig. 1 b. The same; end-on view of the animal, showing the great breathing-opening between the front of the carapace and the anterior border of the external maxillipeds; enlarged four times.

In concluding this paper I have to express my thanks to Professor E. L. Bouvier for his kindness in sending me specimens of *Cyonomopus granulatus* (Norman) for comparison with the new Andaman species.

LXXIX. — *Observations on Coleoptera of the Family Buprestidæ, with Descriptions of new Species.* By CHAS. O. WATERHOUSE, F.E.S.

[Continued from vol. xiv. p. 348.]

Agæocera Fenyesi, Kerr.

The type of this species is a rather small example of *A. gentilis*, Horn. The specimen labelled *A. gentilis* in Capt. Kerremans' collection is *A. gigas*.

Hypoprasia magnifica, Phil.

Capt. Kerremans gives this as a synonym of *H. harpago*, Fairm. (Wytzman's 'Genera,' p. 67). I have not been able to see the description of this species, but the specimens received by the Museum with this name differ from *H. harpago*, Fairm., in having the sides of the thorax coppery, and the posterior angles more rugosely punctured. The elytra are less acuminate. I think it is a distinct species.

Halecia soror, sp. n.

Fusco-æneous, shining. Head concave in front, and deeply longitudinally canaliculate; the clypeus coppery.

Antennæ greenish blue. Thorax one quarter broader than long, obliquely narrowed in front, almost rectilinear at the middle (not angulated), slightly sinuate before the posterior angles, which are only very slightly or scarcely divergent. The disk is longitudinally, moderately strongly impressed, with a sharply defined central impressed line extending from the front margin to the basal round fovea. The punctuation on the disk is moderately fine and not very close; at the hind angles it is stronger but not closer; the area of the anterior angles is closely and rather strongly punctured. The elytra at the humeral callus are only slightly wider than the thorax, but gradually widen for three fifths their length, and then narrow to the apex; the apices very acute. Each elytron has a very slightly raised obtuse costa near the suture; a second extending from the shoulder joins the first near the apex; a third very obscure one commencing below the shoulder; and the usual sublateral one. The third costa has a very slight interruption about the middle, and behind the middle it is interrupted by a moderately large but very shallow impression.

Long. 21-26, lat. 7-9 mm.

Hab. Ecuador, Balzar (*Buckley*).

This species is near *H. rugipennis*, L. & G., but rather differently coloured. The thorax is straighter at the sides, and the discoidal impression is of more uniform width, and the median line is very distinct and extends the whole length.

Halecia auropunctata, Kerr.

There is a specimen in the Museum from Bogota which has scarcely any trace of the spots on the elytra so conspicuous in the type specimens of this species.

Halecia trilineata, sp. n.

Closely allied to *H. octopunctata*, Fabr., and *H. decemimpressa*, Saund. Above obscure purple; below bright golden green. Head very closely and finely punctured; with a narrow green line bordering the eyes, widening somewhat on the lower part of the face; there is a short, slightly impressed median green line above the clypeus. Thorax convex, narrowed towards the front, the sides rectilinear; the surface is rather closely punctured, the punctures rather stronger and rather more asperate than in *H. 10-impressa*. There are three green lines as in that species, but they are scarcely impressed. There are two small impressions near

the base, one on each side of the sublateral green line, placed obliquely. The margin is green. The anterior area between the green line and the margin is somewhat swollen, and the punctuation here is distinctly less close than in *H. 10-impressa*. The elytra have the lines of punctures quite distinct, much more so than in *H. 10-impressa*. Each elytron has the following golden-green marks:—a short stripe near the scutellum; a basal fovea; a streak below the humeral callus; a moderately large impressed ovate spot on the disk at one-third from the base, and immediately above this there is a short oblique streak; a fine, scarcely noticeable streak above the sublateral carina, almost uniting with the spot below the humeral callus; a large, transverse, impressed spot at one third from the apex; a stripe at the suture at the apex; the extreme margin is very narrowly edged with green. Tibiæ cyaneous.

Long. 16, lat. 6 mm.

Hab. Mexico.

Halecia elongata, sp. n.

Very elongate and narrow. Purple-coppery, reflecting green shades in certain lights; smooth, shining; below æneous. Head very densely and rugosely punctured in front, the punctures slightly separated on the vertex. Thorax purple with green sides; broadest rather behind the middle, slightly narrowed in front; gently sinuate before the hind angles, which are acute. There is a distinct elongate impression in the middle of the base. The punctures on the disk are very distinct, variable in size, not very close together; at the sides they are closer, and are slightly crowded at the front angles. Elytra rather deeply striated, the striae rather strongly and closely punctured; the interstices gently convex, smooth; the sides rather closely but vaguely punctured. The marginal serration is strong and acute. The apex of each elytron is emarginate, the sutural and outer teeth thus formed nearly equal. Femora æneous-black. Tibiæ and tarsi ferruginous, slightly pubescent. Antennæ reddish brown, long, the third to seventh joints very elongate. Abdomen in the middle finely punctured, the punctures not very close together; at the sides the punctuation is finer and much closer, with fine pubescence.

Long. 19, lat. 6 mm.

Hab. Ecuador, Chiguinda (*Buckley*).

Halecia Buckleyi, sp. n.

Elongate, rather narrow, above viridi-æneous, below

brunneo-æneous, shining. Head densely and rugosely punctured in front, the punctures slightly separated on the vertex. Thorax broadest behind the middle, slightly narrowed in front, scarcely sinuate before the basal angles, which are slightly acute, but not prominent; the sides very gently arcuate. Disk with a distinct but not very deep longitudinal impression extending from the base to the front margin. The punctures on the disk are distinct, not very close together; at the sides they are closer and stronger, and are somewhat crowded near the front angles. There is a deep fovea at the base, near the posterior angle. The elytra strongly punctate-striate, the striae rather deeply impressed near the suture, the interstices convex near the suture, less so laterally, the second and fourth costiform at the apex. There is a shallow, wrinkled impression at the base; a moderately large, distinct, oblique, reniform impression at the middle; and another transversely ovate one halfway between this and the apex. The apex of each elytron gently emarginate, the sutural and lateral teeth subequal. Femora blackish æneous, shaded with purple at the apex. Tibiæ and tarsi ferruginous, with very short pubescence. Antennæ obscure æneous, the third joint very long, the fourth rather shorter, the following gradually decreasing in length. Abdomen in the middle finely punctured, the punctures not very close together; at the sides the punctures are very fine and much closer, with some fine pubescence.

Long. 14-22, lat. $4\frac{1}{2}$ -7 mm.

Hab. Ecuador, Sarayacu, and Chiguinda (*Buckley*).

The small specimen, which is a male, is more golden green below, with coppery shades, and the femora are green.

Halecia sexcostata, sp. n.

