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MAGAZINE OF NATURAL HISTORY,

INCLUDING
ZOOLOGY, BOTANY, AND GEOLOGY.

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

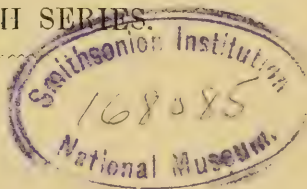
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AND

WILLIAM FRANCIS, JUN., F.L.S.

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VOL. VI.—SEVENTH SERIES.  
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“Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatis humanæ:—ex harum usu *bonitas* Creatoris; ex pulchritudino *sapientia* Domini; ex œconomiâ in conservatione, proportione, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstimata; à verè eruditis et sapientibus semper excultâ; 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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CONTENTS OF VOL. VI.

[SEVENTH SERIES.]

NUMBER XXXI.

	Page
I. On some Fish-remains from the Parana Formation, Argentine Republic. By A. SMITH WOODWARD, LL.D., F.L.S. (Plate I)..	1
II. The New Mexico Bees of the Genus <i>Megachile</i> and a new <i>Andrena</i> . By T. D. A. COCKERELL, Professor of Entomology, New Mexico Agricultural College	7
III. On the West-Indian Species of <i>Madrepora</i> . By J. W. GREGORY, D.Sc., F.G.S., Professor of Geology in the University of Melbourne	20
IV. British Amphipoda.—IV. Families <i>Stegocephalidæ</i> and <i>Ædiceridæ</i> (part.). By Canon NORMAN, M.A., D.C.L., LL.D., F.R.S., &c. (Plate III.)	32
V. Description of a new Sea-Horse (<i>Hippocampus</i>) from Muscat. By G. A. BOULENGER, F.R.S.	51
VI. A List of the Fishes collected by Mr. Rupert Vallentin in the Falkland Islands. By G. A. BOULENGER, F.R.S. With Notes by the Collector	52
VII. Rhynchotal Notes.—V. <i>Heteroptera: Asopinæ</i> and <i>Tes-saratominae</i> . By W. L. DISTANT	55
VIII. Descriptions of some new Species of Heterocera from Tropical South America. By HERBERT DRUCE, F.L.S. &c.	64
IX. Report on the Neuroptera Odonata collected by Mr. E. E. Austen at Sierra Leone during August and September 1899. By W. F. KIRBY, F.L.S., F.E.S. (Plate II.)	67
X. Notes on the <i>Forficularia</i> .—V. Descriptions of new Species and a new Genus. By MALCOLM BURR, F.Z.S., F.E.S. (Plate IV. figs. 3, 5, 7.)	79
XI. Notes on the <i>Forficularia</i> .—VI. On a Collection of <i>Forficularia</i> from Sarawak. By MALCOLM BURR, F.Z.S., F.E.S. (Plate IV. figs. 1, 2, 4, 6.)	88
XII. The Lower Palæozoic Crinoids of Bohemia. By F. A. BATHER, M.A., F.G.S.	102
XIII. Asiatic <i>Tortricidæ</i> . By the Rt. Hon. LORD WALSHINGHAM, M.A., LL.D., F.R.S.	121
XIV. On Giant Squirrels from the Amazonian Region. By OLD-FIELD THOMAS	137

	Page
XV. Plankton Studies.—II. On <i>Pleodorina illinoisensis</i> , a new Species from the Plankton of the Illinois River. By C. A. KOFOID, Ph.D. (Plates V. & VI.)	139
<i>New Book</i> :—Catalogue of the Lepidoptera Phalaenæ in the British Museum. Volume II. Catalogue of the <i>Arctiadae</i> (<i>Nolinae</i> , <i>Lithosiaceae</i>) in the Collection of the British Museum. By Sir GEORGE F. HAMPSON, Bart.	157
On the 'Ankündigung eines systematischen Werkes von dem Schmetterlingen der Wienergegend' of Schifferrmüller and Denis, by Louis B. Prout, F.E.S.; Abundance of the Greater Siil-Smelt (<i>Argentina silus</i> , Ascan) on the Market of Boston, Lincolnshire, by G. A. Boulenger, F.R.S.	158, 160

NUMBER XXXII.

XVI. Note on Diptera from South Africa (<i>Tabanidae</i> and <i>Asilidae</i>). By Miss GERTRUDE RICARDO	161
XVII. Note on a Hermaphrodite Frog. By R. C. PUNNETT, B.A. (Plate IX.)	179
XVIII. Descriptions of new Batrachians and Reptiles collected by Mr. P. O. Simons in Peru. By G. A. BOULENGER, F.R.S.	181
XIX. Descriptions of new Batrachians and Reptiles from the Larut Hills, Perak. By G. A. BOULENGER, F.R.S.	186
XX. Description of a new Lizard from Jamaica. By G. A. BOULENGER, F.R.S.	193
XXI. Description of a new Lizard from British East Africa. By G. A. BOULENGER, F.R.S.	194
XXII. On a new Species of the Genus <i>Alepas</i> (<i>A. Lankesteri</i>), from the Collection of the British Museum. By A. GRUVEL, Chargé de Cours à la Faculté des Sciences de Bordeaux. (Plate VIII.) ..	195
XXIII. Two Spiders new to the British Fauna. By GEORGE H. CARPENTER, B.Sc. Lond., of the Science and Art Museum, Dublin.	199
XXIV. An undescribed Type of Rusine Deer. By R. LYDEKKER.	204
XXV. On Two English Millipedes (<i>Iulus londinensis</i> , Leach, and <i>Iulus teutonicus</i> , sp. n.). By R. I. POCKOCK	206
XXVI. Descriptions of Two Species of <i>Cypræa</i> , both of the Subgenus <i>Trivia</i> , Gray. By JAMES COSMO MELVILL, M.A., F.L.S. ..	207
XXVII. Description of a new Species of <i>Papilio</i> from Bwool, North Celebes. By H. GROSE-SMITH, F.E.S., F.Z.S., &c.	210
XXVIII. Notes on the Collection of African <i>Phasgonuridae</i> formed by Mr. W. L. Distant in the Transvaal &c., with Descriptions of Two new Species. By W. F. KIRBY, F.L.S., F.E.S., &c.	211

Page

XXIX. Note on a Variation in the Number of the Genital Pouches in <i>Thalassema neptuni</i> , Gaertner. By F. H. STEWART, M.A., Gatty Marine Laboratory, St. Andrews	218
XXX. Description of a new Species of <i>Buprestidæ</i> . By CHAS. O. WATERHOUSE, V.P.E.S.	219
XXXI. Rhynchotal Notes.—VI. <i>Heteroptera: Dinidorinæ, Phyllocephalinæ, Urolabidinæ, and Acanthosominæ</i> . By W. L. DISTANT	220
XXXII. Asiatic <i>Tortricidæ</i> . By the Rt. Hon. LORD WALSHINGHAM, M.A., LL.D., F.R.S.	234
XXXIII. Note on Variation in the Weasel and Hedgehog. By G. E. H. BARRETT-HAMILTON	243
<i>New Books</i> :—Zoological Results based on Material from New Britain, New Guinea, Loyalty Islands, and elsewhere, collected during the Years 1895, 1896, and 1897, by Arthur Willey, D.Sc. Lond., Hon. M.A. Cantab. Part IV.—A Monograph of the Coleopterous Families <i>Corylophidæ</i> and <i>Sphæriidæ</i> . By the Rev. A. MATTHEWS, M.A.	246, 247
Priority or Usage, by F. Jeffrey Bell, M.A. &c.	248

NUMBER XXXIII.

XXXIV. On some Malacostracous Crustaceans from Malaysia in the Collection of the Sarawak Museum. By W. F. LANCHESTER, M.A., King's College, Cambridge. (Plate XII.)	249
XXXV. On new Species of <i>Histeridæ</i> and Notices of others. By G. LEWIS, F.L.S. (Plate X.)	265
XXXVI. Descriptions of Five new Species of <i>Panynoninæ</i> from South America. By Miss GERTRUDE RICARDO	291
XXXVII. Descriptions of new Rodents from Western South America. By OLDFIELD THOMAS	294
XXXVIII. On the "Tohi," the East-African Reedbuck currently known as <i>Cervicapra bohor</i> . By OLDFIELD THOMAS	303
XXXIX. New Species of Eastern and Australian Moths. By Colonel C. SWINHOE, M.A., F.L.S., &c.	305
XL. On a new Theriodont Reptile (<i>Ictidosuchus primævus</i>) from the Kaioo Beds, South Africa. By R. BROOM, M.D., B.Sc.	314
XLI. Some new Arachnida from Cape Colony. By R. I. POCOCK.	316
XLII. Asiatic <i>Tortricidæ</i> . By the Rt. Hon. LORD WALSHINGHAM, M.A., LL.D., F.R.S.	333
<i>New Books</i> :—A Treatise on Zoology. Edited by E. RAY LANKESTER, M.A., LL.D., F.R.S. Part III. The Echinodermata. By F. A. BATHER, M.A., assisted by J. W. GREGORY, D.Sc., and E. S. GOODRICH, M.A.—A Monograph of Christmas Island. Physical Features and Geology by CHARLES W. ANDREWS, B.A.; with Descriptions of the Fauna and Flora by numerous Contributors	341, 343

NUMBER XXXIV.

	Page
XLIII. Description of Sponges from Funafuti. By R. KIRKPATRICK, Assistant, Natural History Museum. (Plates XIII.—XV.)	345
XLIV. The Scorpions of the Genus <i>Heterometrus</i> . By R. I. POCOCCO	362
XLV. Rhynchotal Notes.—VII. <i>Heteroptera</i> : Fam. <i>Coreidae</i> . By W. L. DISTANT	366
XLVI. Notes on some Insects from the Yang-tse-Kiang. By W. F. KIRBY, F.L.S., F.E.S., &c.	380
XLVII. Descriptions of new Rodents from Western South America. By OLDFIELD THOMAS	383
XLVIII. A new Dassie from North Nyasaland. By OLDFIELD THOMAS	387
XLIX. Description of a new Species of <i>Ornithoptera</i> . By H. GROSE-SMITH, B.A., F.E.S., F.Z.S., &c.	388
L. Descriptions of Brazilian <i>Coccidæ</i> . By ADOLPH HEMPEL, S. Paulo, Brazil	389
LI. Descriptions of new Species of Japanese Land-Shells. By G. K. GUDE, F.Z.S.	398
LII. Asiatic <i>Tortricidæ</i> . By the Rt. Hon. LORD WALSLINGHAM, M.A., LL.D., F.R.S.	401
LIII. Description of a new Snake of the Genus <i>Ablabes</i> from Burma. By G. A. BOULENGER, F.R.S.	409
LIV. Descriptions of new Genera and Species of Hymenoptera. By P. CAMERON	410
LV. On the Presence of <i>Echis coloratus</i> , Günther, in Africa. By JOHN ANDERSON, M.D., LL.D., F.R.S.	419
<i>New Books</i> :—In Bird-land with Field-glass and Camera. By OLIVER G. PIKE.—The Birds of Eastern North America. Parts I, II. By CHARLES CORY.—A Natural History of the British Lepidoptera. A Textbook for Students and Collectors. By J. W. TUTT, F.E.S. Vol. II.	425, 426

NUMBER XXXV.

LVI. Asiatic <i>Tortricidæ</i> . By the Rt. Hon. LORD WALSLINGHAM, M.A., LL.D., F.R.S.	429
LVII. Descriptions of some Species of <i>Coccidæ</i> collected by Mr. James Lidgett in Victoria, Australia. By E. ERNEST GREEN, F.E.S., Government Entomologist, Ceylon. (Plate XI.)	448
LVIII. Descriptions of new Species of Japanese Land-Shells. By G. K. GUDE, F.Z.S.	453

	Page
LIX. Notes on the Neuropterous Family <i>Nemopteridæ</i> . By W. F. KIRBY, F.L.S., F.E.S.	456
LX. On <i>Equus Penricei</i> , a Representative of the Mountain Zebra (<i>Equus zebra</i> , L.) discovered by Mr. W. Penrice in Angola. By OLDFIELD THOMAS	465
LXI. New Peruvian Species of <i>Conepatus</i> , <i>Phyllotis</i> , and <i>Akodon</i> . By OLDFIELD THOMAS	466
LXII. A new Free-tailed Bat from Central America. By GERRIT S. MILLER, JR.	470
LXIII. Natural History Notes from H.M. Royal Indian Marine Survey Ship 'Investigator,' Commander T. H. Heming, R.N., commanding.—Series III., No. 4. Some Results of the Dredging Season 1899-1900. By A. F. McARDLE, B.A., M.B., Capt. I.M.S., Surgeon-Naturalist to the Survey	471
LXIV. Diagnoses of new Fishes discovered by Mr. J. E. S. Moore in Lake Tanganyika. By G. A. BOULENGER, F.R.S.	478
LXV. Note on Diatoms from Chincha Guano. By C. MERESCHKOWSKY. (Plate XVI.)	481
LXVI. Some new African Theraphosoid Spiders in the British Museum. By R. I. POCKOCK	489
LXVII. Descriptions of new Genera and Species of Hymenoptera. By P. CAMERON	495
<i>New Books</i> :—Catalogue of Eastern and Australian Lepidoptera Heterocera in the Collection of the Oxford University Museum. Part II. <i>Noctuina</i> , <i>Geometrina</i> , and <i>Pyralidina</i> . By Col. C. SWINHOE, M.A., F.L.S., F.Z.S., F.E.S. <i>Pterophoridaæ</i> and <i>Tineineæ</i> by the Right Hon. LORD WALSLINGHAM, M.A., LL.D., F.R.S., &c., High Steward of the University of Cambridge, and JOHN HARTLEY DURRANT, F.E.S., Memb. Soc. Ent. France.—Sexual Dimorphism in the Animal Kingdom. By J. T. CUNNINGHAM, M.A.—Colour in Nature. By MARION I. NEWBIGIN	503, 507

NUMBER XXXVI.

LXVIII. A suggested Origin of the Segmented Worms, and the Problem of Metamerism. By H. M. BERNARD, M.A. Cantab.	509
LXIX. On some little-known African Silurid Fishes of the Subfamily <i>Doradinae</i> . By G. A. BOULENGER, F.R.S.	520
LXX. Descriptions of new Genera and Species of Hymenoptera. By P. CAMERON	530
LXXI. Plankton Studies.—III. On <i>Platydorina</i> , a new Genus of the Family <i>Volvocidae</i> from the Plankton of the Illinois River. By C. A. KOFOID, Ph.D. (Plate VII.)	541
LXXII. On the Luminous Organs of Selachian Fishes. By RUD. BURCKHARDT, Nat. Hist. Mus., S. Kensington	558

	Page
LXXIII. <i>Mormopterus Whitleyi</i> —a new Species of Bat from W. Africa. By R. F. SCHARFF, Ph.D., B.Sc.	569
LXXIV. A new Bat from Peru. By GERRIT S. MILLER, Jr. ..	570
LXXV. Reptiles and Batrachians collected in German New Guinea by the late Dr. Erik Nyman. By Dr. EINAR LÖNNBERG ..	574
<i>New Book</i> :—The Story of Bird-life. By W. P. PYCRAFT	582
Proceedings of the Geological Society	583
Index	584

PLATES IN VOL. VI.

PLATE I. Teeth of Elasmobranch Fishes from the Parana formation.	
II. Neuroptera from Sierra Leone.	
III. British Amphipoda.	
IV. New species of Forficularia.	
V. { Pleodorina illinoisensis.	
VI. {	
VII. <i>Platydorina caudata</i> .	
VIII. <i>Alepa Lankesteri</i> .	
IX. Anatomy of an hermaphrodite frog.	
X. Species of Histeridæ.	
XI. New Australian Coccidæ.	
XII. Crustaceans from Malaysia.	
XIII. {	
XIV. { New Sponges from Funafuti.	
XV. {	
XVI. Diatoms from Chinchaguano.	

ERRATUM.

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read sectors of the triangle.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

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

No. 31. JULY 1900.

I.—*On some Fish-remains from the Parana Formation, Argentine Republic.* By A. SMITH WOODWARD, LL.D., F.L.S.

[Plate I.]

THERE is an interesting marine deposit exposed in the banks of the River Parana near the city of Parana, in the province of Entrerios, Argentine Republic. It has been known since the explorations of d'Orbigny and Darwin, and is of special importance not only as containing the remains of land-mammals itself, but also as being intimately associated with other deposits which yield abundant evidence of extinct mammalian faunas. Since marine fossils are of much more value in determining the age of a formation than the remains of land animals, this small Parana deposit may therefore be expected to afford a clue to the geological age of some of the South-American terrestrial faunas, concerning which various opinions have been expressed. Its interest in this connexion has already been recognized by several observers, including

Ann. & Mag. N. Hist. Ser. 7. Vol. vi. 1

Bravard *, Doering †, Ameghino ‡, Burmeister §, and Stelzner ||, of whom the first three consider that its marine fossils indicate an Eocene or Oligocene age, while the two latter place the formation in the Upper Tertiary. The latest examination of its fish-remains is supposed to have proved its equivalence or homotaxy with the Eocene formations of the northern hemisphere ¶.

Fortunately a considerable number of the Parana fish-remains are the teeth of sharks, which may be supposed to have had a very wide distribution in the oceans at the time when they flourished. The evidence of geological age which they afford may thus be regarded as of considerable value. I therefore propose to record a few observations on the Elasmobranch fossils from the Parana collections in the National Museum of Buenos Aires, the La Plata Museum, and the San Paulo Museum, which have been kindly lent to me by Dr. Carlos Berg, Dr. F. P. Moreno, and Dr. H. von Jhering. The loan of these fossils has also enabled me to identify a small series of Parana fish-remains labelled by Bravard in the British Museum.

1. *Raja Agassizi*, Larrazet.

1886. *Raja Agassizii*, Larrazet, Bull. Soc. Géol. France, [3] vol. xiv. p. 259, pl. xiii. figs. 1-6.

The large dermal tubercles of an extinct skate thus described are still known only from the Parana formation. One typical specimen in the La Plata Museum measures no less than 0·088 m. by 0·075 m. across, by 0·03 m. in maximum thickness.

2. *Dynatobatis paranensis*, Larrazet.

1886. *Dynatobatis paranensis*, Larrazet, *loc. cit.* p. 263, pl. xiv. figs. 1-4.

These dermal tubercles evidently belong to a member of

* A. Bravard, 'Monografía de los Terrenos Marinos Terciarios de las Cercanías del Parana' (Parana, 1858).

† A. Doering, in Roca, 'Informe Oficial Com. Cient. Exped. al Rio Negro,' pt. iii. (1882) p. 429.

‡ F. Ameghino, 'Contribucion al Conocimiento de los Mamiferos Fósiles de la República Argentina' (1889) p. 14.

§ H. Burmeister, 'Description Physique de la République Argentina,' vol. ii. (1876) p. 219.

|| A. Stelzner, 'Beiträge zur Geologie und Paleontologie der Argentinischen Republik,' pt. i. (1885) p. 139.

¶ G. de Alessandri, 'Ricerche sui Pesci Fossili di Paraná (Repubblica Argentina),' Atti R. Accad. Sci. Torino, vol. xxxi. (1896) pp. 715-730, with plate.

the family Trygonidæ, as already observed by Jaekel*. There are two typical examples in the National Museum, Buenos Aires.

3. *Myliobatis americanus*, Bravard.

1858. *Myliobates americanus*, A. Bravard, Monogr. Terr. Marinos Tere. Parana, p. 53.

1896. *Myliobates americanus*, G. de Alessandri, Atti R. Accad. Sci. Torino, vol. xxxi. p. 724, pl. i. fig. 6.

The best-known specimen is described and figured by Alessandri, but this is too imperfect for specific determination. It seems probable that some of the detached teeth labelled as belonging to this species are truly referable to *Rhinoptera*.

4. *Cestracion paranensis* (Alessandri).

1896. *Acrodus paranensis*, G. de Alessandri, *loc. cit.* p. 723, pl. i. fig. 5.

There are two teeth of this species in the San Paulo Museum. On careful comparison with *Cestracion* they are found to agree exactly with the larger grinding-teeth in this existing genus. There is therefore no justification for referring them to the extinct Mesozoic genus *Acrodus*.

5. *Odontaspis elegans* (Agassiz). (Pl. I. figs. 1-5.)

1843. *Lamna elegans*, L. Agassiz, Poiss. Foss. vol. iii. p. 369, pl. xl. b, fig. 24 (non p. 289, pl. xxxv. figs. 1-7, pl. xxxvii. a, figs. 58, 59).

1858. *Lamna elegans*, A. Bravard, *op. cit.* p. 52.

1858. *Lamna unicuspidens*, A. Bravard, *op. cit.* p. 52.

1885. *Lamna elegans*, F. Noetling, Abh. Geol. Specialk. Preussen u. Thüring. Staaten, vol. vi. pt. 3, p. 61, pl. iv.

1896. *Odontaspis elegans*, G. de Alessandri, *loc. cit.* p. 720, pl. i. fig. 1.

1896. *Odontaspis Hopei*, G. de Alessandri, *loc. cit.* p. 720, pl. i. fig. 2.

1899. *Odontaspis elegans*, A. S. Woodward, Proc. Geol. Assoc. vol. xvi. p. 8, pl. i. figs. 15-18.

All the teeth from Parana referred to this species are rather small, and five well-preserved specimens are represented in Pl. I. figs. 1-5. It seems impossible to distinguish them from the typical teeth of *O. elegans* from the European Eocene, but the striation of their inner face is perhaps more feebly marked than in the latter. Most of the specimens are much rolled and abraded. When their inner face is worn quite smooth they are of the form referred to *O. Hopei*, Ag., by Alessandri; when they have lost their lateral denticles they are the *Lamna unicuspidens* of Bravard, as shown by his label in the British Museum.

* O. Jaekel, 'Die Eocaenen Selachier vom Monte Bolca' (1894), p. 140.

6. *Oxyrhina hastalis*, Agassiz. (Pl. I. figs. 6-8.)

1838-43. *Oxyrhina hastalis*, L. Agassiz, *op. cit.* vol. iii. p. 277, pl. xxxiv. figs. 3-13, 15-17.

(?) 1858. *Squalus eocenus*, A. Bravard, *op. cit.* p. 51.

1881. *Oxyrhina Agassizii*, R. Lawley, Studi Comp. Pesci foss. coi viv. generi *Carcharodon*, *Oxyrhina*, e *Galeocerdo*, p. 93, pls. v.-ix. (*Oxyrhina*). [The species renamed by Lawley.]

1889. *Oxyrhina hastalis*, A. S. Woodward, Catal. Foss. Fishes B. M. pt. i. p. 385.

Several teeth in the National Museum, Buenos Aires, agree both in size and shape with the European Miocene and Pliocene teeth ascribed to this species by Lawley. A well-preserved anterior mandibular tooth is shown from the outer face and in side view in Pl. I. figs. 6, 6*a*, while two characteristic upper teeth, the first with imperfect base, are seen, outer aspect, in figs. 7, 8.

7. *Carcharodon megalodon*, Agassiz. (Pl. I. fig. 9.)

1835-43. *Carcharodon megalodon*, L. Agassiz, *op. cit.* vol. iii. p. 247, pl. xxix.

1878. *Carcharodon gigas*, R. A. Philippi, Zeitschr. f. gesamt. Naturw. vol. li. p. 685, pl. xix.

1881. *Carcharodon megalodon*, R. Lawley, *op. cit.* p. 35, pls. vi.-xi. (*Carcharodon*).

1889. *Carcharodon megalodon*, A. S. Woodward, Catal. Foss. Fishes B. M. pt. i. p. 415.

There are two upper teeth of this species from Parana in the National Museum, Buenos Aires, one being in the Lelong collection, the other presented by Señor Don Marcos Sastre. The first is considerably the larger, and is shown of two thirds the natural size in Pl. I. fig. 9. It evidently belongs to the middle of the side of the upper jaw, and is quite unabraded. Another upper lateral tooth, from a Tertiary formation at Coquimbo, Chili, has been described by Philippi under the name of *C. gigas*, and teeth either of the same or a closely related species occur in the Patagonian formation of Chubut. The Chilean specimen was found in a deposit which has yielded teeth indistinguishable from those of the existing *Carcharodon Rondeleti* (A. S. Woodward, *loc. cit.* 1889, p. 421).

8. *Carcharius (Prionodon) obliquidens* (Bravard).

1858. *Squalus obliquidens*, A. Bravard, *op. cit.* p. 51.

1858. *Lamna amplibasidens*, A. Bravard, *op. cit.* p. 53.

1858. *Lamna serridens*, A. Bravard, *op. cit.* p. 53.

1896. *Carcharias (Aprionodon) Gibbesii*, G. de Alessandri, *loc. cit.* p. 721, pl. i. fig. 3.

1896. *Corax aff. falcatus*, G. de Alessandri, *loc. cit.* p. 722, pl. i. fig. 4.

The meaning of Bravard's specific names quoted above is indicated by his labels in the British Museum and in the National Museum, Buenos Aires. Two teeth in the British Museum marked *Lamna obliquidens* are upper lateral teeth of *Carcharias (Prionodon)*; numerous specimens in the National Museum labelled *Lamna serridens* are obviously upper teeth of the same species, while other specimens labelled *Lamna amplibasidens* in both museums are for the most part, if not all, lower teeth of the same fish. The majority of the lower teeth are distinctly serrated, like the specimen erroneously referred to *C. (Aprionodon) Gibbesi* by Alessandri; but many of the smaller specimens exhibit quite smooth edges—possibly a character of immaturity*. Some of the upper teeth have been referred to *Corax* by Alessandri; but I have made sections of several examples identical in shape with that represented in his fig. 4, and found all to have a central cavity. I therefore regard his determination of *Corax* from the Parana formation as a mistake.

9. *Galeocерdo aduncus*, Agassiz. (Pl. I. figs. 10, 10 a.)

1835-43. *Galeocерdo aduncus*, L. Agassiz, *op. cit.* vol. iii. p. 231, pl. xxvi. figs. 24-28.

1889. *Galeocерdo aduncus*, A. S. Woodward, *Catal. Foss. Fishes B. M.* pt. i. p. 444.

Like those of *Carcharias* the species of *Galeocерdo* are difficult to determine, but the tooth from Parana represented in Pl. I. figs. 10, 10 a, seems to belong to the side of the jaw of the European and North-American Miocene species *G. aduncus*. It is readily distinguished from the Eocene *G. latidens* by its deeper crown and finer serrations.

10. *Hemipristis serra*, Agassiz. (Pl. I. figs. 11, 11 a.)

1835-43. *Hemipristis serra*, L. Agassiz, *op. cit.* vol. iii. p. 237, pl. xxvii. figs. 18-30.

1889. *Hemipristis serra*, A. S. Woodward, *Catal. Foss. Fishes B. M.* pt. i. p. 449.

This species is rare in the Parana formation, but a few well-preserved upper teeth are unmistakable. The best specimen, not in the least abraded, is shown in Pl. I. figs. 11, 11 a. It is in all respects a typical upper tooth.

* A. Günther, *Catal. Fishes B. M.* vol. viii. (1870) p. 357.

11. *Undetermined Siluroids &c.*

Remains of Siluroid fishes are very abundant in the Parana formation, but all the known specimens are too fragmentary for exact determination. They evidently represent *Arius*, *Pimelodus*, *Platystoma*, and other genera which still live in the fresh waters of South America.

Fragments of Characinoids also occur and are easily recognized; but other remains, such as those which have been referred to Sparoids and Labroids by Bravard and Alessandri, are not satisfactorily determinable. The so-called tooth of *Lepidosteus* described by Alessandri (*loc. cit.* p. 726, pl. i. fig. 8) is not sufficient to indicate the presence of this genus.

If the foregoing determinations of the fish-remains from the Parana formation be accepted, it is evident that Alessandri's argument for the Eocene age of this deposit has no foundation in fact. The so-called teeth of *Acrodus* and *Corax* (which are typically Mesozoic genera) become, on renewed examination, evidence of *Cestracion* and *Carcharias*, which range throughout the Tertiary formations and survive at the present day. It is by no means certain that the teeth determined as *Odontaspis elegans* in the Parana collection belong to the same fish as those originally thus named in European Eocene collections; and even if *Carcharias* (*Aprionodon*) *Gibbesi* were correctly identified, the Phosphates of South Carolina, from which the type specimens of that species were obtained, seem to include fossils of all Tertiary ages from the Eocene to the Pleistocene. In fact, the only species in the Parana collection which seem to be of real importance for stratigraphical purposes are *Oxyrhina hastalis*, *Carcharodon megalodon*, and *Hemipristis serra*. All these in Europe are exclusively Miocene and Pliocene fossils, while the only teeth from the undoubted Eocene of North America (Alabama) commonly referred to the same species are comparatively small, not of typical size like those from Parana. Moreover, it is to be noted that several teeth of *Oxyrhina hastalis* and *Carcharodon megalodon* were dredged from the bed of the South Pacific Ocean by the 'Challenger' expedition*, this discovery probably implying that these great sharks did not become extinct until quite the latest geological times. I therefore conclude, with Burmeister and Stelzner, that the

* J. Murray and A. Renard, "Deep-sea Deposits" ('Challenger' Reports, 1891), pls. v., vi.

Parana formation is truly of late Tertiary age, and may probably be correlated with the Pliocene of the northern hemisphere.

EXPLANATION OF PLATE I.

Teeth of Elasmobranch fishes from the Parana formation, Province of Entrerios, Argentine Republic.

- Figs. 1, 1 a. Odontaspis elegans*, Ag. ; outer and lateral aspects.
Fig. 2. Ditto; inner face.
Figs. 3, 3 a. Ditto; inner and lateral aspects.
Figs. 4, 5. Ditto; inner face.
Figs. 6, 6 a. Oxyrhina hastalis, Ag. ; outer and lateral aspects.
Figs. 7, 8. Ditto; outer face.
Fig. 9. Carcharodon megalodon, Ag. ; outer face, two thirds nat. size.
Figs. 10, 10 a. Galeocerdo aduncus, Ag. ; outer and inner faces.
Figs. 11, 11 a. Hemipristis serra, Ag. ; outer and inner faces.

The original specimens are in the National Museum, Buenos Aires, and all the figures except no. 9 are of the natural size.

II.—*The New Mexico Bees of the Genus Megachile and a new Andrena.* By T. D. A. COCKERELL, Professor of Entomology, New Mexico Agricultural College.

Megachile Wootoni, Ckll., 1898.

The type was a male. I have before me two females from the Rio Ruidoso, about 6900 feet, at flowers of *Verbascum thapsus*, July 23 (*C. H. T. Townsend*). They differ at once from the female of *M. calogaster* by having little or no black hair on the vertex and mesothorax; one has the orange scopa as in *calogaster*, but the other has the scopa orange in the middle and black at the sides, thus approaching *M. melanophæa*.

This belongs to the subgenus *Megachile* s. str., as restricted by Friese.

Megachile sapellonis, sp. n.

♀.—Length 17-22 millim., the shorter examples having the abdominal segments retracted.

Black, with rather thin pubescence, white on sides of face, cheeks, pleura, metathorax, femora, sides of first segment of abdomen, and hind margins of second and following segments, more or less interrupted in the middle, at least on

the second segment; vertex, mesothorax, and scutellum with erect black hair; basal portions of second and following abdominal segments with short black hair; labrum with erect pale orange hair; hair on inner side of tarsi more or less orange or reddish, on hind tarsi deep orange-ferruginous; ventral scopa entirely very pale yellowish to yellowish white, never quite a pure white; spurs bright ferruginous; antennæ wholly black, reaching about to tegulæ; clypeus shining, with strong punctures, sparse in the middle, its anterior margin with four short teeth; head large, subquadrate; cheeks simple; vertex broad, with strong punctures, dense in the middle, where they are of two sizes; mandibles broad, 4-dentate, not counting the inner angle; mesothorax densely punctured at the sides, more sparsely in the middle; tegulæ black, microscopically sculptured, punctured anteriorly; wings smoky; claws with a ferruginous denticle at the base.

Allied to *M. bucephala*, Smith, but considerably larger.

Hab. Beulah, Sapello Cañon, N. M., July 26, 2 ♀, one at flowers of thistle (*W. Porter*); Beulah, Aug. 18, 2 ♀ (*Ckll.*); hill west of Beulah, Aug. 23, 1 ♀ (*W. Porter*); Harvey's Ranch, 9600 feet, Aug. 22, 4 ♀ (*Porter & Ckll.*); South Fork, Eagle Creek, White Mts., about 8100 feet, at flowers of *Senecio Bigelovii*, Aug. 13, 1 ♀ (*Townsend*).

Greene, 'Pittonia,' iv. p. 118, announces that the plant of the White Mts., distributed as *Senecio Rusbyi*, is really *S. Bigelovii*. It is visited also by *Bombus improbus* and *Andrena apacheorum*.

Megachile pugnata, Say, 1837.

Santa Fé, 5 ♂, 2 ♀; Las Vegas, July 22, at flowers of *Rudbeckia laciniata*, 1 ♀ (*W. Porter*); Beulah, July 26, 3 ♀ (*W. Porter*); hill near Beulah, Aug. 19, 2 ♀ (*W. Porter*).

The female is easily distinguished from the last by its smaller size (not over 15 millim.) and the large tooth at the lower hind angles of the cheeks. The abdominal bands are entire.

The Santa Fé males were at flowers of *Lactuca pulchella* and *Rudbeckia*, the females at *Lactuca pulchella* and *Grindelia*.

Megachile fidelis, Cress., 1878.

Las Vegas Hot Springs, at flowers of *Senecio Douglasii*, Aug. 10, 3 ♀ (*W. Porter*); Burnt Cañon, Aug. 14, at flowers of *Cleome*, 1 ♀ (*Sarah L. Mize*); Las Vegas, July 6 and

19, at flowers of *Verbena*, 2 ♂ (*Porter & Ckll.*); July 7, at flowers of *Senecio Douglasii*, 1 ♀ (*W. H. Rishel*); Aug. 10, at flowers of *Grindelia squarrosa*, 1 ♀ (*S. L. Mize*); San Ignacio, Sept. 1, 1 ♀ (*Porter & Ckll.*); Beulah, July 26, 1 ♀ (*W. Porter*); west fork of Gila River, July 16, ♂ (*Townsend*); Rio Ruidoso, about 6500 feet, July 31 and Aug. 1, at flowers of *Heliopsis scabra*, 2 ♂ (*Townsend*).

The female differs at once from that of *pugnata* by the yellow abdominal bands and the large tooth or lamina on each side of the anterior margin of the clypeus.

Megachile exilis, Cress., 1872.

The male has the first three joints of the anterior tarsi flattened at the side. The female resembles the male; the ventral scopa is white, sometimes with a few black hairs at the extreme tip; in one specimen from the Rio Ruidoso the scopa on the last three segments is greyish brown; the anterior margin of the clypeus has two little teeth in the middle and a broad tooth or lamina at each side.

West fork of Gila River, July 12 to 16, many males (*Townsend*); Santa Fé, at flowers of *Pentstemon Torreyi* in a garden, crawling on the outside of the flower, July 11, 1 ♂ (*Ckll.*); Las Vegas Hot Springs, July 11, 1 ♂; Las Vegas, July 18, at flowers of *Lycium vulgare*, 1 ♀ (*W. Porter*); Gallinas River at La Cueva, at flowers of *Psoralea tenuiflora*, 2 ♀ (*Porter & Ckll.*); Rio Ruidoso, about 6700 feet, at flowers of *Vicia* near *pulchella*, July 29, 2 ♀, 6 ♂ (*Townsend*).

This species differs from most of its genus in not being addicted to the Compositæ.

Megachile occidentalis, Fox, 1894.

A narrow species, much like the last, but rather larger, and both sexes with two spots of white hair on the anterior part of the mesothorax. The female has the anterior margin of the clypeus with a broad but shallow median excavation, in the middle of which is a tooth; the ventral scopa is white, wholly black on the last segment.

Riley's Ranch, at base of Organ Mts., Aug. 26, 1 ♀ (*Ckll.*); Las Cruces, June 8, 1 ♂ (*Ckll.*); Mesilla, May 10, at flowers of *Prosopis glandulosa*, 1 ♂ (*Jessie Casad*); April 22, at flowers of *Phacelia*, 1 ♂ (*Ckll.*).

This is a species of the Middle and doubtless Lower Sonoran, whereas *M. exilis* belongs to the Upper Sonoran and transition zones.

Megachile latimanus, Say, 1823.

The female is easily distinguished by its rather large size (13–15 millim.), shovel-shaped abdomen, ventral scopa whitish at base, becoming ferruginous at apex, broad face, and the greyish-white pubescence of the vertex and mesothorax hardly at all mixed with black.

Santa Fé, July and August (*Ckll.*); Las Vegas, June 1, ♂, June 9, ♀ (*R. Devine*); July 6, at flowers of *Verbena Macdougali*, 1 ♀ (*W. Porter*); July 11, at flowers of *Cleome serrulata*, 2 ♀ (*M. Winters & Ckll.*); June 19, at flowers of *Medicago sativa*, 1 ♀ (*Ckll.*); Aug. 11, at flowers of *Petalostemon candidus*, 1 ♀ (*W. Porter*); Aug. 9, at flowers of *Grindelia squarrosa*, 1 ♀ (*W. Porter*); San Ignacio, Sept. 1, ♀ (*Porter & Ckll.*).

This is a species of the transition zone, and it is remarkable that it was neither found at Beulah nor in the White Mountains.

Megachile fortis, Cress., 1872.

This species in the male exhibits a dichroism like that of *Anthophora occidentalis*; the pale form is the *M. comata*, Cress., 1872, but in a long series it becomes impossible to recognize it as a separate species. The female has never been described as such, but from analogy with *M. latimanus* and the facts of distribution I feel certain that it is the insect described by Cresson in 1878 as *M. texana*. The male assigned to *texana* by Cresson is a different species.

This species inhabits higher altitudes than *M. latimanus*, though it also occurs in the transition zone. Las Vegas Hot Springs, Aug. 10, at flowers of *Senecio Douglasii* and *Verbena Macdougali*, 3 ♂ (*W. Porter*); Gallinas River, at La Cueva, Aug. 6, 1 ♂ (*W. Porter*); San Ignacio, Sept. 1, ♂ ♀ (*Porter & Ckll.*); Beulah, end of August, 1 ♀ (*Ckll.*); Mesacero Indian Reservation below the Agency, at flowers of *Bigelovia graveolens*, var. *glabrata*, Oct. 1 and 2, 7 ♀ (*Ckll.*); Rociada, Aug. 20, 1 ♀ (*W. Porter*); South Fork of Eagle Creek, 8000–8200 feet, Aug. 18–20, ♂ at flowers of *Heliopsis scabra*, ♀ at flowers of *Erigeron macranthus* and *Senecio Bigelovii* (*Townsend*); Rio Ruidoso, July 8, at flowers of *Pentstemon*, ♀ (*Wooton*); July 21–Aug. 3, 6500–7600 feet, males at flowers of *Verbena Macdougali* (some of these var. *comata*), *Vicia* near *pulchella*, *Monarda stricta*, *Heliopsis scabra*, *Astragalus humistratus*, and *Potentilla Thurberi*, but only single specimens on the last two; females at flowers of

Verbascum thapsus (very many), *Rhus glabra*, and *Verbena Macdougali*.

Megachile relativa, Cress., 1878.

This and the next form a little group distinguished in the female by the ferruginous scopa, punctures of mesothorax relatively sparse in the middle, abdomen with hair-bands mostly interrupted, and the clypeus normal. *M. relativa* is rather small (about 11 millim.) and has the hair-bands of the abdomen white, overlapped with orange hairs, so as usually to appear yellowish or orange. In *monardarum* there are no overlapping hairs, unless it may be some black ones.

Rio Ruidoso, July 30, 1 ♀ (*C. M. Barber*); Rociada, Aug. 20, 1 ♀ (*W. Porter*); Harvey's Ranch, Aug. 22 (*W. Porter*); Beulah, July 26, Aug. 18, Aug. 25, many females, one at flowers of *Polemonium filicinum* (*W. Porter*).

The species evidently extends right across the northern part of the continent, as I have a female from Olympia, Washington State, at flowers of *Potentilla*, June 30 (*T. Kincaid*).

Megachile monardarum, sp. n.

♀.—Length 13–16 millim.

Similar to *relativa*, but differing in its larger size; the abdominal hair-bands (very broadly interrupted on the second and third segments, narrowly interrupted or entire on the fourth and fifth) white instead of orange; the black hairs on the dark parts of the abdomen longer, conspicuous at the sides when the abdomen is viewed from above; the vertex more sparsely punctured at the sides, and the two apical teeth of the 4-dentate mandibles perhaps not so long.

Hab. Hill near Beulah, Aug. 19 (*W. Porter*); Rio Ruidoso, 6500–6700 feet, at flowers of *Monarda stricta* and *Astragalus humistratus*, July 27–31 (*Townsend*).

Megachile pruina, Smith, 1853.

Our insect is *M. facunda*, Cress., now considered to be identical with *pruina*. The following records are based on the male, which is distinguished from the allied males flying in the same region by the simple anterior tarsi and the large teeth at the apex of the abdominal venter. It is a larger insect than *M. Townsendiana*, though variable in size (11–14 millim.), and does not have the emarginate apical

portion of the abdomen curved downwards as in that species; but the two are closely allied.

Las Vegas Hot Springs, Aug. 10, at flowers of *Senecio Douglasii*, two (*W. Porter*); Las Vegas, July 22, at flowers of *Rudbeckia laciniata* (*W. Porter*); Aug. 9, at flowers of *Melilotus alba* (*W. Porter*); Aug. 12 (*A. Garlick*).

Megachile Townsendiana, Ckll., 1898.

Las Cruces, Aug. 23, 4 ♂ (*Ckll. & Townsend*); Rincon, July 6, at flowers of *Actinella*, 2 ♂ (*Ckll.*).

A species of the Middle Sonoran zone.

Megachile pollicaris, Say, var. *pereximia* nov.

♂.—Length 13 millim.

Anterior and middle femora and tibiæ ferruginous; hind femora and tibiæ black; middle tibiæ with a black basal streak behind; anterior tibiæ yellow in front at apex; second joint of anterior tarsus white, with a long linear apical process; apex of flagellum somewhat dilated.

Hab. Beulah, May 30, at flowers of wild plum (*W. Porter*).

Megachile Casadæ, Ckll., 1898.

Found as yet only in the Mesilla Valley.

The female has the scopa entirely white; clypeus and mandibles normal; punctures of mesothorax large, the intervals between them shining, and presenting some extremely minute punctures.

Megachile soledadensis, sp. n.

♂.—Length 10 millim.

Agreeing with the description of *M. legalis*, Cress., but possessing the following peculiarities:—Eyes pale green; apical joint of flagellum broad and flattened; anterior coxæ with a bright ferruginous hair-patch, their spines short, oblique, pointed, and slightly curved; anterior femora with the basal two fifths above pale ferruginous, beneath with a large yellowish keel, subtriangular in shape, like that of a racing-yacht; anterior tibiæ three-sided, ferruginous, except on the outer side; anterior tarsi yellow, moderately dilated, with a long white fringe, which is brownish within, second joint with a conspicuous black spot within; hind tibiæ stout, their tarsi broadened; hair of vertex and thoracic dorsum

slightly greyish, not at all mixed with black; tegulæ clear testaceous; wings nearly clear, costal nervure ferruginous; abdomen rather broad, but parallel-sided, clothed with greyish-white hair, hind margins of the segments with conspicuous entire white hair-bands; apex rounded, irregularly serrulate, not emarginate; apex of venter with a rather large tooth on each side and a small one in the middle.

Has the general aspect of *M. Townsendiana*, from which its front legs and abdominal structures at once separate it. The non-emarginate apex of abdomen allies it with *M. manifesta*, but it has not the long median ventral apical tooth of that insect.

♀.—Similar to the male, except for the usual sexual differences. Hind border of scutellum and sides of mesothorax conspicuously bounded by white pubescence; apical teeth of mandibles very little developed; ventral scopa white, black on the last segment.

Hab. Soledad Cañon, Organ Mts., Aug. 15, 2 ♂, 1 ♀ (*C. H. T. Townsend*); Mesilla Valley, at flowers of *Baileya multiradiata*, 1 ♂ (*Townsend*).

Megachile manifesta, Cress., 1878.

♂.—The abdominal bands, described as white by Cresson, are often ochraceous.

♀.—Similar to the male, except in the usual sexual characters, the broader more shovel-shaped abdomen, and the vertex and disk of mesothorax (but not the scutellum) being clothed with black hair. The abdominal hair-bands are entire and very distinct, and the second and following segments have their dark portions clothed with black hair. Ventral scopa white, black on the apical segment and apex of penultimate one, white, however, at extreme base of apical segment.

Las Vegas Hot Springs, Aug. 10, at flowers of *Senecio Douglasii*, 1 ♂ (*W. Porter*); Las Vegas, Aug. 9-14, at flowers of *Grindelia squarrosa*, 14 ♂, 3 ♀ (*S. L. Mize & W. Porter*); Aug. 11, at flowers of *Petalostemon candidus*, 1 ♀ (*W. Porter*). Apparently absent from the White Mountain region.

Megachile cleomis, sp. n.

♀.—Length 11-13 millim.

Pubescence mostly dull white, on vertex black, on mesothorax and scutellum thin, greyish white at the sides, black in the middle; on the middle of the second and following

abdominal segments black, very conspicuous at the sides when the abdomen is viewed from above; white pubescence dense on sides of face, pleura, tubercles, sides of metathorax, sides of first abdominal segment, and on hind margins of segments 1 to 5, forming conspicuous entire white bands; ventral scopa white or with a yellowish tinge, black on last segment; pubescence on inner side of tarsi dull ferruginous; clypeus ordinary, with strong punctures, well separated in the middle; antennæ short; vertex with large punctures; mesothorax microscopically tessellate, with large punctures, well separated on the disk; abdomen inversely mitre-shaped, strongly punctured; tegulæ black, punctured all over; wings dusky.