Form of the preceding, brownish æneous above and below, shining. Head closely and rather rugosely punctured in front, the punctures slightly separated on the vertex. Thorax shining, slightly narrowed in front, the sides gently arcuate, very slightly sinuate before the posterior angles, which are somewhat acute. The disk with a not very deep longitudinal impression extending from the base to the front margin. The surface on each side of this with distinct but rather small punctures, which are rather widely separated; towards the sides the punctures are somewhat stronger and crowded, the intervals having a tendency to form short oblique rugæ. There is a fovea at the base near the posterior angle. The elytra strongly punctate-striate, the second, fourth, and

sixth interstices costiform: the first costa becomes very fine at the apex; the second extends from the humeral callus to the outer apical tooth; the third is abbreviated at each end. The apex of each elytron is rather deeply emarginate, and the two teeth thus formed are very acute. Tibiæ shaded with steel blue, slightly pubescent. Tarsi ferruginous, but more or less metallic green above. Abdomen in the middle more strongly punctured than in the preceding species, the punctures slightly elongate; at the sides the punctuation is very fine and rather close. The pubescence is extremely short. ♀.

Long. 20, lat. $6\frac{1}{2}$ mm.

Hab. Bogota.

A single specimen presented by Señor José Vergara, F.Z.S.

Halecia rugosa, sp. n.

Elongate-elliptical, blackish æneous above, dark æneous below, moderately shining. Head very closely and rather strongly punctured, tinted with steel-blue, with a lightly impressed median line. Thorax moderately narrowed in front, broadest just behind the middle, almost straight to the posterior angles, which are acute and slightly prominent. Disk with a rather strongly marked impression extending from the base to the apex; it is rather broad at the base, narrowed in front, with a short smooth line in the middle, on each side of which is an irregular line of strong punctures. The punctures on the disk are small but very distinct, not very close together, at the sides they are very deep, larger, and at the anterior angles often confluent. The surface is very uneven; the anterior margin is impressed, and there is a small fovea at the base near the hind angles. The elytra are at their base distinctly broader than the thorax, subparallel for two thirds their length, and then narrowed in the usual way to the apex. They are very deeply punctate-striate, or rather there are lines of deep foveæ, the foveæ being of unequal size, and sometimes two or three unite into one; the second interstice is slightly costiform, the others are narrow and rendered irregular by the strong foveæ. The apex of each elytron is emarginate, the outer tooth rather less acute than the sutural one. The abdomen is more strongly and rather more closely punctured in the middle than in the preceding species; at the sides it is closely and finely punctured, the punctures being slightly asperate. Tarsi bluish green. Antennæ almost black; the second joint rather short, the third about one third longer, the following rather shorter and widened towards the apex.

Long. 18, lat. 6 mm.

Hab. Amazons, Barciraó de Monte Alegre, Nov. 1873.

A single example collected and presented by Prof. Trail.

Halecia viridispilendens, sp. n.

Bright golden green, shining. Head densely and moderately strongly punctured, with an impressed median line extending almost to the vertex. Thorax obliquely narrowed in front, broadest at one third from the base, somewhat angularly emarginate before the posterior angles; the sides slightly angular at the broadest part, with the margin slightly thickened at this part. Disk tinted with darker bluish green, with a little purple near the base; the darker portion finely, distinctly, but not very closely punctured; the anterior part of the margin and all the region of the anterior angles very closely and more strongly punctured, the closely punctured surface extending along the front margin. There is a shallow but distinct median golden line which is impressed posteriorly. There is a round puncture at the base, rather nearer the posterior angle than the middle, and this is extended forward by a slight impressed punctured line as far as the middle. The sides are slightly impressed above the lateral angulation. The elytra are scarcely broader than the thorax. Each elytron has a slightly raised obtuse costa near the suture, of a slightly darker or more coppery hue than the impressed parts, but at the point where it diverges at the base there is a small green spot. There is another slightly sinuous costa extending from the humeral callus to the apex, of unequal width, and with a small green spot on the middle. There is a third costa arising below the shoulder and joining the second at a short distance from the apex; this is interrupted by two small green spots. Each costa has an irregular line of punctures on each side of it. The interstices are convex in the middle, the second and third each having two small green spots. The apices are very acute, each being slightly and obliquely truncate on the inner side. Tarsi tinted with cyanous. Abdominal segments shaded with coppery golden at the base.

Long. 23, lat. 7 mm.

Hab. Brazil, Joinville.

This species closely resembles *H. chrysodemoides*, Saund., but differs from it in having the thorax angulated at sides; the punctuation on the disk is finer, and closer at the anterior angles; there is an impressed longitudinal line at some distance from the side; and the apices of the elytra are much more acute.

Iridotænia javana, Kerremans.

The type specimen of this species agrees well with one in the Museum collection labelled by Saunders '*lineata*, Deyr., compared with type.'

Chrysodema navicularis, Kerr.

This is the same as *C. ventralis*, Waterh., which has priority.

Chrysodema Fairmairei, Kerr.

In Wytsman's 'Genera,' p. 74, Capt. Kerremans has sunk this species as a synonym of *C. Mniszechi*. This is an error. It is really a synonym of *C. Dohrnii*, Saund. (Mindanao). *C. Mniszechi*, Deyr., has the thorax less closely punctured; it occurs in Goram and Ceram.

Chrysodema sumatrensis, Kerr.

I doubt if this is distinct from *C. Wallacei*, Deyr. Capt. Kerremans appears not to have known *Wallacei*; the specimen in his collection so named was *Mniszechi*, Deyr.

Chrysodema Yerburyi, sp. n.

Elongate, elliptical, not very convex, golden green. Thorax gently convex, slightly narrowed in front, closely punctured, the punctuation more dense and finer at the sides than on the disk; the median raised line scarcely noticeable. There is a slight round impression near the side, a little behind the middle. Elytra only a very little wider than the thorax, gently and evenly convex, green with a slight coppery shade. Rather closely and moderately strongly punctured, the punctures uneven in size and quite irregular; near the base the punctures are rather stronger and are transverse, the intervals forming transverse rugæ. The costæ which are seen in *C. auroplagiata* and many other species are only seen in this species at the apex in the form of a y. Near the margin there is a finely punctured brassy impression, extending from the apex for two fifths the length of the elytra. Prosternum slightly convex, moderately strongly and not very thickly punctured. Antennæ black. Legs rather bluish green.

Long. 28, lat. 10 mm.

Hab. Ceylon, Trincomali (*Yerbury*).

This is quite unlike any other species of this genus known to me.

GELÆUS, gen. nov.

Closely allied to *Chrysodema*, but differs from all the species of that genus in having two sharply cut impressions at the base of the thorax. Just below the shoulders the elytra are acutely angular. The tarsi are yellow.

I propose this for the insect I formerly described as *Pseudochrysodema* (?) *Walkeri* (Ann. & Mag. Nat. Hist. 1892, x. p. 411).

Capt. Kerremans has more recently described it as *Chrysodema cupriventris*.

THYMEDES, gen. nov.

Closely allied to *Chrysodema*, but with a form and appearance which are suggestive of *Psiloptera*. Thorax evenly convex, without impressions, but with a slightly raised median line. The marginal carina extended to the anterior angle. Elytra strongly striato-punctate; the apical margins serrate. Antennæ yellow. Tarsi metallic. Metathoracic episterna gradually acuminate posteriorly.

I propose this generic name for *Chrysodema flavicornis*, Saund.

The only *Chrysodema* known to me that at all resembles this is *C. hebes*, Kerr., but neither in that nor in any other species does the lateral carina of the thorax extend quite to the anterior angles as in *flavicornis*.

[To be continued.]

LXXX.—New Neotropical *Molossus*, *Conepatus*, *Nectomys*, *Proechimys*, and *Agouti*, with a Note on the Genus *Mesomys*. By OLDFIELD THOMAS.

Molossus Burnesi, sp. n.

Allied to the very small species of *Molossus*, *M. tropidorhynchus*, Gray, and *M. pygmaeus*, Miller, but distinguished by the different shape of the brain-case.

Size about as in *M. tropidorhynchus* and *pygmaeus*, markedly less than in *M. obscurus*, of which there are two specimens in the same collection. Hairs of back exceedingly short, less than 2 mm. in length, as against 3 in *M. obscurus*, their bases white and their tips brown, the net result being a

lighter colour than in *M. obscurus*. Belly paler brown, approaching "broccoli-brown." Muzzle not so high and not so conspicuously ridged as in *M. obscurus*. General characters of ear, tragus, &c. as in other members of the group. Hind legs markedly shorter than in *M. obscurus*.

Skull, as compared with that of *M. tropidorhynchus*, which it about equals in size, remarkable for its large, rounded, and inflated brain-case; anteriorly the brain-case bulges out over the temporal fossa much more than in the allied species, and the upper part projects laterally beyond the lower. In consequence the greatest breadth of the brain-case has to be taken high up on the skull, and not at the base of the zygomata, and is equal to the same dimension in the much larger *M. obscurus*.

Teeth apparently much as in *M. tropidorhynchus*; upper incisors not quite touching canines; anterior lower premolar little more than half as broad as the posterior.

Dimensions of the type (measured on the spirit-specimen):—

Forearm 33.7 mm.

Head and body 53; tail 31; third finger, metacarpus 35, 1st phalanx 16, 2nd phalanx 15; fifth finger 33; lower leg and foot (c. u.) 19.5.

Skull: greatest length 16.2; basal length 12; zygomatic breadth 10.7; interorbital breadth 3.9; breadth of brain-case 8.9; mastoid breadth 10; front of canine to back of m^3 6; front of lower canine to back of m_3 6.7.

Hab. Cayenne.

Type. Female in spirit. B. M. no. 5. 1. 8. 7. Presented by W. Barnes, Esq.

This little species is evidently a member of the *M. tropidorhynchus* group, but may be distinguished by its short fur and the peculiarly swollen shape of its brain-case. Specimens of the true *M. obscurus* were also obtained by Mr. Barnes at the same time, and are at once recognizable by their very much larger size (forearm 39–40 mm.).

The nearest ally of *M. Barnesi* is probably Miller's *M. pygmaeus** from the Island of Curaçoa, but this has a brain-case breadth of only 8 mm., which indicates a very differently shaped skull.

Conepatus tropicalis trichurus, subsp. n.

Apparently very similar to the Mexican *C. tropicalis*, Merriam, but with decidedly longer tail, whose black is

* P. Biol. Soc. Wash. xiii. p. 162 (1900).

restricted to a shorter area at the base. Dorsal white streaks barely extending on to the loins (about 280 mm. from commencement on crown), not "to hips." Brush at end of tail very thick, the hairs attaining 110 mm. in length. Fur of back coarse, sparse, not very long (hairs about 30-35 mm. in length), less mixed with wool-hairs than in *C. mapurito*.

Skull of about the same size as in *tropicalis*, smaller than in *mapurito*.

Dimensions of the type (measured in the flesh):—

Head and body 417 mm.; tail (vertebrae) 170; hind foot, s. u. 67, c. u. 74.

Skull: basal length 69; zygomatic breadth 46.5; mastoid breadth 40.5; palate length 32.7; length of upper molar on outer side 9.3.

Hab. Panama and Costa Rica. Type from Boquete, Chiriqui. Alt. 4000 ft.

Type. Male. B.M. no. 4.7.6.5. Collected 5th March, 1904, by Mr. H. J. Watson. Five specimens examined.

This skunk has hitherto been referred to *C. mapurito*, Gm., but the recent acquisition of a second specimen representing that form shows that the Central-American animal is distinct, being smaller, and having a shorter bushier tail, on which the black extends for a shorter distance at the base. It may also be noted, though probably an accident of preparation, that both our specimens of *C. mapurito* have the dorsal light colour of a dull creamy tone, while in five specimens of the Central-American animal it is really white.

Nectomys dimidiatus, sp. n.

A diminutive species with the glossy fur of the typical S.-American members of the genus.

Size immensely less than in any hitherto known member of the typical glossy-furred *Nectomys*, rather smaller even than in *N. esmeraldarum*, the smallest of the fluffy-furred species. Fur obviously modified for an aquatic life, close and glossy, with a thick velvety underfur; hairs of back about 6 mm. in length. General colour of back rather lighter than "clove-brown," the sides becoming more "bistre." A dull buffy line edging the dark colour on the flanks, and running down the inner side of the hind limbs. Belly dull clay-colour, deadened by the slaty bases of the hairs showing through. Outer side of arms greyish brown. Upper surface of hands and feet dull white. Tail of medium length, finely scaled, 15 rings to the centimetre, slaty greyish above, dull white below.

Skull, in correlation with its smaller size, much more lightly built than in ordinary *Nectomys*; supraorbital ridges little developed, the brain-case broad, smooth, and rounded. Zygomata widely and evenly spread. Nasals not markedly narrowed behind. Palatal foramina much larger than in any other species, narrowed in front, widely open and rounded behind, where they extend to the level of the front edge of m^1 .

Molars much worn in the type, but apparently with the complicated structure of those of true *Nectomys*, with which their shape and general proportions agree.

Dimensions of the type (measured in the flesh):—

Head and body 125 mm.; tail 115; hind foot, s. u. 26, c. u. 28; ear 13.

Skull: greatest length 30; basilar length 23.4; zygomatic breadth 17; nasals 11.2×3.2 ; interorbital breadth 4.8; breadth of brain-case 13; palate length 12.8; diastema 7.6; palatal foramina 5.7×2.3 ; length of upper molar series 4.4.

Hab. Escondido River, 7 miles below Rama, Nicaragua.

Type. Old male. B.M. no. 5. 3. 4. 2. Collected 5th November, 1904, by Mr. W. G. Palmer.

This remarkable species, not half the bulk of any hitherto known member of the true glossy-furred *Nectomys*, is the first of the group found in Central America. Allen's *Sigmodontomys Alfari* and the closely allied *Nectomys russulus* of Colombia are forms with more *Oryzomys*-like fur; but their exact generic position is not at present easy to define, owing to want of specimens with unworn teeth. Although the same difficulty exists with the type of *N. dimidiatus*, its general characters are so much like those of typical *Nectomys* that I have no hesitation in assigning it to that genus, of which it forms the most diminutive member.

“Caught in banana-plantation, on very wet red clay.”

Proechimys Goeldii, sp. n.

Size about as in the ordinary Para species, *P. oris*, Thos.* Colour of type a dull greyish brown, darker and more rufous on back, greyer and lighter on head and sides. But this colour is probably not that natural to the animal (which is presumably some shade of rufous), but is due to the action of the preservative in which the specimen has been kept. Under surface dull white, not sharply defined laterally. Spines of back feeble, barely exceeding half a millimetre in breadth, about 17–18 mm. in length, with a long slender

* Ann. & Mag. Nat. Hist. (7) xiv. p. 195 (1904).

point; greyish basally, black terminally. Fifth hind toe, without claw, reaching just to the level of the front of the pad at the base of the third and fourth digits. Mammeæ 6, two pairs high up on the sides between the limbs, one pair in the inguinal region.