This agrees almost exactly with Cresson's description of the female *M. grandis*, but that is the female of *M. pollicaris*, which our insect certainly is not. Among the females found in New Mexico it is known by the white scopa, black on the last segment, normal clypeus, rather broad form, and the absence of any spots of white pubescence on the mesothorax or white band between the mesothorax and scutellum. The absence of the last-mentioned marks at once separates it from the superficially similar *M. sidulceæ*.

♂.—Length 11 millim.

Abdomen rather parallel-sided; antennæ long, last joint not modified; punctures of mesothorax closer; mesothorax and scutellum with scarcely any dark hairs; face densely covered with silky white hair; black hair on abdomen inconspicuous; cheeks simple; anterior coxæ armed with black spines of moderate length; anterior femora ferruginous beneath and with a ferruginous patch above; anterior tarsi simple, but fringed with white hair; margins of tegulæ more or less ferruginous; apex of abdomen emarginate, irregularly denticulate on each side of the emargination; apex of venter with three very short teeth.

This appears to be the male which Cresson supposed (erroneously, as I hold) to belong to his *M. texana*. It differs from that of *M. rufimanus* by the armed anterior coxæ.

Hab. Santa Fé, July 5–25, many males, one at flowers of *Cleome serrulata*, 1 ♀ (*Ckll.*); Las Vegas, June 28–July 20, both sexes numerous at flowers of *Cleome serrulata*, 1 ♀ at flowers of *Medicago sativa* (alfalfa), one of each sex at flowers of *Verbena Macdougali* (*M. Holzman*, *N. Stern*, *E. K. Rishel*, *A. Garlick*, *W. Porter*, *M. Winters*, *Ckll.*); Albuquerque, 1 ♀, June 30 (*Ckll.*).

Megachile cleomis, var. *lippiae* nov.

♀.—Always has two transverse white hair-marks at the front of the scutellum, but lacks the two marks at the front of the mesothorax, which are present in *M. sidalceæ*; scopa yellowish white, black on apical segment; mesothorax between the punctures dull; tegulæ more or less edged with ferruginous; flagellum sometimes a little ferruginous beneath; abdomen with less black hair at the sides.

♂.—Usually with more black hair on the thorax, especially on the scutellum.

This is the Middle Sonoran race of the species. La Cueva, Organ Mts., about 5300 feet, at flowers of *Lippia Wrightii*, Sept. 3-5, 2 ♂, 2 ♀ (*C. H. T. Townsend*); West Fork of Gila River, July 12-16, ♀ (*Townsend*); Las Cruces, ♀, Sept. 7 (*Ckll.*), and males as follows:—June 16, at flowers of *Aster spinosus* (*Ckll.*); Aug. 11 (*Townsend*); Sept. 4, at flowers of *Solidago canadensis*, var. *arizonica* (*Ckll.*).

The following males have no black hair on the scutellum, and offer no satisfactory differences from those of typical *cleomis*:—Las Cruces, Aug. 24, at flowers of *Solidago canadensis*, var. *arizonica*; Mesilla, July 4 (*C. M. Barber*); Mesilla Park, April 24, at flowers of *Onobrychis* (*Jessie Casad*); Fillmore Cañon, Organ Mts., Aug. 29 (*Ckll.*); Lone Mountain, July 7 (*Ckll.*).

The species is recognized in the male by the ferruginous patch on the upperside of the anterior femora.

Megachile sidalceæ, Ckll., 1897.

Described originally from the male. The subjoined records are based on the female, which is very similar to that of *M. cleomis* and is distinguished by the following combination of characters:—Ventral scopa pure white, black at extreme tip; a conspicuous white hair-band in the scutello-mesothoracic suture; two white hair-marks, converging posteriorly, on mesothorax in front; mesothorax microscopically tessellate between the punctures; borders of tegulæ more or less ferruginous; pubescence of face white, of vertex often mixed with black; clypeus and mandibles normal, anterior edge of clypeus smooth, often with a small median tubercle; abdomen mitriform.

Mesilla, May 13, two at flowers of *Prosopis glandulosa* (*Jessie Casad*); June 24, one at flowers of *Helianthus ciliaris* (*Ckll.*); Mesilla Park, two at flowers of *Isocoma Wrightii*, Sept. 11 (*Ckll. & Porter*); Las Cruces, Aug. 23 (*Ckll.*);

east of Las Cruces, about 4000 feet, two at flowers of *Senecio filifolius*, Sept. 10 (*Townsend*); Soledad Cañon, Organ Mts., one at flowers of *Pectis papposa*, Aug. 15 (*Townsend*).

The abdomen, viewed from above, does not show the black hair at the sides, which is so conspicuous in *M. cleomis*, except on the last two segments. This separates it at a glance from the typical female *cleomis*, but *cleomis* var. *lippicæ* has conspicuous lateral black hair only on the last two segments, as in *sidalceæ*. It would be easy to regard *lippicæ* and *sidalceæ* in the female as forms of one species, but the males are quite different in the structure of their anterior legs. There is a bare possibility that the female here assigned to *sidalceæ* does not belong to it, but is really a form of *lippicæ*, in which case one of the next two species should probably be mated with *sidalceæ*; but in the absence of absolute proof I have followed the apparent probabilities.

Megachile prosopidis, sp. n.

♀.—Length $12\frac{1}{2}$ – $15\frac{1}{2}$ millim.

Resembling *M. sidalceæ* in the pubescence, but abdomen subcylindrical and parallel-sided; pubescence white, not hiding the surface except in particular places; the vertex and mesothorax have some very scanty and short dark hair, scarcely visible; pubescence dense, forming conspicuous white marks at sides of face, below tegulæ, two white marks on mesothorax in front converging posteriorly, a spot at lateral hind angles of mesothorax and on hind margins of abdominal segments, forming narrow entire bands; pubescence also dense on pleura and sides of mesothorax, but no well-defined band at the scutello-mesothoracic suture; band on first abdominal segment produced at each side into a triangular patch; scopa white, black on last segment; legs black; margins of tegulæ dull ferruginous; wings hyaline, slightly smoky on margins; antennæ black, flagellum faintly ferruginous beneath; mesothorax with large very close punctures, not at all sparse on disk; clypeus deeply and broadly emarginate, the sides of the emargination directed inwards, the middle occupied by a large lobe, so that the opening, if closed by an imaginary line connecting the opposite lower corners, would have a reniform outline; labrum with the apical lateral angles pointed, the apical middle thickened but not produced, bearing a brush of brown hairs directed somewhat backwards; mandibles broad, 5-dentate counting the inner angle, only the apical tooth large.

Allied to *M. rufimanus*.

Male unknown.

Hab. Mesilla, May 10, two at flowers of *Prosopis glandulosa* (*Jessie Casad*); Las Cruces, one (*Townsend*); Rincon, July 5, at flowers of *Chilopsis linearis*, one (*Ckll.*).

The maxillary palpi are covered with bristles.

Megachile chilopsidis, sp. n.

♀.—Length 14 millim.

In form, size, and pubescence just like *M. prosopidis*, so that, without looking at the face, one would take it for the same species, but clypeus and mandibles entirely different. Clypeus extremely short, produced in the middle into a very broad truncate lobe, more than twice as broad as long, projecting, shining and punctured above; labrum broadly truncate and thickened at end, the lateral corners pointed, the middle with a narrow brush of brown hairs directed obliquely backwards; mandibles long and narrow, somewhat broadened at apex, with three small teeth; a large open space between the mandibles and the clypeus. First joint of labial palpi shorter than in *M. prosopidis*, being not greatly longer than the second.

Male unknown.

Allied to *M. rufimanus*, which resembles this species in the mandibles, and the last more in the clypeus.

Hab. Mesilla, one at flowers of *Prosopis glandulosa*, May 13 (*Jessie Casad*); Rincon, one at flowers of *Chilopsis linearis*, July 5 (*Ckll.*).

Megachile populi, sp. n.

♀.—Length about 13 millim.

Black, with white pubescence; black on disk of mesothorax, middle of scutellum, and vertex, but in these places thin, wholly exposing the surface; hair of cheeks and sides of face long, dense, and pure white; antennæ short, hardly reaching to tegulæ, flagellum faintly ferruginous beneath; vertex strongly punctured, but the punctures separate; clypeus shining, strongly punctured at the sides, the punctures evanescent on the disk, anterior edge straight and normal; mandibles normal, 4-dentate counting the inner angle; first joint of labial palpi very broad, shorter than the second; mesothorax shining, though microscopically tessellate, densely punctured at the sides, sparsely in the middle; tegulæ

piceous, punctured all over; wings hyaline, faintly smoky; tarsi with ferruginous hair on the inner side; abdomen long-mitriform, the segments with entire white hair-bands; ventral scopa white, black on the last segment and sometimes the hind margin of the penultimate one.

There are no white hair-marks on the front of the mesothorax nor at the scutello-mesothoracic suture.

Superficially resembles *M. cleomis*, var. *lippie*, but easily distinguished by the character of the mesothoracic punctuation and the much longer second joint of the labial palpus.

Hab. Mesilla Park, campus of New Mexico Agricultural College, April 16, cutting the leaves of *Populus*, to use in preparing their nests.

Megachile vallorum, sp. n.

♀.—Length 14–15 millim.

Much like *M. populi*, with the same kind of pubescence and entire white abdominal bands, but differing in many details. Black pubescence arranged on vertex, mesothorax, and scutellum as in *M. populi*; flagellum wholly dark or faintly reddish beneath; mandibles with prominent sharp teeth; second joint of labial palpus a little longer than first; clypeus with large punctures, dense all over; anterior border of clypeus with a broad shallow emargination, beneath which is a conspicuous fringe of orange hair; mesothorax densely punctured all over, the areas between the punctures wholly dull; no white hair-marks on anterior part of mesothorax nor at scutello-mesothoracic suture; tegulae dark, punctured all over; wings hyaline, broadly smoky on outer margin, and especially at apex; basal joint of hind tarsi long and flat, considerably longer than the other joints together, covered on inner side with orange-ferruginous hair; spines at apices of first four tibiae quite long, dark ferruginous; abdomen, viewed from above, showing abundant black hair at the sides of the last two segments, but not the others; ventral scopa white, varying to quite yellowish, black on last segment and apex of penultimate one.

By the clypeal structure allied to *M. montivaga*, but otherwise different.

Hab. Las Cruces (*Agnes Williams*); Mesilla, June 24, entering burrow in an adobe wall (*Ckll.*); Socorro, June 29, two at flowers of a species of *Compositae* (*Ckll.*).

Megachile heterodonta, sp. n.

♀.—Superficially, in size, form, and colour, even to the

tint of the abdominal bands and dark shading of the wings, exactly like *M. pugnata*, but differing as follows:—Cheeks not toothed; head not so large behind the eyes; middle of vertex with the punctures large and well-separated, the space between them shining, though microscopically tessellate; first joint of flagellum shorter; clypeus ordinary, densely punctured all over, with very large punctures, its anterior margin inconspicuously tridentate and fringed beneath with long orange hairs; mandibles stout, shorter than in *pugnata*, 4-dentate, the apical tooth long and pointed, the next truncate, the next quadrate, broader than long, with its inner corner somewhat produced, the innermost tooth short and pointed; mesothorax dull and as densely punctured as possible all over; ventral scopa white, black on last segment. The second joint of the labial palpus is conspicuously longer than the first. The abdominal bands are very distinct.

Hab. Las Vegas, Aug. 1 (*Porter & Ckll.*); Fillmore Cañon, Organ Mts., about 5700 feet, Sept. 1 (*C. H. T. Townsend*).

Megachile brevis, Say, 1837.

Hab. Gallinas River, at La Cueva, Aug. 6, 1 ♀ (*Porter & Ckll.*).

This agrees with *M. brevis*, received from Mr. Charles Robertson, and is the only genuine *brevis* in the New Mexico collections. The insect is recognized by its rather small size (11–12 millim.), wholly white ventral scopa, mesothorax dull and densely punctured, abdomen mitriform, mandibles curved at the apex, the two apical teeth close together.

I have the species also from Baldwin, Kansas, July (*J. C. Bridwell*).

Andrena sapellonis, sp. n.

♀.—Length $9\frac{1}{3}$ –11 millim.; ♂ about 8 millim.

With a wholly dark face and very long antennæ, the flagellum entirely black. In Robertson's table in *Trans. Amer. Ent. Soc.* xviii. p. 50, this runs to *A. salicis*, but it is a little larger, and differs from the description of the female by having the basal process of labrum narrow but quite large, produced, and rounded at the end instead of truncate; the well-developed hair-bands on the second, third, and fourth abdominal segments are white instead of fulvous. The clypeus, as in *salicis*, has a well-developed median impunctate ridge, and the long rather dense hair of the thoracic dorsum is ochreous, though that of the cheeks and pleura is white. The mesothorax is dull, microscopically tessellate,

with sparse punctures; the abdomen is impunctate. The anal fimbria is greyish brown. The enclosure of the metathorax is granular and ill-defined. Tarsi dark in both sexes.

I had thought it possible that this might be *Andrena trizonata* (Ashmead, as *Cilissa*), so I sent a specimen to Mr. Ashmead, who kindly compared it with his type, and reported as follows:—"The *Andrena* sent is not my *trizonata*, although it superficially resembles it. Your specimen is slightly larger, differently sculptured, and has quite a different pygidial plate. The hind legs and tarsi are also differently coloured. It is quite a different insect."

These remarks relate to the female; the male of *trizonata* is said to have a banded abdomen; that of *sapellonis* ♂ is shining, without bands, though the first segment, lateral hind margins of the two following, and whole hind margins of the rest are clothed with rather pale brown hair, which is only conspicuous under a lens.

The female *sapellonis* must resemble Robertson's recently described *A. salicacea*, but it differs from the description of the latter as follows:—Pubescence of thorax above ochraceous; facial grooves white, their width about as great as length of first flagellar joint; enclosure and sides of metathorax rugose-reticulate, but sculptured alike; anal fimbria pale brown. *A. sapellonis* agrees with *salicacea* in the process of labrum, proportions of the first three flagellar joints, fuscous pubescence on tibiæ, and third submarginal cell at least twice as long as the second. The two doubtless are closely allied.

Hab. Beulah, 4 ♀, 1 ♂ at flowers of *Salix*, 2 ♀ at flowers of wild plum, May 30, 1899 (*W. Porter*).

Mesilla Park, New Mexico, U.S.A.,
March 28, 1900.

III.—On the West-Indian Species of *Madrepora* *. By
J. W. GREGORY, D.Sc., F.G.S., Professor of Geology in
the University of Melbourne.

THE term *muricatum* was first applied to West-Indian corals

* [This paper was read before one of the London Societies in June last year after a visit to the West Indies to study, amongst other questions, the *Madreporæ* of that region. The paper was withdrawn by request of the Society.

I delayed publication in order to reconsider the matter after a few months' interval. A recent letter from Mr. J. E. Duerden, of Jamaica,

by Sloane * in 1707. Sloane used the word in describing the three forms of *Madrepora* which are now generally known as *M. palmata*, *M. cervicornis*, and *M. prolifera*. Linnæus accepted the term as the name of a species which he called *Millepora muricata* in 1754 and *Madrepora muricata* in 1767 †. Linnæus founded the species to include all the *Madreporæ* with an arborescent branching corallum. It was adopted in the sense of either Sloane or Linnæus by subsequent zoologists until 1816, when Lamarck ‡ broke up the *M. muricata*, L. et auct., into five species and abandoned Linnæus's specific name. For the West-Indian *Madreporæ* he founded the species *M. palmata*, *M. cervicornis*, and *M. prolifera*. Lamarck's course of action was adopted by all students of corals until 1890; in that year Prof. Heilprin suggested that the West-Indian branched and palmate forms of *Madrepora* are members of the same species. "I feel doubtful," says Prof. Heilprin §, "if the palmate form of the corallum, as seen in *M. palmata*, *M. flabellum*, and *M. alces* (East Indies), is in itself a character sufficient to distinguish the species from those forms, agreeing with the palmate types in other respects, in which the corallum is strictly digitate. My associate, Mr. J. E. Ives, has called my attention to the tendency in the direction of digitation which many individuals of the palmate species exhibit. This is carried so far in some of the specimens contained in the collections of the Academy of Natural Sciences that it becomes difficult, if not really impossible, to class the individuals." By the digitate types Prof. Heilprin presumably means *M. cervicornis*, for *M. prolifera* he kept quite distinct. The same conclusion was reached and extended in 1893 by Brook ||,

who is making a detailed study of the polypes of the West-Indian corals, shows that, like myself, he had been misled by deference to Brook's opinion. It therefore seems to me advisable to publish the paper, and it is issued exactly as written last June. Mr. Duerden says:—"Relying upon Brook's statement that he had met with intermediate specimens of *cervicornis* and *palmata*, I was inclined to regard them all [including *alciformis*] as one species. I have examined acres of *Madrepora* growth with the object of finding such intermediate forms, but without any success, although such would be expected considering that *prolifera* and *palmata* grow together."

* Hans Sloane, 'A Voyage to the Islands Madera . . . Jamaica,' vol. i. (1707) pp. 51-53, pl. xviii. figs. 3, 4, pl. xvii. figs. 2, 3.

† Linnæus, Syst. Nat. ed. x. p. 792, ed. xii. p. 1279.

‡ Lamarck, Hist. Nat. Anim. s. Vert. vol. ii. 278, 281.

§ A. Heilprin, "The Corals and Coral-reefs of the Western Waters of the Gulf of Mexico," Proc. Acad. Nat. Sci. Phil. 1890, p. 304.

|| Geo. Brook, "The Genus *Madrepora*," Cat. Madrep. Brit. Museum, vol. i. 1893, pp. 23-30.

whose opinion was no doubt formed independently, as he does not refer to Prof. Heilprin's paper. In Brook's great monograph of the genus *Madrepora* he not only merged Lamarck's three West-Indian species, but adopted for them Linnæus's name of *muricata*.

During a recent visit to the West Indies I have had the opportunity of studying the three forms of *Madrepora* on the reefs, and have been led to revert to the Lamarckian arrangement. As in 1895 * I accepted Brook's proposals, it may be advisable to state the reasons for my change of opinion.

It will be convenient first to consider whether the West-Indian *Madreporæ* are all to be included in a single species. Brook supported this idea by two lines of evidence:—1st, the distribution of the corals on the reefs; 2nd, the existence of a series of specimens having characters intermediate between those of Lamarck's species.

HABIT AND ENVIRONMENT.

The first argument was based on statements that Brook attributed to Pourtalès. Thus he says † that Pourtalès has "hinted that the three species of Lamarck may prove to be variations of one species, dependent on environment for their precise habit." But this is not quite a correct account of Pourtalès's opinion. The only reference to Pourtalès which Brook includes in his synonymy is to the memoir on the "Deep-sea Corals." Therein Pourtalès ‡ does hint that possibly *M. cervicornis* and *M. prolifera* may be specifically identical; but he makes no suggestion that *M. palmata* should be united with them. He even comes finally to the conclusion that *M. cervicornis* and *M. prolifera* may be conveniently kept apart. The passage referred to is as follows:—"Some specimens partake so much of the characters of both this [i. e. *M. prolifera*] and the preceding species [*M. cervicornis*] as to shake the belief in their specific difference. Still the greater number of specimens examined are readily distinguished, more perhaps by their habitus than by the more minute characters of the calicles."

Portalès's conclusion seems to me sound. Specimens of *M. prolifera* and *M. cervicornis* are distinguishable without

* J. W. Gregory, "Contributions to the Palæontology and Physical Geography of the West Indies," Quart. Journ. Geol. Soc. vol. li. (1895) p. 282.

† Brook, *op. cit.* p. 18.

‡ L. F. de Pourtalès, "Deep-sea Corals," Ill. Cat. Mus. Comp. Zool. no. iv. 1871, p. 84.

difficulty, though fragments may sometimes be indeterminable. But the two forms are sufficiently allied for their separation to be a mere matter of convenience.

The difference between *M. palmata* and *M. cervicornis* is, however, far more definite, and Pourtalès had no hesitation in keeping them distinct. Brook *, however, unites them on the ground that "Portalès has pointed out, with regard to the West-Indian specimens of *palmata*, *cervicornis*, and *prolifera*, that the proper habit and robustness of each form is associated with a different position on the reef. *M. palmata* grows in situations exposed to the force of the sea; *M. cervicornis* in less exposed localities; while for its full development *M. prolifera* appears to require sheltered spots on the inner side of the reef." This passage involves another unfortunate misrepresentation of Pourtalès, for, according to that author, the species which "requires a rather sheltered position for its full development" † is *M. cervicornis*, and not *M. prolifera*. In respect to the position of growth of the latter, Pourtalès gives no information; and, so far as my own observations go, *M. prolifera* does not flourish in sheltered spots inside the reef, but in deeper water than *M. cervicornis*, and often outside the main reef. Thus the typical species in the quiet coves of Parham Sound, Antigua, are *M. palmata* and *M. cervicornis*. The best specimens of *M. prolifera* that I obtained from Antigua came from the depth of 3 fathoms from an exposed position on the slopes of Sandy Island.

Portalès did say that *M. palmata* is characteristic of the exposed positions on the outside reefs, a statement, however, which is only true with one important limitation. The particular form of *M. palmata* known as "the car of Neptune," which has a massive corallum formed of thick lamellar expansions, is no doubt the typical form of *Madrepora* found in exposed positions in the West-Indian reefs. The fragile branched coralla of *M. cervicornis* and *M. prolifera* would be shattered if struck by the full force of a breaker; they accordingly grow in protected situations or at a depth below the limit of the surf.

It is possible that it was the "Neptune's car" form of *palmata* which Pourtalès had in mind when writing the previously quoted remark. His statement, so far as my observations go, is not correct for *M. palmata* as a whole. The alciform variety of *palmata*, which both Pourtalès and Brook include in that form, grows under identically the same conditions as *M. cervicornis*. For example, I collected specimens of both forms

* Brook, *op. cit.* p. 28.

† Pourtalès, *op. cit.* p. 84.

which were growing side by side, not 18 inches apart, on precisely the same sea-floor, rising to exactly the same level, and equally exposed to wave and current. The position was sheltered in the extreme, for it was on the shore of a small land-locked bay in Parham Sound on the lee side of Bird Island; and the bay was further protected by a shoal across its mouth. In an adjacent patch of reef *M. palmata* and *M. cervicornis* were growing interlocked, but each species was perfectly distinct. In another bay in deeper water there were circular patches of *M. palmata* and *M. cervicornis*, forming flat-topped tabular masses from 10 to 15 feet in diameter. They were growing under identical conditions.

The statements therefore that *M. palmata* and *M. cervicornis* are dimorphic forms of one species and that they have acquired different habits owing to their occurrence at different situations on a reef are not in accordance with their distribution on the coasts of Antigua. Indeed, the fact that where *M. palmata* grows in association with *M. cervicornis* the former is represented by a digitate or branched variety is fatal to the assumption of their specific identity; for the *M. alces* of Dana, and not the *M. cervicornis* of Lamarck, is the branched variety of *M. palmata*.

THE EVIDENCE OF INTERMEDIATE SPECIMENS.

Brook supported his argument by the existence of corals intermediate between *M. palmata* and *M. cervicornis*. I carefully looked out for such in all the reefs I had the chance of examining, but the search was unsuccessful. Brook stated that the "intermediate forms occur chiefly in the collection of the British Museum." He enumerates them on p. 29 of his monograph. The specimens are four in number, and, thanks to the kindness of Prof. Bell, I have had the opportunity of examining them.

The first specimen was collected by the 'Challenger' expedition at St. Thomas. Its registration number is 86. 12. 9. 274. The specimen is 200 millim. long, and consists of a central stem which gives off a series of cylindrical branches. On one side there is, a little above the base, an imperfectly separated branch which subdivides into two and shows the proximal ends of six cylindrical branches. On the other side there are eighteen branches or branchlets. I fail to see any approach to *M. palmata* in this specimen. If the specimen were palmate we should expect it to be so at the base. But at the bottom the central stem measures 30 millim. wide and 20 millim. thick. There is nothing palmate in that. The

specimen appears to me only a *M. cervicornis* in which the branches are numerous and mainly in one plane.

In regard to the three other intermediate forms, my difficulty is to understand why Brook assigned them to the *palmata-cervicornis* group. I had the privilege of examining them in conjunction with Mr. H. M. Bernard, who agreed as to the improbability of their specific identification. There is no evidence that the corals came from the West Indies, and from the characters of the specimens this source seems unlikely.

The second specimen is 93. 4. 7. 22, and its locality is unknown. It is apparently the young basal portion of a corallum, and is, perhaps, too immature for specific identification. It is 120 millim. long by 100 millim. wide, and its surface bears three rows of subconical elevations. On the middle row one process has grown upwards into a branch 30 millim. wide by 25 millim. thick, rising 55 millim. from the bottom of the furrow between the rows and rising 35 millim. above the slit which separates the branch from the adjacent subconical elevation. In one of the outside rows there is a lower branch, 45 millim. long by 30 millim. thick by 32 millim. high. In these characters I fail to see anything to ally the specimen to either *M. palmata* or *M. cervicornis*. The corallum agrees more nearly with Brook's description of that of *M. conigera* *.

The third specimen is no. 93. 4. 7. 23, and its locality is also unknown. It is divided almost to the bottom into branches which if broken into fragments would be indistinguishable from those of *M. cervicornis*, as they would be from several Pacific species. But the corallum is reticular and its general aspect is not that of *cervicornis*, much less of *palmata*. It appears to me to be more like *M. brevicollis* †, though I do not care to venture an attempt at a specific identification of any Indo-Pacific Madrepora.

The fourth specimen (93. 4. 7. 85, locality unknown) is labelled in Mr. Brook's handwriting "*M. muricata*?" The note of interrogation seems amply justified, unless that species be accepted in its original Linnean sense for Indian Ocean muricated *Madreporæ*. The specimen consists of thick, flat, basal lobes, whence arise short thick branches, which divide into a crowded and irregular series of branchlets. If I had to give the specimen a name I should feel tempted to call it a short-branched form of the corals which Brook has identified as *M. Ehrenbergi* ‡.

* Brook, *op. cit.* p. 34.

† Brook, *op. cit.* p. 159, pl. xxvii. figs. A, B.

‡ Edwards & Haime, *Hist. nat. Cor.* vol. iii. p. 143; Brook, *op. cit.* p. 48.

Hence the specimens which Mr. Brook quoted as linking *M. palmata* and *M. cervicornis* do not seem to me to give any support to the belief in the specific unity of these corals. To dismiss such differences in the form of the corallum as not worthy of specific value appears to me inconsistent with Mr. Brook's practice in later pages of his monograph. Thus he founded a species, *M. attenuata*, for a form which appears to be based on a series of fragments of slender branches of *M. cervicornis*, and he accepted Dana's *M. cyclopea*, which appears to be only an alciiform variety of *M. palmata*. In the case of *M. attenuata* it may be objected that the terminal axial corallites are shorter than in *M. cervicornis*; but they are not shorter than in Agassiz's* figures of that species, which show that the character is inconstant. A more serious inconsistency is that Brook divided his subgenus *Conocyathus*, Brk., non d'Orb.†, into four sections, characterized solely by the form of the corallum. The following are his diagnoses of those sections:—

- A. Corallum corymbose, with or without confluent branches. If the central branches are long the habit is bushy. (P. 161.)
- B. Corallum forming a subcomplanate reticulum, with short twigs on the upper surface. (P. 166.)
- C. Corallum cæspitose. (P. 166.)
- D. Corallum subarborescent or bushy, usually with numerous short proliferations. (P. 169.)

If the difference between a cæspitose ‡ corallum and a bushy corallum is of more than specific value in "*Conocyathus*," why is the well-marked difference between the palmate and arborescent coralla of less than specific value in *Eumadrepora*?

* L. Agassiz, "Report on the Florida Reefs," Mem. Mus. Comp. Zool. vol. vii. no. 1, 1880, pl. xviii. figs. 1, 4, & 8.

† This name was preoccupied for a genus of corals which has living Australian representatives. Another of Brook's subgeneric names, *Odontocyathus*, is preoccupied for a deep-sea coral dredged by the 'Challenger' and described by Moseley.

‡ The difference that Brook intended to suggest between a cæspitose and a bushy corallum is not very easy to realize. According to Murray's new English Dictionary, cæspitose means "growing in thick tufts or clumps." But Brook places *M. Forskali*, in which he describes the "corallum [as] forming dense and much branched clumps," among the bushy and not among the cæspitose section; and *M. Rousseaui*, in which he describes the corallum as "consisting of tufts," is also excluded from the cæspitose section. Both Ogilvie and Worcester's dictionaries define cæspitose as "growing in tufts."

THE SPECIES "*MURICATA*."

Hence, in the absence of corals intermediate between *M. palmata* and *M. cervicornis*, and in view of the fact that the differences in form between them are not due to growth under different conditions, it appears advisable to return to Lamarck's arrangement of the species. That decision raises the question whether Linnæus's name ought not to be retained. But if we follow Brook, and unite the three species, *M. palmata*, *M. cervicornis*, and *M. prolifera*, and take the first as the typical form—for Brook accepts it as forma A—then the name *muricata* is both inappropriate and inapplicable. It is inappropriate, since the name *muricata* was probably suggested by Linnæus from the resemblance of the branchlets of many species to the varices of *Murex* *. And *M. palmata* is not a muricated species in this sense.

But the name is inapplicable, since, although Linnæus used it to cover all the ramose *Madrepora* that he knew, he carefully excluded the palmate variety from *M. muricata*. He excluded it in three ways. In the first place, both in his own diagnosis and in his additional remarks, he describes the species as a ramose form—"Madrepora ramosa composita"; "rami albi"; "corallium sæpe format pulcherrime ramis suis corymbum rosaceum." Linnæus makes no reference to palmate or alciform varieties. He also quotes from earlier authors a series of descriptive phrases in which references to the ramose condition continually recur. In the second place, Linnæus carefully excluded the palmate form by omitting reference to the figures of that coral in the list of literature on his *muricata*. Thus Sloane figured an excellent example of the alciform variety †; Linnæus accepts Sloane's figures of the *cervicornis* and *prolifera* types, but not of the *palmata* ‡. Seba § also figured all three forms, the *prolifera* on pl. cviii. fig. 6, the *cervicornis* on pl. cxiv. fig. 1, and a typical *palmata* on pl. cxiii. Linnæus again accepted the two first, but excluded the last. In the third place, the inclusion of *M. palmata* in *M. muricata* is rendered unsatisfactory by the geographical evidence. When Linnæus founded the latter species in 1754 he gave as its habitat "Pelago Asiatico."

* *Muricata*, as Prof. Bell has remarked to me, means spiny, with sharp points.

† Sloane, 'Voyage . . . Jamaica,' vol. i. pl. xvii. fig. 3.

‡ *I. e.*, he accepts Sloane, *ibid.* vol. i. pl. xviii. fig. 3, pl. xvii. fig. 4; but not pl. xvii. fig. 3.

§ Seba, 'Loc. Rerum Natur. Thesauri,' vol. iii. 1758.

And *M. palmata* is typically, if not exclusively, West Indian, not East Indian.

It is therefore undesirable to take as the type form of Linnæus's species the one *Madrepora* known to Linnæus, which he excluded from it. It seems to me advisable to drop the name *muricata* altogether, on the ground that Linnæus used that name for all the ramose Madrepores he knew, as well as for ramose corals which belong to other families. Thus Linnæus included in *muricata* the coral figured by Seba on his pl. cxvi. fig. 5, which is not a *Madrepora* at all. He included the three corals figured by Morris * as "anomalous submarine plants"; they are equally anomalous as specimens of *Madrepora muricata* as defined by Brook. To take one of the many corals included by Linnæus in *M. muricata* would be an arbitrary proceeding; but if it is to be done the name ought to be applied to an Indo-Pacific species, both since Linnæus assigned it to that area and as the best figures he quotes are those in 'Rumphius Herbarium Amboinense' †. Not one of the three species *M. palmata*, *M. cervicornis*, or *M. prolifera* has been recorded from Amboyna.

THE RANGE OF THE WEST-INDIAN MADREPORÆ.

The argument from the geographical distribution raises the question as to the range of *M. palmata* and *M. cervicornis*. I refer to this question with reluctance, and only at the strong suggestion of Prof. Bell.

According to most authorities the three forms or species of *Madreporæ* found in the West Indies and the western tropical Atlantic are confined to that region. According to Mr. Brook they also occur in the Pacific and Indian Oceans, ranging from Tahiti to the Red Sea. As Prof. Bell pointed out to me, the distribution of these forms as accepted by Brook is very remarkable; for all three forms are very abundant in the West Indies, and they all occur very widely but very sparsely distributed in the Western Pacific and Indian Oceans. The Indo-Pacific specimens referred by Brook to *M. muricata* are eight in number. I examined some of them in 1895, but did not see any one character by which they could all be separated from the West-Indies species, though demurring to the idea that they were all members of one phylogenetic species. After a more careful examination of the specimens, the doubts then expressed are strengthened. The specimens

* Morris, 'Plantarum Hist. Oxon. Univ.' pt. iii. 1699, sect. 15, pl. x. figs. 3, 9, & 10.

† 1750, pl. lxxxvi. figs. 1 & 2.

in the zoological collection of the Museum appear to me insufficient to justify the attribution of an Indo-Pacific range to *M. palmata*, *M. cervicornis*, and *M. prolifera*.

It will be advisable to consider the specimens separately in the order in which Brook catalogued them.

A. *palmata*.

1. No. 92. 6. 8. 213. Port Darwin. Saville Kent coll. This specimen is a fragment showing no signs of the base. It is a thin flat lamellum, interrupted by lacunæ; it is comparatively level on one face, but has a series of muricate branchlets on the other face.

The specimen differs from typical forms of *palmata* by the presence of the numerous varices, of the small lacunæ, and by the thinness of the lamellum. These differences are perhaps unimportant, but the specimen is such a fragment that its evidence also is unimportant.

2. No. 93. 4. 7. 24. Singapore. This specimen is a fine palmate vasiform corallum; the growth is irregular, and lacunæ pierce the lamellæ. The upper surface is covered with numerous small flat-topped branchlets, at the end of which is a deep pit. The walls are dense.

What specific name should be given to this coral I do not propose to enquire. It is sufficient to point out that it differs from *palmata* by the presence of the numerous branchlets on the upper surface, and that some of its characters necessitate its transference to a different division of *Madrepora* from that to which *M. palmata* belongs.

Brook divided *Madrepora* into four divisions. The first division he characterized as follows:—"Madreporæ with cylindrical axial corallites, which project to a greater or less extent at the apex of each division of the corallum; wall usually very porous, margin plane, exterior more or less distinctly striate or rugose." Now in the Singapore specimen each branchlet does not end in a projecting axial corallite; on the contrary, the branchlets are flat-topped and the axial corallites are not exsert. The specimen must therefore be transferred from the division containing *Eumadrepora* to the division comprising the two subgenera *Isopora* and *Tylopora*. It cannot, however, rest in either of those genera as they were defined by Brook; for according to the characters of the corallum it would be an *Isopora*, and according to those of the branchlets it would be a *Tylopora*.

B. prolifera.

3. No. 46. 7. 30. 8. Wreck Bay, Great Barrier Reef, N.E. Australia.

This specimen is the only one in the collection which is catalogued as a Pacific form of *prolifera*. It is a small fragment, 2 inches long, and its evidence is insufficient.

Form intermediate between prolifera and cervicornis.

4. No. 93. 4. 7. 43. Tahiti. (*M. regalis*, Ehr.)

Milne-Edwards & Haime * described *M. regalis* as "très-voisine du *M. prolifera*, mais ayant les branches plus grosses." That definition accurately describes the habit of this specimen. The thickness of the branches agrees with that of *M. cervicornis*. The specimen differs from *M. cervicornis* by having very short (1-2 millim. exsert) terminal corallites, in which the primary septa are very unequal. According to Brook the axial corallites of *cervicornis* have the terminal corallite 6-8 millim. exsert and the primary septa subequal.

The corallites differ from those of *M. prolifera* by having well-developed septa, whereas, according to Brook, in that form "the directive septa are moderately developed, but the remaining members of the primary cycle are more or less rudimentary."

C. cervicornis.

5-7. Nos. 92. 6. 8. 210-212. Port Darwin. Saville Kent coll.

These three specimens, though differing somewhat in the relative closeness of the branches probably belong to the same species. The habit is cervicorn; but the most striking feature of the coral is that the terminal axial corallites are broad, short, and thick-walled; the wall, in fact, is equal in thickness to the transverse diameter of the calice. In the youngest corallites there are 6 septa; in older corallites the septa number from 12-16; in the largest and best-preserved corallites (*e. g.* in one marked with an ink-dot on specimen 92. 6. 8. 210) there are 3 complete cycles of septa.

Now, according to Brook, in the subgenus *Eumadrepora* the axial corallites have a "relatively thin wall and 12 septa." Hence the Port Darwin corals are not typical members of the same subgenus as *M. cervicornis*.

* Hist. nat. Cor. vol. iii. p. 139.

S. No. 92. 6. 8. 214. Thursday Island. Saville Kent collection.

This is the last specimen in Brook's list, and it is that which most closely resembles *M. cervicornis*. It agrees with that form in (1) the radial corallites being nariform below and tubo-nariform in the distal parts, (2) in the thin walls of the terminal radial corallite, and (3) in the striate or echinulate ornamentation of the walls of the corallites.

These three characters are common to most of the arborescent Madreporæ; the first and third characters occur in nearly all, as, e. g., in *M. intermedia*. The most important point of resemblance between this specimen and *M. cervicornis* is the length of the terminal corallite. This structure is shown, however, only on one branch of the Thursday Island specimen.

There are not wanting differences between this coral and Brook's description of *M. cervicornis*. Thus he states that the primary septa are subequal, whereas in this specimen they are very unequal, while the one terminal corallite, though of the same length as in *M. cervicornis*, is narrower, being 3 millim. instead of 4-5 millim. in diameter.

Why this specimen, with its long narrow terminal corallite, was regarded as the same species and variety as the Port Darwin specimens, with their short, broad, thick-walled, terminal corallites, is not obvious.

Hence I am driven to the conclusion that the evidence of the eight Madreporæ which Brook catalogued as Indo-Pacific representatives of *M. palmata*, *cervicornis*, and *prolifera* is insufficient to prove the occurrence of those species in the Indo-Pacific Ocean.

SUMMARY OF CONCLUSIONS.

1. *M. palmata*, Lam., may be conveniently kept distinct from *M. cervicornis*, since (a) the two forms live under identical conditions, their differences are not due to environment, and (b) the evidence of the intermediate forms is inconclusive.
2. *M. palmata*, Lam., should not be treated as the typical form of *M. muricata*, L., from which Linnæus excluded it.
3. If the name *M. muricata* be retained, which seems undesirable, it should be used for an Indo-Pacific species.
4. The evidence of the range of *M. palmata*, *M. cervicornis*, and *M. prolifera* into the Indo-Pacific is inadequate.

IV.—*British Amphipoda*.—IV. *Families Stegocephalidæ to*
Cediceridæ (part.). By Canon NORMAN, M.A., D.C.L.,
 LL.D., F.R.S., &c.*

[Plate III.]

Fam. VI. *Stegocephalidæ*.

Genus 1. *STEGOCEPHALOIDES*, G. O. Sars.

81. *Stegocephaloides christianiensis*, Boeck.

1869. *Stegocephalus ampulla*, Norman, "Last Report Dredging Shetland Isles," Brit. Assoc. Rep. for 1868, p. 276 (nec *Cancer ampulla*, Phipps).

1870. *Stegocephalus christianiensis*, Boeck, (137) p. 48.

1876. *Stegocephalus christianiensis*, Boeck, (138) p. 424, pl. viii. fig. 4, pl. ix. fig. 1.

1892. *Stegocephaloides christianiensis*, G. O. Sars, (142) p. 202, pl. lxx. fig. 2.

Hab. St. Magnus Bay, Shetland, 50 fathoms, 1867 (A. M. N.); 'Porcupine,' 1869, Stat. 18, to the west of Galway, 183 fathoms: *Mus. Nor.* Loch Fyne, 40–70 fathoms (D. R.); S.W. of Ireland, 750 fathoms, 1888, and west coast of Ireland off the Skilligs, 52–62 fathoms, 1890 (specimens in Dublin Museum, fide A. O. W.).

Distrib. Trondhjem Fiord, Norway, 40–300 fathoms (A. M. N.); West Norway (G. O. Sars): *Mus. Nor.* Sars states that it is found as far north as the Lofoten Islands. Bohuslän (*Malm*); Skagarak (*Meinert*); Belle Ile, France (*Chevreux*).

[Genus 2. *STEGOCEPHALUS*, Kröyer.

[*Stegocephalus inflatus*, Kröyer.

1842. *Stegocephalus inflatus*, Kröyer, Naturhist. Tidsskr. vol. iv. p. 150; Voyage en Scandinavie &c. pl. xx. fig. 2.

1876. *Stegocephalus ampulla*, Boeck, (138) p. 421 (but not *Cancer ampulla*, Phipps).

1892. *Stegocephalus inflatus*, G. O. Sars, (142) pl. lxix.

Off Holsteinborg, Greenland, in 57 fathoms, 'Valorous' Exped., 1875, Stat. 5.

Trondhjem Fiord, 200–300 fathoms; Hardanger Fiord, between the islands Valoddin and Hidle, 110 fathoms (in both these cases I found it among *Lophohelia prolifera*); also

* See for preceding paper 'Annals,' vol. v. 1900, p. 326.

Klosterelv Fiord, East Finmark (*A. M. N.*); West Norway (*G. O. Sars*); 'Triton,' 1882, Faroe Channel, lat. $60^{\circ} 9' N.$, long. $7^{\circ} 16' W.$, in 466 fathoms; Spetsbergen (*Lovén*); 'Vega' Exped., lat. $67^{\circ} 7' N.$, long. $173^{\circ} 24' W.$ (*i. e.* Behring's Strait), 24 fathoms (from *Stockholm Mus.*); 'Willem-Barents,' Barents Sea (*Stebbing*); U.S. Fish. Comm., Gulf of Maine, 51 fathoms (*S. I. Smith*): *Mus. Nor.* It will thus be seen that this is a true Arctic species with circumpolar distribution.]

Genus 3. ANDANIA, Boeck,

82. *Andania abyssi*, Boeck.

1870. *Andania abyssi*, Boeck, (137) p. 49.

1876. *Andania abyssi*, Boeck, (138) p. 426, pl. ix. fig. 2.

1892. *Andania abyssi*, G. O. Sars, (142) p. 207, pl. lxxi. fig. 2, and pl. lxxii. fig. 1.

Hab. 'Porcupine,' 1869, Stat. 24, south of Rockall, lat. $56^{\circ} 26' N.$, long. $14^{\circ} 28' W.$, 109 fathoms: *Mus. Nor.*

Distrib. Trondhjem Fiord, 200–300 fathoms (*A. M. N.*); West Norway (*G. O. Sars*): *Mus. Nor.* Sars speaks of it as a true deep-water form, only occurring in greater depths from 200–400 fathoms; it has occurred from Southern Norway northwards to the Lofoten Islands.

Fam. VII. Amphilochildæ.

Genus 1. AMPHILOCHUS, Bate.

83. *Amphilochus manudens*, Bate.

1862. *Amphilochus manudens*, Bate & Westwood, (1) vol. i. p. 180, ♂.

1876. *Amphilochus concinnus*, Stebbing, "Some new and little-known Amphip. Crust.," Ann. & Mag. Nat. Hist. ser. iv. vol. xviii. p. 443, pl. xix. figs. 1 a, b, ♀.

1876. *Cullinerus acutidigitata*, id. ibid. p. 445, pl. xx. figs. 3 a, b.

1890. *Amphilochus Boeckii*, Meinert, (71) p. 160.

1892. *Amphilochus manudens*, G. O. Sars, (142) p. 217, pl. lxxiv.

Hab. Off Farland Point, Cumbrae, 20 fathoms (*A. M. N.*): *Mus. Nor.* Mull (*G. Brook*, fide *T. S.*); Upper Loch Fyne and Granton Harbour, Firth of Clyde (*T. S.*); St. Andrews (*M'Intosh*); off North Wales and Isle of Man (*A. O. W.*); Torbay (*Stebbing*); Jersey (*Sinel & Hornell*).

Distrib. Dröbak, Christiania Fiord, and Trondhjem Fiord, 200 fathoms (*A. M. N.*): *Mus. Nor.* On Norwegian and Finmarkian coasts, not rare from Christiania to Vadsö (*G. O. Sars*); Greenland (*Hansen*); Kattegat (*Meinert*); west coast of France (*Chevreux*).

84. *Amphilocheus tenuimanus*, Boeck.

1870. *Amphilocheus tenuimanus*, Boeck, (137) p. 51.

1876. *Amphilocheus tenuimanus*, Boeck, (138) p. 437, pl. ix. fig. 7.

1892. *Amphilocheus tenuimanus*, G. O. Sars, (142) p. 218, pl. lxxv. fig. 1.

Hab. Cumbræ (*D. R.*); Firth of Clyde (*T. S.*); off Spurm Head, Yorkshire (*T. S.*).

Distrib. Sars says that it is a deep-water form living in 100–200 fathoms, especially among deep-sea corals, and that it is found in several places and West Norway.

85. *Amphilocheus neapolitanus*, Della Valle. (Pl. III. fig. 1.)