Skull less ridged than that of *P. cayennensis*, more heavily built than that of *P. oris*, with a broader muzzle, the forehead convex mesially, the profile evenly convex to the middle of the brain-case, then strongly declining backwards, supra-orbital ridges not strongly developed and not continued backwards past the fronto-parietal suture, the surface of the parietals smooth and unridged. Malars slenderer and less high than in *P. oris*. Palatal foramina short, ending 4 mm. in front of the molars, parallel-sided, the edges produced backwards as two parallel ridges enclosing the area immediately behind the foramina, this area being at a lower level than the rest of the palate; septum comparatively broad. Posterior palatal notch penetrating to the level of the hinder edge of m^2 . Pterygoids narrow, little spatulate. Bullæ of medium development.

Cheek-teeth of normal size and structure, the premolar and last molar each with four, m^2 and m^3 each with an indication of five laminae. In the lower jaw the premolar appears to have five laminae and the molars four each. In *P. oris* the teeth throughout, upper and lower, have four laminae each. In *P. cayennensis* the upper all have four laminae, but the lower premolar is as in *P. Goeldii*.

Dimensions of the type (measured on the spirit-specimen):—

Head and body 223 mm; tail (lost); hind foot (s. u.) 49; ear 20.

Skull: greatest length 56; basilar length 40; zygomatic breadth 27.5; nasals 21×6.5 ; interorbital breadth 13; mastoid breadth 20.5; palate length from hensenion 19.3; diastema 12.5; palatal foramina 5×3 ; length of upper cheek-tooth series 9.8.

Hab. Santarem, Lower Amazon.

Type. Adult female. B.M. no. 5. 1. 25. 6. Presented by Dr. E. A. Goeldi, after whom the species is named.

The members of the genus *Proechimys* being only distinguishable by their cranial characters, I have ventured to describe this spiny rat in spite of its apparent discoloration and the tailless condition of the type. The skull is readily distinguishable from that of both *P. oris* and the Guianan species *P. cayennensis* by its peculiar palatal foramina, even if the differences in the number of the molar laminae prove to disappear on the examination of further specimens.

Agouti sierræ, sp. n.

Size comparatively small. Fur long and thick, as in *A. Taczanowskii* *. General colour about as in that animal, dark brown, near "seal-brown," but less purple. White spots large, subequal, not coalesced into lines, disposed, though rather irregularly, in three rows, of which the most superior approach within an inch of each other on the withers and are about 4 inches apart on the back, where the space is partly filled up by a few extra spots. This *Paca* is therefore one of the most heavily and evenly spotted of the group. Belly-hairs whitish, washed terminally with pale brown, not sharply demarcated laterally. Top of head blackish brown, without spots; cheeks paler brown, more or less grizzled with whitish; lips and throat dull whitish; a brown chin-spot present. Ears brown, with some whitish hairs at their anterior base. Limbs brown like the sides, their inner surfaces scarcely lighter; upper surface of hands and feet of a reddish brown, quite different to the blackish brown of the general colour, something between "umber" and "Prout's brown"; sole-pads profusely granulated, except just under the heel. Mammæ 1—1=4.

Skull conspicuously smaller than in *paca* and *Taczanowskii*, the surface almost quite smooth (but the type is a female). Zygomatic concavities small. Postpalatal region of skull proportionally short, the postpalatal length less than the distance from the back of the palate to the maxillary suture. Teeth large, the length of the molar series conspicuously greater than the maxillary part of the diastema. Bullæ very low and small, little inflated, their antero-posterior length barely 14 mm., as compared to 16–17 in the allied forms.

Dimensions of the type (measured on skin):—

Head and body 650 mm.; hind foot, s. u. 84, c. u. 94.

Skull: greatest length 123; basilar length 99; zygomatic breadth 82; nasals 41 × 22.5; interorbital breadth 35; tip to tip of postorbital processes 49; least breadth above auditory meatus 37.5; greatest posterior breadth 47.5; occipital height from basion 28.7; length of broadened surface of zygoma 64; greatest height of zygoma 36; zygomatic concavity, measured internally in horizontal plane, 34 × 18; diastema 38; postpalatal length 38; length of upper tooth-row (crowns) 28.

Hab. Pedregosa Montañas, Sierra de Merida, Venezuela. Alt. 2000 m.

* Stolzmann, P. Z. S. 1885, p. 161.

Type. Adult female, permanent dentition in place. B.M. no. 5. 2. 5. 19. Collected 24th November, 1904, by S. Briceño. Two specimens. An imperfect specimen from Bogota also apparently the same.

"Eyes blue. Makes a nest underground, with two exits."—S. B.

The Pacas fall into two groups, those of the mountains and those of the plains. The former are comparatively long and thickly haired and darker coloured, and have the sole-pads distinct and profusely granulated; so far as is yet known, they are confined to the mountains of N.W. S. America. On the other hand, the lowland Pacas, ranging from Panama to South Brazil, are more sparsely covered with shorter hair, are paler in colour, brown or rufous, and their foot-pads are smoother, especially posteriorly, and less sharply defined from the general surface of the sole.

To the lowland group belong the forms described as *paca*, Linn., *fulvus*, F. Cuv., *subniger*, F. Cuv.*, and *virgatus*, Bangs, while to the highland series should be referred *Taczanowskii*, Stolzmann, and the present new form, which may be identified by its small size and very small bullæ. The animal described by Gervais, from the skull only, as *sublevis*, from Colombia, cannot be identified, and the type is no longer to be found in the Paris Museum. It may have been a female of either *paca* or *Taczanowskii*, but, no mention being made of its size being specially small, it is not likely to have been the present species.

MESOMYS, Wagn.

At last I am able definitely to identify the genus *Mesomys* of Wagner, which has been a puzzle to zoologists for half a century. Founded originally on a specimen which had lost its tail, an accident of most common occurrence in the group, tailless specimens of several other groups have been assigned to it, and all sorts of erroneous conclusions have been published about it on this account. Of late years, as in Dr. Allen's paper † on *Echimys* and *Proechimys*, it has been looked upon as probably synonymous with the former.

* Type locality Tobago. But I am informed by that excellent naturalist Mr. H. Caracciolo that the Paca is not indigenous to Tobago, and that it was probably introduced there from Trinidad.

† Bull. Am. Mus. N. H. xii. p. 257 (1899). Trouessart, in the recent Supplement to his 'Conspectus,' seems to have misunderstood the gist of Dr. Allen's paper, as he uses *Echimys* for the *cristatus* group and *Euryzygomatomys* for *spinosus*. But it is quite clear, as Dr. Allen has shown, that *Echimys* should be used for the latter and *Louchevres* for the former.

I now owe to the kindness of Dr. E. A. Goeldi of Para the two spiny rats from Marajo mentioned incidentally in his paper of 1901 on *Mesomys ecaudatus**; and at first I supposed them to represent a new genus, but soon found that they corresponded so closely in all their characters with the original description of *Mesomys ecaudatus* (except for the presence of a long tail), that they were certainly identical generically, and probably specifically, with Natterer's animal.

Günther's "*Echimys ferrugineus*"† is also assignable to the same genus, and is closely allied to *M. ecaudatus*.

The following is a short description of the genus, with measurements of one of the Marajo specimens:—

External form as in *Proechimys*, but the ears short and the feet short and broad, as in *Loncheres*, the fifth hind toe reaching to the end of the first phalanx of the fourth. Spinous system at a maximum. Tail long, well haired. Cheek-teeth rounded, as in *Proechimys*, each upper one with five or six transverse laminae, the lower premolar with five and the lower molars with four oblique laminae. General form of skull as in *Loncheres*, the muzzle being similarly short, narrow, and parallel-sided; palatal foramina small; bullae flattened.

Exactly as Wagner stated, *Mesomys* may be said to have the skull, ears, and feet of *Loncheres*, with the teeth of *Proechimys*, to which latter it is really no doubt most closely allied. From the structure of its feet it is ^{to be} presumably an arboreal form, like *Loncheres*, instead of being ^{terrestrial}, like *Proechimys*. It is true that there are rather more laminae in the upper teeth than is usual in *Proechimys*, but there is a certain amount of variation in the number of the laminae, even in the same species‡, so that this difference does not nullify the strong general resemblance that the teeth of *Mesomys* have to those of *Proechimys*.

The following are the dimensions of a Marajo specimen (an adult male, preserved in spirit):—

Head and body 163 mm.; tail 186; hind foot (s. u.) 30; ear 11.

Skull: greatest length 44; basilar length 33; zygomatic breadth 22·5; nasals 12·4 × 5; interorbital breadth 11; mastoid breadth 20; palate length 15·3; diastema 9·4; palatal foramina 3·8; length of upper tooth-series 6·7.

* Bol. Mus. Para, iii. p. 170 (1901).

† P. Z. S. 1876, p. 750, pl. lxxiv. (animal).

‡ Cf. *P. vacillator*, Thos. Ann. & Mag. Nat. Hist. (7) xi. p. 490 (1903).

LXXXI.—On a British Specimen of the Great Sea-Perch
Epinephelus cernioides, Capello. By G. A. BOULENGER,
 F.R.S.

THE identification of the huge sea-perches of the genus *Epinephelus* which have, at rare intervals, been captured on the coast of Cornwall has been a matter of difficulty, as the specimens on which the records are based do not appear to have been preserved. Yarrell, Couch, and Day have confounded several quite distinct fishes in their synonymies of "*Serranus gigas*." Yarrell's figure certainly represents an *Epinephelus gigas*, but it was not taken from a British example, whilst Couch's coloured plate, though incorrect, clearly represents an adult *Epinephelus aeneus*; so does Day's plate, taken from a young specimen received from the Berlin Museum. Probably examples of two or three different species of the large *Epinephelus* of the Mediterranean and neighbouring parts of the Atlantic have occasionally wandered to our south-western coast, but *E. aeneus* is the only one which, through Couch's description and figure, may be regarded as properly identified.

Thanks to the generosity of the Directors of Harrods Stores, the British Museum has received, in fresh condition, a very fine sea-perch measuring 4 ft. 2 in. and weighing 70 lbs., which was caught in the middle of May off Looe in Cornwall. It proves to belong to a species, hitherto unrepresented in the National Collection, which was described and figured by Brito Capello in 1867 as *Serranus cernioides*, from the coast of Portugal. Although placed by Day in the synonymy of *Serranus gigas*, this species differs from it, as well as from *E. aeneus*, in several important characters. The teeth, which Capello described, somewhat vaguely, as in broad bands, differ from those of *E. gigas* in being in two series on the sides of the lower jaw, as in *E. aeneus*. Whilst in the smaller scales, all ctenoid, and covering nearly the whole maxillary, and in the ridge-like base of the three opercular spines, this species differs from the latter and bears some resemblance to *Polyprion americanus* or *cernium*, whence the name *cernioides* chosen by Capello.

The following description is drawn up from the Looe specimen:—

Teeth in villiform bands in the upper jaw and in front of the lower, with an outer series of larger conical teeth, similar to those on the sides of the lower jaw, where they form two

series only; a rather small canine tooth on each side, in front of each jaw. Depth of body nearly equal to length of head, one third total length. Snout once and two thirds diameter of eye, which is six and a half times in length of head and once and two thirds in interorbital width; lower jaw projecting; maxillary extending to below the posterior border of the eye, the width of its distal extremity nearly equalling the diameter of the eye; præoperculum slightly produced at the angle, which is armed with feebly enlarged serræ; suboperculum and interoperculum serrated; opercular spines strong, proceeding from three distinct ridges, middle spine nearer lower than upper, lower a little further back than upper; opercular flap acutely pointed; head covered with ctenoid scales, including the maxillary. 14 gill-rakers on lower part of anterior arch, the longest half the diameter of the eye. Dorsal XI 14, originating above base of pectoral; third spine longest, one third length of head, a little shorter than longest soft rays. Anal III 8; second and third spines equal, one fourth length of head, half length of soft rays. Pectoral a little more than half length of head. Ventral shorter, widely separated from vent. Caudal round. Scales 145 ²⁰/₆₀, all with strongly denticulate edge; lateral line 95. Pinkish brown, without any markings, except a very indistinct dark streak from the eye to the angle of the præoperculum; fins dark purplish brown at the base, blackish at the end, the tips of the pectoral, anal, and caudal fins white. Iris pale golden.

Measurements:—

	mm.
Total length	1200
Greatest depth of body.....	350
Length of head	380
Width of head	210
Diameter of eye.....	52
Interorbital width	85
Third dorsal spine.....	120
Eleventh dorsal spine	75
Longest soft ray of dorsal	150
Third anal spine	70
Longest soft ray of anal	140
Length of pectoral.....	200
" ventral	160
" caudal	190

The specimen agrees very closely with Capello's figure, and there cannot be the least doubt as to the correctness of its identification.

BIBLIOGRAPHICAL NOTICES.

The Fauna of British India, including Ceylon and Burma. Published under the authority of the Secretary of State for India in Council. Edited by W. T. BLANFORD.—*Butterflies.* Vol. I. By Lieut.-Colonel C. T. BINGHAM. London: Taylor & Francis, 1905. Pp. xxii, 511; pls. 10.

ENTOMOLOGY has been given a considerable share in this valuable series of works, and we are glad to see the first of three volumes on the important and interesting group of Butterflies added. There are some large unfinished works on the subject already; but a compact and complete manual, condensing the vast scattered literature, has long been felt as an ever-increasing want, both by collectors at home and residents in India. There is here every facility given for the determination of specimens, by excellent plain and coloured half-figures, good descriptions, and carefully worked-out keys of families, subfamilies, and genera. Brief descriptions of the earlier stages are also added, when known.

The Indian Fauna is specially interesting in itself: in the south we find occasional affinities with Africa; and along its northern and western frontier it shades gradually into the Western Palearctic Region, the species of Western India having Mediterranean affinities, and those of the high mountains exhibiting Alpine, and occasionally even Subarctic, affinities. On the other hand, there is comparatively little resemblance between Indian and Tropical-American forms.