1893. *Amphilocheus neapolitanus*, Della Valle, (139) p. 595, pl. xxix figs. 16, 17.

1895. *Amphilocheus melanops*, A. O. Walker, "Revision Amphipoda of Liv. M. B. C. District," Trans. Liv. Biol. Assoc. vol. ix. p. 298, pl. xviii. fig. 12, pl. xix. figs. 13–15.

Hab. Off Little Ormes Head, Denbighshire, 5–7 fathoms (*A. O. W.*); Falmouth Harbour; Jersey, tide-marks (*A. M. N.*): *Mus. Nor.* Also Menai Strait, near Beaumaris, 5–10 fathoms (*A. O. W.*).

Distrib. Naples (*Della Valle*): *Mus. Nor.* West France (*Chevreux*).

Having compared typical specimens of *A. melanops* kindly given me by Mr. Walker, and other British examples taken by myself in the localities mentioned above, with a specimen of *A. neapolitanus* received from Della Valle, I am satisfied as to their identity. *A. neapolitanus* and *A. brunneus*, both described by Della Valle, are very closely allied. Of the latter I took several specimens at Naples in 1887, and thus have had the opportunity of comparing the two forms. The one point in which they are described by Della Valle as differing consists in the character of the gnathopods: those of the second pair are very broad, triangular, and the *carpal process reaches to the extremity of the posterior margin of the hand*; the armature of the palm and dactylus is exactly as represented by Della Valle in the allied species *A. brunneus* (*Della Valle*, pl. xxix. fig. 14), the palm being bounded by two spines and its edge excessively finely denticulated, and within the denticulations a row of small spinules.

Mr. Walker's fig. 14 gives the carpal process shorter than in any specimen I have seen; but in *A. brunneus* it only extends about half the length of the hand. The very close resemblance of the species might raise a question in the mind whether they are really distinct. In favour of their distinction is the fact that all the specimens I took at Naples agreed

with *A. brunneus* and all the British examples which I have examined agree with *A. neapolitanus*. Of this last species Della Valle wrote that he had only seen a single specimen; but he must have obtained others subsequently, since immediately after the publication of his work he kindly sent me an example. *A. tenuimanus*, G. O. Sars, is distinguished from the present species by the character of the gnathopods, and especially by the telson exceeding in length the peduncle of the last uropods, whereas in *A. neapolitanus* the telson is much shorter and scarcely equals half the length of the peduncle of the much produced last uropods.

Genus 2. AMPHILOCHOIDES, G. O. Sars.

86. *Amphilochoides serratipes* (Norman).

1869. *Probolium serratipes*, Norman, "Last Report Dredging Shetland Isles," Brit. Assoc. Rep. for 1868, p. 273.

1892. *Amphilochoides odontonyx*, G. O. Sars, (142) p. 221, pl. lxxv. fig. 2 (nec *A. odontonyx*, Boeck).

1895. *Amphilochoides Boeckii*, G. O. Sars, (142) p. 690.

Hab. St. Magnus Bay, Shetland, in 50 fathoms; Isle of Cumbrae, 5 fathoms (*A. M. N.*): *Mus. Nor.* Blackwaterfoot, Arran, N.B., 20 fathoms (*D. R.*); 8 miles off Fleshwick Bay, Isle of Man, 33 fathoms (*A. O. W.*).

Distrib. West Norway (*G. O. Sars*): *Mus. Nor.* On the Norwegian coast here and there from Christiania to the Trondhjem Fiord, in 50-100 fathoms (*G. O. Sars*); Concarneau (*Chevreaux*).

87. *Amphilochoides odontonyx*, Boeck.

1870. *Amphilocheus odontonyx*, Boeck, (137) p. 51.

1876. *Amphilocheus odontonyx*, Boeck, (138) p. 434, pl. xi. fig. 3.

1892. *Amphilochoides pusillus*, G. O. Sars, (142) p. 222, pl. lxxvi. fig. 1.

1895. *Amphilochoides odontonyx*, id. *ibid.* p. 690.

1896. *Amphilochoides odontonyx*, T. Scott, Fourteenth Annual Rep. Scotch Fish. Board, p. 159, pl. iv. figs. 4-6.

Hab. Plymouth, 8 fathoms, 1887 (*A. M. N.*): *Mus. Nor.* Near Bass Rock, Firth of Forth, 22-23 fathoms; St. Andrews Bay; off Spurn Head, Yorkshire; several places in the Clyde district (*T. S.*).

Distrib. Christiania Fiord, 20-40 fathoms, and Vadsö, E. Finmark, 30-60 fathoms (*G. O. Sars*); Denmark (*Meinert*).

88. *Amphilochoides intermedius*, T. Scott.

1896. *Amphilochoides intermedius*, T. Scott, Fourteenth Annual Report Scotch Fish. Board, p. 159, pl. iv. figs. 1-3.

Hab. Various parts of the Firth of Forth (*T. S.*).

Genus 3. GITANOPSIS, G. O. Sars.

89. *Gitanopsis bispinosa* (Boeck).

1870. *Amphiloachus bispinosus*, Boeck, (137) p. 51.

1876. *Amphiloachus bispinosus*, Boeck, (138) p. 435, pl. x. fig. 1.

1892. *Gitanopsis bispinosa*, G. O. Sars, (142) p. 224, pl. lxxvi. fig. 2.

Hab. "Dredged off Blackwater-foot, Arran, N.B., in 20 fathoms, bottom sand and mud" (*D. R.*).

Distrib. Lofoten Islands, Norway (*G. O. Sars*): *Mus. Nor.* South and West Norway as far north as Lofoten Islands, but nowhere in abundance, generally in 50-100 fathoms (*G. O. Sars*); Greenland (*Hansen*); west coast of France (*Chevreaux*).

90. *Gitanopsis inermis*, G. O. Sars.

1882. *Gitanopsis inermis*, G. O. Sars, (102) p. 51.

1892. *Gitanopsis inermis*, G. O. Sars, (142) p. 224, pl. lxxvi. fig. 2.

Hab. Specimens taken by Professor G. S. Brady* off Cullercoats, Northumberland, were identified by Mr. Stebbing as this species (*Nat. Hist. Trans. Northumb., Durham, and Newcastle-upon-Tyne*, vol. xiii. pt. 3, 1900, p. 442).

Distrib. Professor Sars has met with this species only in a single locality, and that a very northern one—Vadsö—where it was found rather sparingly in 20-50 fathoms.

Genus 4. GITANA, Boeck.

91. *Gitana Sarsii*, Boeck.

1870. *Gitana Sarsii*, Boeck, (137) p. 52.

1876. *Gitana Sarsii*, Boeck, (138) p. 439, pl. xi. fig. 2.

1878. *Amphiloachus Sabrinæ*, Stebbing, "Two new Species of Amphipodous Crustacea," *Ann. & Mag. Nat. Hist. ser. 5, vol. ii. p. 365*, pl. xv. figs. 1 a-g.

1892. *Gitana Sarsii*, G. O. Sars, (142) p. 228, pl. lxxviii. fig. 1.

1893. *Gitana Sarsii*, Della Valle, (139) p. 590, pl. xxix. figs. 18-32.

* It may be desirable to mention that Professor Brady, who has done so much good work among the Entomostraca, does not study the Amphipoda, and that when his name is added to a locality, if it be this present locality the specimens have been determined by Mr. Stebbing, and from all other localities they have been identified by myself.

Hab. Off Little Orme, Denbighshire, 2-7 fathoms (*A. O. W.*): *Mus. Nor.* Tenby (*Stebbing*); Kilchattan Bay, Firth of Clyde, 5 fathoms, muddy sand (*D. R.*); Inchkeith, Firth of Forth (*T. S.*); 8 miles off Fleshwick Bay, Isle of Man, 33 fathoms, and Valentia, Ireland (*A. O. W.*).

Distrib. West Norway (*G. O. Sars*); Baie de Houat, France (*Chevreux*): *Mus. Nor.* Among algæ in shallow water all along coasts of Norway and Finmark (*G. O. Sars*); Spetsbergen (*Norw. North Atlant. Exped.*); Franz-Josef Land, Jackson-Harmsworth Exped. (*T. S.*); Kattegat (*Meinert*); Naples (*Della Valle*).

Genus 5. CYPROIDIA (Haswell ?), Stebbing.

=? *Peltocoxa*, Catta.

It is at this time impossible to say in what genus the *Cyproidia damnoniensis*, Stebbing, should be located, and I think it best therefore to leave it where he placed it. As both Della Valle and myself, however, have found this species in the Mediterranean, probability is given to the assumption of Della Valle that *Cyproidia* is a synonym of *Peltocoxa*, Catta, described in 1875* from specimens taken at Marseilles, but that author's description of the genus is so inadequate that it requires much to be assumed to employ it.

Haswell, in his amended description of *Cyproidia* ('Cat. Australian Stalk- and Sessile-eyed Crustacea,' Sydney, 1882), states that the "antennæ are subequal, superior without an appendage." If that is really so, *Stegoplax* of *G. O. Sars* is a synonym. But Stebbing appears to have concluded that the secondary appendage, which is extremely minute, had been overlooked by Haswell, and consequently placed in Haswell's genus his *Cyproidia damnoniensis*, which has such an appendage.

Haswell put two species in his genus, *Cyproidia lineata* and *C. ornata*. Quite recently Mr. Stebbing †, having received specimens of the first of these species from Mr. Haswell, has instituted, apparently on very slight grounds, another genus (*Paracyproidia*) for its reception, but gives us no information as to the antennæ either of his new genus or of *Cyproidia ornata*, which he leaves as the type of Haswell's *Cyproidia*.

* *Peltocoxa Marioni*, Catta, *Revue des Sci. Nat.* vol. iv. 1875, p. 161.

† Stebbing, "Revision of Amphipoda," *Ann. & Mag. Nat. Hist.* ser. 7, vol. iv. 1899, p. 207.

Still more recently Dr. Charles Chilton* has described a species from New Zealand under the name *Cyproidia otakensis*, which accords in all generic characters with *C. damnoniensis*, Stebbing.

Two other species have been characterized under the name *Cyproidia*: one from New Zealand, doubtfully referred by its author to *Cyproidia*, and since affirmed by him to be quite distinct; for this *Cyproidia? crassa*, Chilton †, Mr. Stebbing ‡ has instituted a genus *Tetradeion*.

The other, *Cyproidia brevirostris* of T. & A. Scott I here place in the genus *Peltocoxa*, G. O. Sars, because the upper antennæ have no secondary appendage.

92. *Cyproidia damnoniensis*, Stebbing.

1885. *Cyproidia damnoniensis*, Stebbing, "Descr. of a new English Amphipodous Crustacean," Ann. & Mag. Nat. Hist. ser. 5, vol. xv. p. 59, pl. ii.

1893. *Peltocoxa damnoniensis*, Della Valle, (139) p. 648, pl. xxx. figs. 19-32, pl. lx. figs. 9, 10.

Hab. Starcross, Devon (*C. W. Parker*): *Mus. Nor.* Blackwater-foot, Arran, N.B., 20 fathoms, muddy gravel, and off Fairland Point, Cumbræ, 19 fathoms, gravel (*D. R.*).

Distrib. Naples (*Della Valle & A. M. N.*): *Mus. Nor.* Le Croisic, France (*Chevreux*).

Genus 6. STEGOPLAX, G. O. Sars.

93. *Stegoplax brevirostris* (T. & A. Scott).

1893. *Cyproidia brevirostris*, T. & A. Scott, "On some new and rare Crustacea from Scotland," Ann. & Mag. Nat. Hist. ser. 6, vol. xii. p. 244, pl. xiii. figs. 1-11.

Hab. Loch Fyne (*T. S.*): *Mus. Nor.* Moray Firth, washed from *Filograna implexa* from a depth over 40 fathoms (*T. S.*), 8 miles west of Fleshwick Bay, Isle of Man, in 33 fathoms, and Valentia, Ireland (*A. O. W.*).

* Chilton, "A New-Zealand Species of the Amphipodous Genus *Cyproidia*," Ann. & Mag. Nat. Hist. ser. 7, vol. v. 1900, p. 242.

† Trans. New Zealand Institute, vol. xv. 1882, p. 80, pl. iii. fig. 1.

‡ Ann. & Mag. Nat. Hist. ser. 7, vol. iv. 1899, p. 207.

Fam. VIII. *Stenothoidæ*.Genus 1. *STENOTHOE*, Dana.94. *Stenothoe marina* (Bate).

1860. *Stenothoe Danai*, A. Boeck, Förh. ved de Skand. Naturf. 8de Møde, p. 655.

1861. *Montagua marina*, Bate & Westwood, (1) vol. i. p. 58.

1892. *Stenothoe marina*, G. O. Sars, (142) p. 236, pl. lxxx.

Hab. Shetland; Skye; Isle of Cumbræ; Cullercoats, Northumberland; Durham coast; Plymouth; Donegal Bay, Ireland (*A. M. N.*); 'Porcupine,' 1869, Stat. 6, off S.W. Ireland, 90 fathoms; Firth of Forth (*T. S.*): *Mus. Nor.* Moray Firth and off Spurm Head (*T. S.*); St. Andrews (*M'Intosh*); Loch Fyne (*Murray*); North Wales; Isle of Man; near Bray Head, W. Ireland (*A. O. W.*); Jersey and Sark (*Köhler*).

95. *Stenothoe crassicornis*, A. O. Walker.

1897. *Stenothoe crassicornis*, Walker, Rep. Brit. Assoc. for 1896, p. 420.

1897. *Stenothoe crassicornis*, Walker, "New Species of Etdriophthalma from the Irish Sea," Journ. Linn. Soc., Zool. vol. xxvi. p. 229, pl. xviii. figs. 3-3e.

Hab. "Three males taken in the bottom tow-net 6 miles W.S.W. of Calf of Man, in 23 fathoms" (*A. O. W.*).

96. *Stenothoe monoculoides* (Montagu).

1861. *Montagua monoculoides*, Bate & Westwood, (1) vol. i. p. 54.

1892. *Stenothoe monoculoides*, G. O. Sars, (142) p. 240, pl. lxxxii. fig. 1.

Hab. Apparently to be found all round our coasts. Shetland; Firth of Clyde; Plymouth; Falmouth; Guernsey; Jersey; Roundstone, Ireland (*A. M. N.*); Cullercoats, Northumberland (*J. Alder*); Starcross, Devon (*C. Parker*): *Mus. Nor.* Farne Islands, Northumberland (*A. M. N.*); Ardbear Bay, Ireland (*Brady & Robertson*); North Wales and Isle of Man (*A. O. W.*); St. Andrews (*M'Intosh*); Firth of Forth (*T. S.*); Loch Fyne (*Murray*); Valentia, Ireland (*A. O. W.*).

Distrib. South and West Norway, as far north as Trondhjem Fiord (*G. O. Sars*); Denmark (*Meinert*); West France (*Chevreaux*); Azores (*Barrois*).

97. *Stenothoe setosa*, sp. n. (Pl. III. figs. 2-4.)

Coxal plates of second peræopods resembling those of *S. marina* in form. Superior antennæ with basal joint longer

than the second; flagellum of twenty-four articulations. Lower antennæ with the last joint of the peduncle one fourth shorter than the penultimate; flagellum of twenty-one articulations. First gnathopods (fig. 2) having the lobe of the meros well rounded at the extremity; hand slightly longer than the wrist, widening distally; palm defined, occupying the slightly oblique extremity. The hand of the second gnathopods (fig. 3) elongated ovate, widest in the middle, front margin evenly and regularly arcuate, fringed throughout with long setæ, the length of which almost equals the breadth of the hand, wholly without spines, tubercles, or crenation, and the palm undefined; finger broad, extending to only half the length of the hand. The last peræopods (fig. 4) have the meral and propodal joints subequal in length, the carpal joint somewhat shorter, the nail half as long as the propodus; the posterior lobe of the meros is well arched, but not greatly developed, extending to half the length of the carpus. Colour white, tinted with rose-colour; eye red.

Hab. A single specimen taken at Plymouth, August 1889 (*A. M. N.*): *Mus. Nor.*

My dissection does not show the mandible, but from the general character of the species it would seem to belong to this genus. *S. setosa* has its nearest known ally apparently in *S. Dollfusi*, Chevreux*. It resembles that species in the form of the first gnathopods and, judging from the drawing, in the proportionate length of the joints of the last peræopods; but it differs in the form of the second gnathopods and the absence of all teething of the palm of its propodus.

Genus 2. METOPA, Boeck.

98. *Metopa Alderi* (Bate).

1861. *Montagua Alderi*, Bate & Westwood, (1) vol. i. p. 61, ♀.

1868. *Metopa norvegica*, Bate & Westwood (nec Lilljeborg), (1) vol. ii. p. 500, ♂.

1876. *Metopa clypeata*, var., Boeck, (138) p. 451, pl. xviii. fig. 5, ♂.

1892. *Metopa Alderi*, G. O. Sars, (142) p. 250, pl. xxxvi.

Hab. Aberdeenshire (*R. Dawson*): *Mus. Nor.* Northumberland coast (*A. M. N.*); Firth of Forth (*T. S.*); Firth of Clyde and Mull of Kintyre (*D. R.*); North Wales (*A. O. W.*); Torbay (*Stebbing*).

Distrib. Norway, from the south northwards to Tromsø (*G. O. Sars*); Spetsbergen and Sweden (*Goës*); Murman

* Chevreux, "Quatrième Campagne de 'l'Hirondelle,' 1888: *Hyale Grimaldi* et *Stenothoe Dollfusi*," Bull. de Soc. Zool. de France, 1891.

coast (*Stuxberg*); Iceland (*Sars*); Denmark (*Meinert*); Holland (*Hoek*); Boulogne (*J. Bonnier*); La Manche (*Chevreaux*).

99. *Metopa norvegica* (Lilljeborg).

1850. *Leucothoe norvegica*, Lilljeborg, "Bidr. till Norra Rysslands och Norrige fauna &c.," K. Vet.-Akad. Hand. vol. ii. p. 335, pl. xx. fig. 4.

1855. *Montagua pollexiana*, Bate, Brit. Assoc. Rep. p. 57.

1861. *Montagua pollexiana*, Bate & Westwood, (1) vol. i. p. 64.

1887. *Metopa pollexiana*, H. J. Hansen, (141) p. 92, pl. iii. figs. 5, 5 a.

1892. *Metopa pollexiana*, G. O. Sars, (142) p. 269, pl. cxv.

The *Metopa* which Bate and Westwood figured as *Leucothoe norvegica*, Lilljeborg, was the male of *M. Alderi*, and to that species Sars has referred Lilljeborg's species; but from his reference to Bate and Westwood's figure it would almost seem that he had not consulted Lilljeborg's papers. That author's *Leucothoe norvegica* is, it appears to me, undoubtedly the present species. The following description applies to it, and not to *M. Alderi*:—" *L. clypeata*, Kröyer, sat affinis. Antennæ superiores inferioribus longiores, flagello pedunculo longiore, articulo primo secundum superante, et articulo tertio minimo; flagellum antennis inferi ultimo pedunculi articulo brevius vel æquale; manus pedum secundi paris maximæ, dilatatæ, apice vero acuminato, aculeoque marginis posterioris medii validissimo et ungui æquali; epimera quarti annuli thoracici maxima, latitudine vero altitudine parum majore." The italics are Lilljeborg's, but for comparison with *M. Alderi* the statement as to comparative lengths of the antennæ should also be italicized. The figure represents a second gnathopod with the palm projected forwards and the lateral process reaching beyond the palm (*cf.* Sars's figure *p.*² ♂), so that the finger impinges upon it; and in no other species is this the case.

Hab. Shetland; near Holy Island, Northumberland; Durham coast (*A. M. N.*); Aberdeen (*R. Dawson*); *Mus. Nor.* St. Andrews (*M'Intosh*); Firth of Forth (*T. S.*). There is thus no record of it as yet from the west side of our islands except St. Ives, whence Spence Bate received specimens from Mr. George Barlee.

Distrib. Bejan, at entrance of Trondhjem Fiord, Norway, in 30-50 fathoms (*G. O. Sars*); Tromsö (*Schneider*); Greenland (*H. J. Hansen*); Murman coast (*Jarzynski*, *fide Sars*).

100. *Metopa rubrovittata*, G. O. Sars. (Pl. III. fig. 5.)

? 1876. *Probolium Spence-Batei*, Stebbing, Ann. & Mag. Nat. Hist. ser. 4, vol. xvii. p. 344, pl. xix. fig. 4.

1882. *Metopa rubrovittata*, G. O. Sars, (102) p. 90, pl. iv. figs. 2, 2 a.

1892. *Metopa rubrovittata*, G. O. Sars, (142) p. 255, pl. lxxxix. fig. 2.

Hab. Cullercoats, Northumberland, Oct. 5, 1854. Fresh specimens, mounted in Dean's medium at that date, have now their beautiful crimson markings perfectly preserved, exactly corresponding to Sars's coloured drawing. Isle of Cumbrae; Lerwick Bay, Shetland (*A. M. N.*): *Mus. Nor.* Off north side of Little Cumbrae, 10-15 fathoms (*D. R.*); North Wales (*A. O. W.*).

Distrib. Christiansund, Norway, and Vadsö, East Finmark (*G. O. Sars*); Kattegat (*Meinert*); Holland (*Hoek*); West France (*Chevreaux*).

101. *Metopa abscisa* *, sp. n. (Pl. III. figs. 6-10.)

1869. *Montagua clypeata*, Bate & Westwood, (1) vol. ii. p. 499 (nec *Leucothoe clypeata*, Kröyer).

Upper antennæ with two first joints of peduncle subequal, third not quite half length of second; flagellum about two and a half times as long as the peduncle, consisting of about 17 articulations. Lower antennæ shorter than the upper, its flagellum shorter than the peduncle; last joint of peduncle slightly longer than the penultimate.

First gnathopods (figs. 6 and 7) with the hand a little shorter than the carpus, oblong, upper and lower margins parallel for the first two thirds of the length, from which point the hinder margin curves upwards to the base of the nail; nail short, not one third the length of the hand; hand with a few setæ but no spines.

Second gnathopods (figs. 8 and 9) with the hand oblong, slightly widening distally, breadth equalling from one half to three fourths of the length; palm absolutely transverse, somewhat shorter than the margin; not toothed and scarcely waved, bounded by a tooth-formed process, near to which the palmar margin is extremely minutely serrated (but the serrations are so minute that they are only visible under a high magnifying-power); finger very stout and strong.

Last peræopods (fig. 10) with the meros and carpus subequal in length, the hinder lobe of the meral joint small, not reaching beyond half the length of the carpus; propodos much longer than the preceding joints; nail as long as the carpus, the tip turned inwards, with a little seta at the base of the tip.

Telson devoid of dorsal spines.

* *Abscisa*, "cut off," in reference to the truncate extremity of the hand of the second gnathopods.

Hab. The specimens I have seen of this species are all from the eastern side of our island. That figured is one of those from Cullercoats, Northumberland, which Bate and Westwood recorded under the name *Montagua clypeata*. Other specimens in my collection are from St. Andrews (*Professor McIntosh*) and Aberdeen (*Mr. R. Dawson*).

I have thought it best to figure a Cullercoats specimen, since it was one of these which was recorded by Bate and Westwood. My St. Andrews example is, however, more mature, and, agreeing in all other respects, differs somewhat in the form of the hand of the second gnathopod, which is somewhat longer in proportion to the breadth, nearly twice as long as the greatest width; the palm &c. is as in the Cullercoats example.

This species is nearest allied to *M. rubrovittata*, from which it may be easily distinguished by the totally different form of the first gnathopod (fig. 5, first gnathopod of *M. rubrovittata*), by the absolutely transverse palm of the second gnathopods, and by differences in the last peræopods.

My friend the late Dr. D. Robertson, in the appendix to his first report (p. 91, separate copy), recorded "*Metopa clypeata*" from Cumbrae. It is probable that the Amphipod found by him was *Metopa rubrovittata*, since I have on two occasions, in 1854 and in 1885, taken that species at Cumbrae.

Dr. Hoek has described from Holland a *Metopa* nearly allied to *M. rubrovittata* under the name *Metopa Normani* (Hoek, "Crustacea Neerlandica, II.," Tijdsch. der Nederl. Dierkundige Vereen. ser. 2, vol. ii. p. 21 (separate copy), pl. vii. figs. 5 and 5'); but it appears to be more closely allied to *M. rubrovittata* than the species which I have here described.

102. *Metopa borealis*, G. O. Sars.

1882. *Metopa borealis*, G. O. Sars, (102) p. 91, pl. iv. fig. 4 (but not fig. 4 a).

1892. *Metopa borealis*, G. O. Sars, (142) p. 254, pl. lxxxix. fig. 1.

Hab. Isle of Cumbrae, 1885 (*A. M. N.*); South Bay, Firth of Forth, 1888 (*T. S.*); Menai Strait (*A. O. W.*): *Mus. Nor.* Guernsey (*A. O. W.*).

Distrib. Tromsø (*J. S. Schneider*): *Mus. Nor.* Norway (*G. O. Sars*); Greenland (*Hansen*).

103. *Metopa propinqua*, G. O. Sars.

1892. *Metopa propinqua*, G. O. Sars, (142) p. 264, pl. xciii. fig. 1.

Hab. The only record of this species occurring in our fauna

is one by Mr. T. Scott, who found it off Crail in the Firth of Forth in 1892 (Twelfth Ann. Rep. Fishery Board of Scotland, 1894, p. 263).

Distrib. The only specimens known to Sars were taken by him in about 40 fathoms in company with *Cressa dubia* in two places in the Trondhjem Fiord.

104. *Metopa pusilla*, G. O. Sars.

1892. *Metopa pusilla*, G. O. Sars, (142) p. 256, pl. xc. fig. 1.

Hab. Off Fairland Point, Isle of Cumbrae, 20–24 fathoms (*A. M. N.*); Menai Strait, 7–12 fathoms (*A. O. W.*): *Mus. Nor.* Rhos Bay, on north coast of Wales, just below tide-marks (*A. O. W.*).

Distrib. South and West Norway as far north as the Trondhjem Fiord, in comparatively shallow water among Algæ and Hydroids (*G. O. Sars*); Franz-Josef Land, Jackson-Harmsworth Expedition (*Thomas Scott*, Journ. Linn. Soc., Zool. vol. xxvii. 1899, p. 72).

105. *Metopa tenuimana*, G. O. Sars.

1892. *Metopa tenuimana*, G. O. Sars, (142) p. 259, pl. xci. fig. 1.

Hab. A single specimen taken at Shetland in 1867 (*A. M. N.*): *Mus. Nor.*

Distrib. West Norway (*A. M. N.*): *Mus. Nor.* Where Sars's type specimens were also found.

106. *Metopa Bruzelii*, Goës.

1865. *Montagua Bruzelii*, "Crust. Amphip. Maris Spetsberg. &c.," Efv. af K. Vet.-Akad. Förhand. (p. 522, *vide* Sars), p. 6 separate copy, pl. xxxviii. fig. 10.

1887. *Metopa Bruzelii*, H. J. Hansen, (141) partim (?), p. 97, pl. iv. figs. 2 c-g (? figs. 2 a, b).

1892. *Metopa Bruzelii*, G. O. Sars, (142) p. 261, pl. cxii. fig. 1.

1900. *Proboloides Bruzelii*, Stebbing, Ann. & Mag. Nat. Hist. ser. 7, vol. v. p. 15.

(Nec *Metopa Bruzelii*, Boeck, = *M. Boeckii*, G. O. Sars.)

Hab. Port Erin, Isle of Man, 24 fathoms (*A. O. W.*): *Mus. Nor.* Colwyn Bay and Little Orme, North Wales (*A. O. W.*); Firth of Forth (*T. S.*).

Distrib. Widely distributed in West Norway and Finmark (*G. O. Sars*); Spetsbergen (*Goës*); Greenland (*Hansen*).

Genus 3. *METOPELLA*, G. O. Sars.

First gnathopods not subchelate. Basos of last three peræopods not expanded behind and almost or quite linear in form, and the meros only very slightly produced behind.

107. *Metopella nasuta*, Boeck.

1870. *Metopa nasuta*, Boeck, (137) p. 65.

1876. *Metopa nasuta*, Boeck, (138) p. 465, pl. xviii. fig. 6.

1892. *Metopa nasuta*, Sars, (142) p. 276, pl. xxviii. fig. 1.

Hab. Taken in company with my late friend Dr. D. Robertson in 1888 off Fairland Point, Isle of Cumbræ, in 20 fathoms: *Mus. Nor.* Deep water off May Island, in the Firth of Forth, and in the Moray Firth (*T. S.*).

Distrib. West Norway (*G. O. Sars*): *Mus. Nor.* Hansen records it with doubt from Greenland.

Genus 4. *METOPINA*, gen. nov.

I institute this genus to receive three aberrant forms of *Metopa*, in which the first gnathopods are not subchelate, and have the hand long and very slender, and the terminal joint very minute, flattened, not nail-formed. The second gnathopods are very robust; the last peræopods have the posterior projection of the meros well and often enormously developed. The type species is *Metopa palmata*, Sars; the others are *M. clypeata*, Kröyer, and *M. robusta*, Sars.

108. *Metopina robusta*, G. O. Sars.

1892. *Metopa robusta*, G. O. Sars, (142) p. 270, pl. xevi. fig. 1.

1894. *Metopa robusta*, Thomas Scott, "Some new and rare Crustacea from Scotland," *Ann. & Mag. Nat. Hist.* ser. 6, vol. xiii. p. 148.

Hab. Firth of Forth, 1884 (*Dr. J. R. Henderson*): *Mus. Nor.* In this same locality Mr. Scott subsequently found three specimens, and first recorded the species as British. He has since also found it in the Moray Firth.

Distrib. Varanger Fiord, East Finmark, 125-150 fathoms, 1890 (*A. M. N.*): *Mus. Nor.* Sars's specimens were from Bejan, in the outer part of the Trondhjem Fiord, and Hammerfest, West Finmark; in both places in 30-50 fathoms among Hydroids. Tromsö (*Schneider*).

Genus 5. CRESSA, Boeck.

= *Danaia*, Bate (nec M.-Edw. & Haime).109. *Cressa dubia* (Bate).1861. *Danaia dubia*, Bate & Westwood, (1) vol. i. p. 68.1870. *Cressa Schiödtei*, Boeck, (137) p. 65.1876. *Cressa Schiödtei*, Boeck, (138) p. 467, pl. xviii. fig. 8.1876. *Danaia dubia*, Stebbing, "New and little-known Amphipodous Crustacea," Ann. & Mag. Nat. Hist. ser. 4, vol. xviii. p. 444, pl. xix. figs. 2, 2 a-c.1890. *Cressa dubia*, J. Bonnier, "Les Amphipodes du Boulonnais," Bull. Sci. de France et Belgique, vol. xxii. p. 300, pl. x. figs. 1-11.1892. *Cressa dubia*, T. Scott, Tenth Ann. Rep. Fishery Board of Scotland, p. 262, pl. viii. fig. 13 (the mandible).1892. *Cressa dubia*, G. O. Sars, (142) p. 278, pl. xcvi. fig. 2, & pl. cxix. fig. 1.

Hab. Off the Isle of Cumbrae (*A. M. N.*); Torquay (*Stebbing*); *Mus. Nor.* Firth of Forth; Moray Firth; off Tarbert, Loch Fyne (*T. S.*); off Cullercoats, Northumberland, 20 fathoms (*G. S. Brady & fide Stebbing*); North Wales; Isle of Man (*A. O. W.*); Isle of Mull (*G. Brook*).

Distrib. South and West Norway as far north as the Trondhjem Fiord (*G. O. Sars*). Boulogne (*Bonnier*); S. Croisic (*Chevreaux*).

Fam. IX. Leucothoidæ.

Genus 1. LEUCOTHOE, Leach.

110. *Leucothoe spinicarpa* (Abildgaard).1799. *Gammarus spinicarpus*, Abildgaard, Zool. Dan. vol. iii. p. 66, pl. cxix. figs. 1-4.1804. *Cancer (Gammarus) articulatus*, Montagu, "Desc. several new Animals found on South Coast of Devonshire," Trans. Linn. Soc. vol. vii. p. 70, pl. vi. fig. 6.1862. *Leucothoe articulosa*, Bate & Westwood, (1) vol. i. p. 271.1892. *Leucothoe spinicarpa*, G. O. Sars, (142) p. 283, pls. c. & ci. fig. 1.1893. *Leucothoe spinicarpa*, Della Valle, (139) p. 652, pl. vi. fig. 4, & pl. xix. figs. 1-2 o.

Hab. Shetland in Ascidians; Skye; the Minch; Cumbrae; Loch Fyne in Ascidians; Lulworth, Dorset; Plymouth; Jersey; Roundstone, Ireland, in Ascidians (*A. M. N.*); Polperro, Cornwall (*Laughrin*); *Mus. Nor.* St. Andrews (*M. Intosh*); Firth of Forth (*T. Scott*); Anglesea; Isle of Man; Valentia, Ireland (*A. O. W.*).

Distrib. Hardanger and Trondhjem Fiords, Norway (*A. M. N.*); Adriatic (from Heller and Claus as *L. denti-*

culata, A. Costa); Naples (*Della Valle*): *Mus. Nor.* Kattégat (*Meinert*); Greenland (*Hansen*); W. France (*Chevreaux*); Azores (*Barrois*).

111. *Leucothoe Lilljeborgii*, Boeck.

1855. *Leucothoe articulosa*, Lilljeborg, Öfvers. af K. Vet.-Akad. Förhand. p. 126.
 1860. *Leucothoe Lilljeborgii*, Boeck, Forhand. Skand. Naturf. 8de Möde, p. 653.
 1888. *Leucothoe furina*, Chevreux, Bull. Soc. d'Etudes Scient. de Paris, 11^e année, 1^{er} semestre, p. 9 (separate copy) (nec *L. furina*, Savigny).
 1889. *Leucothoe imparicornis*, Norman, "Notes on British Amphipoda," Ann. & Mag. Nat. Hist. ser. 6, vol. iv. p. 114, pl. x. figs. 1-4.
 1892. *Leucothoe incisa*, D. Robertson, "Second Contrib. Cat. Amphip. and Isop. Firth of Clyde, &c.," Trans. Nat. Hist. Soc. Glasgow, vol. iii. (p. 23, separate copy).
 1892. *Leucothoe Lilljeborgii*, G. O. Sars, (142) p. 284, pl. ci. fig. 2.
 1892. *Leucothoe incisa*, Stebbing, "Amphipoda from Copenhagen Museum and other Sources," Trans. Linn. Soc., 2nd ser. Zool. vol. vii. p. 35, pl. x.

The *Leucothoe* described by Sars under the name of *L. Lilljeborgii*, Boeck, is certainly the same as my *L. imparicornis*. My description was taken from a mounted and only partially dissected specimen, and thus the recurved process of the last segment of the metasome could not be seen. It appears to me that the characters by which Mr. Stebbing would separate *L. incisa*, Robertson, from this species are insufficient; the gnathopods, especially those of the first pair, show some differences dependent upon age.

This species has been named at former periods "*Leucothoe furina*" by Sars, Chevreux, and myself.

I am also inclined to think that *Leucothoe serratipalma*, Della Valle, is the same species. The chief difference, and it is a very unimportant one, appears to be that there is a slight serration at the commencement of the palm of the second gnathopods, where the point of the finger impinges on the palm.

Hab. Shetland, 1863 (*A. M. N.*); Banff (*T. Edward*); Ballock Bay and off Fairland Point, Isle of Cumbræ, 20 fathoms (*D. R.*); near the Bass Rock and in Upper Loch Fyne (*T. S.*); Mull (*G. Brook*, fide *T. S.*); Pool Erin, Isle of Man, and Guernsey (*A. O. W.*).

Distrib. Kopervig, west coast of Norway, 40-60 fathoms (*G. O. Sars*); Kullaberg, Sweden (*Lilljeborg*); West France (*Chevreaux*); Naples (?) (*Della Valle*).

Fam. X. *Ædiceridæ*.[Genus 1. *ÆDICEROS*, Kröyer.[*Ædiceros saginatus*, Kröyer.1865. *Ædiceros saginatus*, Goës, "Crust. Amphip. Maris Spetsberg. &c.," *Æfvers. af K. Vet.-Akad. Förhand.* p. 10 (separate copy), pl. xxxix. fig. 18.1876. *Ædiceros saginatus*, Boeck, (138) p. 257, pl. xiii. fig. 3.1892. *Ædiceros saginatus*, G. O. Sars, (142) p. 288, pl. cii.

Greenland, lat. 67° 50' N., long. 55° 17' W., 20 fathoms, 'Valorous,' 1875.

Vadsö, East Finmark, 1890 (*A. M. N.*): *Mus. Nor.* Iceland (*Torell*); Spetsbergen (*Goës*); Murman coast (*Jarzynski*); Siberian Polar Sea (*Stuxberg*). A truly Arctic species, the most southern locality from which it has been recorded is Christiansund (*V. Düben*, fide *Sars*).][*Ædiceros borealis*, Boeck.1870. *Ædiceros borealis*, Boeck, (137) p. 82.1876. *Ædiceros borealis*, Boeck, (138) p. 261, pl. xiv. fig. 1.1892. *Ædiceros borealis*, G. O. Sars, (142) p. 290, pl. ciii. fig. 1.

Holsteinborg Harbour, Greenland, in 7-35 fathoms, 'Valorous,' 1875.

Finmark (*Boeck*); Kara Sea (*Stuxberg*).The *Ædiceros borealis* of Buchholz ('Die zweite deutsche Nordpolarfahrt,' 1874, vol. ii. p. 325, pl. v.) cannot be this species, nor, indeed, a member of this genus. It is perhaps *Monoculodes simplex*, H. J. Hansen, but the telson does not seem to agree.][Genus 2. *PARÆDICEROS*, G. O. Sars.[*Parædiceros lynceus* (M. Sars).1858. *Ædiceros lynceus*, M. Sars, "Oversigt over de i den Norsk-Arctiske Region forekommende Krebsdyr," *Christ. Vid.-Selsk. Forhand.* p. 143.1876. *Ædiceros lynceus*, Boeck, (138) p. 259, pl. xiii. fig. 4.1883. *Ædiceros lynceus*, J. S. Schneider, "Norges kyster forekommende Arter af familien *Ædiceridæ*," *Tromsø Museums Aarshefter*, vi. p. 14, pl. ii. fig. 12.1892. *Parædiceros lynceus*, G. O. Sars, (142) p. 292, pl. ciii. fig. 2 & pl. civ. fig. 1.

Holsteinborg Harbour, Greenland, 7-35 fathoms, 'Valorous,' 1875.

Sydvaranger and Varanger Fiord, East Finmark; Svolvær, Lofoten Islands, 5-10 fathoms, 1890 (*A. M. N.*); Tromsø

(*J. S. Schneider*); Spetsbergen (*Lovén*); Gulf of Maine, N.E. America, 90 fathoms (*Prof. S. I. Smith*): *Mus. Nor.* Barents Sea (*Hoek*); Iceland (*Torell*); Murman coast (*Jarzynski*); Siberian Polar Sea (*Stuxberg*); Franz-Josef Land, Jackson-Harmsworth Exped. (*T. S.*); Iceland (*Torell*); East Greenland (*Buchholz*); Barents Sea (*Hoek*); Murman coast, Kara Sea, and Jugor Schar (*Stuxberg*).]

Genus 3. MONOCULODES, Stimpson.

112. *Monoculodes carinatus*, Bate.

1855. *Westwoodia carinata*, Brit. Assoc. Rep. p. 58.
 1859. *Ædiceros affinis*, Bruzelius, Skand. Amphip. Gammariden, p. 93, pl. iv. fig. 15, ♂ junior.
 1862. *Monoculodes carinatus*, Bate & Westwood, (1) vol. i. p. 165.
 1862. *Monoculodes Stimpsoni*, iid. ibid. p. 160.
 1876. *Monoculodes affinis*, Boeck, (138) p. 265, pl. xiv. fig. 6, ♀.
 1883. *Monoculodes carinatus*, Schneider, Af Norges kyster forekom. Art. af Ædiceridæ, p. 19, pl. i. fig. 4.
 1889. *Monoculodes carinatus*, Norman, "Notes on British Amphipoda," Ann. & Mag. Nat. Hist. ser. 6, vol. iii. p. 447, pl. xix. figs. 1-5.
 1892. *Monoculodes carinatus*, G. O. Sars, (142) p. 295, pl. cv.
 1893. *Ædiceros affinis*, Della Valle, (139) p. 548, pl. iv. fig. 3 & pl. xxxiii. figs. 27-31.

For notes on the above synonymy see my paper in the 'Annals.' It is not *Ædiceros affinis*, Goës.

Hab. Shetland; Isle of Cumbrae; off the Northumberland coast; Plymouth (*A. M. N.*); Moray Firth (*T. Edward*); off May Island, Firth of Forth, 35 fathoms (*Sir J. Murray*): *Mus. Nor.* Loch Fyne (*Sir J. Murray*); Isle of Man, Jersey, and Valentia, Ireland (*A. O. W.*).

Distrib. Florø, Norway (*A. M. N.*); Croisic, France (*Chevreaux*); west coast of Sweden (*Bruzelius*); Kattegat (*Meinert*); Naples (*A. M. N.*).

113. *Monoculodes subnudus*, Norman.

1889. *Monoculodes subnudus*, Norman, "Notes on British Amphipoda," Ann. & Mag. Nat. Hist. ser. 6, vol. iii. p. 450, pl. xviii. fig. 11, & pl. xix. figs. 6-10.
 1892. *Monoculodes falcatus*, G. O. Sars, (142) p. 302, pl. cvii. fig. 2.

Hab. Shetland; Sleat Sound, Isle of Skye (*A. M. N.*): *Mus. Nor.*

Distrib. Kors Fiord, near Bergen; Rödberg, in the Trondhjem Fiord, in 150 fathoms, and Klosterelv Fiord, East Finmark (*A. M. N.*): *Mus. Nor.* Sars has found it at several places in West Norway.

114. *Monoculodes borealis*, Boeck.

1865. *Ædiceros affinis*, Goës (nec Bruzelius), "Crust. Amphip. Maris Spetsb. &c.," *Æfv. K. Vet.-Ak. Förh.* p. 11 (sep. cop.) (partim), pl. xxxix. fig. 21' (nec 21).

1870. *Monoculodes borealis*, Boeck, (137) p. 88.

1876. *Monoculodes borealis*, Boeck, (138) p. 278, pl. xv. fig. 4.

1883. *Monoculodes borealis*, Schneider, *l. c.* p. 22, pl. i. fig. 3.

1892. *Monoculodes borealis*, G. O. Sars, (142) p. 298, pl. cvi. fig. 2.

Hab. Dredged off Blackwater-foot, Arran, N.B., in 20 fathoms, muddy sand (*D. R.*).

Distrib. Röddberg, in the Trondhjem Fiord, in 40–150 fathoms; Bog Fiord, E. Finmark, 3–5 fathoms (*A. M. N.*); Tromsö (*Schneider*): *Mus. Nor.* The former is the most southern locality in which it has been found by Sars; Spetsbergen (*Goës*); Greenland (*Hansen*); Kara Sea (*Stuxberg*); Franz-Josef Land, Jackson-Harmsworth Exped. (*T. S.*).

115. *Monoculodes tuberculatus*; Boeck.

1865. *Ædiceros affinis*, Goës (nec Bruzelius), "Crust. Amphip. Maris Spetsb. &c.," *Æfv. K. Vet.-Ak. Förh.* p. 11 (sep. cop.) (partim), pl. xxxix. fig. 21 (nec 21').

1870. *Monoculodes tuberculatus*, Boeck, (137) p. 87.

1876. *Monoculodes tuberculatus*, Boeck, (138) p. 277, pl. xv. fig. 2.

1883. *Monoculodes tuberculatus*, Schneider, *l. c.* p. 29, pl. i. fig. 8.

1892. *Monoculodes tuberculatus*, G. O. Sars, (142) p. 303, pl. cvii. fig. 3.

Hab. A single specimen in tow-net gathering a few miles east of the Island of Arran, N.B. (*T. Scott*).—No doubt the tow-net here meant was a net attached near the dredge, and not at surface.

Distrib. West coast of Norway; Trondhjem Fiord; Varanger Fiord, East Finmark (*G. O. Sars*); Tromsö (*Schneider*); Spetsbergen (*Goës*); Greenland (*Hansen*).

116. *Monoculodes Packardii*, Boeck.

1870. *Monoculodes Packardii*, Boeck, (137) p. 86.

1876. *Monoculodes Packardii*, Boeck, (138) p. 274, pl. xiv. fig. 3.

1883. *Monoculodes Packardii*, Schneider, *l. c.* p. 27, pl. i. fig. 6.

1892. *Monoculodes Packardii*. G. O. Sars, (142) p. 307, pl. cix. fig. 1.

Hab. Loch Striven, Firth of Clyde, 40 fathoms (*D. R.*): *Mus. Nor.* Upper Loch Fyne (*T. S.*).

Distrib. Varanger Fiord, E. Finmark, 125–150 fathoms (*A. M. N.*); Tromsö (*Schneider*): *Mus. Nor.* On whole coast of Norway from Christiania to Vadsö in 10–100 fathoms (*G. O. Sars*).

Genus 4. PERIOCULODES, G. O. Sars.

117. *Perioculodes longimanus* (Bate).

1869. *Monoculodes longimanus*, Bate & Westwood, (1) vol. ii. p. 507.
 1870. *Monoculodes Grubei*, Boeck, (137), p. 85.
 1876. *Monoculodes Grubei*, Boeck, (138) p. 269, pl. xvi. fig. 1.
 1883. *Monoculodes Grubei*, Schneider, l. c. p. 24.
 1887. *Monoculodes longimanus*, Chevreux, Cat. Crust. Amphip. du Sud-ouest de la Bretagne, p. 13, pl. v. figs. 1, 2.
 1888. *Monoculodes æquimanus* (Norman, MS.), Robertson, "Contrib. Cat. Amphip. and Isop. of Firth of Clyde," Trans. Nat. Hist. Soc. Glasgow, vol. ii. p. 26 (separate copy), ♂.
 1889. *Monoculodes longimanus*, Norman, "Notes on British Amphip.," Ann. & Mag. Nat. Hist. ser. 6, vol. iii. p. 451, pl. xx. figs. 6-9.
 1892. *Perioculodes longimanus*, G. O. Sars, (142) p. 313, pl. cx. fig. 2, pl. cxi. fig. 1.
 1893. *Æliceros longimanus*, Della Valle, (139) p. 547, pl. iv. fig. 9, pl. xxxiii. figs. 32-36.

Hab. Kames Bay, Isle of Cumbrae, 1-4 fathoms; Oban; off Marsden, Co. Durham, 10 fathoms; Starcross, Devon, 2-3 fathoms; Clew Bay, Co. Mayo (*A. M. N.*); Banff (*T. Edward*); Firth of Forth (*T. S.*); *Mus. Nor.* Upper Loch Fyne and off Spurm Head (*T. S.*); Isle of Man; North Wales; Jersey; Guernsey; Valentia, Ireland (*A. O. W.*).

Distrib. Svolvær, Lofoten Islands; Trondhjem Fiord, 5 fathoms (*A. M. N.*); South Norway (*G. O. Sars*); Naples (*A. M. N. & Della Valle*); *Mus. Nor.* Kattegat (*Meinert*); West France (*Chevreux*); Spezia (*G. O. Sars*).

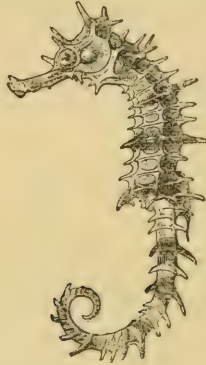
EXPLANATION OF PLATE III.

- Fig.* 1. *Amphilochus neapolitanus*, Della Valle. Second gnathopod.
Fig. 2. *Stenothoe setosa*, sp. n. First gnathopod.
Fig. 3. Ditto. Second gnathopod.
Fig. 4. Ditto. Last peræopod.
Fig. 5. *Metopa rubrovittata*, G. O. Sars. First gnathopod.
Fig. 6. *Metopa abscisa*, sp. n. First gnathopod.
Fig. 7. Ditto. Terminal joints of first gnathopod, more magnified.
Fig. 8. Ditto. Second gnathopod.
Fig. 9. Ditto. Palm of second gnathopod, more magnified.
Fig. 10. Ditto. Last peræopod.

V.—Description of a new Sea-Horse (*Hippocampus*) from Muscat. By G. A. BOULENGER, F.R.S.*Hippocampus Jayakari*.

11 segments on the body. All the tubercles produced into long slender spines; supraorbital spine longer than the diameter of the orbit, longer than the azygous spine in front

of it ; two spines below the orbit ; a very long spine, flanked by a similar one on each side, in front of the coronet, which is rather elevated and terminates in five spines. Snout three times as long as the eye, half the length of the head. Dorsal with 18 rays, inserted on four segments, two of the body, two of the tail. Yellow laterally and ventrally, brown dorsally, with dark brown rings ; most of the spines yellow at the tip.



A single specimen, measuring 85 millim. when stretched out, was picked up at Muscat by Surgeon-Lt.-Col. A. S. G. Jayakar, who, on kindly sending it as a present to the British Museum, pointed out to me its close affinity to *H. hystrix*, Kaup. The latter differs, however, in the longer snout and the shorter and more acutely pointed spines on the head, also in the coloration.

Dr. Jayakar is, I regret to hear, leaving Muscat. It gives me great pleasure to connect his name with this latest discovery of his at the station where for so many years he has been collecting fishes for the British Museum, with the result of enriching ichthyology by many new species, which have been described in the 'Proceedings of the Zoological Society' and in these 'Annals.'

VI.—*A List of the Fishes collected by Mr. Rupert Vallentin in the Falkland Islands.* By G. A. BOULENGER, F.R.S. With Notes by the Collector.

Trachinidæ.

1. *Eleginus maclovinus*, C. & V.

“ ‘Mullet,’ as they are called, abounded in the sea, especially

on the sands near the lighthouse at Cape Pembroke. The fish from this locality were large, from 30–36 inches in length, and were mostly meshed in a trammel. The specimens brought home were caught in a small seine in Stanley Harbour.”

2. *Notothenia sima*, Richards.

Stanley Harbour. Very common.

3. *Notothenia macrocephalus*, Gthr.

Stanley Harbour.

4. *Harpagifer bispinis*, Forst.

“The little *Cottus*-like fish occurring so abundantly along the shores of Stanley Harbour in shallow pools during low water were subject to great variations in colour; indeed one never found two specimens marked exactly the same. The ground-colour of these fish was usually grey, with longitudinal streaks of darker tint. Occasionally one would find a specimen with brilliant carmine patches on the head, with bands of the same colour running along the dorsal surface posteriorly above the pectoral fins. The ventral surface was invariably of a uniform light grey. I was unable to keep any of these brilliantly coloured specimens in captivity so as to find out if these bright colours were permanent or only transitory. These variations of colour had nothing to do with local surroundings, there being no red sea-weeds in Stanley Harbour—at least, I could find none—although there were plenty in the open ocean.”

Lycodidæ.

5. *Lycodes latitans*, Jen.

“Fairly common along the shore and also in the deep water in Stanley Harbour.”

6. *Lycodes flavus*, sp. n.

Depth of body equal to length of head, 8 times in total length. Head as deep as broad, once and a half as long as broad; snout short, rounded, projecting beyond the mouth, which extends to below the posterior border of the eye; the diameter of the latter equals interocular width and is contained once and one third in length of snout, five and a half times in length of head; nostril tubular, near the end of the

snout; large pores on the snout and on both lips; a single series of moderately large conical teeth in the jaws and on the vomer; gill-opening very narrow. Body naked, compressed; lateral line indistinct; the vent more than twice as distant from the end of the tail as from the ventrals. Dorsal with about 80 rays, originating just behind the occiput; anal with about 60 rays. Pectoral about two thirds length of head; ventral nearly one third length of pectoral.

Dark or light saffron-colour; a dark brown stripe along each side of the head, passing through the eye, separated from the dark brown upper surface of the head by a narrower yellowish-white stripe; lower surface of head and body yellowish white.

Total length 113 millim.

This species differs strikingly from *L. latitans*, apart from the coloration, in the shorter head and the larger eye.

"The specimens secured were detected in the hollow tangled roots of *Macrocystis*, whilst the specimens of the blackish-brown *L. latitans* were found under stones resting on mud."

Galaxiidae.

7. *Galaxias attenuatus*, Jen.

"Fish known to the inhabitants as 'smelts' were fairly common, and occurred in shoals in the shallow water along the shore. The specimens brought home were dipped from the sea with a large hand-net while being pursued by a penguin (*Eudyptes chrysolophus*)."

8. *Galaxias maculatus*, Jen.

"Freshwater fish. The Falkland Island 'trout' is very abundant in certain small brooks and streams in the Falkland Archipelago. The specimens sent were secured in a small brook called Wier Creek, a small stream in direct communication with the higher portion of Port William.

"Owing to the abundance of peat and the heavy rainfall one would naturally expect these fish to be black in colour, like moorland-trout. Great was my astonishment to find these Falkland Island trout almost transparent, the principal blood-vessels being plainly visible in the living fish."

VII.—*Rhynchotal Notes*.—V. Heteroptera: Asopinæ and Tessaratominæ. By W. L. DISTANT.

THE present communication calls for little comment. The Asopinæ still require more generic revision to bring them into line with the main division of the Pentatomidæ, to which they belong. The cause is not difficult to see, and is an adherence to supposed authority. Stål treated the Asopinæ in the first part of his 'Enumeratio Hemipterorum,' and there used subgenera for what in the later parts of his work he would distinctly have regarded as genera.

This paper refers to Walker's genera and species belonging to the above two subfamilies, as contained in vols. i.-iii. of his 'Catalogue of Hemiptera-Heteroptera.'

ASOPINÆ.

Genus HETEROSCELIS.

Heteroscelis bimaculata.

Platynopus bimaculatus, Walk. Cat. Het. i. p. 124. n. 6 (1867).

Genus MINEUS.

Mineus triangularis.

Strachia triangularis, Walk. Cat. Het. ii. p. 323. n. 42 (1867).

Genus CERMATULUS.

Cermatulus nasalis.

Ælia nasalis, Westw. in Hope Cat. i. p. 32 (1837).

Rhaphigaster pentatomoides, Walk. Cat. Het. ii. p. 370. n. 81 (1867).

Asopus binotatus, Walk. Cat. Het. i. p. 144 (1867).

Walker gives Brazil as a habitat for his *A. binotatus*, which is clearly an error, there being not the slightest doubt that it is a synonym of the common Australian species.

Genus DORYCORIS.

Dorycoris fuscus.

Asopus fuscus, Germ. in Silb. Rev. p. 187 (1837).

Rhaphigaster perornatus, Walk. Cat. Het. iii. p. 567 (1868).

Genus EALDA.

Ealda, Walk. Cat. Het. ii. p. 409 (1867).

Abdomen with the lateral segmental angles moderately spinous, the two penultimate angles strongly spinous, the apical angles longly spinous.

I have placed the genus near *Hoploxys*, Dall.

Ealda minax.

Ealda minax, Walk. Cat. Het. ii. p. 409, n. 1 (1867).

Hab. New Caledonia.

GORDONERIUS, gen. nov.

Head moderately long and broad, subtruncate in front, where it is slightly notched centrally; antennæ with the second joint a little longer than the third; rostrum reaching the intermediate coxæ, third joint a little shorter than second or fourth joints, which are subequal. Pronotum with the lateral margins very slightly sinuate, much broader at base than long, posterior angles subprominent. Scutellum narrowed at about centre, apex rounded. Abdomen with a short basal spine; anterior femora spined before apex; anterior tibiæ very slightly dilated.

In general shape and appearance allied to *Dorycoris* and *Zicrona*, from both of which it is at once distinct by the character of the spined anterior femora.

Gordonerius lineatus.

Oplomus lineatus, Walk. Cat. Het. i. p. 122, n. 20 (1867).

Hab. Abyssinia (Brit. Mus.).

Genus PLATYNOPUS.

Platynopus rostratus.

Cimex rostratus, Drury, Ill. Nat. Hist. iii. p. 59, pl. xliii. fig. 3 (1782).

Platynopus badius, Walk. Cat. Het. i. p. 125, n. 12 (1867).

Var. *Platynopus trijunctus*, Walk. *loc. cit.* n. 11.

Var. *Platynopus optabilis*, Walk. *loc. cit.* p. 126, n. 13.

Platynopus parvus, sp. n.

Allied to *P. rostratus*, Dru., but much smaller; colour paler, pale castaneous, luteous markings similar but paler;

antennæ with the basal joint and the bases of the fourth and fifth joints ochraceous; second and third joints subequal in length. Other characters as in *P. rostratus*.

Long. 9–10 millim.; exp. pronot. angl. $5\frac{1}{2}$ –6 millim.

Hab. Sierra Leone (Brit. Mus.); Congo (Coll. Dist.).

Platynopus scutellatus, sp. n.

Above bright shining ochraceous. Head dark olivaceous green, with a central lineate ochraceous spot near base; antennæ fuscous. Pronotum sparingly, coarsely, and darkly punctate; a distinct submarginal lateral linear fascia of dark punctures, two blackish ringlets on anterior portion of disk, and the pronotal spines shining black; the space behind the pronotal angles and the posterior margin impunctate. Scutellum sparingly, coarsely, and darkly punctate, the basal angular areas impunctate, and a small dark spot in each basal angle. Corium sparingly, coarsely, and darkly punctate. Membrane cupreous. Body beneath and legs ochraceous; sternum coarsely punctate, a large impunctate spot on each lateral area of pro-, meso-, and metasternum; a transverse fascia at junction of pro- and mesosternum, a much waved sublateral fascia, large subapical spot and anal appendage to abdomen, anterior and intermediate femora (excluding base and a subapical spot), outer surface and base and apex of inner surface of anterior tibiæ, apices of posterior femora, bases and apices of intermediate and posterior tibiæ, and the tarsi castaneous.

Scutellum with the apex obtusely angulate. Anterior tibiæ strongly dilated. Abdominal basal spine long, passing the posterior coxæ.

Long. 13 millim.; exp. pronot. angl. 8 millim.

Hab. Upper Congo, Bopoto (Coll. Dist.).

A species to be known by its angulated apex to scutellum and distinct coloration.

Platynopus melanoleucus.

Alia melanoleuca, Westw. in Hope Cat. i. p. 33 (1837).

Platynopus polygraphus, Walk. Cat. Het. i. p. 126. n. 17 (1867).

Var. *Platynopus melanoleucus*, Dall. (nec Westw.), List Hem. i. p. 87. n. 1 (1851).

The British Museum possesses specimens from Celebes and Ceram which agree with Westwood's type from Java. All the Philippine specimens I have seen are of a varietal form in which the pronotal fasciæ are more strongly marked and continuous.

Platynopus lætus.

Platynopus lætus, Walk. Cat. Het. i. p. 127. n. 19 (1867).

Platynopus dotatus, Walk. loc. cit. p. 128. n. 20.

Platynopus semiscitus, Walk. loc. cit. p. 129. n. 21.

Canthecona decorata, Voll. Faun. Ind. Neerl. iii. p. 9, pl. ii. fig. 2 (1868).

Platynopus melacanthus.

Pentatoma melacantha, Boisd. Voy. Astrol., Ent. p. 628, pl. ii. fig. 7 (1835).

Platynopus tenellus, Walk. Cat. Het. i. p. 127. n. 18 (1867).

Platynopus splendidulus.

Cimex splendidulus, Fabr. Syst. Rhyng. p. 163. n. 40 (1803).

Platynopus splendidulus, Stål, Hem. Fabr. i. p. 16. n. 1 (1868).

Optomus elongatus, Dall. Trans. Ent. Soc. Lond. 1852, p. 6, pl. i. fig. 1.

Dallas gave the habitat of his species as "in Brasilia?" Specimens exactly agreeing with his description, which represents the form described by Fallou as *P. metallicus* (Rev. d'Ent. x. p. 5, 1891), are in the British Museum from Sierra Leone and in my own collection from West Africa and the banks of the River Aruwini (Central Africa).

Genus CANTHECONA.

Canthecona cognata.

Canthecona cognata, Dist. Ent. Month. Mag. xix. p. 157 (1882).

Canthecona insularis, Kirby, Journ. Linn. Soc., Zool. xxiv. p. 79, pl. iv. fig. 4 (1891).

Genus PICROMERUS.

Picromerus obtusus.

Picromerus obtusus, Walk. Cat. Het. i. p. 133. n. 6 (1867).

Picromerus nigrivitta, Walk. loc. cit. n. 7.

Genus PODISUS.

Podisus modestus.

Arma modesta, Dall. List Hem. i. p. 101. n. 13 (1851).

Rhaphigaster aggressor, Walk. Cat. Het. ii. p. 359. n. 19 (1867).

Podisus semialbatus.

Mormidea semialba, Walk. Cat. Het. iii. p. 553 (1868).

A species allied to *P. falcatus*, Dist.

Podisus turbidus.

Arma turbida, Walk. Cat. Het. i. p. 140. n. 43 (1867).

This species is still represented only by the unlocalized type specimen in the British Museum. It is allied to *P. fuscescens*, Dall.

Rostrum dark castaneous, the second joint black.

Podisus cynicus.

Pentatoma cynica, Say, New Harm. Ind., Dec. 1831; Compl. Writ. i. p. 312. n. 1 (1859).

Arma grandis, Dall. List Hem. i. p. 96. n. 3 (1851).

Podisus cynicus, Leth. & Sev. Cat. Gén. Hém. t. i. p. 217 (1893).

Podisus grandis, Leth. & Sev. *loc. cit.* p. 218.

Uhler (Check-list Hem. Het. N. America, 1886, p. 4) correctly sank Dallas's species as a synonym of the above; but as the authors of our best catalogue have kept them as distinct, it is necessary to again draw attention to their being conspecific.

Genus TYLOSPILUS.

Tylospilus megaspilus.

Hoploxyx megaspilus, Walk. Cat. Het. i. p. 141. n. 2 (1867).

Genus ANASIDA.

Anasida funebris, sp. n.

Pitchy black; eyes and a spot at base of head ferruginous. Head thickly and finely punctate, with a small impunctate space before each eye; antennæ with the second and third joints subequal in length, remaining joints mutilated. Pronotum coarsely punctate and rugulose, the sublateral carinæ near posterior angles very distinct and prominent. Scutellum coarsely punctate and rugulose. Corium more opaque, smooth, somewhat more sparingly punctate. Membrane shining bronzy.

Long. 16 millim.; exp. pronot. angl. 7 millim.; abd. $7\frac{1}{2}$ millim.

Hab. Natal (*Gueinzius*: Brit. Mus.).

Allied to the West-African type of the genus, *A. tenebrio*, Karsch, but differing by the scutellum being more elongate and distinctly and angularly narrowed at about two thirds from base; abdomen narrower, with the connexivum much less prominent, &c.

Genus ASOPUS.

Asopus erythromelas.

Strachia erythromela, Walk. Cat. Het. ii. p. 339. n. 81 (1867).

Strachia pyrophila, Walk. loc. cit. p. 340. n. 83.

Var. *Strachia præcipua*, Walk. loc. cit. p. 339. n. 82.

These described forms were reported by me ('Annals,' May 1900, p. 434) as not to be found under the genus and subfamily in which they were described. I have since discovered them under the genus *Asopus*, where I find Walker subsequently mentions them (Cat. Het. iii. pp. 533, 534, 1868).

Genus ECHALIA.

Echalia consocialis.

Pentatoma consociale, Boisd. Voy. Astr., Entom. ii. p. 630. n. 3, pl. ii. fig. 9 (1835).

Rhaphigaster perfectus, Walk. Cat. Het. ii. p. 371. n. 83 (1867).

Mormidea decora, Walk. Cat. Het. ii. p. 256. n. 25 (1867).

This species clearly represents an undescribed genus in Asopinæ; but as the type and only specimen is without antennæ, it must remain for the present a generic nondescript.

Abdomen unarmed; rostrum reaching the posterior coxæ; head rounded in front, the central lobe longer than the lateral lobes; posterior pronotal angles produced into moderately long, slender, acute spines; scutellum somewhat long, subtriangular, its apex extending a little beyond base of membrane.

TESSARATOMINÆ.

Genus PIEZOSTERNUM.

Piezosternum subulatum.

Cimex subulatus, Thunb. Nov. Ins. Sp. ii. p. 41, pl. ii. fig. 55 (1783).

Piezosternum retractum, Walk. Cat. Het. iii. p. 457. n. 4 (1868).

Salica excellens, Walk. loc. cit. p. 469. n. 1.

Genus TESSARATOMA.

Tessaratoma papillosa.

Cimex papillosus, Drury, Ill. Nat. Hist. i. p. 96, pl. xliii. fig. 2 (1770).

Tessaratoma striata, Walk. Cat. Het. iii. p. 463. n. 16 (1868).

Tessaratoma furcifera, Walk. loc. cit. n. 17.

Tessaratoma timorensis, Walk. (Voll. ?) loc. cit. p. 464. n. 18.

Genus HYPENCHA.

Hypencha apicalis.

Tessaratomya apicalis, St.-Farg. et Serv. Enc. Méth. x. p. 591. n. 3 (1825).

Tessaratomya semicuprea, Walk. Cat. Het. iii. p. 465. n. 21 (1868).

Hypencha opposita.

Tessaratomya opposita, Walk. Cat. Het. iii. p. 466. n. 22 (1868).

Walker's type specimen was unlocalized. The Museum now possesses a second specimen from Johore.

Genus PYGOPLATYS.

Pygoplatys cribratus.

Piezosternum cribratum, Walk. Cat. Het. iii. p. 458. n. 6 (1868).

Pygoplatys trucidus, Walk. *loc. cit.* p. 461. n. 8.

Genus EUSTHENES.

Eusthenes thoracicus, sp. n.

Head, pronotum, scutellum, and legs piceous; corium and body beneath very dark castaneous; apex of scutellum and eyes reddish ochraceous. Antennæ black; second joint a little longer than the third, remainder mutilated. Pronotum with the lateral margins distinctly reflexed, rounded anteriorly, and a little concavely sinuate before the posterior angles, which are subprominent; before the rounded anterior lateral margins is a broad sublateral rugosity, which is strongly transversely striate; remainder of disk somewhat faintly striate and moderately punctate. Posterior femora in male strongly incrassated, beneath with a long robust curved spine near base, and with a series of small obtuse spines near apex. Other characters as in *E. robustus*, Lepell. et Serv., but differing from that and all other species of the genus by the structure of the pronotum.

Long. 36 millim.; exp. pronot. angl. 17 millim.; max. lat. abd. 20 millim.

Hab. N. India, Assam (Atkinson Coll., Brit. Mus.).

Genus DALCANTHA.

Dalcantha dilatata.

Dalcantha dilatata, Amy. & Serv. Hem. p. 171. n. 1 (1843).

Dalcantha regia, Walk. Cat. Het. iii. p. 474. n. 3 (1868).

Stål (En. Hem. i. p. 76, 1870) treated Walker's species as a synonym of *D. Ståli*, Voll. Walker's descriptions were made from specimens identified by Dallas as *D. dilatata*, which Stål had previously seen under that name when visiting the British Museum.

Summarized Disposition of Walker's Genera and Species.

Asopinæ and Tessaratominæ.

Genera considered valid.

- Blachia*, Walk. Cat. Het. i. p. 117 (1867).
Cecyrina, Walk. loc. cit. p. 118.
Ealda, Walk. loc. cit. ii. p. 409.
Muscanda, Walk. loc. cit. iii. p. 576 (1868).

Genera treated as synonymic.

- Bodetria*, Walk. Cat. Het. i. p. 119 (1867), = Gen. *Heteroscelis*, Latr.
Gilva, Walk. loc. cit. p. 141, = Gen. *Coryzorhaphis*, Spin.
Salica, Walk. loc. cit. iii. p. 469 (1868), = Gen. *Piezosternum*, Amy. & [Serv.

Species considered valid and described under correct Genera.

- Blachia ducalis*, Walk. Cat. Het. i. p. 117. n. 1 (1867).
Cazira interneza, Walk. loc. cit. p. 118. n. 4.
Cecyrina platyrhinoides, Walk. loc. cit. p. 119. n. 1.
Platynopus lætus, Walk. loc. cit. p. 127. n. 19.
 — *purpurascens*, Walk. loc. cit. iii. p. 530 (1868).
Canthecona concinna, Walk. loc. cit. i. p. 131. n. 9 (1867).
Glypsus truculentus, Walk. loc. cit. p. 132. n. 4.
Picromerus obtusus, Walk. loc. cit. p. 133. n. 6.
Macrorhaphis infusata, Walk. loc. cit. iii. p. 531 (1868).
 — *spureuta*, Walk. loc. cit.
Ealda minax, Walk. loc. cit. ii. p. 409. n. 1 (1867).
Pygoplatys lancifer, Walk. loc. cit. iii. p. 460. n. 7 (1868).
Amissus nitidus, Walk. loc. cit. p. 466. n. 2.
Siphnus dilatatus, Walk. loc. cit. p. 467. n. 3.
Lyramorpha ramifera, Walk. loc. cit. p. 476. n. 4.
Muscanda testacea, Walk. loc. cit. p. 577.

Species considered valid, but requiring generic revision.

- Oplomus lineatus*, Walk. Cat. Het. i. p. 122. n. 20 (1867), belongs to gen. *Gordoneri*, g. n.
Platynopus binaculatus, Walk. loc. cit. p. 124. n. 6, belongs to gen. *Heteroscelis*, de Cast.
Arma invaria, Walk. loc. cit. p. 135. n. 15, belongs to gen. *Podisus*, Herr.-Schäff.
 — *ampla*, Walk. loc. cit. p. 138. n. 34, belongs to gen. *Podisus*, Herr.-Schäff.
 — *caliginosa*, Walk. loc. cit. n. 35, belongs to gen. *Podisus*, Herr.-Schäff.

- Arma submarginata*, Walk. *loc. cit.* p. 139. n. 37, belongs to gen. *Podisus*, Herr.-Schäff.
 — *turbida*, Walk. *loc. cit.* p. 140. n. 43, belongs to gen. *Podisus*, Herr.-Schäff.
Hoploxya megaspilus, Walk. *loc. cit.* p. 141. n. 2, belongs to gen. *Tylospilus*, Stål.
Piezosternum firmatum, Walk. *loc. cit.* iii. p. 458. n. 5 (1868), belongs to gen. *Pygoplatys*, Dall.
 — *cribratum*, Walk. *loc. cit.* n. 6, belongs to gen. *Pygoplatys*, Dall.
 — *ingenum*, Walk. *loc. cit.* p. 459. n. 7, belongs to gen. *Pygoplatys*, Dall.
Tessarotoma forticornis, Walk. *loc. cit.* p. 465. n. 23, belongs to gen. *Pygoplatys*, Dall.
 — *opposita*, Walk. *loc. cit.* p. 466. n. 22, belongs to gen. *Hypencha*, Amy. & Serv.
Pycanum stabile, Walk. *loc. cit.* p. 472. n. 12, belongs to gen. *Carpona*, Dohrn.

Species treated as synonymic.

- Bodetria brentoides*, Walk. *Cat. Het.* i. p. 119. n. 1 (1867), = *Heteroscelis Servillei*, de Cast.
 — *chrysochlora*, Walk. *loc. cit.* iii. p. 528 (1868), = *Heteroscelis Servillei*, de Cast.
 — *indecora*, Walk. *loc. cit.*, = *Heteroscelis Servillei*, de Cast.
 — *scutellaris*, Walk. *loc. cit.* p. 529, = *Heteroscelis lepida*, Stål.
Oplomus biarcuatus, Walk. *loc. cit.* p. 121. n. 17, = *Oplomus rutilus*, Dall.
 — *chrysomelas*, Walk. *loc. cit.* n. 18, = *Oplomus tripustulatus*, Fabr.
 — *basalis*, Walk. *loc. cit.* p. 122. n. 19, = *Oplomus tripustulatus*, Fabr.
Platynopus conspersus, Walk. *loc. cit.* p. 123. n. 3, = *Oplomus proteus*, Stål.
 — *trijunctus*, Walk. *loc. cit.* p. 125. n. 11, = *Platynopus rostratus*, Dru., var.
 — *badius*, Walk. *loc. cit.* n. 12, = *Platynopus rostratus*, Dru.
 — *optabilis*, Walk. *loc. cit.* p. 126. n. 13, = *Platynopus rostratus*, Dru., var.
 — *polygraphus*, Walk. *loc. cit.* n. 17, = *Platynopus melanoleucus*, Westw.
 — *tenellus*, Walk. *loc. cit.* p. 127. n. 18, = *Platynopus melacanthus*, Boisd.
 — *dotatus*, Walk. *loc. cit.* p. 128. n. 20, = *Platynopus lætus*, Walk.
 — *semiscitus*, Walk. *loc. cit.* p. 129. n. 21, = *Platynopus lætus*, Walk.
Picromerus nigrivitta, Walk. *loc. cit.* p. 133. n. 7, = *Picromerus obtusus*, Walk.
Arma monospila, Walk. *loc. cit.* p. 136. n. 16, = *Podisus sagitta*, Fabr.
 — *colorata*, Walk. *loc. cit.* n. 17, = *Euthyrhynchus floridanus*, Linn.
 — *lateralis*, Walk. *loc. cit.* p. 138. n. 36, = *Tynacantha cincticeps*, Stål.
Gilva varipes, Walk. *loc. cit.* i. p. 142. n. 1 (1867), = *Coryzorhaphis spinolæ*, Sign.
Asopus binotatus, Walk. *loc. cit.* p. 144. n. 2, = *Cermatulus nasalis*, Westw.
Piezosternum retractum, Walk. *loc. cit.* iii. p. 457 (1868), = *Piezosternum subulatum*, Thunb.
Pygoplatys trucidus, Walk. *loc. cit.* p. 461. n. 8, = *Pygoplatys cribratus*, Walk.
Tessarotoma striata, Walk. *loc. cit.* p. 463. n. 16, = *Tessarotoma papillosa*, Dru.
 — *furcifera*, Walk. *loc. cit.* n. 17, = *Tessarotoma papillosa*, Dru.

- Tessaratoma timorensis*, Walk. *loc. cit.* p. 464. n. 18, = *Tessaratoma papillosa*, Dru.
 — *clara*, Walk. *loc. cit.* n. 19, = *Tessaratoma papillosa*, Dru.
 — *semicuprea*, Walk. *loc. cit.* p. 465. n. 21, = *Hyphencha apicalis*, Lep. & Serv.
Salica excellens, Walk. *loc. cit.* p. 469. n. 1, = *Piezosternum subulatum*, Thunb.
Pycanum rubidum, Walk. *loc. cit.* p. 471. n. 11, = *Pycanum pretiosum*, Stål.
 — *smaragdiferum*, Walk. *loc. cit.* p. 472. n. 13, = *Carpona angulata*, Stål.
 — *pallipes*, Walk. *loc. cit.* p. 473. n. 17, = *Mattiphus oblongus*, Dall.
Dalcantha regia, Walk. *loc. cit.* p. 474. n. 3, = *Dalcantha dilatata*, Amy. & Serv.

To be treated as non-existent.

Species the types of which are not now to be found in the British Museum.
Arma velata, Walk. Cat. Het. iii. p. 532 (1868).

Species incorrectly placed in the Asopinæ.

Genus CARBULA (*Pentatominae*).

Carbula humerigera.

Pentatoma humerigera, Uhler, Proc. Ac. Philad. 1860, p. 223. n. 4.
Arma japonica, Walk. Cat. Het. iii. p. 533 (1868).

Genus TYOMA (*Pentatominae*).

Tyoma cryptorhyncha.

Cimex cryptorhynchus, Germ. in Silberm. Rev. v. p. 169 (1837).
Arma nanula, Walk. Cat. Het. i. p. 139. n. 38 (1867).

VIII.—*Descriptions of some new Species of Heterocera from Tropical South America.* By HERBERT DRUCE, F.L.S. &c.

Fam. Syntomidæ.

Dycladia lydia, sp. n.

Female.—Head, palpi, antennæ, thorax, abdomen, and legs black; collar and base of the abdomen chrome-yellow; the anal segments of the abdomen dark blue; a fine yellow line on each side of the abdomen extending from the base almost to the anus. Primaries black, crossed beyond the middle from

the costal to the outer margin by a curved semihyaline yellow band: secondaries black, with a fine hyaline line from the base to the middle of the outer margin.

Expanse 1 inch.

Hab. South Brazil, Porto Real (*Mus. Druce*).

Eucereon giganteum, sp. n.

Male.—Head, palpi, and antennæ black, collar bright carmine; tegulæ and thorax black, streaked with yellowish brown; a large yellow spot at the base of thorax; abdomen black, banded with bright carmine, the anal segments bright carmine above, black on the underside; the legs black. Primaries brownish black, with a brownish-white spot at the end of the cell; a band very similar in colour beyond the cell; a submarginal pale brownish line extending from the apex to the anal angle; the veins all pale yellowish brown: secondaries white, broadly bordered with black, the veins black.

Expanse $2\frac{1}{4}$ inches.

Hab. Colombia (*Mus. Druce*).

Eucereon testaceum, sp. n.

Male.—Head, palpi, collar, tegulæ, thorax, abdomen, and legs grey; antennæ black. Primaries semihyaline white beyond the cell, the apex, outer and inner margin clouded with grey: secondaries semihyaline white.—The *female* almost identical with the male, excepting that the base of the thorax is clothed with white hairs.

Expanse, ♂ $1\frac{1}{2}$, ♀ $1\frac{3}{4}$ inch.

Hab. Venezuela (*Mus. Druce*).

Eucereon (?) *fanum*, sp. n.

Male.—Head, palpi, antennæ, tegulæ, and thorax black, the head and base of the tegulæ spotted with white; abdomen bluish black, with a row of white spots on each side; legs black above, white on the underside; the underside of the thorax yellow. Primaries black, with a large greyish patch round the end of the cell, the costal and inner margin slightly streaked with grey: secondaries black, the central part of the wing from the base to the end of the cell semihyaline white, the veins black.

Expanse 2 inches.

Hab. Venezuela (*Mus. Druce*).

Fam. Arctiidæ.

Automolis melea, sp. n.

Male.—Front of head blue; palpi black above, chrome-yellow on the underside; antennæ black; collar and tegulæ chrome-yellow; thorax and basal half of the abdomen black, with a large yellow spot on each side close to the base; the anal segments of the abdomen spotted with metallic blue; the underside black, banded with chrome-yellow; legs black. Primaries black, the costal margin from the base to the end of the cell edged with chrome-yellow; a wide chrome-yellow band extends from the base of the wing to the outer margin, which it does not quite reach; the fringe black: secondaries black, the costal margin from the base to the apex chrome-yellow; the fringe black.—*Female* very similar to the male, but larger and without the chrome-yellow spots near the base of the abdomen.

Expanse, ♂ $1\frac{3}{4}$, ♀ 2 inches.

Hab. Venezuela (*Mus. Druce*).

Automolis Pratti, sp. n.

Male.—Head, palpi, and antennæ black, head spotted with metallic blue in front; tegulæ yellow, edged with black on the outer side; thorax black, metallic blue at the base, with a yellow spot on each side; abdomen black, the anal segments spotted with metallic blue; legs black. Primaries dark yellow, the costal margin, apex, outer and inner margin edged with black: secondaries black, the costal margin from the base to the apex broadly yellow.

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

Hab. Colombia (*Mus. Druce*).

Amaxia theon, sp. n.

Male.—Head and collar yellow; antennæ brown; palpi brown, white on the underside; tegulæ brown, edged with yellow; thorax yellow; abdomen dark brown above, white on the underside, the anal segment pale yellow. Primaries semihyaline pale yellow, spotted and banded with brown, very similar to those of *Amaxia pardalis*, Walker, but with more yellow at the base of the wing: secondaries semihyaline white, shaded with pale brown at the anal angle and round the outer margin.

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

Hab. Venezuela (*Mus. Druce*).

Idalus pythia, sp. n.

Male.—Head, collar, and tegulæ pale greyish fawn-colour; antennæ fawn-colour, the tips white; abdomen yellow, the underside white, the anal segment pale greyish fawn-colour; legs white. Primaries semihyaline yellowish white, the basal half of the wing pale greyish fawn-colour, with several yellowish-brown spots along the inner margin; a large, round, pale greyish fawn-coloured spot with an indistinct darker brown centre close to the apex: secondaries semihyaline yellowish white, dark yellow along the inner margin.

Expanse $1\frac{1}{4}$ inch.

Hab. Bolivia, Songo (*Mus. Druce*).

Opharus amata, sp. n.

Female.—Head, antennæ, collar, tegulæ, thorax, abdomen, and legs black; abdomen banded with yellow. Primaries olive-brown, palest at the base and along the costal margin, the veins black; a rather large indistinct blackish spot at the end of the cell: secondaries semihyaline brownish black, the fringe dark brown.

Expanse 2 inches.

Hab. Venezuela (*Mus. Druce*).

IX.—*Report on the Neuroptera Odonata collected by Mr. E. E. Austen at Sierra Leone during August and September 1899.*
By W. F. KIRBY, F.L.S., F.E.S.

[Plate II.]

DURING Mr. Austen's visit to Sierra Leone, as a member of Major Ross's expedition to inquire into the connexion between mosquitos and malaria, he collected a considerable number of dragonflies; but as he captured long series whenever he was able, the number of distinct species obtained amounted only to eighteen. However, I am able to describe seven new species in the present paper, two of which I have made the types of new genera. I should also mention that specimens of most of these have been in the Museum for some time, but have not previously been described.

In place of quoting full synonymy in the present paper, I generally confine myself to quoting references to the original

author of a species and to my 'Catalogue of Neuroptera Odonata.'

The only other Neuroptera in the collection were four specimens of *Myrmeleon tristis*, Walker, taken on Sept. 5, 1899, and one or two small species of Ephemeriidæ and Termitidæ not at present determinable.

The following species were obtained by Mr. Austen:—

Libellulidæ.	<i>Orthetrum</i> , Newm.
LIBELLULINÆ.	<i>chryso stigma</i> , Burm.
	<i>Julia</i> , Kirb. (sp. n.).
<i>Pantala</i> , Hag.	
<i>flavescens</i> , Fabr.	CORDULINÆ.
<i>Rhythemis</i> , Hag.	<i>Macromia</i> , Ramb.
<i>notata</i> , Fabr.	<i>Selysi</i> , Kirb. (sp. n.).
<i>Palpopleura</i> , Ramb.	
<i>Lucia</i> , Drury.	Æschnidæ.
<i>Portia</i> , Drury.	ÆSCHNINÆ.
<i>Trithemis</i> , Brauer.	<i>Anacischna</i> , De Selys.
<i>Kahula</i> , Kirb. (sp. n.).	<i>triangulifera</i> , McLachl.
<i>serva</i> , Kirb. (sp. n.).	
<i>Helothemis</i> , Karsch.	Agrionidæ.
<i>dorsalis</i> , Ramb.	AGRIONINÆ.
<i>Bebecia</i> , Kirb. (g. n.).	<i>Sapho</i> , De Selys.
<i>adolescens</i> , Kirb. (sp. n.).	<i>ciliata</i> , Fabr.
<i>Crocothemis</i> , Brauer.	<i>Libellago</i> , De Selys.
<i>erythræa</i> , Brullé.	<i>dispar</i> , Beauv.
<i>Thermothemis</i> , Kirb.	
<i>Austeni</i> , Kirb. (sp. n.).	
<i>leonina</i> , Karsch.	
<i>Apeletherus</i> , Kirb. (g. n.).	
<i>Strachani</i> , Kirb. (sp. n.).	

Pantala flavescens.

Libellula flavescens, Fabr. Ent. Syst. Suppl. p. 285 (1798).

Pantala flavescens, Kirb. Cat. Neur. Odon. p. 1. n. 1 (1890).

9 specimens, Aug. 25, Sept. 13, 21, 27 (1899).

Rhythemis notata.

Libellula notata, Fabr. Spec. Ins. i. p. 390. n. 12 (1781).

Rhythemis notata, Kirb. Cat. Neur. Odon. p. 6. n. 21 (1890).

3 specimens, Aug. 26, Sept. 2 (1899).

Palpopleura Lucia.

Libellula Lucia, Drury, Ill. Exot. Ent. ii. pl. xlv. fig. 1 (1773).

Palpopleura Lucia, Kirb. Cat. Neur. Odon. p. 9. n. 1 (1890).

35 specimens, Aug. 21 to Sept. 22 (1899).

One of the commonest and most widely distributed African dragonflies.

Palpopleura Portia.

Libellula Portia, Drury, Ill. Exot. Ent. ii. pl. xlvii. fig. 3 (1773).

Palpopleura Portia, Kirb. Cat. Neur. Odon. p. 9. n. 4 (1890).

5 specimens, Aug. 26 to Sept. 21 (1899).

Although long known and widely distributed, this species does not seem to be nearly so abundant as *P. Lucia*, Drury.

Trithemis Kalula, sp. n. (Pl. II. figs. 2, 2 a.)

Long. corp. 32-34 millim. ; exp. al. 53-55 millim. ; long. pter. 2 millim.

Male.—Rufo-testaceous, with hyaline wings. Very similar to *T. arteriosa*, Burm., from which it differs as follows:—The segments of the abdomen are distinctly shorter and broader, and instead of a row of lateral black spots succeeded by a continuous band, there is a row of lateral black spots enlarging and expanding behind, which are more or less expanded on the last three segments, sometimes so much as to cover most of these segments, except a reddish spot on each side in front. The middle appendages of the same segment consist of a pair of long slender recurved hooks. The neuration is brown, reddish only sometimes in the costal and post-costal areas. The yellow shade at the base of the hind wings is darker than in *T. arteriosa* and the cells in it are usually centred with pale brown. In adult specimens the vertex is violet, and the thorax and abdomen are slightly pruinose, but more of a reddish plum-colour than blue. An immature male (and presumably the female) has a broad brown median band on the thorax, and a narrower one on each side, the latter connected below with a longitudinal black band on the pleura, which emits three oblique brown bands downward, the hindermost connected with a black space, filled up with two pale spots in front and a large transverse one behind on the metapectus. At the base of the abdomen there are also three brown stripes above the level of the lateral markings already described. In the more mature specimens these markings are more or less obscured. Legs black. Pterostigma brown, more or less centred with yellow.

4 specimens, Aug. 26, Sept. 13, 21 (1899).

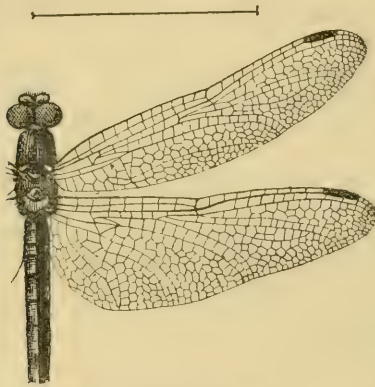
Trithemis serva, sp. n. (Woodcut, fig. 1.)

Long. corp. 34 millim. ; exp. al. 57 millim. ; long. pter. 2½ millim.

Male.—Dull black, more or less varied with testaceous in immature specimens, especially on the face ; in the most

mature specimens the vertex is violet and the thorax pruinose blue. The sides of the mentum are sometimes yellow. Wings hyaline, with black nervures; fore wings with 11-13 antenodal and 7-10 postnodal cross-nervures; pterostigma dark brown, traversed by a narrow yellow line. Triangle traversed, followed by three rows of cells, increasing; sub-triangular space consisting of 3 cells: hind wings with 7-8

Fig. 1.

*Trithemis serva*.

antenodal and 9-11 postnodal cross-nervures; membranule white, stained with blackish; a small yellow cloud beyond, sometimes obsolete, with its outer border straight, and above the lower basal cell, only visible at the extreme base. Appendages of the second segment very prominent, the two hindermost converging like a pair of pincers.

Described from six specimens, two of them taken by Mr. Austen on Sept. 5 and 21 (1899).

Allied to the East-Indian *T. festiva*, Ramb., but easily distinguished by the different shape of the markings at the base of the hind wings and the form of the appendages of the second segment of the abdomen. It must also be allied to *T. dichroa*, Karsch, which seems to be a still darker coloured species in the male.

Helothemis dorsalis.

Libellula dorsalis, Ramb. Ins. Névr. p. 89 (1842).

Trithemis dorsalis, Kirb. Cat. Neur. Odon. p. 19. n. 16 (1890).

Helothemis dorsalis, Karsch, Berl. ent. Zeitschr. xxxiii. p. 378 (1890).

10 specimens, Aug. 19, 26, Sept. 8, 9, 13, 19, 20, 21 (1899).

I am not satisfied that this genus is sufficiently distinct from *Trithemis*.

BEBLECIA, gen. nov.

Eyes connected by a short space; frontal tubercle rounded above, and slightly concave in front; abdomen with segments 2 and 3 carinated. Wings with only one nervure in the lower basal cell and no supratrangular nervures: fore wings with 12–13 antenodal cross-nervures, the last not continuous, and 10–11 postnodals; pterostigma long and thick, nodal sector slightly waved beyond the middle, and with a double row of cells between it and the subnodal sector for the last third or fourth of their length; arculus rising between the first and second antenodal cross-nervures; sectors of the arculus stalked; triangle traversed by 1 or 2 nervures and followed by a row of 4 cells, then by 2 or 3 more or less irregularly, before rising again to 4 increasing, or by seven rows of 3 only; subtriangular space consisting of 3 or 4 cells: hind wings with 10 antenodal and 11 postnodal cross-nervures; triangle traversed by a nervure or (rarely) free; sectors of the arculus widely separated, the upper one rising considerably above the lower angle of the triangle, where the lower sector rises; base of triangle nearly corresponding with the arculus. Claws dentated beyond the middle. Appendages of the second segment in the male rather large; upper terminal appendages rather long and slender, fully as long as the ninth segment; lower appendage nearly as long as the upper ones, truncated at the extremity.

This genus appears to be nearly allied to *Trithemis*, but in typical *Trithemis* the sectors of the arculus are scarcely separated in the hind wings and the triangle of the hind wings is never divided.

It is to be regretted that Mr. Austen obtained only three specimens of this interesting species, all in bad condition.

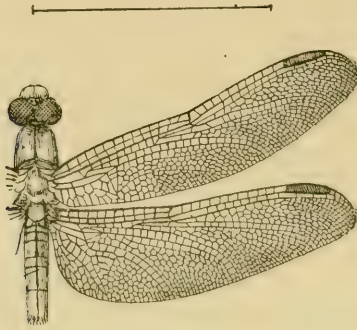
Beblecia adolescens, sp. n. (Woodcut, fig. 2.)

Exp. al. 60 millim.; long. pter. 5 millim.

Lighter or darker ochraceous; pleura, pectus, and face paler; vertex darker, sometimes slightly greenish; antennæ, ocelli, spines on the legs, and central and part of the lateral carinæ on the abdomen black; a pale brown shoulder-stripe and a similar stripe on each side of the upper part of the abdomen: wings hyaline, with black neuration; costal nervure and pterostigma yellow, the latter between black nervures; membranule of hind wings whitish, beyond it the wing is very slightly stained with yellow.