Col. Bingham has adopted six families of butterflies: Nymphalidæ, Nemeobidæ, Papilionidæ, Pieridæ, Lycaenidæ, and Hesperiidæ. The butterflies which these first two families are here described, and the Nymphalidæ, are divided into six subfamilies, *Danainæ*, *Satyriinæ*, *Acræinæ*, *Libytheinæ*, *Morphinæ*, and *Nymphaliniæ*. Of these, the *Acræinæ* are poorly represented by two species only—one belonging to a genus peculiar to India, and the other representing a very extensive and characteristic group of African species. The *Morphinæ* include a number of magnificent species, rivalling those of Tropical America, the subfamily being elsewhere represented only in that region. The Nemeobidæ also are poorly represented in the Indian Fauna by twenty species belonging to five genera against hundreds in the American Fauna—our only European representative of the family being the well-known *Nemeobius lucina*, the only member of its genus, which is also confined to Europe. The *Danainæ* are a characteristic Indian and African group, poorly represented in America. One species, *Danaüs chrysippus*, common throughout India and Africa, occurs in Greece. The *Libytheinæ* form a small family, represented in most parts of the world, but generally by only one or two species in each country; five, including the South-European *Libythea celtis*, are included by Col. Bingham in the Indian Fauna. Of the more familiar subfamilies *Satyriinæ* and *Nymphaliniæ*, several characteristic European genera are represented in India, and occasionally we find the same or closely allied species, including, of course, the cosmopolitan *Vanessa cardui*.

Catalogue of the Lepidoptera Phalæna in the British Museum.
 Volume V. *Catalogue of the Noctuidæ in the Collection of the British Museum.* By Sir GEORGE F. HAMPSON, Bart. 8vo.
 London: Published by Order of the Trustees, 1905. Pp. xvi,
 634; pls. lxxviii.-xev. (coloured) and text-figures (plain) 172.

THE fifth of Sir George Hampson's biennial volumes contains the classification of the Hadeninæ, the second of the subfamilies into which the author divides the great family Noctuidæ. The Noctuidæ were commenced in vol. iv., which contained about 1200 species of Agrotinæ; the Hadeninæ are somewhat less numerous, 916 species belonging to 78 genera being described in vol. v. The genus *Hadena* itself is restricted to the small group called *Neuria* by Guenée, *Noctua reticulata*, Vill. (= *saponarice*, Esp.), being chosen as the type, because it is the first species included by Schrank under *Hadena*. The classification of the Noctuidæ has altered very much of late years, and Sir George includes many genera formerly placed in separate sections, such as *Leucania*, Ochs., in the Hadeninæ. Several genera, such as *Polia*, Walk., are given a very wide extension, no less than 216 species being described under *Polia*. In such a case it is safe to predict that the genus will probably be subdivided later on. The arrangement of the present volume is similar to those which have preceded it, and Mr. Horace Knight's plates are deserving of high praise.

MISCELLANEOUS.

On a Modification of the Tentacular Apparatus in certain Species of Madrepora. By ARMAND KREMPF.

A CURIOUS arrangement presented by a species of the genus *Madrepora* (*M. Durvillei*) was noticed by Fowler in 1866. I have found it in three species of the same genus from the Gulf of Tadjoura. Not one of these three forms appears to me to be capable of identification with that which formed the subject of Fowler's investigations.

I note that it is a question of a certain dimorphism affecting a third of the colony examined, and consisting, according to this observer, in a marked hypertrophy of the endodermic epithelium of the upper part of six macenteric mesenteries of the animal. The formation is traversed in its whole length by a sagittal U-shaped canal on the ectodermic walls, terminating in the pharynx in two distinct superposed orifices.

My observations have led me to an altogether different interpretation of the morphological value of these prolongations and of their U-shaped canal. Contrary to all appearance, they do not belong to the mesenteries; they only prolong these superiorly: they are in effect tentacles deformed by important modifications. As for the ectodermic canal which they contain in their median plane, it represents a portion of the buccal disc which a fusion of two tentacles

has converted into a tunnel and buried in the depths of the body of the thus transformed polype. The following are the facts which have led me to these conclusions.

The determination of the analogies which exist between the tissue of the voluminous endodermic enlargements of *Madrepora* and that of the organ of which I have established the homology with a tentacle in certain *Oculininae**—analogies which bear not only on the structure of the cellular elements, but also on the very special histochemical reactions of their contents—has from the very outset prepared me to understand the following anatomical conditions:—1. The tentacles, so well developed and so easy to observe even when contracted, in normal individuals, are completely wanting, at least in their usual form, on the buccal disc of modified individuals, which thus appear to be devoid of them. 2. The pharynx of these latter, characterized by its very diminutive length, its narrowness, its differentiated ectoderm, is not to be confounded with the irregularly pleated wide and long funnel which precedes it and on the vertical or oblique walls of which the two orifices of six U-shaped canals open. This funnel is, in effect, nothing more than the invaginated buccal disc of the polype, and, as is known, deprived of visible tentacles. The orifices of each of the canals are therefore not situate in the pharynx, but, and the relation is of capital importance, on the surface of the buccal disc: they are arranged along one of its radii, one in the neighbourhood of the mouth, the other on the marginal border. 3. I have been able to observe an individual which presented only one U-shaped canal-organ, that of one of the left directing partitions; all its other partitions were normal.

The animal was adult, provided with six endocœles and six ectocœles, and should have possessed twelve tentacles. An examination of its buccal disc shows (a) that it had but ten; (b) that the two vacant places, very clearly marked in the crown of tentacles and representing the two missing elements, corresponded precisely, one with the directive endocœle, of which the left mesentery was the only one modified, the other with its left ectocœle.

Collating these facts, one may deduce from them particularly:—

1. That there is a constant correlation between the presence of the U-shaped canal-organ in an individual and the apparent absence of tentacles on its buccal disc.

2. That the correlation is particularly manifest in the very clear case in which only a single organ is found in the individual, the case in which the two missing tentacles are those of the endocœle and ectocœle which it occupies.

3. That the plane in which the U-shaped canal with its two orifices is contained coincides with the plane of separation of two neighbouring tentacles.

I am now in a position to demonstrate how the transformations which give rise to the arrangement under consideration in certain

* *Seriaptora*, *Stylophora*, *Pæcilopora*: it is the dorsal tentacle which, in these three genera, is modified, and not the ventral as I am made to say by an error in the text of my note ('Comptes Rendus,' 18th May, 1903).

individuals arise, solely at the expense of the oral disc and the tentacular apparatus by fusion of its elements in pairs.

If we imagine two contiguous tentacles in a state of semi-expansion; owing to their capitate form they come into slight contact by their superior extremities and so define, between their opposed faces and the portion of the buccal disc intercepted between their two bases, a gutter, open interiorly on the side of the mouth, exteriorly on the side of the margin of the tentacular disc. If this arrangement be fixed by, so to speak, soldering up the junction of the two surfaces which are in temporary contact, the gutter aforesaid becomes a canal, which is at once recognizable as the U-shaped canal.

It is situate in an intertentacular plane, its two orifices open on the oral disc, one on the outer side, the other on the inner of the crown of tentacles; lastly, the epithelial covering of its bore is strictly ectodermic.