Described from three specimens (2 ♂, 1 ♀), all more or less damaged and perhaps not quite mature, captured on Sept. 2, 9, and 13 (1899).

Fig. 2.



Beblecia adolescens.

Crocothemis erythræa.

Libellula erythræa, Brullé, Expéd. de la Morée, iii. (1) p. 102, pl. xxxii. fig. 4 (1832).

Crocothemis erythræa, Kirb. Cat. Neur. Odon. p. 21. n. 1 (1890).

19 specimens, Aug. 25 to Sept. 22 (1899).

Specimens from West Africa are rather smaller and slenderer than typical ones from South Europe.

Thermorthemis Austeni, sp. n. (Pl. II. figs. 1, 1 a.)

Long. corp. 54–56 millim.; exp. al. 94–98 millim.; long. pter. 4 millim.

Male.—Rufo-testaceous, thorax with a slight brown line on each shoulder and the borders of the patagia black; abdomen in the male pulverulent blue. Legs black in the adult male, except at the base of the femora; otherwise rufo-testaceous, with black tarsi; spines strongly developed. Wings hyaline, with black nervures, very slightly tinged with yellowish brown at the base; pterostigma yellow, between black nervures; tips very slightly browned. Fore wings with 20–23 antenodal (the last continuous) and 13–14 postnodal cross-nervures; triangle divided by two nervures; two supra-triangular nervures; triangle followed by four rows of cells, increasing subtriangular space consisting of 5–8 cells: hind wings with 13–15 antenodal and 13–16 postnodal cross-nervures; triangle traversed and with the base generally

placed a little nearer the base of the wings than the arculus; one supratrangular nervure; sectors of the arculus slightly separated, the lower one coinciding with the base of the triangle. Abdomen with strong black median and lateral serrated carinæ; terminal appendages of male as long as the ninth segment, the lower appendage broad, half as long as the others.

Female.—Uniform rufo-testaceous, mouth-parts inclining to yellowish, dark shoulder-stripe slightly indicated, carinæ of abdomen black, eighth segment perfoliate.

This species agrees with *T. madagascariensis*, Ramb., in general neuration, the bifid frontal tubercle, the *Orthetrum*-like frontal depression, &c., but differs in the fewer and stronger spines on the hind tibiæ.

Described from five male specimens, one taken by Mr. Austen at Sierra Leone on Sept. 21, 1899, and the others from West Africa, without special locality.

The single female is from Sierra Leone (*Morgan*).

I append the description of an allied species from Angola* :—

Female.—Dark brown; head testaceous; under surface and terminal segments inclining to ferruginous; eighth segment perfoliate, with the edges black. Wings yellowish hyaline, with black nervures: fore wings with 19 antenodal and 12 postnodal cross-nervures; neuration otherwise as in *T. Austeni*.

One specimen from Angola, collected by Mr. and Mrs. Monteiro.

Thermothemis leonina.

Orthetrum leoninum, Karsch, Ent. Nachr. xvii. p. 59 (1891).

Two specimens (♂ ♀) from Sierra Leone, the male taken by Mr. Austen on Sept. 2, 1899, and the female taken by Dr. W. G. Clements.

The insect is a true *Thermothemis*, except that the body is more slender, and the hind tibiæ have fewer and stronger spines than in *T. madagascariensis*; but it shares the latter character with *T. Austeni*. In the male the triangle of the fore wings is followed by four rows of cells increasing, and in the female by five, shrinking to four and then again increasing.

APELEUTHERUS, gen. nov.

Male.—Frontal tubercle strongly bifid; front large and broad, projecting beneath it to about half the width of the eye, almost quadrangular, with a conspicuous median depression. Eyes connected for a short space. Legs rather long,

* *Thermothemis Monteiroi*, sp. n.

spines scarcely more than setæ on the femora, numerous and rather short and strong on the tibiæ, but with a few long slender ones at their base. Abdomen distinctly shorter than the hind wings, not inflated at base; second and third segments transversely carinated; appendages of second segment prominent, consisting of a small lobe, and an appendage in front directed obliquely backward; upper anal appendages rather longer than the ninth segment, slender, hardly longer than the broad lower appendage. Wings with only one cross-nervure in the lower basal cell and no supra-triangular nervures; nodal sector slightly waved; arculus rising between antenodals 1 and 2, its sectors with a long stalk. Fore wings with 13-14 antenodal cross-nervures, the last not continuous, and 8-9 postnodal cross-nervures; triangle crossed by 2 nervures (rarely 1) and followed by one or two rows of 4 cells (rarely 3) and then several rows of 3, increasing; subtriangular space consisting of 3 cells (occasionally 2 or 4 on one side). Hind wings with 8-10 antenodal and 9-11 postnodal cross-nervures; triangle traversed by one nervure, its base lying rather nearer the base of the wings than the arculus; sectors of the triangle subcontiguous; triangle (above the sectors) followed by one row of 3 (rarely 2) cells, and then by several rows of 2, increasing.

Female.—Eighth segment not expanded; vulvar scale distinct, about one third as long as the ninth segment.

Allied to *Thermothemis*, *Hadrothemis*, &c. The presence of the vulvar scale in the female allies it to *Crocothemis*.

Apeleutherus Strachani, sp. n. (Pl. II. figs. 4, 4 a.)

Long. corp. 38-40 millim.; exp. al. 71-73 millim.; long. pter. 4 millim.

Head blackish, face more or less testaceous, especially the labrum and mentum. Thorax brown or blackish; a large oval spot on each shoulder, a longitudinal stripe on each side of the central carina in front, a transverse one behind, in front of the patagia, the inside of the patagia, 3 spots on the upper part of the pleura and others below, and some slighter marks on the interalary spaces pale yellow, or more rarely dull reddish; abdomen greyish brown above (rarely red in the male), but usually reddish below. In the female the base and sides are marked with irregular pale markings and with large pale irregularly-shaped spots, more or less distinct above, on each side of most of the segments, near the base. In the male these markings are usually obsolete. Legs testaceous, more or less blackish above, and with black spines.

Wings hyaline, with black nervures; pterostigma rather long and broad, blackish, rather paler in the middle and towards its lower edge. Membranule of hind wings whitish in the middle and bordered with brown: adjacent part of wing slightly stained with yellow in the reddest males; otherwise this is wholly wanting. Anal appendages yellowish or reddish.

Described from sixteen specimens (seven males and nine females) collected by Dr. Strachan at Lagos. Only one of the males has the abdomen red and the pale abdominal markings obliterated, but the markings of the thorax are of the usual pale yellowish colour seen in the other specimens.

Mr. Austen collected two males at Sierra Leone on Aug. 24 and Sept. 4; in both of these the abdomen is red, but in one the pale abdominal spots are indistinctly visible. In both the spots on the thorax are dull red, which is not the case in any of Dr. Strachan's specimens. There is also an unusually well-marked female, with only one cross-nervure in the triangles of the fore wings, from Abyssinia, which appears to belong to the present species.

Among other interesting species obtained by Dr. Strachan at Lagos is a male belonging to the genus *Dicranopyga*, Karsch, which is allied to the East-African *D. mundula*, Karsch. I believe that Dr. Karsch is correct in referring my *Æthrimanta rezia* from Madagascar to *Dicranopyga*, although the triangle of the fore wings is traversed by a triangle on the right side in the unique type. Dr. Strachan also obtained a single damaged specimen of a new species of *Nympheturia*, Karsch, which I defer describing for the present.

Orthetrum chryso stigma.

Libellula chryso stigma, Burm. Handb. Ent. ii. p. 857. n. 58 (1839).

Libellula barbara, De Selys, Lucas, Expl. Alg. iii. p. 117, pl. 1. figs. 2, 2 a, b (1849).

Orthetrum chryso stigma et *barbarum*, Kirb. Cat. Neur. Odon. p. 36. nn. 3, 4 (1890).

45 specimens, August and September (1899).

The most adult specimens are pulverulent blue in both sexes, and the least mature are of a light red; but there is no median thoracic band, as in *O. Julia*, and the cross-nervures in the lower costal space are nearly always yellow, instead of black like those in the upper space.

Orthetrum Julia, sp. n. (Pl. II. fig. 3.)

Long. corp. 39-43 millim.; exp. al. 60-74 millim.; long. pter. 3-4 millim.

Male.—Head with the vertex, the strongly bifid frontal tubercle, the occipital triangle, extremity of labrum, and a broad central band on the labrum black; hinder orbits yellow, with one or two brown transverse spots; frontal shield greenish, strongly punctured; the rest of the face (except for the black markings already described) yellowish. Prothorax yellow, with a brown transverse band, narrowed in the middle. Mesonotum yellow, with brown and blackish markings; the front transversely black, with a transverse yellow mark in the middle; a median dark central band, with two yellow lines near the centre and a dark shoulder-stripe, not reaching the hinder lappets, which are yellow, enclosed by black carinæ. Interalary spaces black, spotted with yellow in the middle, and with a yellow spot at the base of each wing. On the yellow pleura, below the shoulder-stripe, are five more black or brown bands on or between the sutures, the first double above. The metapectus is enclosed by almost a square of black carinæ, the hindermost detached, and slightly curved. Legs black; femora more or less testaceous. Abdomen black or pruinose blue, with all the carinæ black, the first three segments with yellow markings, separated by the carinæ and by dark hind borders, and a lateral stripe; the three following segments with a broad subbifid spot on each side in the middle, the rest black. On the under surface these pale lateral markings are more extended. Anal appendages yellow, upper ones slender, as long as the ninth segment, the extreme tips black; lower appendage truncated at the extremity, nearly as long as the upper ones, and with a black carina beneath on each side. Appendages of the second segment large. Wings hyaline, with black nervures; fore wings with 13–15 antenodal and 11–12 postnodal cross-nervures. Pterostigma black, with a yellow transverse central line. Membranule blackish, with a white spot at the base: hind wings smoky yellow at the extreme base, the sectors of the arculus subcontiguous at the base.

Female similar, with the lines on the pleura darker and broader. Abdomen with the testaceous spot on the under surface of the seventh segment expanded to the sides far enough to be visible above; eighth segment perfoliate. Anal appendages yellow, longer than the tenth segment, which is also yellow. Wings clouded hyaline, with black nervures; 14–17 antenodal and 11 postnodal cross-nervures.

Abdomen similar in both sexes, much inflated at base, slightly constricted behind the third segment; the rest of the segments rather broad; the fourth about three times as long as broad, widening at the extremity; the rest subparallel,

but successively shorter. Costal nervure black, with a barely perceptible trace of an intersecting yellow line at the base.

In the most adult males, which I was at first inclined to regard as a distinct species, the body is almost entirely pruinose blue, through which a row of long tawny spots may sometimes be seen extending as far as the eighth segment of the abdomen. There is usually a black mark in the middle of the labrum. The appendages of the second segment are apparently better defined, and the upper anal appendages are black, though the lower appendage generally remains tawny. The abdomen is apparently less inflated at the base, less constricted behind the third segment, and somewhat more slender. Yet I find it impossible to venture to separate these specimens specifically.

The species is described from four specimens from Sierra Leone, two of which were collected by Mr. Austen on Aug. 26 and Sept. 11 (1899).

Of the adult form nine males were collected by Mr. Austen between Aug. 26 and Sept. 15. There are also specimens of both forms in the Museum from Accra and Lagos.

This is a species of great interest. The semiadult form, which I have taken as typical, closely resembles *O. Sabina*, Drury, except in the shorter and broader abdomen. In fact, *O. Julia* stands in almost the same relation to *O. Sabina* in the Old World as that occupied by *Mesothemis attala*, De Selys, to *M. verbenata*, Hagen, in the New. I have not seen the true *O. Sabina* from Africa, though De Selys indicates a var. *africana* from the Camaroons (Ann. Soc. Ent. Belg. xxxi. p. 22, 1887). The insect is also very near *O. trinacria*, De Selys, and is, I imagine, regarded by some authors as this species, or as *O. brachiale*, Beauv. But I have not been able to determine *O. brachiale* and *O. africanum*, Beauv., satisfactorily. According to Prof. Calvert, who has examined the types, the former should have the base of the wings entirely unclouded, and *A. annulatum* is described as having the thorax uniform brown. As regards *O. trinacria*, it is a long-bodied insect much resembling *O. Sabina*.

Macromia Selysi, sp. n.

Long. corp. 67 millim.; exp. al. 88 millim.; long. pter. $2\frac{1}{2}$ millim.

Male.—Head: frontal tubercle bifid and, as well as the frontal lobes below, with strong green and violet reflections; face lighter or darker ferruginous brown, with orange mottlings.

Thorax and pleura shining metallic green; thorax and base of abdomen clothed with grey hairs. Pleural sutures and interalary spaces with slight pale markings; abdomen black, with narrow pale belts in the middle of the second, third, and fourth segments, and near the front of the second and sixth segments, the last the broadest.

Wings rather long, narrow, and pointed, clear hyaline, with black nervures. Fore wings with 15-16 antenodal and 9 postnodal cross-nervures; the nodal and subnodal nervures nearly straight and parallel for most of their length; triangles small, free, followed by a cell divided by a curved line running from the triangle, and then by several single or irregularly divided cells, followed by several rows of two, increasing. Only 3 supratrangular nervures; 5 cross-nervures in the lower basal cell. Pterostigma deep black; membranule dark brown, intersected by a pale line. Hind wings with 11 antenodal and 11-12 cross-nervures; 2 supratrangular nervures and cross-nervures, 4 in the lower basal cell; no lower triangle; upper triangle free, followed by a triangular cell, then by 3 single oblong ones, and then by two rows of cells, increasing. Membranule black, with a white speck at the base and tip; anal triangle divided low down, the lower part forming a long narrow isosceles triangle (in *M. Sophia*, De Selys, it is almost equilateral), and the nervure bounding the anal angle is more distinctly marked with red. Anal appendages nearly as in *M. Sophia*.

One male taken by Mr. Austen on Sept. 16 (1899).

This species is closely allied to *M. Sophia*, De Selys, but differs in the clear hyaline wings and many little details of neuration, especially by the commencing single row of post-triangular cells on all the wings.

Anaciæschna triangulifera.

Anaciæschna triangulifera, McLachlan, Ann. & Mag. Nat. Hist. (6) xvii. p. 407 (1896).

Sept. 9 (1899).

A single damaged specimen, which I refer to this East-African species (Delagoa Bay and Natal) with some uncertainty.

Sapho ciliata.

Agrion ciliata, Fabricius, Spec. Ins. i. p. 528. n. 3 (1781).

Sapho ciliata, Kirb. Cat. Neur. Odon. p. 100. n. 1 (1890).

34 specimens, Freetown, Sierra Leone, Sept. (1899).

A very interesting series. The immature specimens of

both sexes are of a clear iridescent hyaline, darkening to yellowish hyaline in the female, and in the male passing on through shades of brown to the deep purple, strongly suffused on the hind wings with coppery red, which characterizes the adult male. Fabricius's type was an adult female.

Libellago dispar.

Agrion dispar, Beauv. Ins. Afr. Amér. p. 85, Neur. pl. vii. fig. 2 (1805?).
Libellago dispar, Kirb. Cat. Neur. Odon. p. 112. n. 1 (1890).

Two specimens, Sept. 13 and 21 (1899).

EXPLANATION OF PLATE II.

- Fig. 1. Thermorthemis Austeni*, ♀, p. 72.
Fig. 1 a. Ditto, ♂, appendages of second segment.
Fig. 2. Trithemis Kalula, ♂, p. 69.
Fig. 2 a. Ditto, ♂, appendages of second segment.
Fig. 3. Orthetrum Julia, ♂, p. 75.
Fig. 4. Apeleutherus Strachani, ♀, p. 74.
Fig. 4 a. Ditto, ♂, appendages of second segment.

X.—Notes on the Forficularia.—V. *Descriptions of new Species and a new Genus.* By MALCOLM BURR, F.Z.S., F.E.S.

[Plate IV. figs. 3, 5, 7.]

Anechura ahrimanes, sp. n. (Pl. IV. fig. 5.)

Statura majore; colore nigro, rubro-variegato; elytra et alæ perfecte explicatæ; abdomen medio paullo dilatatum, ovale; forcipis brachia elongata, gracilia, subsinuata, intus fortiter bidentata. ♂. ♀ ignota.

Long. corporis.....	12-14.5 mm.
„ forcipis.....	9 „

Head deep red; eyes black; sutures indistinct; antennæ dark red (seven segments remain).

Pronotum black, broader than the head; anterior margin straight, posterior margin rounded; the sides parallel.

Elytra broad, finely punctulated, deep red, shaded with black towards the apex and the margins.

Wings prominent, black, with a large yellow spot near the base.

Feet deep red, the knees and tibiæ darker or black; tarsi darker.

Abdomen deep dark red, somewhat dilated in the middle, narrowed towards the extremity; lateral tubercles black, very distinct; the whole abdomen is finely punctulated; last segment transverse, hinder margin straight, a faint median depression, a reddish blunt elevation over the insertion of the forceps, and a small tubercle on the outside angles; penultimate ventral segment ample, rounded.

Pygidium strongly depressed, triangular; two small pale obtuse lobes are visible below the apex of the pygidium, projecting beyond the border of the produced penultimate segment, visible from below.

Forceps ♂ with the branches slender, long, remote at the base and tricarinate there, slightly diverging at first, then subsinuate until the apices meet and cross; there is at the end of the first and second third of the total length a strong triangular depressed tooth: the forceps are red at the base, darker towards the apex; the inner margin of the basal third is finely crenulated.

Patria. North India, Sikkim, 2 ♂.

Type in my collection.

This is a very handsome and distinct species. It appears to be most closely allied to *A. Hugeli*, Dohrn, from Luzon, but is coloured very differently.

STRONGYLOPSALIS *, gen. nov.

Corpus convexum: antennæ segmentis 1° et 3° longis, ceteris brevioribus, 4° et sequentibus conicis: pronotum quadratum: elytra perfecte explicata; alæ nullæ: abdomen medio modice dilatatum, apicem versus ♂ minus, ♀ maxime attenuatum; segmentis 2° et 3° dorsalibus tuberculis pliciformibus distinctis instructis: tarsorum segmentum secundum simplex, cylindricum: forcipis brachia ♂ basi remota, gracilia, basi recta, deinde valde incurva, asymmetrica; ♀ contigua, recta, apice decussata.

This genus stands nearest to *Carcinophora*, Scudd., from which it may be distinguished by the slender forceps, quite remote at the base, and not stout and subcontinuous as in that genus. It has the appearance of certain species of *Chelidura*, Latr., but is easily separated by the simple second tarsal segment. From *Anisolabis*, Fieb., it may be distinguished by the fully developed elytra and the presence of tubercles on the second and third abdominal segments.

* στρογγύλος, circle; ψαλις, forceps.

Strongylopsalis inca, sp. n.

Statura minore; colore fusco; antennæ ?-segmentatæ (segmenta 11 restant), segmento primo et tertio elongatis, secundo brevi, quarto et sequentibus brevibus, conicis; pronotum quadratum, quam caput tam latum, pallido-marginatum; elytra perfecte explicata, marginata, postice oblique truncata, metanotum liberantia; alæ nullæ; pedes fusco-testacei: abdomen convexum, medio modice dilatatum, apicem versus, ♂ modice, ♀ maxime attenuatum; segmentum ultimum dorsale ♂ magnum, medio sulcatum, utrinque tuberculatum, margine postico rectum; ♀ parvum, medio sulcatum, vix tuberculatum: pygidium ♂ quadratum, apice truncatum: forcipis brachia, ♂ basi valde remota, gracilia, inermia, basi ipso recta, dimidia parte apicali valde incurva, mucronibus haud attingentibus, brachio dextro intus, magis, brachio sinistro extus, minus incurvis; ♀ recta, contigua, apice decussata.

	♂.	♀.
Long. corporis	8.5-9.5 mm.	7 mm.
„ forcipis	2 „	1.75 „

Head reddish brown, the eyes small and black; the mouth-parts somewhat paler. The antennæ are darkish testaceous; eleven segments remain, these are all small and conical, except the first and third, which are long, and the second, which is very short and cylindrical.

Pronotum square, as broad as the head, testaceous, the margins lateral, slightly raised, and paler in colour.

Elytra fully developed, testaceous, the lateral margins slightly turned up and paler in colour; hinder margin obliquely truncated.

Wings absent.

Feet dark testaceous.

Abdomen dark blackish brown, the centre of the segments reddish; broadest in the middle, strongly attenuated at the apex in the ♀, less so in the ♂; tubercles of the second and third segment present, but not very distinct. Last segment ♂ transverse, with a central longitudinal furrow and a tubercle on each side thereof, the hinder border straight; in the ♀ the furrow is noticeable, but the tubercles scarcely so.

Forceps: in the ♂ the branches are remote at the base, slender, thicker at the basal part than in the apical part, reddish in colour, straight at first, then strongly arched inwards, the right branch being most strongly bowed and arched within the left; in the ♀ the branches are subcontiguous, straight, the apices crossing.

Patria. Peru, 2 ♂, 1 ♀, 2 nymphs.

Type in my collection.

This is a very curious species. At first glance it might be mistaken for *Chelidura*, but the simple second tarsal segment at once shows that it belongs to a different group of genera. It might be provisionally ranged in *Carcinophora*, but, owing to the very different form of the forceps, I have preferred to erect a new and very distinct genus.

Forficula orientalis, sp. n. (Pl. IV. fig. 7.)

Statura majore. *F. auricularia*, atque *F. lurida* vicina, a quibus differt forma forcipis. ♀ ignota.

♂ forcipis brachia basi valde deplanata et dilatata, hac parte marginè interno crenulato, tota inermia; dehinc valde divergentia, attenuata ad duas tertias partes longitudinis; tunc subito recurva, valde attenuata, apice fere attingentia.

Long. corporis	15 mm.
„ forcipis	4 „
„ „ max.	4·5 „

Head reddish; antennæ testaceous, 12-segmentate, the third segment small and round, the others elongate.

Pronotum dark brown, the lateral margins clear testaceous.

Elytra and *wings* fully developed, of the same form and colour as in *F. auricularia*.

Feet pale testaceous.

Abdomen dark reddish, the lateral tubercles very distinct; the segments finely granulated. The last segment is square, the posterior angles rectangular and depressed; the hinder border is straight, slightly tuberculated and broken; in the middle of the segment there are three faint depressions, arranged in a line horizontally; the abdomen is broadest about segments 5-6, and then slightly narrower towards the last segment. The penultimate ventral segment nearly covers the ultimate segment and is rounded. No pygidium visible.

Forceps: the branches are very strongly dilated in the basal third, where the sides are at first parallel; from the end of the dilated part the branches diverge and are narrowed; in the apical third they are strongly arched inwards and attenuated, the apices almost meeting; the space thus enclosed between the branches is a transverse oval; the branches are entirely unarmed, except that the inner margin of the basal third, the dilated part, is faintly crenulated. The colour of the forceps is black, except the centre of the dilated part, which is testaceous.

Patria. Constantinople (ex coll. Seeldrayers), 1 ♂ and 1 nymph.

Type in my collection.

This species, for which I am indebted to my friend M. Seel-drayers, of Brussels, in size and appearance resembles *F. auricularia* and *F. decipiens*. The unarmed and much more strongly dilated forceps distinguish it from *F. auricularia*; the presence of wings and the very strongly bowed forceps distinguish it from *F. decipiens*, to which perhaps it stands nearest; its larger size and strongly bowed forceps separate it from *F. lurida*. The general appearance of the forceps recalls that of *F. circinata*, Fin., but they are more strongly arched and the insect is larger.

Apterygida Mackinderi, sp. n. (Pl. IV. figs. 3, 3 a.)

Statura majore; elongata; oculis parvis, nigris; (antennæ desunt); pronotum capite paullo angustius, antice rectum, postice rotundatum; elytra et alæ perfecte explicatæ, illa latiora, apice truncata; hæ parum prominentes: pedes breves, femoribus incrassatis; tarsorum segmento secundo lobato: abdomen deplanatum, apicem versus paullo dilatatum; segmentis 2^o et 3^o utrinque tuberculo distincto instructis, primo parvo, secundo maximo; segmentum ultimum dorsale magnum, quadratum, utrinque supra insertionem forcipis tuberculatum; segmentum penultimum ventrale maximum, segmentum ultimum totum obtegens, angulis ipsis posticis exceptis, margine postico rotundato, medio late sed haud profunde emarginato.

Forcepis crura elongata, gracilia, basi valde remota, et triquetra, basi ipso paullo divergentia, tum sensim appropinquantia, apice decussata, margine interno basi dente parvo obtuso, denteque valido medio armata, margine interno usque ad dentem medianum crenulato; pygidium magnum, breve, latissimum, inerme, margine postico recto.

Colore fusco-testaceo, fusco-variegato. ♂. ♀ ignota.

Long. corporis 14·5 mm.
 „ forcipis 12·75 „

Colour generally dark brown, varied with darker; legs paler.

Head darker anteriorly than posteriorly; the eyes small and dark. (In the type, only the first segment of the left antennæ is left; this is long, cylindrical, and testaceous.)

Pronotum reddish testaceous, slightly narrower than the head, the front border straight, the hinder border rounded.

Elytra well developed, dark reddish testaceous, broader than the elytra at the shoulders, smooth, truncated at the apex.

Wings of the same colour as the elytra, smooth, not projecting far beyond the elytra.

Feet light testaceous, short, the femora rather strongly compressed.

Abdomen depressed, slightly dilated posteriorly. The segments, except the last, are all finely granulated, each segment being also slightly broader than the previous one; the tubercle on the second segment is very distinct, black, the tubercle on the third segment is considerably larger and black; these two segments are much darker than the remainder, and the part round the tubercles also is black; the last dorsal segment is very large, square, light testaceous, smooth and shining; at each angle on the posterior margin above the insertion of the forceps is a large round tubercle, slightly furrowed in the middle, giving the appearance of a double tubercle. The underside of the abdomen is much paler than the dorsal side and is entirely granulated. The penultimate segment is very large, only leaving the ultimate segment visible at the extreme posterior corners. The posterior margin of the last dorsal segment has an impression in the middle.

Forceps: these are very long and slender, almost as long as the body. At the base they slightly diverge at first, then gradually point inwards, to meet and cross at the apex. At the base they are triquetric and armed with a small conical tooth on the inner margin, just at the pygidium; there is a second, much stouter tooth halfway down on the inner margin; the part between these teeth is finely crenulated. The colour of the forceps is clear testaceous, on the underside they are flattened.

Pygidium short, rectangular, very broad, not toothed or emarginate, the hinder border straight and simple; the angles are sharp; in the middle on the upperside it is slightly bi-impressed.

Patria. British East Africa, Nairobi, 5500 feet; Kikuyu Country, July 1899 (*H. J. Mackinder & C. B. Hausburg*).

Type in Mus. Hope, Oxford.

In the form of the forceps, lengthening of the body, and largeness of the abdominal tubercles this species recalls certain species of *Forcipula*; but the lobed second tarsal segment definitely shows that it cannot be related to that genus.

I have great pleasure in dedicating it to Mr. H. S. Mackinder, the eminent geographer, who discovered it during the recent expedition to Mount Kenia.

For the drawings of this species I am indebted to my friend Mr. E. H. J. Schuster, F.Z.S.

Opisthocosmia oannes, sp. n.

Statura majore; colore nigro, elytris alisque rufescentibus; antennæ 13-segmentatæ, rufescentes; pronotum capite angustius, nigrum, pallide marginatum, rotundatum; pedes nigri, tarsis pallidioribus: abdomen nigrum, medio subdilatum; segmentum ultimum dorsale angustius, quadratum, margine postico subbituberculatum, angulis acutis: forcipis brachia ♂ basi remota, rotundata, recta, gracilia, apicem versus incurva, mucronibus decussatis, ante medium dente magno obtuso supra sursum spectanti armata, paullo ante apicem margine interno dente parvo acuto armata; pygidium haud prominulum. ♂.

Long. corporis 14 mm.
 ,, forcipis 6 ,,

Head black; antennæ 13-segmentate, the first segment black, the remainder reddish.

Pronotum slightly narrower than the head, the anterior border straight, the hinder border rounded, all angles rounded; black in the middle, the sides pale.

Elytra smooth, considerably broader than the pronotum at the shoulders, black, shaded with dark red.

Wings prominent, black, with a red spot in the middle.

Feet black, the tibiæ towards the apex and the tarsi paler.

Abdomen black, very slightly dilated about the middle, the lateral tubercles very distinct, the sides of segments 5-6 slightly produced backwards; last dorsal segment narrower, square, reddish, the hinder border straight, with two faint obtuse tubercles above the insertion of the forceps.

Pygidium not apparent.

Forceps ♂ with the branches remote at the base, straight, black, cylindrical, incurved at the apex and strongly decussating there; armed near the base above with a strong blunt conical tooth, pointing upwards, and a smaller acute tooth on the inner margin near the apex.

Patria. Assam (*Linden*, 1894, ex coll. Seeldrayers).

Type in my collection.

For this fine novelty I am indebted to my friend M. Seeldrayers.

It is not closely allied to any known species, but approaches rather to an as yet undescribed species brought from Siam by Mr. Annandale; it differs, however, very markedly in colour.

Ancistrogaster inopinata, sp. n.

Statura parva; colore nigro, abdomine æneo-nitenti, pedibus testaceis; antennæ 13-segmentatæ, fuscæ, apice pallescentes; pro-

notum capite paullo angustius, nigrum; elytra punctulata, nigro-castanea, nitentia, apice truncata; alæ parum prominentes, nigrae, apice macula parvula pallide ornatae: abdomen medio dilatatum, nigro-rufescens, tuberculis lateralibus distinctis, segmentis 4 ultimis lateribus paullo retrorsum productis ♂; segmentum ultimum dorsale apice angustatum, margine postico recto, subtuberculato, ♀ distincte tuberculato: pedes testacei, tibiis necnon infuscatis: forcipis brachia ♂ basi subcontigua, plus minus dilatata et deplanata, medio divergentia, tunc incurva, apice attingentibus, prope basin supra dente magno trigonali sursum spectanti armata, margine interno in parte media crenulata; ♂ recta, contigua, inermia, apice decussata. ♂ ♀.

	♂.	♀.
Long. corporis:	7.5 mm.	62.5 mm.
„ forcipis	2.75 „	2 „

Head black; antennæ 13-segmentate, fuscous, paler at the apex.

Fronotum slightly narrower than the head, black, indistinctly marginate with reddish; anterior border straight, with the angles rounded; posterior border rounded.

Elytra short, very finely punctulated, shining, very dark reddish castaneous, truncate at the apex.

Wings not very prominent, of the same colour as the elytra, with a very small indistinct pale spot on the inner margin at the apex of the suture.

Feet testaceous, pubescent, the tibiæ and tarsi somewhat darker.

Abdomen dilated in the middle, dark castaneous, shining, with a slightly metallic reddish sheen, the sides darker; lateral tubercles very distinct; in the ♂ the sides of segments 6–9 are slightly produced backwards, but this is not very distinct; last dorsal segment attenuated, the hinder margin nearly straight, broken with indistinct obtuse tubercles.

Pygidium not apparent.

Forceps: ♂ with the branches subcontiguous at the base and somewhat depressed and dilated there, then diverging, and attenuate and incurved towards the apex, where the points meet; near the base there is a very strong triangular sharp tooth pointing straight upwards; the middle third, where the dilated part is fading out, is crenulated on the inner margin; ♀ with the branches straight, simple, unarmed, the apices crossing; colour dark reddish black.

Patria. Costa Rica, ♂ ♀ (*Linden*, 1894, ex coll. Secl-drayers).

Type in my collection.

For this interesting species I am also indebted to my friend M. E. Seeldrayers, of Brussels.

It is a distinct species, coming next, perhaps, to *A. variegatus*, Dohrn. It has the appearance of an *Opisthocosmia*.

Ancistrigaster intermedia, sp. n.

Castanea; antennæ fusco-rubrescentes, segmentis elongatis, 2° parvo, duobus ultimis pallidis; pronotum antice rectum, postice rotundatum; elytra perfecte explicata, latiora, lævia; alæ perfecte explicatæ, valde prominentes: abdomen medio dilatatum, segmentis 2° et 3° valde tuberculatis, segmentis 4° et 5° obsolete, vix, vel haud tuberculatis; segmentum ultimum dorsale ♂ quadratum, rectangulum, inerme, supra insertionem forcipis subtuberculatum; ♀ angustum, attenuatum, declive, inerme: pedes graciles: forcipis brachia ♂ basi distantia, intus basi ipso dente conico armata, dehinc paullo divergentia, medio unidentata, apicem versus valde incurva, mucronibus decussatis; ♀ simplicia, recta, gracilia, inermia, apice mucronata. ♂ ♀.

	♂.	♀.
Long. corporis	8 mm.	8 mm.
„ forcipis	4 „	2.75 „

Head flattened, clear red; antennæ reddish, the last two segments paler, all elongate, except the second, which is short; eyes jet-black.

Pronotum about as broad as the head, straight on the fore border, rounded posteriorly, dark testaceous or dark red, the margins clear luteous.

Elytra ample, broad, smooth, shining, fusco-testaceous, the hinder border truncate.

Wings ample, projecting well beyond the elytra, fuscous, sometimes with a large pale spot in the middle at the base and a smaller one at the apex.

Feet long and slender, pale testaceous.

Abdomen dilated in the middle, fusco-testaceous or dark brown. Segments 2 and 3 with lateral tubercles dark or black, very distinct; in the male segments 4 and 5 have very faint, barely visible, obsolete tubercles. In the ♂ the last segment narrow, quadrate, rectangular, the hinder border straight, with a small tubercle above the base of each branch of the forceps; in the ♀ the last dorsal segment is narrowed, square at the hinder border, and unarmed.

Pygidium not visible.

Forceps: ♂ with the branches distant at the base, armed there on the inner margin with a strong conical tooth, flattened, slightly diverging, with a sharp tooth in the middle of

the inner margin; towards the apex the branches converge strongly, and are very strongly dilated immediately before the apex, where they are pointed and hooked; in the ♀ the branches are simple, straight, smooth, unarmed, and incurved slightly at the apex.

The feet, abdomen, and forceps are clothed with a pale short yellowish pubescence.

Patria. Peru, 1 ♂, 3 ♀ (ex coll. Staudinger).

Type in my collection.

This species stands nearest to *A. Championi*, Borm., from which it may be distinguished by the square ultimate dorsal segment, which has not the angles sharply produced as in *A. Championi*, by the abdominal tubercles being distinct only on segments 2-3, and not on segments 2-7, and by the forceps, which have the branches less strongly diverging, with fewer teeth.

Dormans Park, East Grinstead,
April, 1900.

EXPLANATION OF PLATE IV. FIGS. 3, 5, 7.

Fig. 3. *Apterygida Mackinderi*, sp. n. Somali. ♂.

Fig. 3 a. Ditto. Segmentum ultimum ventrale, from below.

Fig. 5. *Anechura ahrimanes*, sp. n. Sikkim. ♂.

Fig. 7. *Forficula orientalis*, sp. n. Constantinople. ♂. Last segment and forceps.

XI.—*Notes on the Forficularia.*—VI. *On a Collection of Forficularia from Sarawak.* By MALCOLM BURR, F.Z.S., F.E.S.

[Plate IV. figs. 1, 2, 4, 6.]

MR. R. SHELFORD, of Sarawak, has very kindly handed to me for determination a small collection of earwigs from that region. The collection includes twenty-five species, of which nine are new, and there are some very curious forms.

The localities from which they come are thus explained by Mr. Shelford:—

Kuching.—The capital of Sarawak.

Matang.—A mountain 7 miles from Kuching, 2800 feet.

Penrissen.—A mountain 50 miles from the sea, at the head of the left branch of the Sarawak River, reaching

an elevation of 4800 feet; the specimens were taken between the levels of 3300 feet and 4000 feet.

Pankalan Ampat.—At the foot of Penrissen.

Batu Song.—A mountain in the Baram district.

For the drawings I am indebted to Mr. H. C. Philips.

The collection works out as follows:—

1. *Apachys chartaceus*, de Haan.

Kuching, Feb. 2, 1899, 2 ♂; June 13th, 1899, 1 ♀; Dec. 12th, 1899, 1 ♂.

This species has been recorded by de Haan from Borneo and Sumatra and by Dubrony from Sarawak. According to de Haan, it lives under the bark of dead trees.

2. *Pygidicrana marmoricrura*, Serv.

Batu Song, 1 ♀ (*C. Hose, Esq.*). There are also two females in bad condition which I refer to this species, from Penrissen, Feb. 24th and May 1899.

The species is common in the East Indies.

3. ? *Pygidicrana modesta*, Borm.

Matang, August 1899. One fragmentary female, which I refer with some doubt to this species.

Recorded from Burmah.

4. *Echinosoma sumatranum*, de Haan.

Kuching, Sept. 13th, 1899, and Nov. 27th, 1899, 2 ♂; Sept. 25th, 1899, 1 ♂; Oct. 6th, 1899, 1 ♀.

De Haan remarks of this species, "Vivit sociatim in ligno putrido. Motus alacris."

5. *Psalis borneensis*, Kirb.

Kuching, Feb. 1899, Dec. 26th, 1899, 2 ♂; Dec. 15th, 1899, 1 ♀.

As Kirby suggests, this is probably a melanic form of *P. indica*, Hag.

6. *Spongiphora rubriceps*, sp. n.

Statura mediocri; caput rufum; antennæ 15-segmentatæ, fuscæ, nigro-annulatæ; pronotum postice rotundatum, nigrum, pallide marginatum; elytra alæque fuscæ; pedes testacei, fusco-variegati:

abdomen cylindricum, fuscum; segmentum ultimum magnum, quadratum, margine postico tuberculato: forcipis brachia ♂ basi remota, recta, apice incurva, mucronibus attingentibus, rubra, margine interno crenulata, haud dentata; ♀ recta, deplanata, minute crenulata.

	♂.	♀.
Long. corporis	11 mm.	10·25 mm.
„ forcipis	4 „	3·5 „

Head flattened, clear brick-red; eyes small, black: antennæ 15-segmentate; first segment long, testaceous, dark at the apex; the other segments are black, except segments 10–11, which are clear white; from the second, the segments are short, gradually lengthening.

Pronotum as broad as the head, chocolate-brown, the margins whitish or testaceous; the anterior border is slightly round-convex; the sides are parallel; the hinder border is rounded.

Elytra perfectly developed; chocolate-brown, dull, a little broader than the pronotum at the shoulders, hinder borders obliquely truncate, slightly sinuate.

Wings ample, projecting well beyond the elytra, of the same colour, with a pale spot at the apex on the inner margin (this spot is sometimes very faint).

Feet dark testaceous, varied with paler.

Abdomen slightly depressed, the sides parallel; rich brown in the centre, darker at the sides; abdominal tubercles distinct, black. Last dorsal segment of the ♂ simple, not sulcate, with a row of small tubercles on the hinder margin, which is straight. In the ♀ the last dorsal segment slightly narrower, with a faint sulculus near the hinder margin, the tubercles smaller and fewer in number. The penultimate ventral segment ♂ is ample, almost entirely covering the last segment, nearly rectangular, the hinder margin rounded.

Pygidium not visible.

Forceps: ♂ branches remote at the base and three-keeled there, then simple, nearly straight, gradually converging to meet at the apex; in the apical half on the inner margin there are three small teeth; the forceps are bent noticeably downwards from the base. ♀ branches simple, straight, remote at the base, more or less flattened, the apices meeting; the inner margin near the base is very slightly dilated and crenulate; otherwise the branches are unarmed.

Patria. Sarawak, Kuching, Dec. 3rd, 1898; July 15th, 1899, 2 ♂; March 1899, 2 ♀; Oct. 23rd, 1899, 1 ♀; July 14th, 1899, 1 nymph.

This species is most closely allied to *S. nitidipennis*, Borm.

7. *Spongiphora semiflava*, Borm.

Kuching, Jan. 2nd, 1900, 1 ♀; July 7th, 1899, 1 ♂.

This species, which closely resembles *Labia mucronata*, Stål, in appearance, has hitherto been recorded only from Burmah.

8. *Spongiphora sphinx*, sp. n.

Statura mediocri, gracili; colore testaceo vel fusco; antennæ 18-segmentatæ; caput, antennæ, pronotum, elytra, alæ, pedes testacea vel rubro-testacea; abdomen cylindricum, testaceum vel rubrum; forceps gracilis, brachiis basi remotis, rectis, apice mucronatis, attingentibus, margine interno minute denticulatis; abdomen tuberculis distinctis instructum. ♂ ♀.

	♂.	♀.
Long. corporis	11.5 mm.	10 mm.
„ forcipis	4 „	3.5 „

Head depressed, clear brick-red: antennæ 18-segmentate; the first segment long, testaceous, the remainder darker; second segment very small, the third nearly as long as the second and fourth united, the fourth, fifth, and sixth gradually lengthening, the apical segments long and slender.

Pronotum slightly narrower than the head, long and narrow, slightly broader posteriorly than anteriorly, rectangular, the hinder angles rounded, posterior border nearly straight; clear testaceous, reddish anteriorly, the margins paler; in the ♀ shaded with fuscous on the disk posteriorly.

Elytra long and narrow, clear testaceous, the outer and inner margins darker.

Wings conspicuous, clear testaceous.

Feet clear testaceous, clothed with a few fine pale hairs.

Abdomen cylindrical, reddish testaceous in the ♂, reddish black in the ♀; lateral tubercles very distinct, all the segments very finely granulated; last dorsal segment ♂ square, hinder margin straight, slightly tuberculated above the insertion of the forceps on each side; similar in form in the ♀; penultimate ventral segment ♂ large, rounded posteriorly, not covering the apical part of the last segment, which has the posterior border straight, very deeply emarginate in the middle, divided into two rounded lobes, the outer angles folded, forming a bicarinate tubercle on each side. In the ♀ the penultimate ventral segment is rounded, larger, covering the ultimate segment entirely except for the outer angles.

Pygidium ♂ ♀ quadrate, the side slightly emarginate near the apex.

Forceps: ♂ with the branches remote at the base, slender, almost straight, slightly depressed, the apices meeting, and strongly mucronate; at two thirds their length on the inner margin there is a small tooth; from the base to this tooth the inner margin is very finely denticulated. In the ♀ the branches are straight, remote at the base, less depressed, the apices meeting, the inner margin finely denticulated to about two thirds the length, where there is an obsolete tooth barely distinguishable. The forceps are clear red in the male, reddish black in the female.

Patria. Sarawak, Kuching, August 1897 ("L."), 1 ♂; Oct. 12th, 1899, 1 ♀.

This curious species is very close to *Labidura? decipiens*, Kirb., which must almost certainly be moved, at least provisionally, to this genus. It differs in the form and armature of the forceps. It has the appearance of certain species of *Apterygida*, as *A. erythrocephala*, Oliv., *A. suturalis*, Serv., and *A. bipartita*, Kirb. It may be easily mistaken for the latter at first glance; but an examination of the second tarsal segment shows that it is simple and cylindrical; the distinct lateral tubercles prevent its being placed in *Labidura*. The form of the penultimate ventral segment of the male distinguishes it from typical *Spongiphora*, and, as Mr. W. F. Kirby suggests, a new genus must be erected for his *Labidura? decipiens* and for this species when better known.

9. *Spongiphora nitidipennis*, Borm.

Kuching, July 1899, 1 ♀.

Hitherto recorded from Burmah and Sumatra.

10. *Sparatta setulosa*, sp. n.

Colore sordide testaceo; pronotum valde elongatum, parallelum; pygidium haud perspicuum; forcipis brachia ♂ basi remota, basi ipso intus laminata, dehinc recta, sensim incurva, tertia parte apicali dente inermo armata, mucronibus attingentibus, valde pubescentia. ♂.

	♂.
Long. corporis.....	11 mm.
„ forcipis	3.5 „

Head dirty yellow; eyes small, black; antennæ with 13 segments remaining, fuscous, the segments elongated and slender, numbers 2-4 enlarged at the apex.

Pronotum twice as long as the head, very narrow, the sides

parallel, anterior border produced to a neck, posterior border rounded, tawny yellow.

Elytra narrow, obliquely truncated posteriorly.

Wings prominent, black, the dark colour showing through the clear elytra.

Feet tawny.

Abdomen slightly broader at the apex than at the base; tawny, slightly darker in the middle; all the segments very finely punctulated except the last, which is smooth, large, and quadrate, the posterior margin straight, with a row of small tubercles.

Pygidium barely visible, quadrate.

Forceps slender, remote at the base; on the inner margin at the base itself there is a strong depressed laminated tooth; the branches are then very faintly curved outwards, then gradually inwards, the apices meeting; near the apex on the inner margin is a strong but small oblique tooth; the forceps are dirty yellow at the base, darker towards the apex, clothed with long fine bristles.

The feet and abdomen are also clothed with a few fine long bristles.

♀ unknown.

Patria. Sarawak, Matang, August 1899, 1 ♂.

This species is not closely allied to any described form except *S. Horsfieldi*, Kirb., from which, however, it is very distinct.

11. *Sparatta Brunneri*, Borm.?

Penrissen, May 1899, 2 ♀.

I refer two females with some doubt to this North-Australian species.

12. *Chatospania parvula*, sp. n.

Statura minore; colore nigro, rubro-variegato; caput, pronotum, et elytra nigra; alæ deficientes; abdomen segmentis 1^o-7^m nigris, ceteris rubris; forcipis brachia ♂ basi distantia, valida, basi dente gracili instructa, margine interno denticulata, incurva, mucronibus decussatis. ♂. ♀ ignota.

Long. corporis 5 mm.
 ,, forcipis 1.25 ,,

Head and eyes jet shining black; antennæ with only one or two segments remaining, paler.