Returning to what has been described as the soldering together of two tentacles, if we conceive it to be accompanied by the absorption of the two ectodermic surfaces along the line of which it has taken place, it will in reality be effected through the intermediary of their mesogleal lamella. We also note at the same time that these two latter, fused into one, appear to continue, above the U-shaped canal, the single mesogleal lamella of the subjacent mesentery. Now if we remove the special histological characters (nematocyst, nervous system) from what is left of the ectoderm of the tentacles, and give, on the other hand, to the cells of their endoderm the large size which is known to be the case, we have completed the synthesis of a U-shaped organ without having supplied the normal polype with any elements other than those which we intended to employ.

All that now remains is to make the absence of the U-shaped canal-organ on the two partitions of the directing dorsal endocœle agree with the apparent disposition of its tentacle. This latter, not having experienced the fate of its neighbours, ought to be recoverable.

Its non-existence is, in fact, more apparent than real. A study of sections has enabled me to discover its presence in the gastro-vascular cavity with ease. Invaginated in its endocœle, with its short axial ectodermic canal opening on the buccal disc and its endoderm with its voluminous cells, it is in every sense comparable to its homologue (dorsal tentacle) in the Oculininae. It is thus the totality of the elements of the tentacular apparatus that the change affects in *Madrepora*, while in *Pœcilopora* it affects but a small part ($\frac{1}{4}$), and in *Seriatopora* and *Stylophora* $\frac{1}{12}$.

The presence of like formations in creatures exhibiting such differences of structure as the Oculininae and the Madreporinae, a presence which renders their existence possible in all the Hexacorallids under aspects which may otherwise vary between one group and the other—the considerable development which they assume in those individuals in which they are present,—causes one to suspect that they must play an important rôle in the physiology of these animals. —*Comptes Rendus*, tome cxxxviii. no. 24, pp. 1519-1521 (13th June, 1904).

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END OF THE FIFTEENTH VOLUME.

FIG. 1.



FIG. 2.



FIG. 4.



FIG. 3.

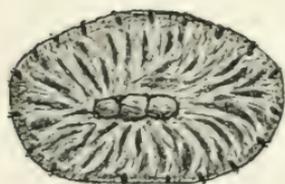


FIG. 5.

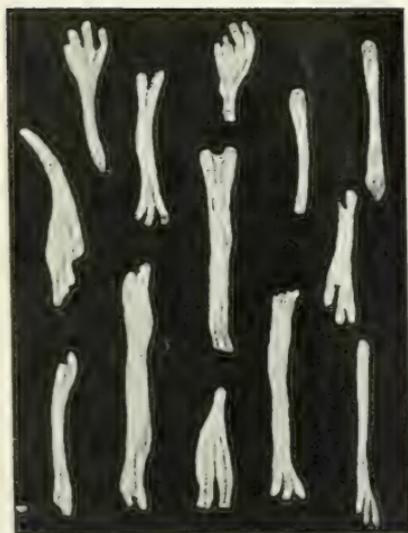


FIG. 6.



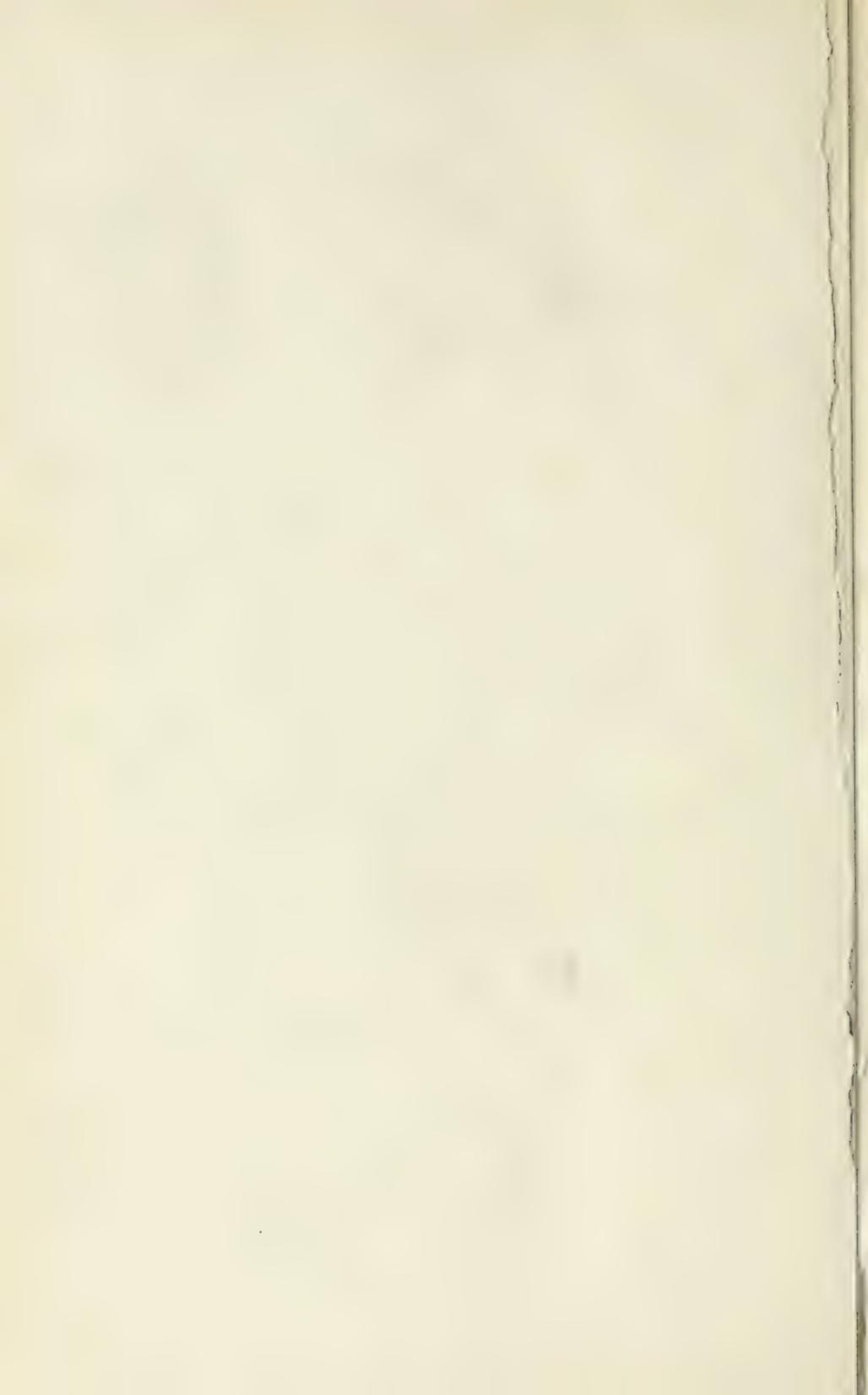




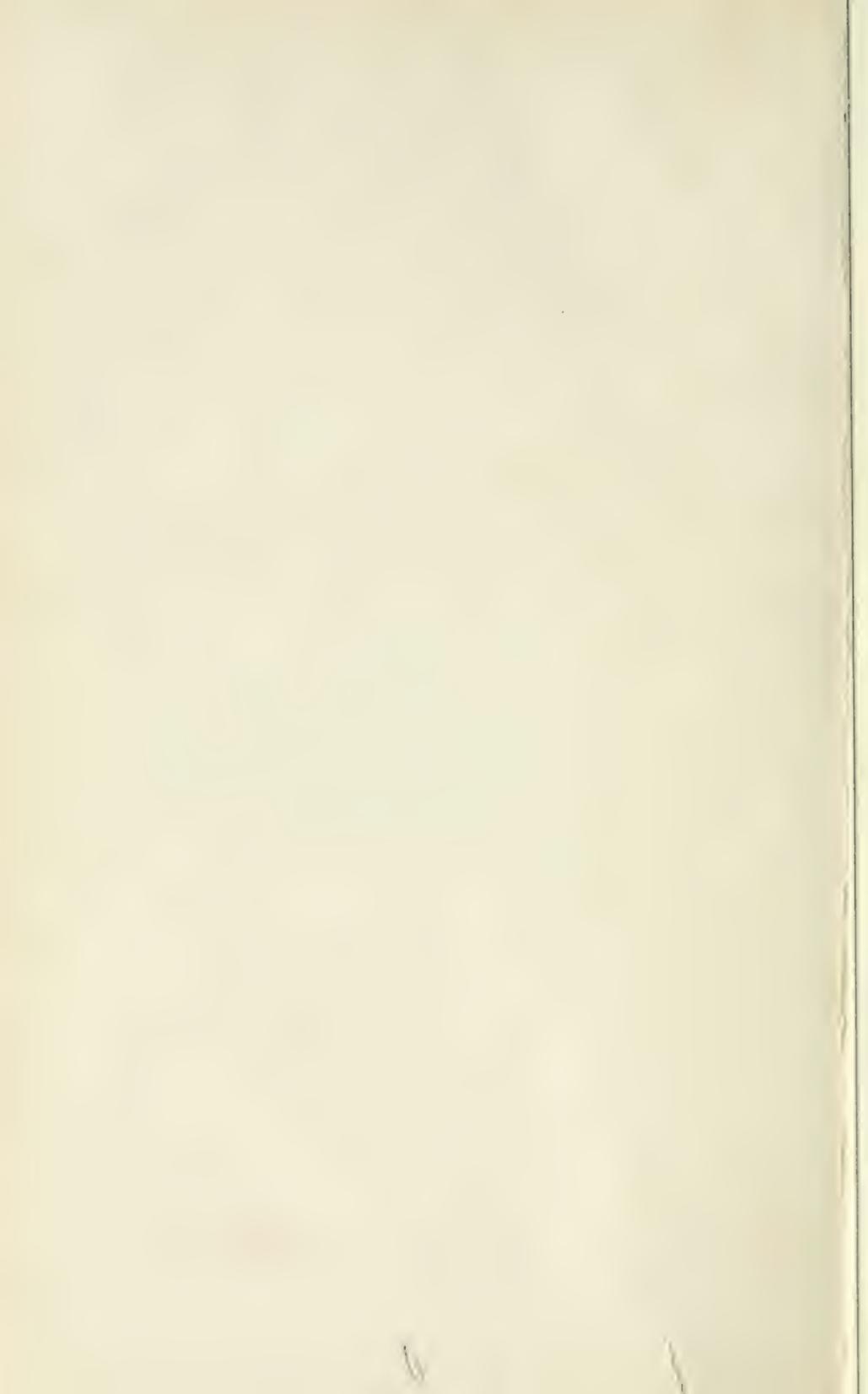
Fig. 3

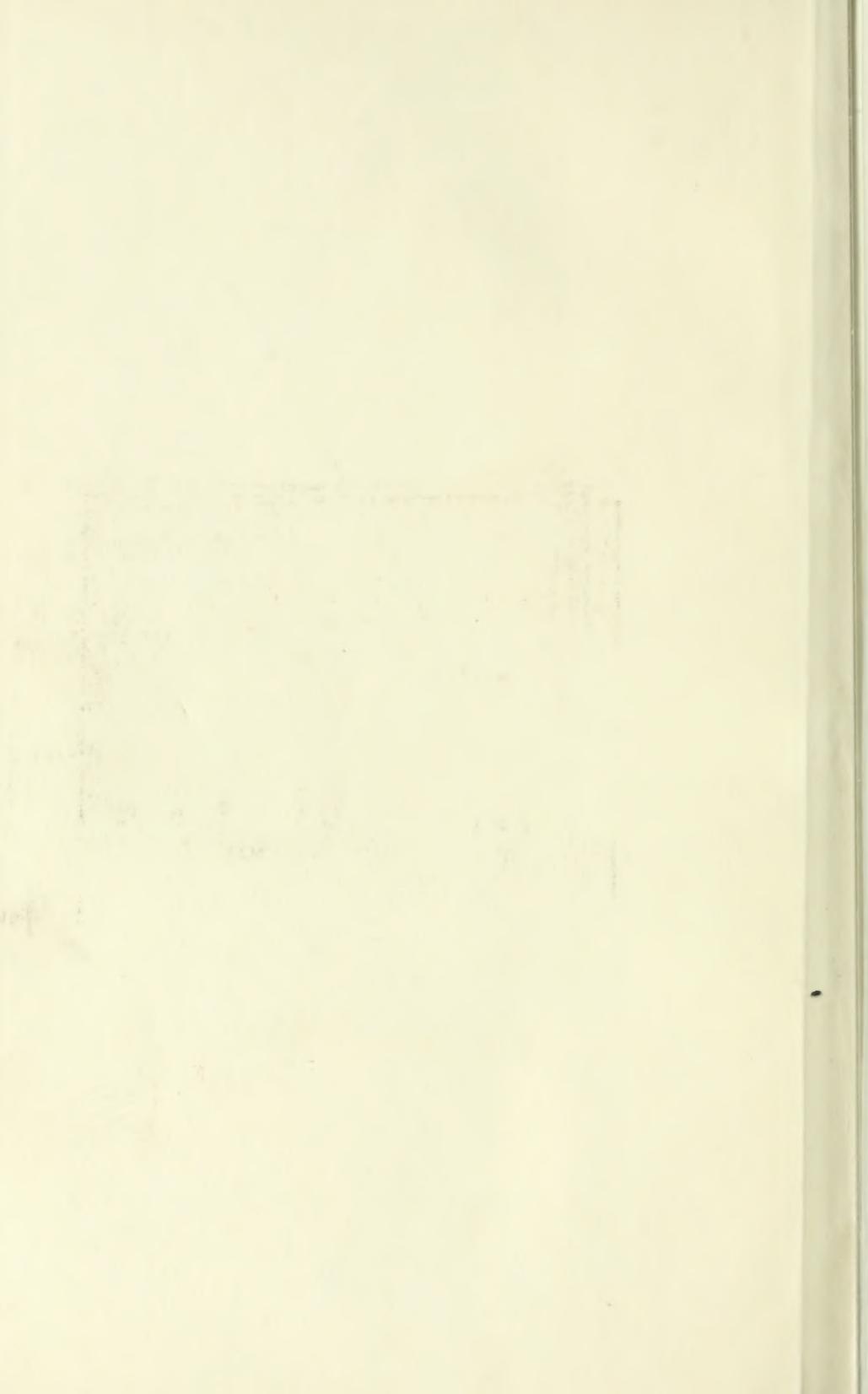


Fig. 4



Fig. 5





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