Pronotum jet-black, as broad as the head, slightly broader posteriorly than anteriorly, the angles rounded; anterior border rounded, posterior border straight.

Elytra black, rounded at the apex.

Wings absent.

Feet clear testaceous.

Abdomen slightly broadest in the middle, shining black, except segments 8-9, which are red, and the last segment, which is red, quadrate, slightly narrower posteriorly than anteriorly; the hinder border straight, smooth, black.

Pygidium not visible.

Forceps ♂ with the branches stout, three-keeled at the base, straight, then gradually incurved towards the apex, where the points decussate; at the base itself, on the inner margin there is a fine oblique tooth, and the inner margin is denticulated for the first two thirds of the length; the forceps are black near the base, red at the apex.

The abdomen is clothed with a few fine pale hairs.

Patria. Sarawak, Kuching, Dec. 15th, 1898, 1 ♂.

This species is nearest to *Ch. fœæ*, Borm., from which it differs entirely in the shape of the forceps.

13. *Chaetospasia Jupiter*, sp. n.

Statura majore; colore fusco-testaceo; antennæ 15-segmentatæ, segmento 2^o parvo, ceteris elongatis, cylindricis; pronotum quadratum, marginibus anteriori et posteriori rotundatis, lateribus parallelis, angulis posticis rotundatis; elytra setulosa, apice truncata; alæ setulosæ; abdomen paullo dilatatum, tuberculis vix prominulis, segmento ultimo margine postico recto, integro: pygidium elongatum, apice attenuatum, emarginatum; ♀ brevius: forcipis brachia ♂ elongata, basi distantia, triquetra, depressa, basi ipso dente valido armata, carina superiori margine interno ante medium dentata, carina inferiori in parte apicali bidentata, dehinc crenulata, mucronibus attingentibus, decussatis; brachia ♀ illis maris similia, rectiora, apice fortius decussata. ♂ ♀.

	♂.	♀.
Long. corporis	12 mm.	10-10·75 mm.
„ forcipis	6-6·5 „	5·25-6 „

Head reddish fuscous, sutures well marked; eyes not prominent; antennæ fuscous, with 15 segments, the second small, the remainder long.

Pronotum longer than broad, reddish fuscous, as broad as the head, hinder border and anterior border rounded, the angles rounded, the sides parallel; posterior part of the disk clothed with fine yellow hairs, directed backwards.

Elytra fuscous, truncated at the apex, pubescent like the pronotum.

Wings prominent, coloured and pubescent like the elytra, the margins very narrowly paler.

Feet dark testaceous, pubescent.

Abdomen reddish brown, very finely granulated, very faintly broader towards the apex; lateral tubercles barely, if at all, distinct. Last segment smooth, deep red; hinder border unarmed, straight in the ♂, sinuate in the ♀. Penultimate ventral segment large, rounded, almost entirely covering the ultimate segment.

Pygidium prominent, attenuated towards the apex, conical, emarginate at the apex in the ♂, in the ♀ shorter and thicker or barely distinguishable.

Forceps: the branches are remote at the base, tricarinate, with a strong triangular depressed tooth on the inner margin at the base itself in both sexes; upper keel on the inner margin before the middle with a strong tooth (♂ ♀); lower margin with two teeth in the apical half, and then denticulated (♂ ♀); the whole of the inner margin, lower keel, is more or less denticulated in both sexes, this armature varying in individuals. The branches ♂ are nearly straight, very gradually incurved, with the points meeting and barely decussating at the apex; in the ♀ the branches are less curved, straighter, but pointing more inwards, meet sooner, and decussate more strongly at the apex; in both sexes they are clothed with fine pale hairs; they are testaceous in the ♂, darker at the apex, much darker throughout their length in the ♀.

The ♀ is smaller and generally darker in colour than the ♂.

Patria. Sarawak, Penrissen, May 1899, 2 ♂, 2 ♀.

This is the largest species of the genus. It stands nearest to *Ch. inornata*, Karsch, from Madagascar, but is larger, and the forceps are different.

14. *Chelisoches Ritsemæ*, Borm.

Kuching, Sept. 13th, 1899, 1 ♂; Dec. 15th 1898, 4 ♂, 1 ♀.

This species has been taken in Sumatra and in Burmah.

15. *Chelisoches Doricæ*, Borm.

Kuching, Oct. 28th, 1898, 1 ♂; Dec. 29th, 1898, 4 ♂; May 20th, 1899, 1 ♂; Dec. 1898, 2 ♀; August 11th, 1899, 1 ♀.

This splendid species has been recorded from Sumatra and Sarawak, where it does not appear to be rare.

Mr. Shelford's specimens from Sarawak all have the branches of the forceps ♂ strongly toothed and crenulate near the base, and then smooth and unarmed almost to the apex, just short of which on the inner margin is a strong tooth. The specimens vary considerably in size, from 15–23 millim. in length of body, excluding the forceps, which are of a more uniform length.

16. *Chelisoche pulchripennis*, Borm.

Kuching, Oct. 17, 1898, 3 ♂; Oct. 28th, 1898, 2 ♂; Oct. 17–18, 1898, 2 ♀.

Recorded from Burmah and "Indes orientales."

17. *Chelisoche Shelfordi*, sp. n. (Pl. IV. fig. 4.)

Statura maxima. Habitus generis *Opisthocosmia*. Fusco-castanea, metallescens; pronotum ovale, capite paullo angustius; elytra granulata, latiora, apice truncata; alæ granulatae: abdomen cylindricum, tuberculis pliciformibus distinctis; segmentum ultimum transversum: forcipis brachia basi remota, recta, elongata, sinuata, margine interno utrinque dentibus duobus validis armata, apice mucronata, attingentia. ♂. ♀ ignota

Long. corporis 15.5 mm.
 ,, forcipis 11 ,,

Head and eyes reddish castaneous; antennæ with 18 segments, fuscous, the last four dirty white.

Pronotum slightly narrower than the head, oval, all the margins rounded.

Elytra ample, broad reddish castaneous, with a metallic sheen, finely granulated, truncated at the apex.

Wings of the same colour as the elytra, granulated.

Feet fuscous, the tarsi and apices of the tibiæ dirty testaceous; the lobe of the second tarsal segment very conspicuous.

Abdomen cylindrical, reddish castaneous, granulated; the last segment is transverse, slightly narrower than the preceding, with a row of tubercles on the hinder border. Penultimate ventral segment large, rounded, entirely covering the ultimate segment.

Forceps ♂ with the branches widely remote and tricarinate at the base, curved at first slightly outwards, the inner keels on this part denticulated; the branches are then nearly straight, subsinuate, each faint sinuation marked on the inner margin with a long oblique sharp tooth; these teeth are two in number on each side; after the second tooth the branches curve in, the apices hooked and meeting. Seen

from the side, the forceps are sinuate, curving slightly upwards.

The legs and forceps are covered with a thick yellowish pubescence.

Patria. Sarawak, Pankalan Ampat, May 1899, 1 ♂.

I have very great pleasure in dedicating this very fine species to Mr. Shelford, to whom I am indebted for the opportunity to work out this interesting collection.

It is a very distinct species and not closely allied to any known form. It comes closest perhaps to *Ch. superbus*. It has somewhat the appearance of a large *Anechura*, but the lobe of the second tarsal segment is very distinct.

18. *Chelisochea Hercules*, sp. n. (Pl. IV. figs. 2, 2 a.)

Statura robusta; colore nigro, elytris alisque cæruleis, metallescentibus; pronotum ovatum, cum elytris alisque granulatum: abdomen cylindricum, nitidum, nigrum, testaceo-pubescentibus, tuberculis lateralibus distinctis; segmentum ultimum dorsale magnum, margine postico utrinque tuberculo obtuso magno, apice truncato, valido obliquo armatum: forcipis brachia ♂ valida, basi depressa et deplanata, hac parte margine interno valde denticulata, dehinc valde semicirculariter incurva, intus denticulata, apice haud attingentia; forceps et pedes valde pubescentes. ♂. ♀ ignota.

Long. corporis	15·5–20 mm.
„ forcipis	4·5 „
Latit. max. forcipis ..	5 „

Head and eyes black; antennæ with 15 segments, typical, black, the eleventh whitish; sometimes the apical half of the antennæ dirty whitish.

Pronotum as broad as the head or very slightly narrower, round, black, granulated; with a very faint median carinula, on each side of which anteriorly there is a round elevation, with a slight depression in the middle; the margins are turned slightly upwards.

Elytra considerably broader than the pronotum at the shoulders, granulated, deep blue, with a metallic sheen; they are truncated at the apex.

Wings of the same colour as the elytra, granulated, very narrowly edged with pale. The elytra and wings are clothed with a short thick pubescence.

Feet stout, fuscous, the tibiæ clothed with a thick testaceous pubescence, the tarsi with a reddish pubescence.

Abdomen cylindrical, finely punctulated, shining black, the lateral tubercles very distinct and prominent; the last dorsal

segment is ample, the hinder border rounded; at the hinder border in the middle there are two very stout, long, elevated tubercles, pointing upwards and obliquely outwards, truncated at the apex. Penultimate ventral segment large, rounded, covering the ultimate segment except at the corners.

Pygidium visible from beneath, short, conical, emarginate at the apex.

Forceps with the branches ♂ short, stout, strongly depressed and dilated at the base, the inner margin of this dilated part is strongly toothed; at half their length the branches are cylindrical and curved inwards in a semicircle, the apices are pointed but do not meet; the inner margin of this curved part is denticulated.

The whole of the abdomen, tubercles, and forceps are thickly coated with a short dense testaceous pubescence.

Patria. Sarawak, Kuching, Dec. 19th, 1899, 1 ♂; Pankalan Ampat, May 1899, 1 ♂.

This remarkable earwig is very distinct from any form familiar to me. The male from Pankalan Ampat presents a curious form of aberration. The right branch of the forceps is scarcely developed, very short, almost straight, bent slightly downwards and inwards, with no sign of teeth or serrulation; the left branch is not fully developed, the denticulation of the curved part being wanting. This arrest of development is well known to occur in Forficularia, and is often called hermaphroditism or gynandromorphism; but it is extremely doubtful whether this is ever really the case. In the specimens which I have examined the normal number of segments of the male—that is, nine—are visible; in the female only seven segments of the abdomen are visible. I have in my collection two specimens of *Chelisothes morio*, Fabr., in which the left branch is that of the male in the form and the right is that of the female, and these I have recorded elsewhere* as hermaphrodites; but it is more probable that the phenomenon is due to arrested development, owing to want of nourishment or some accident. I have a male of *Pygidicrana marmoricrura* in which both branches of the forceps are abnormal, being nearly straight and unusually pubescent; this is certainly an aberration, and not a regular dimorphic form. The specimen of *Ch. Hercules* in which the right branch is malformed is noticeably smaller than the other fully developed male, and it may well be due to defective nourishment.

* Ent. Month. Mag. 1897, p. 147.

19. *Anechura coriacea*, Borm.

Penrissen, May 1899, 1 ♂, 1 ♀; Matang, Dec. 1898,
1 ♂.
Recorded from Burmah.

20. *Anechura scabriuscula*, Serv.

Matang, Dec. 1898, 1 ♂.
Common in the Oriental Region.

21. *Anechura Hermes*, sp. n. (Pl. IV. figs. 1, 1 a.)

Colore atro; pronotum antice rectum, postice rotundatum; elytra pronoto latiora, pubescentia; alæ prominentes: abdomen convexum, medio valde dilatatum, apice attenuatum; segmentum ultimum dorsale angustum, margine postico medio bicarinatum: forcipis brachia ♂ valida, triquetra, basi subcontigua, dehinc valde divergentia, subito fortiter incurva, mucronibus haud attingentibus, prope basin supra dente maximo obtuso perpendiculari armata. ♂. ♀ ignota.

Long. corporis	11.5 mm.
„ forcipis	4 „
Latit. max. forcipis	4 „
Altitudo max. forcipis (tuberculo basali incluso)	2 „

Head jet-black; antennæ ?-segmentate (eleven segments remain, all black, except the eleventh, which is whitish), second segment small, the rest longer, conical.

Pronotum very slightly narrower than the head, straight in front, rounded behind, all black.

Elytra jet-black, very finely punctulated, truncated at the apex.

Wings the same colour as the elytra.

Feet black, with a few fine short bristles.

Abdomen dark reddish brown, strongly dilated in the middle, attenuated towards the apex; lateral tubercles very distinct; edges of the fifth to seventh segments slightly produced; last dorsal segment narrow and small, hinder border straight, with a small tubercle on each side above the insertion of the forceps, produced backwards into a faint carina; penultimate ventral segment large, rounded.

Pygidium not visible.

Forceps with the branches ♂ short, stout, almost contiguous at the base, cylindrical, not keeled, strongly diverging at first, then the points suddenly and sharply turned inwards

at a right angle, then obtuse, not meeting; near the base on the upperside on each branch there is a long and strong conical obtuse tooth, pointing upwards and obliquely outwards backwards; forceps all black, entirely unarmed except for these large tubercular teeth.

Patria. Sarawak, Penrissen, May 1899, 2 ♂.

This curious form recalls *Ancistrogaster* in the form of the abdomen, but the antennæ are different. It is very distinct from any known form of *Anechura*, and in appearance resembles certain species of *Chelisoches*, except for the dilated abdomen, which is oval in shape.

22. *Apterygida borneensis*, Dubr.

Kuching, Dec. 14th, 1898, Dec. 19th, 1899, July 14th, 1899, 3 ♂; May 1897, 1 ♀.

This species is represented by a variety in which the pronotum has no pale border, the head is reddish. The antennæ have 21 segments, of which the tenth to twelfth and the last two are pale whitish.

23. *Forficula? ares*, sp. n. (Pl. IV. fig. 6.)

Niger; pronotum quadratum, postice rotundatum; elytra latiora, minutissime punctulata; alæ nigrae, apice margine interno minute testaceo-maculatae; pedes nigri: abdomen apicem versus paullo dilatatum, apice attenuatum, tuberculis lateralibus distinctis; segmentum ultimum dorsale attenuatum, medio profunde rotundato-impressum; segmentum penultimum ventrale magnum, rotundatum; pygidium haud perspicuum: forcipis brachia gracilia, basi plus minus dilatata et deplanata, hac parte denticulata dehinc inermia, rotundato-incurva, apice mucronibus attingentibus, haud decussatis. ♂. ♀ ignota.

Long. corporis 10·75 mm.

„ forcipis 4·5 „

Head jet-black; antennæ with nine segments remaining, of which the second is very small, the remainder gradually lengthening, conical.

Pronotum black, as broad as the head, straight in front, the posterior margin rounded.

Elytra short, broad, truncated at the apex, black, very finely punctulated.

Wings of the same colour as the elytra.

Feet black, with a thin pubescence.

Abdomen black; lateral tubercles very distinct; broadest

near the apex, but attenuated at the apex itself; last dorsal segment very small, with a very distinct deep round depression in the middle. Penultimate ventral segment large and rounded, completely covering the ultimate ventral segment.

Pygidium not visible.

Forceps ♂ with the branches slender, more or less dilated and depressed at the base, this dilated part crenulated on the inner margin, ending with a small, conical, nearly obsolete tooth; beyond this tooth the branches are very slender, curved outwards and then inwards, enclosing a circular space, the apices almost meeting but not decussating; beyond the obsolete tooth the branches are quite smooth and unarmed.

Patria. Sarawak, Penrissen, May 1899.

This species recalls in appearance *Chelisoches? picticornis*, Kirb., but it is not so long and is more thick-set. It appears to be allied to the little-known *Forficula lobophoroides* of Dohrn, of which *C. picticornis* may be the male, which is not definitely known. *F. ares* is allied to *Anechura hermes* and may have to be moved to that genus. Its uniform black colour and the form of the forceps distinguish it.

24. *Opisthocosmia centurio*, Dohrn.

Kuching, Dec. 10-14, 1898.

Previously recorded from Borneo.

25. *Opisthocosmia lugens*, Borm.

Penrissen, May 1899, 2 ♂, 4 ♀.

Previously recorded from Burmah.

Dormans Park, East Grinstead,
April 1900.

EXPLANATION OF PLATE IV. FIGS. 1, 2, 4 6.

Fig. 1. Anechura Hermes, sp. n. ♂. Forceps.

Fig. 1 a. Ditto. From the side.

Fig. 2. Chelisoches Hercules, sp. n. ♂. Forceps.

Fig. 2 a. Ditto. From the side.

Fig. 4. Chelisoches Shelfordi, sp. n. ♂. Forceps.

Fig. 6. Forficula? ares, sp. n. ♂. Forceps.

XII.—*The Lower Palæozoic Crinoids of Bohemia.*

By F. A. BATHER, M.A., F.G.S.

THE latest volume of 'The Silurian System of Bohemia' * is welcome indeed to students of Palæozoic geology and palæontology, and more than welcome to the worker on Crinoids. The account of the rich and varied Cystid fauna, published 13 years ago, had given us hope that the unwearied efforts of Barrande might have garnered up a fairly rich harvest of Crinoids, while the known differences between this province and that of North-west Europe led us to expect considerable novelty. The eminence and experience of the senior author and the intelligent zeal of his collaborator were further warrant for pleasurable anticipation. We knew that no pains were being spared in looking up the literature, while some valuable papers by Dr. Jahn indicated that the statements of horizon and locality were being placed on a sure basis. If, after all, disappointment be our dole, this is due to many causes, for most of which the authors are in no way responsible. In the first place, the material is neither rich nor well preserved: the many-plated calyces are often crushed and their plates disarranged; they are covered to a deplorable extent by "an extremely hard, irremovable limestone matrix"; several specimens that might have been interesting are represented by mere ochreous powder. Then the vast majority of forms come from one stratum alone, namely reef-like bands of limestone that form a transition between the beds e1 and e2 (about equivalent to our Woolhope Limestone): the first fauna (Cambrian) furnishes no crinoid remains; the second fauna (Ordovician) includes a few indeterminable columns chiefly from d4 and d5, and two species of a new genus, *Caleidocrinus*, from d4 (about equal to Middle Bala); the third fauna (Silurian s. str.) yields a very few stem-fragments from e1, rather more from e2, along with recognizable specimens of *Scyphocrinus* and of the new genera *Bohemicocrinus*, *Carolicrinus*, and *Laubeocrinus*, all which, except the last, occur more abundantly in the underlying transition beds; f1 contains a few doubtful remains, and f2 yields *Beyrichocrinus humilis*, gen. et sp. nov., as well as a

* 'Système Silurien du centre de la Bohême,' par Joachim Barrande, 1ère partie: Recherches Paléontologiques. Continuation éditée par le Musée Bohême. Vol. vii. Classe des Echinodermes. 2^e partie: Famille des Crinoïdes. Par le Prof. Dr. W. Waagen et le Dr. J. Jahn. Traduit par A. S. Oudin. vi and 216 pp., 40 pls. numbered xl-lxxix. Prague (Dec. 1899).

doubtful *Ichthyocrinus* and a few undetermined fragments; G and H are barren of crinoids, except for rare fragments in g 1, g 2, and h 1. From this it is clear that the crinoids of Bohemia could not be made by anyone to throw much light on the general evolution of crinoids or on the succession of faunas in the Bohemian basin.

The next obstacle with which the authors have had to contend is "piété pour la mémoire de Barrande." This praiseworthy sentiment has caused them to follow with marvellous success the monumental style of the great 'Système Silurien,' and the arrangement which necessitates numerous chapters after the model of the notorious one on Snakes in Iceland. It is no doubt the same piety that has induced them to publish 25 plates by a pitiable person called Langhans. Concerning these plates the authors themselves write: "most of the drawings are more or less defective . . . many are so ill executed that they give not the faintest idea of the original; &c. &c." Worse than this, the majority of the specimens misrepresented on these plates are themselves obscure fragments, to which Barrande, doubtless for his own convenience, had casually attached manuscript names "au point de vue scientifique . . . nullement justifiés." And yet "respect for his memory" is supposed to be shown by the retention and publication of all these provisional names. It is useless for the authors to say, as they do on p. 139: "nous déclinons toute responsabilité sur la question de leur admissibilité." Here, unfortunately, are the names, and they have to be reckoned with. As our knowledge of the Bohemian crinoids increases, what dissensions will there not be among systematists as to the value of these names! What hideous confusion, wrangling, and waste of time! For all of it those who have published the names will be responsible.

In this article the drawings by Langhans will be ignored; difficulties enough will confront us in reconciling the artistic representations by Swoboda with the outlines thoughtfully annexed on the thin covering-papers and with the diagrams in the text. For example, the first question that arises is as to the position of the small basal in *Beyrichocrinus*. Plate 59, fig. 4 shows no basal smaller than the two others; the covering outline places it in the left posterior interradius; the diagram on p. 12 (our Fig. 1) shows it in the left anterior interradius; fig. 1, on p. 13, has it in a position that is different but not more precisely determinable. A point of equal importance, especially considering the authors' doubt as to the monocyclic nature of this same base, is the orientation of the lobes of the axial canal as seen in the base of the cup.

The lobation is doubtless peculiar, but in every figure it is represented differently, so that one can only enquire whether the lobes are radial or interrarial: they are clearly radial in one drawing, clearly interrarial in another, and not clearly anything in the rest. The text throws no light on the matter, unless the following sentences may suggest a solution of the riddle: "Ce genre n'est représenté que par un fragment de la couronne" (p. 12); "sous cette dénomination, nous comprenons le calice et les bras, abstraction faite de la tige" (p. 3); "la base est . . . presque entièrement cachée par la tige" (p. 13); "les exemplaires [note plural!] du genre *Beyrichocrinus* étaient munis d'une tige" (p. 15). But the apparent contradiction is probably due to an ambiguity introduced by the translator—another obstacle in the path of the authors. Whether due to the imperfection of the specimens or the carelessness of the artists, such discrepancies are only too numerous.

The Crinoidea of the Lower Palæozoic rocks of Bohemia, as presented in this volume, may be divided into three classes: (i.) *Incertæ sedis*; (ii.) *Scyphocrinus* species and varieties; (iii.) eight new species, distributed among seven new genera. If this statement can be substantiated, then the authors are to be congratulated on having at least fulfilled our dream of novelty. But their caution and candour are so manifest that they will be the first to admit the rather unsatisfactory foundations for some of these genera. Let us examine them in order, the order being first by geological periods and then alphabetical—a final Barrandean touch. The absence of a strict systematic arrangement and the doubt that surrounds many of the genera have prevented our authors from drawing up diagnoses. In attempting to abstract the salient features, I hope to be pardoned if I use the terminology elsewhere employed by me*.

* The old-fashioned terminology retained by Messrs. Waagen and Jahn for the arm-structures obscures their homologies in Camerate Crinoids. The term *pièces brachiales* is due to L. de Koninck, who applied it solely to the fixed arm-ossicles, while he called the free arm-ossicles *articles brachiaux*. Since the present authors restrict the term *brachialia* to the free ossicles, they should not translate it by *pièces brachiales* (p. 5). A similar error as to *articles brachiaux* occurs on p. 17 of Wachsmuth and Springer's "Crinoidea Camerata." The term *route* (vault) connotes a structure now admitted by all to be imaginary; while the terms *trompe* (proboscis) and *canal nourricier* (alimentary canal) are equally misleading. The well-known term *cirri*, though introduced on p. 9, is replaced in practice by the term *willes* (tendrils), which is no gain. Again, the term *calyx* is defined on p. 3 in the sense in which it has been used by Wachsmuth and Springer and others: "the employment of the word *calyx* to designate that part which is only the dorsal

Beyrichocrinus humilis, the sole species of the genus, comes from the limestone f 2 of Koněprus*. Only the cup is preserved (Fig. 1). It consists of the following primary

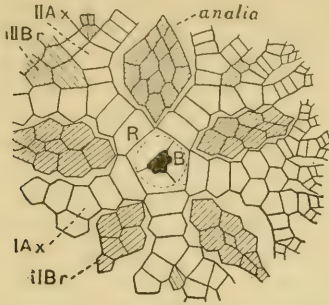


Fig. 1.—Analysis of the cup of *Beyrichocrinus humilis*, outlines copied from Waagen and Jahn, and about twice nat. size. Interbrachials (iIBr) and anals are shaded from right to left; intersecundibrachs (iIIBr) from left to right; intertextibrachs vertically.

elements: 3 basals, 2 large and 1 small; 5 radials, which appear to abut laterally by short sides, except in the posterior interradius; 2 fixed primibrachs in each ray, the first being hexagonal except in the right and left posterior rays; 2 fixed secundibrachs in each half-ray; 2–4 fixed tertibrachs, of which the last is axillary and bore the free quartibrachs. The secondary elements of the cup are: 5–10 interbrachials arranged in 4–6 horizontal zones, the proximal interbrachial resting on the steep shoulders of two adjacent radials and coming very near to the basals; in the wider anal interradius are about 14 interbrachials (anals), of which the

cup is an abuse." It is therefore perplexing to find the authors persistently using the term in the sense they here deny to it. The fact is that the word *calyx* has so often been used for the dorsal cup, that our attempts to define it otherwise seem bound to fail. The adoption of the term *theca*, as used by Haeckel, for the whole case or test containing the central organs of the animal, seems the most rational escape from the difficulty.

The symbols and terminology of the present paper differ but slightly from those explained in the *Ann. & Mag. Nat. Hist.* ser. 6, vol. ix. p. 57, Jan. 1892. The nomenclature and classification follow Part III., *The Echinoderma*, of 'A Treatise on Zoology,' edited by E. Ray Lankester: London, 1900.

* Oddly enough, the authors have adopted for the Bohemian names a spelling different from that hitherto employed in the 'Système Silurien.' Their reasons, though not given, are probably good enough to warrant me following them in this article.

proximal rests, though by a very short side, on the base, while it supports 3 plates above; the intersecundibrachs are at least 2, but are small and obscure; the existence of intertertibrachis is doubtful. The authors profess not to know whether the base was monocyclic or dicyclic. But, since no camerate crinoid has yet been described in which infrabasals are associated with fused basals, we are justified in placing *Beyrichocrinus* among Monocyclica Camerata. Therein it falls apparently into the Suborder Batocrinoidea, and the family Periechocrinidae, although we do not know whether it possessed the biserial free arms characteristic of the latter. Many obscure genera have been referred to this family, mostly as supposed synonyms of *Periechocrinus*. Whether *Beyrichocrinus* may be identical with any of these, is a question for the future. It appears allied to *Periechocrinus*, but the cup is rounded as in *Megistocrinus*; its most distinctive characters are the wedge shape of the proximal anal, and the absence of a distinct median vertical row of anals.

Bohemocrinus (why not *Bohemocrinus*?) is established for two imperfect cups, both assigned to one new species, *B. pulvereus*. The trivial name, taken from a manuscript

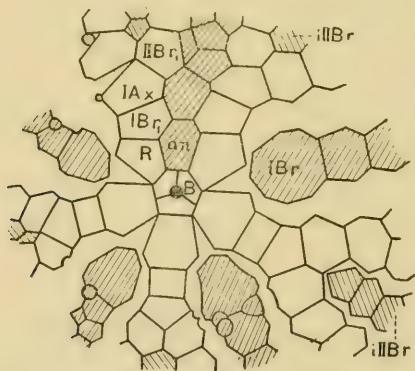


Fig. 2.—Analysis of the cup of *Bohemocrinus pulvereus*, outlines copied from Waagen and Jahn, a little over nat. size. Shading as in fig. 1. The small plates at the angles of some of the interbrachials are described by the authors as accessory plates; they do not occur in the only other specimen known.

label by Barrande, is consistently spelled *pulverens*—a manifest misprint of familiar nature. One specimen comes from the white limestone, e2 of Kosoř, the other from black limestone transitional between e1 and e2, near Dvorce. The

authors refer their genus to the family Actinocrinidæ as defined by Zittel in 1879. There is, however, nothing in the part preserved (Fig. 2) to prevent its assignment to the family Carpocrinidæ founded by the same authority; and, to speak even more precisely, there is no particular reason why these cups should not belong to a *Carpocrinus* or *Desmidocrinus*. The authors indeed say that "*Bohemicocrinus* is distinguished from all other genera of crinoids described down to this day, by the characteristic conformation of the two radii on each side of the anal interradius, as well as by the structure of the latter and of the other interradii." When this was written the authors were doubtless unacquainted with the structure of the cup in *Barrandocrinus*, since that was first published by Wachmuth and Springer in May 1897. The same peculiarities are emphasized in that genus; and yet the structure of the cup alone would scarcely justify the removal of *Barrandocrinus* from *Carpocrinus*. It is highly improbable that *Bohemicocrinus* possessed the remarkable arms of *Barrandocrinus*; therefore, though the name *Bohemicocrinus* may be a convenient way of expressing the imperfect nature of the known specimens, there seems reason to think that it may ultimately prove a synonym of *Carpocrinus* or *Desmidocrinus*. *Eucalyptocrinus*, *Corymbocrinus* (= *Clonocrinus*, Quenst.), and *Dolatocrinus* have no anal resting on the base, and it is not clear why they should have been dragged into comparison.

Carolicrinus is based on a crown and an arm-fragment from the black limestone (e 1-2) of Karlstein (whence the name), and another arm-fragment from the white limestone, e 2, near Lochkov. These are all placed in a new species, *C. Barrandei*. This species is a many-plated camerate crinoid not unlike *Scyphocrinus*, with which it is associated in the rocks; but the biserial arrangement of the brachials would alone justify its severance therefrom. Unfortunately the authors, impressed by the general resemblance to *Scyphocrinus*, have not thought it necessary to compare *Carolicrinus* with genera foreign to Bohemia. The imperfection of the base also is held to excuse them from discussing the systematic position of the genus. The authors believe that there were three basals, two large and one small, the latter being in the posterior interradius (strange position!); and they will not admit that the proximal anal rested on the base. At the same time they "cannot quite guarantee the correctness of the explanation just given." The published figures do not help one even to the bare facts of the case, so that an attempt at any other interpretation is out of the

question. But such facts as are undisputed all indicate that this is nothing but a large species of *Abacocrinus*, although that genus has 4 basals and a proximal anal resting on the base.

Laubeocrinus Barrandei is a new genus and species based on an incomplete cup provided with 3 millimetres of stem, from the white limestone, e 2, of Lochkov (Fig. 3). No attempt

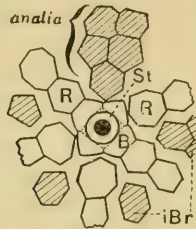


Fig. 3.—Analysis of the cup of *Laubeocrinus Barrandei*, outlines copied from Waagen and Jahn, nat. size. Shading as in fig. 1.

is made by the authors to determine the systematic position of this genus. The peculiarities of the specimen are, indeed, such that they might be considered individual abnormalities; but if that had been the opinion of Messrs. Waagen and Jahn, they would scarcely have based a new genus on them. "It is," they say, "impossible to determine if the base is monocyclic or dicyclic"; but since the basals are 4, not 5, we have every reason to believe that it is what it appears to be, namely, one of the *Monocyclica Camerata*. The fused basals are the right posterior and right anterior. The proximal anal rests on the base; but instead of the posterior basal being widened and truncated to support it, the left posterior basal is widened to occupy the whole of the left posterior radius, and so to come into contact with the anal. Both of these features are without parallel in accepted genera. Considered by itself, the base is like that of *Compsocrinus* or *Abacocrinus* (members of the family *Xenocrinidæ*), but in them the larger basals are posterior and anterior. The remaining portions of the cup might belong to any typical *Actinocrinoid*. The anal area differs from that of the *Xenocrinidæ*, and, indeed, of all known *Batocrinoidea*, in the presence of only two plates in the second row. *Phillipsoocrinus*, M'Coy, is believed by Wachsmuth and Springer to have been based on an abnormal specimen of *Actinocrinus*, and it is noteworthy that the peculiarity is similar to that of *Laubeocrinus*, though still more abnormal.

Vletavocrinus, a name derived from the ancient appellation of the river Moldau, on which lies Dvorce, is based on a unique specimen from the black limestone (e1-2) of that locality. The specimen is an almost perfect crown, to which 47 millim. of stem remain attached. It forms the type of a new species, *V. Haueri*. The crinoid (Fig. 4) is a Camerate,

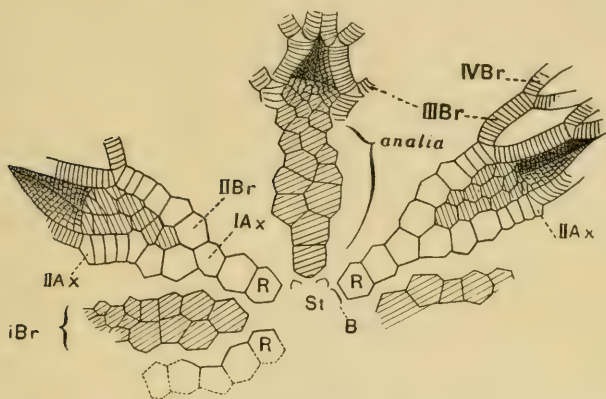


Fig. 4.—Analysis of the type of *Vletavocrinus Haueri*, outlines copied from Waagen and Jahn, nat. size. Shading as in fig. 1. The portions of arms that surmount the anals are intended as repetitions of the arm-branches drawn also in the adjoining rays; the object doubtless was to show the relations of the pinnules, but the chief result is to prove the inaccuracy of the diagram.

but whether monocyclic or dicyclic is uncertain, since the base is almost entirely hidden by the stem. Each ray contains 2 fixed primibrachs, and the fixed secundibrachs in each half-ray are said to be 7 or 8 (a number which each of the five figures chooses its own way of contradicting), the last of these being axillary. The left posterior interradius, as cleaned from matrix by the authors, exhibits a proximal interbranchial resting on the shoulders of the radials, and supporting two parallel rows of interbranchials, which gradually become smaller and more irregular and pass into the tegmen. Fifteen plates in all are exposed in this interradius. The posterior interradius shows over 30 plates, which seem to have passed up into an anal tube. The proximal anal rests on the base, and is followed by a single plate which supports two parallel rows of irregular plates, 5 in each row, followed by smaller plates. Rather large intersecundibrachs are visible in the right and left posterior rays, arranged as in the diagram, and succeeded by smaller and less regular plates. The arms,

which are free from the secundaxil, may branch at least twice more, *i. e.* up to quintibrachs, and are composed of low uniserial brachials bearing closely set pinnules. Unfortunately the authors attach so little importance to the mode of arm-branching that they have passed over without comment the very different appearances drawn by Mr. Swoboda in two identical views of the single specimen. One gathers only that the branching was not a regular dichotomy. It is also regrettable that the relation of the pinnules to the brachials is to be learned from neither description nor figures, the latter being discrepant in this important point also. We are told that immediately after each bifurcation the fine pinnules form a solid pavement, but we are not told whether any of these apparently united pinnules form part of the cup-wall; nor, what is far more important, is it stated if more than one pinnule is borne by each brachial. Whenever the whole base is not exposed as in a diagram, Messrs. Waagen and Jahn seem to think that they are absolved from any attempt to relegate the specimen to its place in the system. Had they likewise refrained from weighting such a specimen with a new generic name, their avoidance of responsibility would have been more readily excused. When, however, they go so far, we may demand to have such details as it is obvious could be learned from the specimen, without being forced "to wait for more abundant material." The facts vouchsafed to us do, all the same, permit some inference. The families of Dicyclia Camerata, as at present known, afford no place for *Vletavicrinus*. Its reference to Monocyclia Camerata is more than consistent with the small amount of base that is visible. If placed in this Order, the relations of its proximal anal prevent admission to the Melocrinoidea, while the number of secundibrachs, if nothing else, keeps it out of Actinocrinoidea. The disposition of the anals, though not that typical of the Batocrinoidea, is not absolutely discordant therewith, and it is in that Suborder that it seems to find its nearest allies. If the brachials do bear more than one pinnule apiece, if, in other words, they are compound structures, one would place the genus near *Carpocrinus*. In any case it might provisionally be placed in the Carpoocrinidæ. Our conclusion, then, is similar to that reached in the case of *Bohemiocrinus*, from the same horizon and locality; and we now remember that the anals of that genus have an arrangement almost identical with that of the present specimen. Comparison of the descriptions reveals many minor resemblances, so many, indeed, that one is impelled to ask why

Vletavocrinus is not the same as *Bohemiocrinus*, even if *V. Haueri* be not a synonym of *B. pulvereus* itself.

The last of the alleged new genera from the black limestone, e 1-2, is based on an ill-preserved cup from Dvorce, and is now called *Zenkericrinus melocrinoides*. It is the *Xenocrinus* mentioned by name only on p. 416 of Dr. Jahn's "Beiträge zur Stratigraphie und Tektonik der mittelböhmischen Silurformation"*. The authors refer it to the Melocrinidæ, to which family, even in its latest and most restricted sense, it certainly belongs. They say that "it is nearest to *Melocrinus*, from which, however, it differs in many essential features." This opinion also is well founded; but the authors seem unaware that the genus *Mariacrinus*, Hall, is distinguished from *Melocrinus* by those same features. There is nothing to prevent the relegation of the present specimen to *Mariacrinus*.

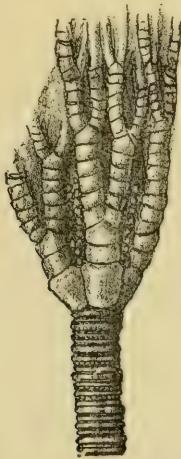


Fig. 5.—*Caleidocrinus multiramus*. Proximal portions of stem and crown, seen from alleged right posterior radius; the supplementary plates of the alleged posterior interradius are in two vertical rows, those of the other are in a single row. This is fig. 28 a of Waagen and Jahn, and is said to be "grossi"; but not a single measurement is given throughout the account of this genus. The block has been kindly lent by Dr. Anton Fritsch, on behalf of the Barrande Committee.

In the second fauna the only representative of the Crinoidea is a new genus, *Caleidocrinus*, based on impressions in the "schistes de grauwacke," d 4, of Háj Hill, near Zahořan.

* Jahrb. d. k. k. geol. Reichsanst. Wien, xlii. pp. 397-462, Feb. 1893 (not 1892).

Several specimens were distributed by Barrande under the manuscript name, *Echinoencrinites multiramus*. The present authors place it in or near the Taxocrinidæ of Angelin, which is as much as to say that it belongs to the Flexibilia Impinnata. It is of interest as being older than any Flexible genus hitherto known, and the interest is enhanced when we see how its structure accords with its age in the eyes of the evolutionist (Fig. 5). The Flexibilia Impinnata of the Silurian rocks fall into four main groups, which may provisionally be regarded as families and named Ichthyocrinidæ, Taxocrinidæ, Calpiocrinidæ, and Sagenocrinidæ. The two latter are clearly more specialized than the two former and have a larger proportion of representatives in later rocks. Both Ichthyocrinidæ and Taxocrinidæ have isotomous arms, which may abut, and in some Ichthyocrinidæ even interlock, by their sides. Taxocrinidæ have a few interbrachials, of which the proximal is the largest; their anals form a well-defined vertical series resting on the posterior basal. The Ichthyocrinidæ have no interbrachials, and their simplest genus, *Ichthyocrinus*, has no anals. Now *Caleidocrinus* resembles *Ichthyocrinus* in the absence of anals from the radial circlet and in the isotomy of its arms, which are, as in that genus, sometimes inrolled at their distal ends; but it resembles the Taxocrinidæ in the presence of interbrachials with occasional intersecundibrachs, which, however, are all very small and irregular. The authors believe themselves able to distinguish an anal interradius by the presence of 3 vertical rows of interbrachials instead of 2. But since these interbrachials lay in a flexible integument, a greater or less expansion of the arms would of itself expose more or fewer interbrachials. However this may be, we have in *Caleidocrinus* a genus that approaches the common ancestor of *Ichthyocrinus* and *Taxocrinus*, although an important point of divergence, and one by no means primitive, lies in the minuteness of the basals. All the specimens except one are assigned to *C. multiramus*, which has two primibrachs. The remaining specimen, having 3 primibrachs, is made another species, *C. Barrandei*. The authors' argument is not without force, but "the possibility that more abundant material of the two species may disclose yet other distinctive characters" seems to me far from the probability.

We return to the consideration of those members of the third fauna which are referred either with doubt or certainty to genera previously known. The first is called *Calpiocrinus? bohemicus*, or sometimes *Calpiocrinus??? bohemicus* (Fig. 6). The latter mode of expression is preferable, for, as the authors

fully recognize, their own interpretation of the fragment does not agree with Angelin's diagnosis of his genus. Their interpretation is that the fragment represents the lower portion of a cup, consisting of 3 basals, 5 radials, each followed by about two thirds of a broken primibrach, and 5 large inter-radials, all but one reaching from the basals to the same level

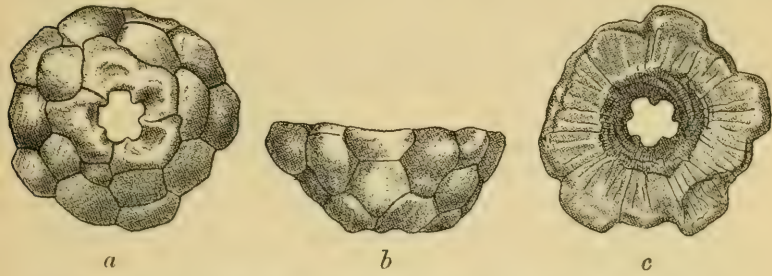


Fig. 6.—The so-called *Calpiocrinus*? ? ? *bohemicus*, after Waagen and Jahn, pl. lix. figs. 7, 8, 9; $\times \frac{4}{3}$ diam. *a*, “calice incomplet, vu d'en bas,” but from above if regarded as a root. *b*, from the side, in what W. & J. consider the normal position, but upside down if it be a root. *c*, “vu d'en haut,” but showing the surface of attachment to the sea-floor if a root.

as the broken top of the first primibrachs. It is admitted that all the plates are extremely irregular. This point, however, need not be laboured, for a glance at Mr. Swoboda's drawing of the alleged upper surface (pl. lix. fig. 9; our Fig. 6 *c*) is enough to suggest—nay, to force upon one—a very different interpretation. The published figures having failed us so constantly, it may seem the height of rashness to take their evidence in opposition to the opinion of two eminent naturalists who have devoted so many years to the study of these fossils. But no human being could have drawn that figure 9 without having either before him or in his mind's eye the root of some stalked Echinoderm. Here is faithfully represented the flat surface of adhesion to the sea-floor, with grooves, like those of *Lichenocrinus* and other genera, radiating from the central cavity. Within that cavity are shown what the authors themselves describe as “*écailles nombreuses, imbriquées, ornées de côtes fines longitudinales, et traversées par un grand nombre de petits canaux radiaires.*” This is no description of the thecal cavity of any fossil crinoid, but is perfectly intelligible in the light of certain roots well known to geologists in North America. As for an appearance of pentamerous symmetry in the outer plating,

that also is so far from unusual that it has recently led an American palæontologist to make the remark (extraordinarily exaggerated no doubt) that "the root of crinoids appears to be the counterpart of the calyx in type of symmetry." Should this interpretation commend itself to Dr. Jahn, he will be able to discuss it in that future volume which is to deal with Loboliths and other crinoid roots.

An imperfect crown from the white limestone, f2, near Koneprus was labelled by Barrande "*Lecanocrinus bohemicus*," but Messrs. Waagen and Jahn incline to place it in *Ichthyocrinus*, to which it certainly presents a closer resemblance.

To the long-known genus *Scyphocrinus* are devoted no less than sixty-three pages and nearly twenty-two plates, not to mention those on which are described and figured the numerous fragments probably belonging to it. The more one appreciates the thoroughness of this piece of work, the more one regrets that its wonderful array of detail is unprovided with a summary in the form of diagnoses of the genus and its species. There is a key to the latter, but it has proved incomplete and inapplicable in practice. For the generic diagnosis the reader is referred to the description by Zenker (1833), which, he is told, "forme une diagnose générale fort exacte." Even had Zenker given a diagnosis, it would have been framed in accord with the knowledge of his time, and would have required revision after the discovery of hundreds of genera unknown to him, some of them closely allied to *Scyphocrinus*. Merely to learn that the present authors refer *Scyphocrinus* to the Melocrinidæ (which they nowhere define) one has to hunt back from p. 73 to p. 11. But such is the vast plan to which they will be faithful at all costs!

The Melocrinidæ belong to that division of Monocyclica Camerata which has the radials in contact all round. They are distinguished by having 4 basals; in each half-ray 2-5, occasionally more, fixed secundibrachs, which support 2 or 4 main rami, giving off pinnules or pinnulate ramuli; numerous and usually definite interbrachials, intersecundibrachs, and anals; a tegmen of numerous, small, and irregular plates; a stem circular in section. The known genera are *Scyphocrinus*, *Mariacrinus*, *Melocrinus*, and *Ctenocrinus*; and of these the oldest and, in some respects, least specialized is *Scyphocrinus*.

Scyphocrinus may be diagnosed as a Melocrinid with a large number of interbrachials, anals, and intersecundibrachs, varying both in number and arrangement within a single

species or even a single individual; with the anal area distinguished only, and that slightly, by its greater width and greater number of plates; with arms bifurcating fairly regularly from 3 to 5 times (possibly more), and composed of simple brachials, which in the free portions are pinnulate and either uniserial (especially in the proximal region) or alternating (especially in the distal region), but not biserial in any authentic specimen; with both the primibrachs, all the secundibrachs, which are numerous, and the more proximal tertibrachs loosely joined to those of adjacent rays by a pavement or network of plates.

A very careful study of a large number of specimens belonging to this variable genus has led the authors to separate them, according to the ornament of the cup-plates and especially the interbrachial network, into the following species and varieties, which form a closely connected series: *Scyphocrinus subornatus*; *S. excavatus*, var. *Zenonis*, var. *Schlotheimi*, var. *typica*, var. *Schroeteri*; *S. decoratus*. Except *S. excavatus*, all these names are new; the name *S. subornatus* is indeed ascribed to Barrande, but apparently only on manuscript evidence. One misses the familiar *S. elegans*, Zenker; but this yields to the name *Pentacrinites excavatus*, which Schlotheim in 1820 applied to pl. iv. fig. 2 of J. S. Schroeter's 'Vollständige Einleitung &c.,' 1778, in which work the honour of original discovery is ascribed to F. Zeno, Professor at Prague University. The case is, however, no clearer than usual with these old names. It is admitted that the details given by Schroeter and Schlotheim do not indicate definitely any one even of the species, much less one of the varieties, distinguished by the present authors. The name *excavatus* has by no previous writer been resuscitated or applied to *Scyphocrinus*. One would therefore be inclined to let it rest and to adopt *S. elegans*, Zenker, did not Messrs. Waagen and Jahn assert their inability to find in either figures or description of Zenker the characters absolutely necessary for any decision as to which of their species may claim the name *elegans*. Since, moreover, not one of the numerous writers on this genus has attempted to give precision to the specific name, the way seems clear for the present authors to exercise their free choice. Therefore they make the loosely defined *elegans* a synonym of the loosely defined *excavatus*, and adopt the older term for their largest species. The chief objection to this proceeding is that one can after all determine the species to which Zenker applied the name *S. elegans*. In the very words of the volume before us: "l'espèce de Zenker diffère notablement

des Crinoïdes du Silurien de la Bohême, désignés par Barrande sous le nom de *Scyph. subornatus*, et par nous, sous le noms de *Scyph. decoratus* et *Scyph. excavatus*, var. *Zenonis*. Cependant la description de *Scyphocr. elegans* Zenker convient parfaitement à la plupart des spécimens que nous rangeons dans trois variétés nouvelles: *Scyph. excavatus* var. *typ.*, var. *Schlotheimi*, et var. *Schröteri*; il y a même une concordance remarquable entre les spécimens et les figures données par Zenker." Briefly then: *Scyphocrinus excavatus* Waagen and Jahn, non Schlotheim, is identical, even in its var. *typica*, with *S. elegans*, Zenker. It seems a pity that our authors did not draw the obvious conclusion, and so preserve a name in universal use. Had they chosen, "par respect pour la mémoire de" Schlotheim, to give the name *excavatus* to their new species *S. decoratus*, none could have said them nay. However, for the sake of concord, let us accept the action which the authors themselves have seen fit to base on their profound research.

To the features of great morphological interest presented by *Scyphocrinus* we can here do little more than allude. It has been supposed that the peculiar network or pavement which unites the proximal portions of the arms is formed of modified ramuli; but to this conception the authors do not refer. The resemblance to fixed ramuli or pinnules, such as are known in other genera (e. g. *Uinacrinus*), is more obvious in the figures of *S. excavatus* var. *typ. et Schroeteri* than in those of the other varieties and species, some of which represent only a solid and continuous pavement. There is no geological evidence to show which is the more primitive type, since, as the authors are careful to point out, all the varieties are contemporaneous and associated. We must turn to anatomical and comparative evidence. The arms of *Scyphocrinus* are simpler than those of other Melocrinidæ, and have not the ramuli of *Mariacrinus* and *Melocrinus*. Therefore the structures in question are not so likely to be modified ramuli as modified pinnules. Two statements made by the authors suggest possible arguments. They say (p. 72) "les brachiales de premier ordre [distal secundibrachs] sont en forme de croissant ou de fer à cheval. L'échancreure . . . correspond au sillon ambulacral du tronc des bras, lequel sillon passe dans la voute du calice." If branches were given off from this ventral groove to the lines of plates forming the interbrachial network, this would confirm the view that the latter were fixed pinnules. But specimens examined by me, notably a fine one apparently referable to *Scyphocrinus excavatus* var. *Schlotheimi* (Brit.

Mus. 15417), show that the supposed ventral groove cuts into the actual brachials either not at all or only to the smallest extent, but that the markedly crescentic appearance is formed by the incurving of the adjoining interbrachials or fixed pinnules (Fig. 7). This helps to explain the otherwise

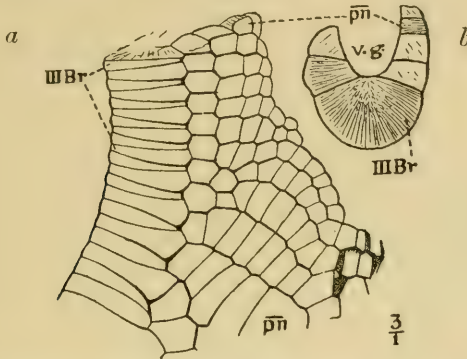


Fig. 7.—*Scyphocrinus excavatus*, var. *Schlotheimi*, from British Museum specimen 15417. $\times 3$ diam. Drawn by Gilbert C. Chubb.

- a.* Tertibrachs (III Br) seen from the inner side of the ray, showing their relations to the supposed fixed pinnulars (\overline{pn}) that occupy the intersecundibrach area. The subhexagonal outlines of the latter plates are much clearer in such a diagram, where only the sutures are accurately represented; in a shaded drawing the linear arrangement of the plates would stand out more clearly. The latter effect is suggested here by thickening the lines between the rows.
- b.* The distal surface of the same set of tertibrachs, showing how the ventral groove (*v.g.*) is formed by the supposed fixed pinnulars (\overline{pn}). Some of these, being broken, do not show the striated sutural surface.

unintelligible, and doubtless incorrect, fig. 25 on p. 90, purporting to show some arms of *Scyphocrinus decoratus*. The other statement alluded to is that the components of the network are joined to the arms and to one another by articular surfaces. This expression, if used in its strict morphological sense, would indicate, not merely that the structures were of brachial origin, but that they had not long become incorporated in the cup. Unfortunately for the argument, the union, at least in the specimens at my disposal, is by loose suture, with a crenelated edge and probably a striated joint-surface, just like that between the primary elements of the cup. On the other hand, since this is also the mode of union between the fixed brachials, the pinnular origin of the network remains undisproved. The above-quoted statement,

that the ventral groove passes into the vault (*i. e.* tegmen), implies that the distal secundibrachs are still above the level of the tegmen. If this were so, the plates uniting them could not be ordinary interbrachials, and their pinnular origin would be as good as proved. But, since our authors profess themselves unacquainted with so much as a fragment of a tegmen referable to *Scyphocrinus*, their rather inexplicable remark may be dismissed as a vague and inaccurate generality. The tegmen, if discovered, would certainly throw light on the question, since, if it could be proved to pass into the covering plates of the arms and pinnules, and if no rigid line could be drawn between free pinnules and those which were partially or wholly united, then the arrangement would resemble that of *Uintacrinus*. But if the network were found to pass gradually into the strictly interambulacral area of the tegmen, then its plates would have to be regarded as more or less modified interbrachials. Had this problem been present to the minds of Messrs. Waagen and Jahn, they could probably have solved it from their abundant material. With the help of Mr. Gilbert C. Chubb in preparing the specimen of *S. excavatus* above alluded to, I have been able to see that the tertibrachs and proximal quartibrachs (beyond which the arms are broken away) are all fixed by small plates arranged in definite rows; that the brachials in question are wedge-shaped and alternating, just as the free brachials of any pinnuliferous arm; and that the thickened end of each brachial corresponds with a single one of the rows of plates just mentioned. In other words, the relation of the rows to the fixed tertibrachs and quartibrachs is precisely the same as that of pinnules to free brachials. It is not so easy to trace this relation in the case of the distal secundibrachs, partly because the plates are here folded and less regular; partly because the secundibrachs are not low and wedge-shaped, but are more than twice the height of the tertibrachs, and are possibly compound ossicles. In this particular specimen there appear to be 13 secundibrachs: the lower four are flat cup-plates; the fifth and sixth are irregular in shape, and the line of the ramus is hard to trace; from the seventh onward they assume the form of free brachials. It seems probable that the plates uniting the lower secundibrachs are true interbrachials, and that their simulation of ramuli or pinnules is due to their axial folding. The true resemblance to pinnules increases in the more distal region, although in this specimen, as in many others, the plates there form a flat pavement. I am convinced that the gradual passage of these lines of plates into free pinnules

could be traced in specimens that have the arms better preserved.

It is curious that, in describing some undetermined tegmina which may possibly belong to *Scyphocrinus*, the authors should twice observe that they are unable to see "l'ouverture buccale sur le fragment," especially as they most definitely refer these specimens to the Camerata of Wachsmuth and Springer or the equivalent Hypascocrina of Neumayr, which are characterized by the total absence of a mouth-opening. Possibly these remarkable sentences are due to the translator.

Of all the specimens of *Scyphocrinus* only four retain any of the stem, and in the most perfect of these it consists of but 7 columnals. Nevertheless there is reason to believe that the stem often attained a length of many metres. Various roots are associated with the remains of *Scyphocrinus*, but the authors do not feel justified in referring any one of these to the genus. Some of these roots sprang from the curious hollow and chambered spheroids known as Loboliths. But if these cautious palæontologists ever intend to hint that those bodies may be a part of *Scyphocrinus*, they have reserved their remarks for a future volume on roots.

Realizing the futility of discussing, on the evidence of professedly incorrect figures, those remains which the authors themselves decline to determine, we may summarize in a table (p. 120) what this analysis has brought out concerning the Palæozoic crinoid fauna of Bohemia.

It is probable that all the species are new, but they should be compared afresh with known species of the genera to which they are here referred. The genera, however, are not so strange as they seemed at first. *Bohemiocrinus* and *Caleidocrinus* may be accepted without hesitation; *Beyrichocrinus* and *Laubeocrinus* are open to slight question. But if half of the genera are new, even that is a large proportion; and since the authors believe that all records of *Scyphocrinus* outside Bohemia are insufficiently supported, five out of the eight genera may possibly be peculiar to that province.

The authors have nowhere ventured to arrange their genera in systematic order. The attempt here made, if near the truth, is rather startling. The extraordinarily large proportion of Monocyclica and the truly remarkable absence of Inadunata afford much food for reflection. But considering the rarity of crinoid-bearing beds in Bohemia, perhaps one should not lay great stress on negative evidence. Some of the doubtful remains are of rather Inadunate appearance. The absence of Monocyclic Adunata is less noteworthy, since this order did

	d 4.	d 5.	e 1.	e 1-2.	e 2.	f 1.	f 2.
MONOCYCLICA.							
INADUNATA							
None.							
ADUNATA							
None.							
CAMERATA .							
MELOCRINOIDEA.							
Melocrinide ....	..	..	..	3	1		
<i>Scyphocrinus</i>.....	..	..	..	1			
<i>Mariacrinus</i> (syn. <i>Zenkericrinus</i>) ..	..	..	..	
<i>Abacocrinus</i> (syn. <i>Carolicrinus</i>) ....	..	..	..	1	1		
<i>Bohemioocrinus</i> , n. g. ? (syn. <i>Vlctaviev.</i>)	..	..	..	2 (?)	1		
<i>Beyrichocrinus</i> , n. g. ? .....	..	..	..	..	..	..	1
<i>Laubeocrinus</i> , n. g. (abnormal ?)....	..	..	..	..	1		
BATOCRINOIDEA.							
Xenocrinide							
Carpocrinide ..							
Perechocrinide.							
ACTINOCRINOIDEA.							
Fam. incert.							
1 sp.							
DICYCLICA.							
INADUNATA							
None.							
FLEXIBILIA.							
IMPINNATA.							
Fam. incert.							
2 (?) sp.							
Ichthyocrinide .	..	..	..	..	..	..	1
1 sp.							
CAMERATA							
None.							
Total	1 or 2	0	0	6 or 7	4	0	2
8 genera.	10 or 12 sp.						

not originate till Silurian times and was nowhere represented in large numbers. Flexibilia, too, have not hitherto been known earlier than the Wenlock Age, so that their rarity in the lower beds and the appearance of an *Ichthyocrinus* in f 2 are just what one might expect. The importance of *Caleidocrinus* has already been dwelt on. The Monocyclica Camera-ta, which form the dominant assemblage, present no genus at all puzzling except *Laubeocrinus*. The others belong to widely spread families, and even the new genera among them are not so distinct as to indicate any great isolation of their life-province. Indeed, the vertical distribution of the Crinoids within the Bohemian basin, and such a curious detail as the fact that all the stem-fragments attacked by parasites (Myzostomidæ, the authors say) come from the one band f 2, seem to show that the nature of the genera found was dependent rather on their selection by a local and temporary environment than on any wider conditions governing the migration of faunas or the evolution of orders.

Since the foregoing pages were written the senior author has passed beyond reach of criticism. I have not, for that reason, thought it necessary to modify any of my remarks, since they were never intended to depreciate the labours of those to whom we are indebted for this exhaustive account of the Lower Palæozoic Crinoids of Bohemia. It is clear that the conditions imposed on them rendered their task one of peculiar difficulty; but the volume they have produced is none the less worthy of its place in the magnificent work of Barrande.

Natural History Museum,
London, S.W.

XIII.—ASIATIC TORTRICIDÆ.

By the Rt. Hon. LORD WALSHINGHAM, M.A., LL.D., F.R.S.

[Continued from vol. v. p. 490.]

CARPOSINA, H.-S.

912 (3). *Carposina niponensis*, sp. n.

Antennæ (♂) biciliate (3); dirty brownish white. *Palpi* whitish, the median joint shaded externally with fuscous, the terminal broadly annulate with fuscous at its base. *Head*

and *thorax* dirty brownish white. *Fore wings* dirty brownish white; with a short triangular basal patch, much widened on the costa, pale brownish fuscous, with a darker fuscous spot of raised scales near the lower extremity of its outer edge; four or five ill-defined pale brownish fuscous shade-spots along the costa, of which one only is before the middle, from this a diffused shade of scattered fuscous scaling slopes outward to the lower angle of the cell, where there is a small raised spot, thence a similar diffused shade, much raised at the upper angle of the cell, is continued to the two outer costal spots; a broken shade-line is indicated around the apex and termen; cilia brownish grey. *Exp. al.* 16 mm. *Hind wings* grey; cilia brownish grey. *Abdomen* brownish grey. *Legs* whitish, with hind tarsal shade-rings.

Type, ♂ (70601) Mus. Wlsm.

Hab. JAPAN (*Pryer*, 1886). Unique.

The colouring of this species is very obscure and ill-defined, and although it is obviously distinct I should scarcely have thought it worthy of description had it not been desirable to indicate this interesting geographical extension of the genus.

PROPEDESIS, gen. nov.

(προπήδησις = a springing forward.)

Type *Propedesis excisa*, Wlsm.

Antennæ (♀) simple. *Labial palpi* projecting nearly twice the length of the head beyond it; terminal joint short, median joint somewhat triangular owing to upstanding scales above at the middle and depressed scales below at its apex. *Head* densely clothed above. *Thorax* smooth. *Fore wings* narrow, elongate; costa slightly arched near the base, straight beyond; termen very oblique, sinuate. *Neuration*, 12 veins; 2 from very near angle of cell; 3 and 4 closely approximate at angle of cell; 7 to termen; 8 and 9 stalked, 8 to a little above termen. *Hind wings* with the costa straight, apex produced, termen sinuate, flexus rounded, median vein with long loose hairs above. *Neuration*, 6 veins; 3 and 4 stalked. *Abdomen* smooth. *Legs* with slight projecting scales at hinder extremity of tibiæ.

The genus is closely allied to *Carposina*, H.-S., from which it is distinguishable only by the staking of veins 8 and 9 of the fore wings and the somewhat more produced apex of the hind wings. The male will probably have biciliate antennæ and short palpi.

912 (4). *Propedesis excisa*, sp. n.

Antennæ dirty white, annulate with fuscous towards the base. *Palpi* white, black beneath and at the base. *Head* and *thorax* white. *Fore wings* with the termen very oblique, strongly sinuate beneath the produced apex; white, dusted with greyish fuscous, the markings dark greyish fuscous; a triangular basal patch, wider on the costa than on the dorsum, is followed by a costal spot before the middle, succeeded by three smaller ones beyond the middle; an oblique patch at the outer end of the cell is parallel to the outer edge of the basal patch, it reaches down to the fold and upward nearly to the costal spot, and is accompanied by tufts of raised scales, as is also the outer edge of the basal patch itself; there is a series of spots along the termen, with a parallel shade-line faintly indicated before them; cilia brownish cinereous. *Exp. al.* 20 mm. *Hind wings* with strongly produced apex, the termen more deeply excised than in the fore wings; brownish grey; cilia brownish cinereous. *Abdomen* brownish grey. *Legs* dirty whitish.

Type, ♀ (70602) Mus. Wlsm.

Hab. JAPAN (*Pryer*, 1886). Unique.

912 (5). *Propedesis japonica*, sp. n.

Antennæ dirty white, very faintly annulate. *Palpi* whitish, shaded externally with greyish fuscous. *Head* and *thorax* whitish, tinged with greenish grey. *Fore wings* greenish white, sparsely dusted with olive-grey, with a triangular patch of pale olivaceous grey at the base, wider on the costa than on the dorsum, its outer edge consisting of raised scales; a slight olive-grey shade-spot on the costa before the middle, followed by three others beyond it; an oblique fuscous streak at the end of the cell, consisting of raised scales, and preceded by other tufts of raised scales (white dusted with fuscous), one at the upper edge of the cell, one resting on the middle of the fold, another preceding it below the fold; the termen shows a faint indication of greyish marginal spots preceded by a parallel greyish shade; cilia pale cinereous. *Exp. al.* 20 mm. *Hind wings* pale rosy grey; cilia greyish cinereous. *Abdomen* cinereous. *Legs* whitish.

Type, ♀ (70603) Mus. Wlsm.

Hab. JAPAN (*Pryer*, 1886). Unique.

This species differs from *excisa* in the different outline of the wing as well as in the markings; both in the fore and hind wings the apex is less produced and less acute, the termen being only very slightly sinuate.

RHYACIONIA, Hb.

Type *Tortrix buoliana*, Schiff. (Stph. 1834).

915. *Rhyacionia duplana*, Hb.

Retinia duplana, Stgr. & Wk. Cat. Lp. Eur. 246. No. 915 (1871)¹;
Fern. Tr. Am. Ent. Soc. X. 27. No. 158 (1882)².

Hab. EUROPE¹. JAPAN (*Pryer*, 1886)—HONDO—Yokohama (*Manley*, 1888). UNITED STATES—Oregon².

919. *Rhyacionia turionana*, Hb.

Retinia turionana, Stgr. & Wk. Cat. Lp. Eur. 246. No. 919 (1871)¹;
Fern. Tr. Am. Ent. Soc. X. 27. No. 157 (1882)².

Hab. EUROPE¹. JAPAN (*Pryer*, 1886). UNITED STATES—Nevada².

921. *Rhyacionia buoliana*, Schiff.

Retinia buoliana, Stgr. & Wk. Cat. Lp. Eur. 246. No. 921 (1871)¹.

Hab. EUROPE¹. SIBERIA¹. COREA—Gensan, VI. 1886 (*Leech*).

923 (1). *Rhyacionia retiferana*, Wk.

*Retinia *margarotana*, Hein. Schm. Deutsch. Tortr. 95-6. No. 168 (1863). *Retinia retiferana*, Wk. Zts. Ent. Bresl. (n. s.) VII. 73 (1879). *Retinia *margarotana*, Brit. Ent. Mo. Mag. XXVI. 49 (1890); Hdgn. Ent. XXIII. 119 (1890). *Retinia retiferana*, Brit. Ent. Mo. Mag. XXIX. 113-4 (1893); Rag. Ann. Soc. Ent. Fr. LXIII. 200. No. 923 bis (1894).

Hab. EUROPE. JAPAN (*Pryer*, 1886).

EXARTEMA, Clem.

924 (1). *Exartema castaneanum*, sp. n.

Antennæ brownish grey. *Palpi* whitish ochreous, with two fuscous spots on their outer sides. *Head* and *thorax* brownish grey, the tegulæ and patagia paler. *Fore wings* rich chestnut, with shining leaden grey markings narrowly outlined with pale ochreous and some brownish fuscous shades; a basal patch extending to one-third is mottled with brownish fuscous, leaden grey, and chestnut, its outer edge straight, but with a slight outward angle below the costa, and bounded by a leaden grey band narrowly outlined with pale ochreous; a leaden grey patch at the tornus sends two branches inwards from its upper extremity, the upper one

moderately straight, the lower one angulated downward at its middle, all narrowly outlined with ochreous; there are five pairs of outwardly oblique pale ochreous costal streaks beyond the middle, alternating with brownish fuscous, the first pair emitting a sinuate leaden grey line which reaches the termen above the middle; cilia brownish ochreous, with a fuscous spot at the apex and another on the middle of the termen. *Exp. al.* 15–17 mm. *Hind wings* greyish brown; cilia pale ochreous, a dark dividing line running through them near their base. *Abdomen* greyish brown. *Legs* ochreous, shaded and banded with greyish brown.

Type, ♂ (60792, Kiusiu); ♀ (60793) Mus. Wlsm.

Hab. COREA—Gensan, VII.–IX. 1887 (*Ito*). JAPAN—KIU SIU (*Leech*, 1890). Five specimens.

Allied to the American *Exartema ferrugineanum*, Riley, but the only specimen I have of this differs decidedly in the position of the first geminated costal streak beyond the middle, the leaden line extending to the termen being much shorter and coming from the second instead of from the first pair.

924 (2). *Exartema velutinum*, sp. n.

Antennæ fuscous. *Palpi* dirty whitish ochreous. *Head* and *thorax* fuscous. *Fore wings* dark brownish fuscous, bright reddish ferruginous towards the apex and below the middle of the termen, with a pale brownish olivaceous ochreous patch on the middle of the dorsum, mottled on the basal patch and on the rather oblique median band with steel-blue; with seven pairs of pale whitish ochreous costal streaklets, of which two only are before the middle, the first pair beyond the middle giving out a sinuous steel-blue line to above the middle of the termen; a steel-blue patch at the tornus sends inward two branches from its upper extremity, forming the blue mottling on the dark band; cilia ochreous, tessellated with fuscous, a fuscous line along their base. *Exp. al.* 15 mm. *Hind wings* rather deeply emarginate below the lobe in ♂; greyish brown; cilia pale cinereous, a dark shade-line near their base. *Abdomen* greyish brown. *Legs* greyish, banded with pale cinereous.

Type, ♂ (60459, Mupin); ♀ (60796) Mus. Wlsm.

Hab. W. CHINA—Mupin, 21 V., 28 V. 1890 (*Leech*). COREA—Gensan, VI. 1886 (*Leech*), VII.–IX. 1887 (*Ito*). JAPAN (*Pryer*, 1886)—KIU SIU (*Leech*, 1890)—Satsuma, V 1886 (*Leech*). Eight specimens.

924 (3). *Exartema transversanum*, Chr.

Penthina transversana, Chr. Bull. Soc. Imp. Nat. Mosc. LVI. 75-7. No. 108 (1881)¹; *sep.* 163-5 (1882)¹.

Hab. AMUR—Pompejefka, VII.¹; Wladiwostok¹, 15 VII., 3-4 VIII. 1877 (*Christoph*). COREA—Gensan, VI. 1886 (*Leech*). CHINA—Chang Yang, 4000-6000 feet (*Pratt*, 1886). JAPAN (*Pryer*, 1886)—YESSO—Hakodate, VIII. 1886 (*Leech*); HONDO—Tsuruga, VII. 1886 (*Leech*).

924 (4). *Exartema japonicum*, sp. n.

Antennæ cinereous. *Palpi* whitish cinereous. *Head* cinereous. *Thorax* mixed whitish cinereous and olive-brown. *Fore wings* shining whitish cinereous, with olive-brown streaks and blotches; the first series bounding a much reticulated basal patch, wider on the dorsum than on the costa, and containing an admixture of steel-grey scales; the second series forming a moderately straight transverse fascia in the middle of the wing, wider on the dorsum than on the costa and bulging outwards in the middle in two large irregular excrescences, broken up with dark fuscous and shining steel-grey scaling; an olive-brown spot before the tornus is more or less connected by a pale olivaceous shade with an elongate oblique olivaceous patch above it, which again is connected with some oblique streaks of the same colour from the costa, alternating with creamy white geminated streaks, each divided by steel-grey lines which run together to the middle of the termen; the apex is olive-brown; cilia pale whitish ochreous, with an olive-brown line along their base; the whole of the paler portions of the wing are rendered more or less lustrous by the admixture of steel-grey scaling. *Exp. al.* 20 mm. *Hind wings* dark brown; cilia shining whitish cinereous, with a dark line through them near their base. *Abdomen* greyish brown, anal tuft cinereous. *Legs* cinereous.

Type, ♂ (70537); ♀ (60392) Mus. Wlsm.

Hab. JAPAN (*Pryer*, 1886)—HONDO—Tsuruga, VII. 1886 (*Leech*). Four specimens.

924 (5). *Exartema Pryerianum*, sp. n.

Antennæ brownish cinereous. *Palpi* pale brownish cinereous, with some fuscous scales. *Head* and *thorax* brownish fuscous, mixed with brownish cinereous. *Fore wings* brownish cinereous, much shaded across the middle and on the basal patch, and sprinkled toward the apex with brownish fuscous; a reduplicated narrow leaden grey band at one-

third, narrowly outlined with brownish cinereous, ends in two pairs of brownish cinereous costal streaklets, and from a little beyond the middle a similar band tends obliquely outward from costa to tornus, sometimes broken about its middle, where it sends a branch obliquely inward to the dorsum; the shape of this band seems to be somewhat variable, but at its upper-extremity is a pair of costal streaklets, and these are succeeded by three other pairs before the apex, which tend to converge upon a sinuate leaden grey line running toward the middle of the termen; cilia pale brownish cinereous, shaded along their base and on their outer half with fuscous. *Exp. al.* 19 mm. *Hind wings* dark greyish brown; cilia pale brownish cinereous, with a shade-line near their base. *Abdomen* greyish brown. *Legs* pale cinereous, with slightly spotted tarsi.

Type, ♂ (70542); ♀ (70546) Mus. Wlsm.

Hab. JAPAN (*Pryer*, 1886)—HONDO—Oiwake (*Pryer*, 1885).
Four specimens.

924 (6). *Exartema fasciatanum*, Clem.

Exartema fasciatana, Clem. Pr. Ac. Nat. Sc. Phil. XII. 357 (1860)¹.
Sciaphila decisana, Wkr. Cat. Lp. Ins. B. M. XXVIII. 340-1 (1863)².
Exartema fasciatana, Wkr. Cat. Lp. Ins. B. M. XXX. 994 (1864)³.
Sericoris fasciatana, Clem. Pr. Ent. Soc. Phil. V. 134 (1865)⁴.
Exartema albofasciatum, Z. Verh. ZB. Ges. Wien, XXV. (1875) Abh. 272-3 (1875)⁵.
Exartema fasciatana, Z. Verh. ZB. Ges. Wien, XXV (1875) Abh. 273 (1875)⁶.
Eccopsis fasciatana, Fern. Tr. Am. Ent. Soc. X. 30. No. 177 (1882)⁷; Mft. Can. Ent. XIX. 88 (1887)⁸.

Hab. JAPAN (*Pryer*, 1886)—HONDO—Yokohama (*Manley*, 1888). CANADA—Ontario³. UNITED STATES¹⁻⁴—Maine⁷, Massachusetts⁷, New York⁷, Pennsylvania⁷, Maryland (*Mus. de Joannis*), Ohio³, North Carolina (*Morrison*), Illinois³.

924 (7). *Exartema semicremanum*, Chr.

†*Penthinea semicremana*, Chr. Bull. Soc. Imp. Nat. Mosc. LVI. 77-8. No. 109 (1881)¹; *sep.* 165-6 (1882)¹. *Penthina semicremana*, Rag. Ann. Soc. Ent. Fr. LXIII. 203. No. 949 *bis* (1894)².

Hab. AMUR—Pompejefka, VII.¹, 13 VII. 1876 (*Christoph*). JAPAN—YESSO (*Pryer*, 1882).

OLETHREUTES.

924 (8). *Olethreutes arcuella*, L.

Penthina arcuella, Stgr. & Wk. Cat. Lp. Eur. 249. No. 980 (1871)¹; Stgr. Hor. Soc. Ent. Ross. XV. 250 (1879)². *Eucosma arcuella*, Meyr. HB. Br. Lp. 465 (1895)³.

Hab. EUROPE¹. ASIATIC TURKEY—KHUDEVENDIKIAR—

Brussa, VI.² SIBERIA². COREA — Gensan, VI. 1886 (Leech). JAPAN³—HONDO—Oiwake, VI. 1885, VI.—VII. 1887 (Prjer).

The specimens of this species from Corea and Japan differ from our English form in their larger size and paler colouring on the underside, but precisely correspond in their markings. The males all have a small hanging appendage near the base of the limbus in the hind wings, a character hitherto confined to the genera *Exartema*, Clem., and *Cymolomia*, Ld. The discovery of this character in Japanese specimens caused me to re-examine carefully a series of British specimens of *arcuella*, which has been placed by different European authors in *Penthina*, Tr., and *Sericoris*, Tr. It was at once apparent that all the males in the series possessed a very small rudimentary appendage, scarcely noticeable unless special attention had been called to it. The stronger development of this character in Japanese specimens is scarcely sufficient to justify their description as a distinct species, especially as I find German specimens of intermediate size and decidedly paler on the underside than our British examples.

Meyrick, whose attention had been called to the existence of the lobe, wrote (HB. Br. Lp. 465) that this was so rudimentary that it appeared insufficient for generic separation. In this I am unable to agree with him, for it is certainly a structural character, corresponding with that which was relied upon by Clemens when describing the genus *Exartema*.

The question is one of degree, but it may fairly be argued that the possession of a structural character rather than the mere degree of its development is the true test of generic rank; and Meyrick has recognized this principle very forcibly in including *Ptycholoma*, Stph., and *Lozotenia*, Stph., in the genus *Cacæcia*, Hb., the only cause of separation by the older authors having apparently been the inferior development of the costal fold.

If Meyrick is justified in placing *arcuella* in the same genus as many other species which possess no limbal fold or lobe, it follows that the Japanese form (specially inseparable, as I think, from *arcuella*) would fall into a different genus through the slightly greater development of the limbal lobe, unless he is prepared to include with it *Exartema*, *Eccopsis*, &c.

Clemens, in describing *Exartema*, clearly refers to the hind margin being deeply and sharply excised opposite to the median nervules. He described five species: the first two only, viz. *nitidana* and *permundana*, possess this character; the other three species, *versicolorana*, *inornatana*, and *fasciata*, have the dorsum evenly rounded beyond the flexus,

although there is an excavation on the limbus as well as the tubular lobe at the base. In the outline of the wing these three species agree with *Cymolomia*, Ld., rather than with *Olethreutes*, which possesses the lobe without any excavation of the limbus, but the American species differ from *Cymolomia* in the tubular structure of the lobe. Thus we have in this group four published genera, which can be distinguished by structural differences:—

1. ECCOPSIS, Z.—Limbus rolled at base, without lobe, with strongly angular limbal excavation and deep dorsal excavation beyond the flexus.
2. EXARTEMA, Clem.—With partially free tubular lobe from base of limbus, moderately excised limbal margin, and excised dorsum beyond the flexus.
3. CYMOLOMIA, Ld.—Limbus rolled at the base, without free lobe; limbus excised, dorsum not noticeably excised.
4. OLETHREUTES, Hb.—Limbus rolled, with slightly developed lobe; limbus and dorsum not excised.

924 (9). *Olethreutes notata*, sp. n.

Antennæ cinereous, basal joint yellow-ochreous. *Palpi* pale whitish ochreous, shaded externally with fuscous. *Head* yellow-ochreous, shaded with fuscous. *Thorax* bright yellow-ochreous, mottled with fuscous. *Fore wings* bright yellow-ochreous, reticulated on the basal half and deeply suffused on the outer half with blackish fuscous, and with numerous spots and short cross-bars of bright shining steel-blue; the spots for the most part being evenly distributed over the basal half, and with three bars and some spots on the outer half, one below the termen at the commencement of the apical third, one above the tornus, and one within and below the apex, the two outer moderately straight, the inner slightly oblique, except where the deep outer shade touches the costa immediately beyond the middle; the edges of the wing are uniformly bright yellow-ochreous, mottled and spotted with dark fuscous; cilia greyish fuscous, with a broad pale whitish ochreous interruption below the apex, a black line along their base. *Exp. al.* 19–20 mm. *Hind wings* dark brown; cilia pale whitish ochreous, a dark line running through them near their base. *Abdomen* brownish. *Legs* grey.

Type, ♂ (70014); ♀ (70016) Mus. Wlsm.

Hab. JAPAN—YESSO (Pryer, 1882). Six specimens.

This species has a very rudimentary excrescence near the base of the limbus of the hind wings, scarcely more than a thickening of the cuticle on the margin itself, in this respect

agreeing with the European form of *arcuella* rather than with *Eccopsis*, in which this character is much more strongly developed.

PHÆCADOPHORA, gen. nov.

(*φακός* = a woolly shoe; *φορεῖν* = to carry.)

Type, ♂ ♀, *Phæcadophora fimbriata*, Wlsm.

Antennæ (♂) slightly ciliate. *Palpi* (♂) short, projecting only the length of the head beyond it; terminal joint very short, almost concealed in the strong tuft above and below the median joint: ♀ longer than the ♂, more porrect, terminal joint more apparent and slightly depressed. *Head* with a strong erect crest. *Thorax* with a slightly erect tuft posteriorly. *Fore wings* narrow, elongate, costa gently arched, ♂ without a costal fold; apex acute or abruptly angulated; termen straight or slightly impressed, not convex; tornus rounded, dorsum straight. *Neuration*, 12 veins, all separate; 2 from middle third of cell; 7 to termen; 10 not nearer to 11 than 9. *Hind wings* much broader than the fore wings, more or less trapezoidal, apex rounded, termen slightly indented below it; ♂ with a strong pencil of hairs near the limbus on the upperside and a fringe of long hairs on the underside between the branches of vein 1. *Neuration*, 8 veins; 3 and 4 connate; 5 bent over to near origin of 4; 6 and 7 separate but parallel and closely approximate at their base. *Legs*, hind tibiæ and tarsi strongly clothed above with long tufts of woolly scales.

This genus differs from *Phæcasiophora*, Grt., in its narrower fore wings and in the hind tarsal joints as well as the tibiæ being clothed with thick hair-tufts, as well as in the more strongly developed fringes of hairs above and below the hind wings near the limbus.

924 (10). *Phæcadophora fimbriata*, sp. n.

Antennæ and *palpi* tawny cinereous. *Head* and *thorax* dark tawny vinous red; tegulæ pale cinereous, shaded with reddish grey, with a strong raised tuft of vinous red scales on the thorax posteriorly. *Fore wings* whitish stone-colour, thickly and slenderly streaked throughout with rosy pink and olive-brown; costa with oblique striæ throughout its length, a pair before the apex turning downwards and meeting the end of the oblique streak which precedes them; at the end of the cell are a few blackish scales, and along the dorsum a conspicuous dark band of tawny brownish, bluish fuscous on the extreme margin, with a blackish brown line

running along its middle and bent obliquely upwards at two-thirds from the base, where it is bounded on each side by a narrow margin of the pale ground-colour of the wing, running to a point at the lower angle of the cell, the upper edge of this dorsal band is somewhat waved, a slight bulge occurring before the middle of the wing, its upper edge carrying a reduplication of the blackish brown central line; about the tornus the dorsal band is continued after a slight interruption, and here also it contains some blackish brown lines; an elongate olive-brown shade lies below the outer half of the discal cell, with some lines of the pale ground-colour running through it; above the tornus is a small shining whitish ocelloid spot, tinged with rosy pink scales immediately above the angle; cilia beautifully mottled with olive-brown, silvery whitish, greyish fuscous, and rosy pink, the greyish fuscous being at their tips on the middle of the termen, also at the extreme apex and at the tornus, the rosy pink coming above and below the middle and also on the outer half of the cilia; the reddish brown is situated on the basal half of the cilia on the upper half of the margin, and the silvery whitish is immediately below it in a small spot also on the basal half of the cilia. *Exp. al.* 20 mm. *Hind wings* dark brown, on the upper surface of vein 2 is a distinct fringe of brownish grey hairs; cilia shining whitish, with a dark line running through them near their base. *Abdomen* brownish grey. *Legs* greyish white, clouded with greyish fuscous.

Type, ♂ (70257, Japan); ♀ (70249) Mus. Wlsm.

Hab. JAPAN (*Pryer*, 1886)—*KIUSIU* (*Leech*, 1890). AS-SAM—*Margherita* (*Doherty*, 1889). E. PEGU—*KAREN HILLS*—*Thandsung*, 4000 ft. (*Doherty*, 1890). Twenty-four specimens.

This description is taken from a male in beautiful condition, which exhibits some differences from others in the series. I find that in one variety (40124) the longitudinal streaks are more distinctly carried through the wing and there is more olive-brown alternating with longitudinal lines of fuscous, the rich rosy tint being chiefly confined to the space below the costa, especially in a long streak beneath the outer half; the black scales at the end of the cell are almost obsolete, and the cilia, although they exhibit somewhat the same pattern, are not so rich in colouring. It is evidently a variable species.

924 (11). *Phæcadophora* (?) *acutana*, sp. n.

Antennæ pale stone-grey, faintly spotted above. *Palpi* long, porrect, extending twice the length of the head beyond

it, thickly clothed to the base of the exposed terminal joint, above and beneath; light stone-grey. *Head* light stone-grey. *Thorax* pale stone-grey; tegulæ with two brownish spots. *Fore wings* elongate, apex slightly produced, termen slightly concave, scarcely oblique, angulated at the extremity of vein 3, thence very oblique to the dorsum, which is straight; stone-white, streaked throughout with pale olive-brown; a series of short oblique streaklets along the costa, olive-brown mixed with brownish fuscous scales; an olive-brown spot at the apex is followed by a greyish fuscous spot at the base of the cilia immediately below it; a small patch of greyish fuscous at the base of the dorsum, followed by some scattered specks of the same colour, especially along the lower half of the wing to the tornus, and a small streak of brownish fuscous scales at the angle of the termen on vein 3; cilia shining stone-white, inclining to olivaceous about the tornus. *Exp. al.* 21 mm. *Hind wings* brownish fuscous, costa whitish; cilia greyish fuscous, a dark line running through them near their base. *Abdomen* greyish fuscous. *Legs* stone-white, yellowish white on their underside; hind tarsal joints somewhat densely clothed, but not so thickly as in the male of the allied species *fimbriata*.

Type, ♀ (60191) Mus. Wlsm.

Hab. JAPAN — *KIUSIU* — Satsuma, V. 1886 (*Leech*).
Unique.

I should have regarded this as a variety of *fimbriata* had it not been for its much longer palpi and the absence of the dark dorsal band. The male is at present unknown, but the generic determination is almost certainly correct.

924 (12). *Phæcadophora* (?) *divisa*, sp. n.

Antennæ, *palpi*, and *head* cinereous. *Thorax* mixed greyish cinereous and dark reddish fuscous. *Fore wings* with the dorsal half pale cinereous, slightly mottled with greyish fuscous, the costal half dark reddish fuscous; the colour on the costal half extends to the fold at the base, is slightly indented before the middle, and diminishes obliquely from about the lower angle of the cell to the apex; along the extreme costa is a series of very small greyish cinereous geminated dots, with a slight tawny gloss, connected with the three pairs which precede the pair nearest to the apex; on the pale half of the wing is an oblique dash from the dorsum before the tornus, pale chestnut-brown, containing five or six short blackish fuscous transverse dashes; at its upper end this streak is connected with a brownish fuscous

spot, about the middle of the termen, which sends a dark shade through the whitish ochreous cilia; below this spot the space within the tornus inclines to whitish grey, and above it the triangular space between the dark costal shade and the upper half of the termen is white, a narrow dark line running around the termen at the base of the cilia; on the underside the geminated streaks are distinctly visible on the outer half of the costa. *Exp. al.* 22 mm. *Hind wings* dark greyish fuscous; cilia tipped with greyish. *Abdomen* dark greyish fuscous. *Legs* cinereous, clouded with fuscous on the hind tibiæ and tarsi.

Type, ♀ (40228) Mus. Wlsm.

Hab. ASSAM—NAGA HILLS—Golohat (*Doherty*, 1890).
Unique.

The termen of the fore wings in this species differs from that of *acutana* in not being more distinctly impressed below the apex than in the typical species. The ♂ is unknown, but it will probably be found to be congeneric with *fimbriata*.

924 (13). *Phæcadophora* (?) *ochracea*, sp. n.

Antennæ cinereous. *Palpi* whitish ochreous, the fringes at the end of the median joint and the terminal joint purplish fuscous. *Head* fuscous. *Thorax* cinereous. *Fore wings* with the termen slightly impressed beneath the apex; pale ochreous on the dorsal half, dark tawny red on the costal half, a dark purplish fuscous shade overspreads the basal and lower portions of the costal half, and on the costa is a series of pale ochreous geminated streaks terminating (especially those towards the apex) in very oblique pale steel-grey lines; the pale ochreous dorsal colouring extends to the costa at the extreme base and separates the costal shade from the fold for about one-fourth the wing-length; it also encroaches upon it by a small angular excrescence at about one-third, from a little beyond the middle of the wing it extends obliquely across the fold in a straight line to the extreme apex; a slight brownish ochreous shade passes upwards from the tornus direct, not obliquely, and contains three or four dark fuscous dots, this shade extends to the upper half of the termen; there is also a shade of a similar colour below the middle of the fold, with a small patch of fuscous scales at the extreme base of the dorsum; cilia pale ochreous, shaded with brownish ochreous at their middle, and with greyish fuscous for a small space above the middle of the termen; underside with the costal spots showing distinctly throughout. *Exp. al.* 20 mm. *Hind wings* dark brownish fuscous; cilia

greyish. *Abdomen* dark greyish fuscous; anal tuft ochreous. *Legs* whitish ochreous, shaded with greyish ochreous, hind tarsal joints spotted.

Type, ♀ (60421) Mus. Wlsm.

Hab. COREA—Gensan, VII.—IX. 1887 (*Ito*). Unique.

DUDUA, Wkr.

DUDUA, Wkr. Cat. Lep. Ins. B. M. XXX. 1000 (1864).

Dudua hesperialis, Wkr.

Dudua hesperialis, Wkr. Cat. Lep. Ins. B. M. XXX. 1000 (1864)¹.

Antennæ dark brownish fuscous. *Palpi* short, porrect, terminal joint almost concealed; bluish grey. *Head* very dark brownish fuscous. *Thorax* with an erect crest posteriorly; very dark brownish fuscous; tegulæ spotted with steel-blue. *Fore wings* dark brownish fuscous, freely spotted with shining steel-blue; before the middle of the costa are three pairs of steel-blue streaks, touched with whitish at their upper ends; on the extreme costa beyond the middle are four pairs of oblique geminated whitish streaklets, with a single one, not oblique, before the apex; of these the first pair, and the third pair (counting from the middle of the wing), send out oblique lines of steel-blue towards the termen; a steel-blue band from the tornus, running upwards for more than half the breadth of the wing, is preceded and followed by some patches of cinereous scales, which also extend upwards along the termen; the remainder of the lower half of the wing, with the exception of a space above the middle of the fold, is freely sprinkled with steel-blue spots; these are more thickly grouped beyond the middle than before it, except perhaps at the extreme base; cilia shining steel-blue, tipped with fuscous, at the apex dark fuscous. *Exp. al.* 19 mm. *Hind wings* greyish brown; cilia pale cinereous, a dark shade running through them near their base. *Abdomen* greyish brown. *Legs* pale cinereous; posterior tarsal joints shaded and banded with greyish fuscous.

Type, ♂ (*Saunders Coll.*), Mus. Br.—acquired 1894.

Hab. JAPAN (*Pryer*, 1886)—*KIVSIV*—Satsuma, V. 1886 (*Leech*). CHINA—Chang Yang, 4000–6000 ft. (*Pratt*, 1886). BORNEO—Sarawak¹.

The above description, taken from a female from Satsuma (60012), was made before the rediscovery of the missing types “in Mr. Saunders’s Collection.” I have only females and therefore cannot determine whether the genus *Dudua* is

distinct. I noted that the type, which is unset, had broadly fringed hind tibiæ, and Mr. Durrant, who drew the neuriation, thought that the flexus of the hind wings was probably somewhat bulged as in *Phæcadophora*. At present it cannot be determined whether *Dudua* should be referred to *Phæcasio-phora*, Grt., or to *Phæcadophora*, Wlsm., or whether it is distinct from both.

PHÆCASIOPHORA, Grt.

924 (14). *Phæcasio-phora Fernaldana*, sp. n.

Antennæ reddish fuscous. *Palpi* reddish brown at the sides, paler towards the apex. *Head* reddish brown. *Thorax* rosy fawn, mottled with umber-brown. *Fore wings* rosy fawn, with a short basal patch and three irregular fasciaform markings all confined to the costal side of the fold; these markings are all broken up and jagged at the edges and consist of greyish fuscous and olive-brown, margined and reticulated with dark umber-brown; the short basal patch is narrow on the costa, dilated and angulated on the upper edge of the cell, its lower margin not reaching the fold and ill-defined; the first fasciaform band is, at one-third the wing-length, broken into two patches, the first adjacent to the costa, irregularly quadrate, the other beneath it, adjacent to the fold, somewhat reniform; the second fascia, beginning scarcely beyond the costa, is wider and more conspicuous than the other two, and sends out three excrescences on its outer side and two slight projections on its inner side, the pale ground-colour between the outer excrescences gives the appearance of a spot (or reduplicated spot) about the upper angle of the cell; the third fascia does not reach the costa, but is curved from near its outer fourth, first outwards towards the apex, then downwards in the direction of the tornus, sending out two projections on its outer side towards the termen; between this fascia and the apex of the wing is a slight grey shade, followed by a slender dark umber-brown line and a small triangular apical spot; the extreme costa is narrowly pale fawn-colour, with numerous short striæ, some oblique, some almost straight; the rosy fawn portions of the wing between the fasciæ, as well as the dorsal fourth of the wing-width, are clouded and reticulated with grey and greyish fuscous and with a small proportion of umber-brown; cilia pale fawn, with a narrow brownish line near their base and three or four greyish spots running through them at the apex and on the termen. *Exp. al.* 22-24 mm. *Hind wings*

brownish fuscous, inclining to whitish on the costa and limbus; cilia pale cinereous, a dark line near their base. *Abdomen* greyish fuscous, anal tuft cinereous fawn. *Legs*: ♂ with the posterior pair densely and widely tufted above with long white hair-scales; posterior tarsal joints lightly spotted with greyish fuscous above.

Type, ♂ (70279, Japan); ♀ (70275) Mus. Wlsm.

Hab. COREA — Gensan, VII.-IX. 1887 (*Ito*). JAPAN (*Pryer*, 1886). Sixteen specimens.

This species is larger than the American *confuzana*, Wkr., which it greatly resembles, although the actual form of the markings is somewhat different, the pattern appearing fairly constant through a considerable series of specimens.

924 (15). *Phacasiophora Pryeri*, sp. n.

Antennæ pale brownish fawn. *Palpi* whitish fawn, touched with brownish externally. *Head* brownish fawn. *Thorax* evenly mottled with whitish fawn and brown. *Fore wings* whitish fawn, divided into innumerable streaks and reticulations by brown spots, lines, and patches; a basal patch occupying about one-third of the wing is but faintly indicated by three brownish spots in a fasciaform series, each margined with umber-brown, and is much reticulated throughout; from the middle of the costa is a large brown blotch shaded with umber-brown, and another below it, not crossing the fold, and partly connected with the first, at its upper edge this patch is also clouded with dark umber-brown and sends out two excrescences on its outer side, these are outlined by whitish fawn streaks enclosing shining bluish grey scales and forming an elongate whitish fawn spot between the excrescences, extended outwards and downwards; beyond them is a curved patch of fawn-brown, through which run six or more transverse lines of dark umber-brown; this patch is narrowly connected with the termen about its middle, and on its upperside is bounded by a long curved whitish fawn line, reaching from the dark costal patch to the middle of the termen, having some shining grey scales along its upper edge; above it are five pairs of pale costal geminations, separated by brown spaces, the apex itself is brown, a pale waved line running from the last costal gemination nearly to the middle of the termen; there is also a rather inconspicuous brown patch on the dorsum before the tornus; cilia reddish fawn, a reddish brown shade running throughout them near their base, and some greyish spots about the apex and termen. *Exp. al.* 20 mm. *Hind wings* dark greyish

brown; cilia whitish cinereous, with a greyish brown line near their base. *Abdomen* greyish brown, anal tuft inclining to ochreous. *Legs*: ♂, posterior pair, densely and widely tufted above with long whitish cinereous hair-scales; posterior tarsal joints faintly spotted with pale brownish.

Type, ♂ (70270); ♀ (70269) Mus. Wlsm.

Hab. JAPAN (Pryer, 1886)—HONDO—Foochau, IV. 1886 (Leech). Nine specimens.

XIV.—On Giant Squirrels from the Amazonian Region.

By OLDFIELD THOMAS.

THE British Museum has received during the last two or three years a number of Giant Squirrels belonging to the *Sciurus Langsdorfi* group from several different localities in South America. On determining these one proves to need description, while additional localities may be recorded for others.

During the progress of this work Dr. Kükenthal, of Breslau, has been good enough to render me valuable assistance by the loan of the original type of *S. tricolor*, Pöppig, from Maynas, Peru, without which it would have been impossible to determine to what form that name should be applied.

Sciurus igniventris, Wagn.

Nericagua and Munduapo, Upper Orinoco (*G. K. Cherrie*); Bogota (*G. D. Child*).

The type locality of this species is Marabitanas, on the Upper Rio Negro, not far from the latter river's junction with the Upper Orinoco. The further extension of the species westwards to Bogota follows the line of the Rio Meta, which falls into the Orinoco in the same district that Mr. Cherrie collected in. South-eastwards the species ranges along the Rio Negro to its mouth.

Sciurus tricolor, Pöppig.

Mouth of Rio Coca, Upper Rio Negro. Collected and presented by Mr. W. Goodfellow.

The type locality of Pöppig's species was Maynas, in the angle between the Lower Huallaga and the Marañon; but as Mr. Goodfellow obtained two species on the Coca to the northwards, and a third had been found by Signor Balzan to the southwards, I was in great difficulty as to which was the real *S. tricolor*. Happily Dr. Kükenthal's kindness has

enabled me to fix *S. tricolor* as one of the two species found by Mr. Goodfellow on the Coca. Its differences from its ally are enumerated below. The type is an old female, and though it was said by Prof. Gravenhorst* to have only 6 mammæ, careful search shows that it has 8, the usual number in this group.

The skull of *S. tricolor* is less bowed than in the other species and has an unusually long narrow muzzle.

The melanoid *S. fumigatus*, Gray, from the "Upper Amazon," may possibly be referable to *S. tricolor*, but its determination must always remain somewhat doubtful. The same author's *S. brunneoniger* is also a member of the present group, but is not like any properly localized specimen that I have seen.

Sciurus cocalis, sp. n.

Not dissimilar at first sight to *S. tricolor*, found in the same place, and it is only after the examination of three skins of one form and seven of the other that I have satisfied myself of their essential difference. General colour above grizzled yellowish anteriorly, becoming chestnut-rufous posteriorly. Crown finely grizzled rufous, not blackish. Backs of ears rich rufous, a prominent spot behind their posterior bases bright fulvous. Under surface clear buffy or orange-buffy, becoming more rufous on the throat and inner sides of the limbs; line of demarcation on sides sharply defined and in most specimens with a distinct black line running along the lower edge of the upper colour, and an indication of a rufous line along the pale colour just below it. Fore limbs bright orange-rufous on their outer surfaces from the elbows downwards. Hind limbs chestnut-rufous externally as far down as the ankles, then the feet are again orange-rufous like the fore limbs. Tail long, bushy, black for its basal 3 inches, then broadly washed with bright orange-rufous, and so far like that of *S. tricolor*, but below the black which succeeds the rufous on the hairs there is a broad band of yellowish or orange, which may either extend downwards to the bases of the hairs or be succeeded again by another dull ring.

Skull shorter, more bowed, and with a more normal-shaped muzzle than in *S. tricolor*.

Dimensions of the type (an adult male, measured in skin):—

Head and body 315 millim.; tail 283, with terminal hairs 345; hind foot (wet), s. u. 63, c. u. 66; ear (wet) 32.

* Tschudi, Faun. Peruana, Mamm. p. 157 (1845).

Skull: basilar length (of a second specimen) 47·5; nasals (of type) 18·3 * × 8·5; interorbital breadth 20·5; intertemporal breadth 19·2; diastema 17·8; length of upper molar series 10·4.

Hab. Mouth of Coca River, Upper Rio Napo.

Type. Male. B.M. no. 0. 6. 3. 4. Collected in June 1899 and presented by Mr. Walter Goodfellow.

It is probable that just as *S. tricolor* ranges northwards from Maynas to the Coca River, so *S. cocalis* will be found to range up that river westwards and northwards, and that the two species only overlap just at this point. As the two species are found together it may be well to emphasize their differences by repeating that *S. cocalis*, as represented by seven specimens, differs from *S. tricolor* (1) by its grizzled instead of blackish crown, (2) by the light patches behind the ears, (3) by its bright orange instead of chestnut fore limbs and hind feet, (4) its black-lined sides, (5) its basally ringed caudal hairs, and (6) its shorter muzzled skull.

Sciurus pyrrhonotus, Wagn.

Yungas and Misiones, on the Upper Mamoré, Bolivia (*L. Balzan*, in Museo Civico, Genoa).

The type locality of *S. pyrrhonotus* is Borba, near the mouth of the Madeira, so that its occurrence on the Mamoré, on the far upper waters of that stream, affords another instance of the manner in which the ranges of these squirrels follow the lines of the great Amazonian rivers.

XV.—*Plankton Studies*.—II. On *Pleodorina illinoisensis*, a new Species from the Plankton of the Illinois River. By C. A. KOFOID, Ph.D.†

[Plates V. & VI.]

THE genus *Pleodorina* was discovered in 1893 by Shaw (1894) at Palo Alto, California, and in May of the following year the species *Pleodorina californica*, upon which the genus was founded, was detected by Mottier (1894) in water from a shallow stagnant pool near Bloomington, Indiana. During

* Diagonally.

† From the 'Bulletin of the Illinois State Laboratory of Natural History,' vol. v. pp. 273-293. From a separate impression communicated by the Author.

the same summer the form also occurred in the Illinois River and its adjacent waters (Clinton, 1894), and it has been found in the plankton of these situations in succeeding years from June to September. The distribution of the species in this continent is thus quite extended, and it is not at all improbable that continued investigation of freshwater plankton will demonstrate that this genus has a cosmopolitan distribution similar to that of some other genera of the family Volvocineæ to which it belongs.

On June 16, 1898, a form which may be referred to the genus *Pleodorina* was found in the Illinois River in water entering the stream in large part from Cook's Slough and Quiver Lake. Owing to high water (10 feet above low-water mark) prevailing at the time, a considerable portion of the habitat of the form in question consisted of submerged territory, with shallow warm water abounding in growing aquatic and semi-aquatic vegetation.

This *Pleodorina* could not be found in Quiver Lake collections made on the 7th of June, but on the 16th it was present in the river in small numbers, increasing until the 20th, when a maximum was reached. From this time the numbers decreased until the 27th, when, following a rise in the river, the species seemingly disappeared entirely from the plankton. It was also found sparingly in Thompson's Lake during this period, a large area of slightly submerged territory being at this time tributary to the lake.

Associated with this species in great abundance was *Eudorina elegans* in all stages of asexual reproduction, and *Pandorina morum* was also present in smaller numbers and in like condition. *Volvox*, *Euglena*, *Phacus*, *Lepocinclis*, *Trachelomonas*, *Dinobryon*, *Synura*, *Mallomonas*, *Uroglena*, *Melosira*, and *Fragillaria* occurred in varying frequency, but only a single specimen of *Pleodorina californica* was found in collections containing the species described in this paper. The animal plankton was represented in the main by rotifers, *Polyarthra* being most abundant, while *Synchaeta*, *Euchlanis*, *Pterodina*, *Brachionus*, and *Anuræa* were also present. *Diffugia*, *Codonella*, *Bosmina*, *Cyclops*, and nauplii complete the list of the more common associates of this *Pleodorina* in the plankton.

Pleodorina illinoisensis, sp. n.

The species here described consists of an ellipsoidal cœnobium or colony of 32, rarely 16 and still more rarely 64,

biflagellate cells. The shape is quite constant, occurring in the youngest colony and continuing throughout the asexual cycle until the daughter colonies abandon the gelatinous matrix of the maternal organism. Among the large number examined only a few specimens were seen which approached a spherical form. Measurements of twelve seemingly full-grown colonies from material freshly killed in 2 per cent. formalin showed a range of 101 to 137 μ in long diameter and an average of 113 μ . The transverse diameter ranged from 84 to 102 μ , and averaged 94 μ . Individuals in which the gonidia have begun to divide show a considerable swelling of the hyaline gelatinous envelope. One specimen containing 2- and 4-cell stages measured 178 \times 155 μ , and when the young colonies are ready to escape the parent may measure as much as 200 \times 175 μ . At the time of escape the young colonies measure 46 \times 38 μ . The measurements of the colonies approach very closely those given by Bütschli (1880-1889, p. 840) for *Eudorina*, viz. 100-150 μ ; and the colonies of this genus found in association with the form here described exhibit dimensions almost, if not quite, identical with those above recorded for the *Pleodorina*.

The colony (Pl. V. fig. 1) contains, as a rule, 32 cells, arranged, as Henfrey (1856) first noted for *Eudorina*, in five circles, two of which are polar and contain four cells each, while eight cells are found in each of the remaining three circles, one of which is equatorial, and the other two lie between the latter and the polar circles. The cells resemble those of *Eudorina* in that they are situated in the periphery of the hyaline gelatinous matrix and are not closely crowded together, the degree of separation depending upon the age of the colony, and varying considerably in different cases. Their inner ends do not approach the centre of the colony, as is the case in *Pandorina*. No trace of any protoplasmic connexion between the cells of a colony could be detected in the living organisms, nor in material killed in formalin or in chromoacetic acid and afterwards stained in fuchsin, hæmatoxylin, or Bismark brown. Specimens treated by Zograf's method (1 per cent. osmic acid followed by 4 per cent. crude pyro-ligneous acid), or by 1 per cent. osmic acid followed by picrocarmin, showed no connexion between the cells.

The colony is surrounded by a common gelatinous sheath (*sh.*) increasing in thickness (3.5 to 12 μ) with the age of the organism. This membrane or sheath is of equal thickness in all regions, and consists of two parts—an outer, thin, denser, more highly refractive layer (*o.l.*), and an inner homogeneous

one (*i.l.*), which shows no traces of the concentric structure found in *Pandorina*. It is within this latter layer that the increase in thickness takes place in the older colonies. It is limited centrally by a thinner and less highly refractive layer (*m.m.*), which encloses the common matrix (*m.*) in which the cells of the colony lie. Frequently among the older organisms there occur upon the posterior end of the colonies blunt pseudopodia-like protuberances (Pl. V. fig. 4) of the sheath, of irregular form and of no constant number. Their position and the fact that they are often, though not always, found in old colonies from which some of the daughter colonies have already apparently escaped, suggest that they may mark the place of exit of the young individuals from the parent. Similar protuberances were observed upon *Eudorina* and *Pandorina*, under similar conditions, in the collections in which the *Pleodorina* under discussion was found. Wills (1880) found that the daughter colonies of *Volvox globator* escaped through a rift in the posterior hemisphere of the parent, and Klein (1889) observed the same phenomenon in *Volvox aureus*. The escape of the daughter colonies in *Pleodorina* has not been observed by me.

The sheath stains deeply in an aqueous solution of methylen blue, more deeply, in fact, than the enclosed matrix, the outer layer taking the deeper stain. It also shrinks to about one fourth its former thickness. This shrinkage, together with that of the central matrix, causes the sheath to wrinkle along lines which bound hexagonal areas from whose centres the cells now project, thus giving the appearance of a division of the surface of the colony into regular polygons. The sheath shows no trace of the layer of radial rod-like structures found by Klebs (1886) in *Pandorina*, but iodine or methylen blue demonstrates a finely granular condition like that described for *Eudorina*. The sheath is traversed by the pairs of flagella which arise from the outer ends of each of the cells.

The matrix (*m.*) is a gelatinous substance of some consistency, filling the colony inside of the inner membrane. In the living colonies, in those which were killed in the various reagents mentioned above and afterwards stained, and in disintegrating material, no traces of any divisions can be detected in this substance that are not due to wrinkling caused by shrinkage. Methylen blue or iodine causes the matrix to show a faintly reticulated or vacuolated appearance due to different densities of staining. That the substance of the matrix has considerable consistency, even in the swollen condition found in the maternal colonies, is shown by the fact that the flagella of the young forms, before rotation begins,

can be seen to penetrate the matrix of the parent very slowly. Their ends are often blunted, or even knob-like, and their lateral motion is very limited. The movement of the young colonies through the matrix is a very slow and gradual one, showing the gelatinous consistency of the substance in which they are imprisoned.

The striking feature in the structure of this species, as in the case of *P. californica* (Shaw, 1894), is the presence of two distinct types of cells in the colony (Pl. V. fig. 1), the vegetative (*v.c.*) and the gonidial (*g.c.*) cells. The presence of these two types of cells at once places this new species in the genus *Pleodorina* rather than in *Eudorina*, which it otherwise closely resembles.

The vegetative cells (*v.c.*) are four in number and constitute the anterior polar circle, being always directed forward in locomotion, as in the other species of the genus. Their number remains the same in the smaller colonies of sixteen cells and in the larger ones of sixty-four. The diameter of these cells ranges from 9.5 to 16.8 μ , twelve cells averaging 12.25 μ . The size of these cells varies even in the matured colonies, measurements at this stage ranging from 9.6 to 15.6 μ . At birth the cells of the young colonies vary in diameter from 3.5 to 5 μ in different parents. In the daughter colonies, while still in the maternal matrix, no distinction in size between the vegetative and gonidial cells can be detected, nor can this distinction be made in the younger free-swimming colonies, it being thus impossible at this stage to distinguish the young *P. illinoisensis* from the similar stages of *Eudorina elegans* with which they were associated. When the young colonies have attained dimensions of $46 \times 38 \mu$ the vegetative cells measure 4 μ and the gonidia 4.8 μ . A like similarity between the two kinds of cells in the young colonies exists, according to Shaw (1894), in *P. californica*.

In structure the vegetative cells (Pl. V. fig. 2) are in most particulars similar to the gonidia, described below. They sometimes appear to be a trifle lighter green in colour—a difference which may be due to their smaller size. The principal differences lie in the smaller number of pyrenoids and the larger size, both absolute and relative, of the stigma or eye-spot.

As to the fate of the vegetative cells, the evidence at hand is insufficient and conflicting. In three colonies in which the daughters were moving about in the maternal matrix, some having already escaped, the vegetative cells showed very evident signs of degeneration, the contents being shrunken and irregular. In the larger number of instances of this stage

under observation the cells appeared normal, showing no trace of degeneration or division. In one instance only have I found a specimen in which the vegetative cells had divided beyond question. This was a colony in which the gonidia had completed their division but had not escaped. Three of the vegetative cells were in the two-cell stage and one was undivided. In two instances matured colonies have been found in which four smaller daughter colonies (of eight and sixteen cells respectively) were present at one pole.

The gonidial cells (Pl. V. fig. 3) constitute the remainder of the colony. They usually number 28, rarely 12 or 60, and occupy the parts behind the anterior polar circle of vegetative cells. These cells in most instances can be easily distinguished by their larger size. In form they are spherical, though some specimens in preserved material are slightly flattened on their inner ends. In diameter they range in seemingly full-grown colonies from 15 to 25 μ , averaging in twelve specimens 19.2 μ . Their dimensions just before their division, that is, in colonies in which division has begun, also show the extreme range quoted above, the smaller diameter having been found in a sixteen-cell colony. As a rule the gonidia are all of the same size, but occasionally specimens have been found in which one or more dwarf cells occur among them. These are irregular in their distribution and can be distinguished at once from the vegetative cells by their position. Similar dwarf cells were found in both *Pandorina* and *Eudorina*. In matured colonies gonidial cells are frequently found which fail to divide. The gonidia are of a light green colour, a trifle darker than the vegetative cells. Their colour in general is similar to that in *Eudorina*, and is somewhat lighter than that in *Volvox* and *Pandorina*, with which they are associated.

A distinct cell-membrane (*c.m.*) is found about each of the cells. In the living condition and in the material preserved in formalin it forms a highly refractive hyaline layer, about 1 μ in thickness, outside of the green contents of the cell. It stains very faintly in hæmatoxylin and assumes a deep brown tint with long-continued action of iodine and sulphuric acid. In the case of diseased colonies hereafter mentioned the cell-membranes persist, often retaining their original form and shape, after the entire disappearance of the contents.

The greater part of the cell-contents consists of what seems to be one large chromatophore (Pl. V. fig. 2, *chr.*), which occupies all of the cell except the centrally placed nucleus with its enveloping protoplasm, and a slender column (*p.c.*) passing from this region to the anterior end of the cell. In

many cells a faintly marked notch or furrow (*fu.*, fig. 1) is to be detected on one side of the chromatophore at the anterior end of the cell. This seems to mark the line of contact of the sides of the chromatophore which has surrounded the nucleus. In the 2- and 4-cell stages of the gonidial cells the nucleus and the protoplasmic mass are plainly seen to occupy one side of the cell (Pl. VI. figs. 7, 8), but in the cells of the young colony it again occupies a central position. The chromatophore is uniformly of a bright chlorophyll-green, and shows a finely granular structure under high magnification. In the youngest colonies each cell contains but a single spherical pyrenoid (*pr.*), which occupies a lateral position in the chromatophore, in the inner hemisphere of the cell. In the older colonies the number of pyrenoids increases, as many as twelve having been found. They are scattered irregularly through the chromatophore, and may occur in any part of it. A similar increase of pyrenoids is reported by Shaw (1894) for *P. californica*. In the vegetative cells the number of pyrenoids is often but 2-4, and is, as a rule, less than that of the gonidial cells. In a very few instances as many as eight have been found, and in one old colony the vegetative cells seemed to be packed full of pyrenoids. In the young colonies the pyrenoids have a diameter of about $1\ \mu$, and in the older colonies of $2.5\ \mu$.

The nucleus (*n.*) lies in about the centre of the cell in the midst of a mass of protoplasm enclosed by the chromatophore. In mature gonidial cells before division it has a diameter of $7-8\ \mu$, and contains a sub-central nucleolus (*ncl.*) whose diameter is $3\ \mu$. The nucleolus stains deeply with picrocarmine, and is by this means easily distinguished from the pyrenoids, which it resembles in appearance and size. The nuclear membrane is detected with difficulty. It encloses a faintly stained nuclear reticulum (*r.*). In the younger cells the nucleus is much smaller ($4-5\ \mu$), the nucleolus is relatively larger, and the reticulum is not evident. In the living cell the nucleolus alone can be seen in the midst of the greyish protoplasmic mass at the centre of the cell. The protoplasm is continued from this central region peripherally, in the axis of the cell as a slender column (*p.c.*), to the anterior end, where it includes the stigma and bases of the two flagella. A protoplasmic mantle enclosing the chromatophore was not demonstrated.

The stigma or eye-spot (*s.*) lies at the anterior end of the cell, near its axis, and is often so placed that an equilateral triangle may be drawn with it and the bases of the two flagella as apices. It is of a bright reddish-brown colour, though in

some of the posterior cells the colour is often very faint, giving the stigma the appearance of a slightly tinged oil-globule. It is of an elongated hemispherical shape when seen from the side, and has a circular outline when seen from above. Its upper end often projects slightly so as to elevate the cell-membrane. The application of killing agents and alcohol soon removes its colour, and even in formalin this fades out in the course of a few days, leaving merely a colourless, highly refractive structure. The larger stigmata have a diameter of 2.5μ and a depth of 2.8μ , and are to be found in the cells in the anterior part of the colony, especially in the four vegetative cells of the anterior polar circle. Posteriorly the stigmata are less prominent, and are often not to be found at all as brightly coloured spots but merely as pale globules whose position alone affords a clue to their real character.

This specialization of the stigmata in the anterior end of the colony occurs also in *Eudorina*, *Pandorina*, and *Volvox*, and Shaw (1894) states that in *P. californica* the stigmata, which are present in the posterior part of the young colonies (in gonidial cells), become less conspicuous and disappear as the colony enlarges and the differentiation of the cells proceeds. This prominence of the stigmata in the anterior end, together with the facts that this end is always directed foremost in locomotion and that the species showing this differentiation are positively phototactic in the vegetative condition when the differentiation is prominent, all point toward the participation of the stigmata in the function of light perception. An interesting phenomenon occurs at the time of the division of the gonidia, for the stigma of the mother cell persists and is passed on through the five successive cell-divisions to the outer end of one of the cells of the daughter colony, situated in the margin of the cup which arises from the plate of cells and closes to form the ellipsoidal daughter colony. Inasmuch as this cup always closes from the inside out, that is, with the opening directed outward, it is evident that the stigma must traverse the distance between the outer end of the mother cell and its inner end, which corresponds to the outer ends of the cells of the daughter colony. New stigmata arise in the cells of the daughter colony, but being at first very small are thus quickly distinguishable from the persisting stigma. The ultimate fate of this persisting stigma has not been traced.

No contractile vacuole was observed in the living cells, and careful search with a Zeiss $\frac{1}{2}$ -inch oil-immersion lens for this structure in preserved and stained material has led to no positive identification of a vacuole. The bleached stigma

and what seem to be the enlarged bases of the flagella are the only areas discernible in the anterior end of the cell which at all resemble a contractile vacuole. Shaw (1894) finds in picronigrosin material a single vacuole in the anterior end of the young cells of *P. californica*.

The flagella (*f.*) are two in number for each cell, and unite with the cell at the anterior end adjacent to the stigma. The two flagella have the same proportions, and in adult colonies they measure 40 μ in length. In the young colonies they are relatively longer. They are visible on the young colonies shortly after the cup closes, and persist upon the maternal colony during the early divisions of the gonidia.

The locomotion of the colonies of *Pleodorina illinoisensis* is of the type prevailing among other spherical or ellipsoidal genera of the *Volvocineæ*; viz., rotation about the principal or long axis of the colony, either from right over to left or the reverse, frequently with one direction predominating, progression being usually along the line of the axis, the same end of the colony always leading. In *P. illinoisensis* the vegetative pole always leads in locomotion in horizontal, oblique, and vertical movements, and is therefore the anterior pole of the colony. Under normal conditions, when under observation, this species is rarely quiet during the period of growth. While still within the matrix of the mother colony the ceaseless rotation with its frequent reversals begins. Colonies in the life cell, while favourable conditions prevail, can be seen in active movement, jostling one another and their neighbours in their seemingly aimless wanderings. When an object is met which does not yield to their persistent rotation, their movements may slacken for a time to be resumed shortly in some line of less resistance. The rotation of this species is prevailingly from right over to left, as the following tables show, which indicate the number and direction of the reversals of rotation in ten individuals in one minute.

Direction	1	2	3	4	5	6	7	8	9	10	Total.
Right over to left ..	2	1	1	2	1	2	1	5	4	3	22
Left over to right ..	2	0	0	1	1	2	1	4	3	2	16

A few days later a second set of observations was made with the following result :—

Direction	1	2	3	4	5	6	7	8	9	10	Total.
Right over to left . .	3+	5±	3±	3±	4+	3+	5+	3+	2+	4+	35
Left over to right . .	2-	5±	2±	3±	3-	3-	5-	2-	2-	3-	30

In the majority of instances where the direction of rotation was observed it was from right over to left, the ratios being 22 to 16, and 35 to 30. These tables give some idea of the frequency of change in direction and its variation in different individuals, but do not show the duration of the directions of rotations. This is indicated in a general way in the second table by the plus and minus signs, which show the direction in which the rotation was of longer and shorter duration. In conclusion it may be said that both directions of rotation occur, though that from right over to left is more frequently met with, or, in other words, is of longer duration.

With regard to locomotion in *P. californica*, Shaw (1894) says that "the movement of the plant in the water was followed in the case of a few individuals bearing well-developed gonidia. In swimming through the water the vegetative pole is directed forward and the plant revolves to the right (in observed cases) on the axis connecting the vegetative and reproductive poles. The path is parallel to this axis in upward vertical as well as in horizontal movement." The polarity of this genus thus expressed physiologically in the movements of the colony is accompanied by a corresponding structural differentiation of the cells composing the organism.

In *Gonium*, according to Fresenius (1856), the motion of the colony resembles that of a wheel, progression taking place in the line of the axis of rotation. According to Bütschli (1883-1887, p. 858), locomotion is accomplished by the rotation of the plate-like colony around its shorter axis, the direction of rotation being to the right in some individuals and to the left in others. Pfeffer (1884), on the other hand, describes the rotation during the forward movement as alternately from the right and the left. Migula (1890) calls attention to the wavering, often backward, and irregular movements of this genus, and also notes its rotation about an axis through the middle of the colony. This rotation is either to the right or to the left, no predominance being mentioned. Polarity is thus marked in the activity of the *Gonium* colony, though not expressly marked in its structure except as it appertains to the individual cells.

In *Stephanosphaera* the polarity in structure is but slightly marked in the colony, being indicated in some colonies by the asymmetrical position of the cells, but there is a physiological differentiation in that one pole of the colony leads in locomotion. In this genus also, according to Cohn (1852), the rotation is in either of the two directions and is subject to frequent change. No predominant direction was noted by him.

In *Pandorina* the only structural expression of polarity is found in the greater development of the stigmata in the cells in the anterior end of the colony. In other particulars the poles are not differentiated. Braun (1851) maintains that in this genus the rotation is constantly around the long axis of the colony in the direction of the hands of a clock, when the motion is toward the observer. Nägeli (*vide* Bütschli, 1883-1887, p. 858), on the other hand, observed rotation in both directions. My own observations upon *Pandorina morum* show beyond question that the direction of rotation is not constant, as the following table demonstrates:—

Direction	1	2	3	4	5	6	7	8	9	10	Total.
Right over to left ..	6+	12+	5±	1-	2±	3±	7±	1+	1+	3±	41
Left over to right ..	6-	12-	4±	2+	2±	4±	6±	2-	1-	3±	42

The table gives the direction and number of changes in direction in rotation of ten colonies, each observed for one minute. The plus and minus signs indicate the estimated predominance in duration. According to the table the instances of direction observed are approximately equal for the two directions, though that from right over to left showed the greater duration. The younger and smaller colonies showed much the greatest activity and exhibited more frequent changes in direction than the older colonies. In all observed cases the same end continues to lead in locomotion, physiological polarity being thus fully developed in this genus.

In the case of *Eudorina* the structural polarity of the vegetative colonies is no more marked than it is in *Pandorina*, though according to Carter (1858) there is in the monœcious sexual colony a differentiation, in that the four cells at one pole divide to form spermatozoa, while the remaining twenty-eight become egg-cells. It should be noted in this connection that no such colonies were observed by Goroschankin (1875) in the sexual generation. The literature at hand presents no

precise statement as to locomotion in this genus. As observed by me, it closely resembles that described above for *Pleodorina illinoisensis*; viz., rotation around the long axis of the colony, the same pole constantly leading in progression. The direction of rotation is frequently reversed, though it was predominantly from right over to left in the cases observed. A functional polarity thus exists in this genus.

In *Volvox*, according to Klein (1890), there is a polar differentiation as regards the stigmata that is even more marked than it is in the genera previously mentioned. He finds that the cells of the pole directed forward in locomotion each possess a stigma which is especially large and intensely coloured; that the colour fades out and the stigmata become smaller and paler as the equator is approached; and that beyond this they are usually represented merely by a colourless oil-drop, which in some cases may even disappear. The posterior hemisphere is also marked by the development there of the gonidia, as was first shown by Cohn (1856), and occasionally ellipsoidal colonies are found whose long axis connects the anterior and posterior poles. Locomotion in *Volvox* is accomplished, as elsewhere in the family, by the rotation of the colony about its principal axis. Wills (1880) observed the predominance of the rotation to the right and its occasional brief reversal. Klein (1889) states that this preference is found in *V. globator*, but that it is not shown by *V. aureus*. In this latter species the changes are frequent and are often separated by a brief pause. Backward motion is rarely seen and lasts but a short time. In the case of *Volvox* the axis of rotation is slightly oblique, the centre of the colony remaining in the line of progress, but the axis of rotation being inclined from above the line at the anterior pole to below it at the posterior one.

We thus find that *Pleodorina illinoisensis*, which exhibits both a structural and physiological polarity, shares with most, if not all, of the genera of the family to which it belongs the physiological differentiation which is expressed in locomotion, and also, in observed cases, exemplifies the extreme form of a predominance of rotation in one direction. We also find that the structural differentiation shown in the decadence of its posterior stigma obtains in varying degrees in the other spherical and ellipsoidal genera of the family—least in *Pandorina*, most in *Volvox*. The genus *Pleodorina* agrees with *Volvox* in having a structural polarity based upon the division of the colony into vegetative and gonidial regions, but the differentiation is simpler. Of the two species of *Pleodorina*, the one here described exhibits the simplest possible

differentiation of the colony consistent with the symmetry of the organism; viz., the differentiation of the anterior polar circle of four cells as vegetative members of the colony. Of the two species of the genus it thus stands nearer *Eudorina*, while its sister species, *P. californica*, approaches more closely to *Volvox* both in the number of cells and in the extent of the differentiation.

The discovery of this additional species of the genus *Pleodorina* thus supports the opinion expressed by Shaw (1894), who founded the genus, that it was intermediate between *Eudorina* and *Volvox* but nearer the former. Judging merely from the asexual stage, *P. illinoisensis* affords additional evidence of the close relationship of *Pleodorina* and *Eudorina*.

Throughout the preparation of this paper the writer has had constantly in mind the possibility that the form here described is merely a stage in the life cycle of *Eudorina*. A number of facts lend support to this hypothesis: (1) the occurrence of *Pleodorina illinoisensis* with *Eudorina elegans*; (2) their marked similarity, aside from the four vegetative cells, in structure and measurements; (3) the impossibility of separating the youngest free-swimming colonies of the two forms; (4) a considerable variation in the size of the vegetative cells in *Pleodorina*, grading toward the condition in *Eudorina*; (5) some evidence that in certain cases at least the vegetative cells may divide, one case of a 2-cell stage having been seen in the hundreds, if not thousands, of specimens examined, and one instance noted in which a maternal colony containing thirty-two daughter colonies had at one pole four colonies which were slightly smaller than the remaining twenty-eight; and (6) the occurrence of pleomorphism in the family Volvocineæ, Klein (1889 and 1890) citing no less than twenty-four "combinations" in the case of *Volvox aureus*. It may then be that the form here described as *Pleodorina illinoisensis* is only a "*Pleodorina* stage" of *Eudorina*.

The abrupt disappearance of this supposed new species from the plankton prevented the carrying out of breeding experiments designed to test its validity, and it seems that the matter must remain undecided for the present. In the absence of satisfactory proof that the form here described is but a phase of the life cycle of *Eudorina* it has seemed best to the writer to make the above suggestion and to take the only course open in publication, namely, the description of the form as a new species, inviting the criticism of subsequent investigation. The dilemma here presented is by no means an isolated one in plankton work, nor is it new to the family Volvocineæ:

witness the long confusion which existed over the two species of *Volvox*, *aureus* and *globator*, which has been at last cleared up by the excellent work of Klein (1889, 1889 *a*, and 1890) and Overton (1889). Another instance is often presented when *Pandorina* and *Eudorina* both occur in the same collections and the plankton statistician must decide to which genus each specimen observed must be referred. Typical specimens of each can be found, but all individuals do not conform to the type, or they may present conditions in which the conformation is obscured by some phase of the life cycle.

The asexual reproduction of *Pleodorina illinoisensis* (Pl. VI.) resembles that of other species of the genus in that it is accomplished by the repeated division of the gonidial cells, resulting in the formation of daughter colonies in the maternal matrix. These escape later from the parent organism, and by growth attain the adult condition with the differentiation of the four vegetative cells. Five successive cell divisions, pervading all the cells of the parent organism except the vegetative cells, are necessary for the completion of the process, and result in the 2-, 4-, 8-, 16-, and 32-cell stages of the forming colonies. The first two of these divisions result in the formation of a quadrangular plate of cells—a form which is retained through the two succeeding divisions, which produce the 8- and 16-cell stages. The cupping of this plate, which results in the formation of an ellipsoidal colony, is apparent as early as the 4-cell stage (Pl. VI. fig. 9) and continues through the later stages (figs. 11, 13), so that by the time the 16-cell plate is formed it has almost the curvature of a saucer. With the formation of thirty-two cells the closure of the cup proceeds and is soon completed. The orifice of the cup is directed outward in all cases, and thus the ends of the cells of the daughter colony which are formed from the *outer* end of the maternal gonidial cell come to lie in the inner side of the cup, and are the *inner* ends of the cells of the daughter colony. In the matured colonies the young usually lie with their long axes parallel to the surface of the parent. I have not, however, been able to identify the point of closure of this cup with this region or positively with any other.

The sequence and position of cleavage planes which produce the quadrangular plate of the 16-cell stage is, in the main, similar to that described by Goroschankin (1875) and Braun (1875) for *Eudorina* and *Volvox*. Beyond this stage there is some doubt as to the agreement. A full discussion of the subject is beyond the scope of the present paper, for which the

following brief description must suffice. The first cleavage plane (I) divides the gonidial cell into two hemispheres along the axis of the cell, and the daughter nuclei, with the surrounding protoplasm, are placed close together in the centre of the opposing faces of the new cells (Pl. VI. fig. 7). The second plane (II) is at right angles (figs. 8, 9) to the first and also passes through the regions representing the axis of the ancestral cell. In this instance also the nuclei are gathered near the centre of the young colony, which exhibits to an appreciable extent the curving indicative of the later formation of the cup. The 8-cell stage results from the divisions of each of the quadrants of the 4-cell stage by a plane (III) which is parallel to one of the previous planes and perpendicular to the other, meeting the latter at a point about midway between the centre and the circumference. By a subsequent adjustment of the cells the four more centrally placed ones come to form a sort of Greek cross whose angles are filled by the other four (Pl. VI. figs. 10, 11). The 16-cell stage is formed by four additional planes, each of which divides one of the cross-cells and its corner neighbour. The location of these planes may be described in the same terms as the last, excepting that they meet the radial planes, I and II, at about one fourth the distance from the circumference toward the centre. The cupping of the plate soon advances to such an extent that it consists of a square of four centrally placed cells, upon each of the four sides of which there overhangs a row of three cells, of three grades of elevation (Pl. VI. figs. 12, 13). The succeeding division and the completion of the cup (Pl. VI. fig. 14) result in the young colony's assuming the ancestral form. Throughout these divisions the number of pyrenoids in the daughter cells grows steadily less. But one can be found in each cell in the 32-cell stage, while in the 16-cell stage two are readily recognizable in each cell. In the earlier stages and before division the number often varies, and the pyrenoids are frequently so crowded that enumeration is difficult, if not impossible. It seems not improbable that these structures also must undergo some division during the process of cell-multiplication. During the processes of division the nuclei continue to occupy a position near the inner ends of the cells (in the new colony), and it is only after the divisions have been completed that they come to occupy their usual positions at the centre of the cells—perhaps as a result of the growth of the chromatophore.

No stage of sexual reproduction has been positively identified for this species.

A peculiar condition of the colonies of this species, also

occurring in *Pandorina* and *Eudorina*, deserves passing notice. It occurred with considerable frequency in all three genera, and resulted in each case in the destruction of the entire colony affected. The early stages of the disease, if it be such, are indicated by the homogeneous condition of the cells and the fading out of the colour, together with a flattening of the cell-contents into a disk- or lozenge-shaped mass (Pl. V. fig. 4). In the subsequent stages this mass assumes a yellow and then a brownish colour, takes on an irregular shape (Pl. V. fig. 5), and disintegrates, leaving the empty cell-walls occupying the matrix. In spite of the suggestion in the above description there was never any trace of the formation of spermatozoa in the colonies presenting these phenomena, neither was there any indication of encystment. There was no indication of either a fungous or an algal parasite, and it seems not improbable that the occurrence of these diseased forms may have been due to some unfavourable local condition in the water tributary to the habitat of the genera affected.

The following brief synopsis of the prominent characters of this genus and its two species will serve as a convenient diagnosis for their determination:—

PLEODORINA, Shaw.

Colony consists of a spherical or elliptical cœnobium of greenish biflagellate cells of two types, vegetative and gonidial, in the anterior and posterior parts of the colony respectively, which lie in the periphery of a hyaline gelatinous matrix and are surrounded by a common hyaline envelope. Cells each with one reddish stigma, which is more prominent in the anterior part of the colony. No connecting filaments between the cells. Non-sexual reproduction by gonidia, which are formed by increase in size of a part of the cells of the colony. Daughters escape from parent as small colonies of biflagellate cells, which at this stage are all similar. Sexual reproduction not known.

Pleodorina californica, Shaw.

Number of cells in colony 64 or 128. Maximum diameter of colony 175-340 μ . Vegetative cells constituting approximately one half the colony. Gonidial cells 2-3 times diameter of vegetative cells. Known habitat: ponds, ditches, and streams in California, Indiana, and Illinois.

Pleodorina illinoisensis; sp. n.

Number of cells in colony usually 32, rarely 16 or 65. Dimensions of colony range from $46 \times 38 \mu$ to $200 \times 175 \mu$. Vegetative cells always 4 in number. Gonidial cells approximately 1.1—2 times diameter of vegetative cells. Known habitat: submerged lands along the Illinois River. Types deposited in collections of Illinois State Laboratory of Natural History and United States National Museum.

Illinois Biological Station,
July 25, 1898.

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EXPLANATION OF THE PLATES*.

Abbreviations.

<i>A.</i> Anterior pole.	<i>ncl.</i> Nucleolus.
<i>chr.</i> Chromatophore.	<i>o.l.</i> Outer layer of sheath.
<i>c.m.</i> Cell-membrane.	<i>P.</i> Posterior pole.
<i>f.</i> Flagellum.	<i>p.c.</i> Protoplasmic column.
<i>fu.</i> Furrow.	<i>pr.</i> Pyrenoid.
<i>g.c.</i> Gonidial cell.	<i>r.</i> Reticulum.
<i>i.l.</i> Inner layer of sheath.	<i>s.</i> Stigma.
<i>m.</i> Matrix.	<i>sh.</i> Sheath.
<i>m.m.</i> Matrix membrane.	<i>v.c.</i> Vegetative cell.
<i>n.</i> Nucleus.	I, II, III. Cleavage planes.

PLATE V.

- Fig.* 1. *Pleodorina illinoisensis*, lateral view of colony. $\times 500$.
- Fig.* 2. Lateral view of vegetative cell. $\times 1500$.
- Fig.* 3. Lateral view of gonidial cell. $\times 1500$.
- Fig.* 4. Lateral view of matured colony, showing posterior lobes. $\times 185$.
- Fig.* 5. Diseased cell, early stage. $\times 1250$.
- Fig.* 6. Diseased cell, later stage. $\times 1250$.

PLATE VI.†

- Fig.* 7. *Pleodorina illinoisensis*, top view of 2-cell stage.
- Fig.* 8. Top view of 4-cell stage.
- Fig.* 9. Lateral view of 4-cell stage.
- Fig.* 10. Top view of 8-cell stage.
- Fig.* 11. Lateral view of 8-cell stage.
- Fig.* 12. Top view of 16-cell stage.
- Fig.* 13. Lateral view of 16-cell stage.
- Fig.* 14. Top view of 32-cell stage.

* Figures drawn by C. A. Kofoid and inked by Miss L. M. Hart.

† Figs. 7-14 magnified 1000 diameters.

BIBLIOGRAPHICAL NOTICE.

Catalogue of the Lepidoptera Phalænæ in the British Museum.
Volume II. *Catalogue of the Arctiadaë (Nolinæ, Lithosianæ) in the Collection of the British Museum.* By Sir GEORGE F. HAMPSON, Bart. 8vo. Pp. xx, 589. Plates xviii.—xxxv. London: printed by order of the Trustees, 1900.

THE first Catalogue of Moths (Lepidoptera Heterocera as they used to be called, or Lepidoptera Phalænæ as some recent authors prefer to call them) was published in thirty-five small volumes, without plates, between 1854 and 1866, and was edited by the late Francis Walker. Notwithstanding the numerous errors which have fairly or unfairly been charged against this work, its publication lent an enormous impetus to the study, for it enumerated upwards of 20,000 species, most of which, except in a portion of the Micro-Lepidoptera, were described, with full synonymy in the case of known species.

But Walker's Catalogue is now quite out of date, and the earlier volumes are entirely out of print, and therefore the Trustees of the British Museum have projected a new Catalogue covering the same ground, but profusely illustrated with plates and figures (rendered all the more necessary by the stringency of the official regulations, which do not admit of specimens once registered ever being lent out of the building), and have entrusted the commencement of the work to Sir George F. Hampson. We say the commencement, for though Sir George is not an old man, and his energy and rapidity of work are well known, it will take two or three men's official lifetimes at least to complete the work on the same plan, unless several men are employed to work at different families at the same time.

The two volumes which have already appeared (in 1898 and 1900) include descriptions of 2377 species, and yet the ground which they cover only corresponds to a comparatively small portion of the first two volumes of Walker's Catalogue, with the corresponding supplements. This will be enough to show the enormous increase in our knowledge of the subject within the last fifty years.

Sir George is working under very favourable circumstances, for the entomological section of the reference library at South Kensington is to all intents and purposes practically complete; and the collection of Moths has been so largely increased lately, that it is now, beyond dispute, one of the very best in the world, if not incontestably the best. Moreover, in the earlier families he has the advantage of the assistance of Mr. Kirby's approximately complete Catalogue of Sphingæ and Bombycæ, published in 1892, and for later years the 'Zoological Record' &c.; so that the chances of anything important being overlooked are reduced to a minimum.

Sir George Hampson's methods of work are so similar in all his publications that those who have seen one volume of his work on the 'Moths of India' or one volume of the present series, may form a fair judgment of the whole. All the species are briefly described (the bulk of the book forbids very lengthy descriptions, which are, moreover, less necessary in the case of recognizably figured species),

and the numerous tables of genera and species will be very useful. We are glad to see, too, that transformations are described in the case of the comparatively few species in which they are known. We may mention that the excellent (and, in the present volume, crowded) coloured plates are by Mr. Horace Knight.

MISCELLANEOUS.

On the 'Ankündigung eines systematischen Werkes von den Schmetterlingen der Wienergegend' of Schiffermüller and Denis. By LOUIS B. PROUT, F.E.S.

THE well-known 'Systematisches Verzeichniss der Schmetterlinge der Wienergegend' by the above-named authors is invariably cited by modern writers as dating from 1776, and I am not aware that that date has ever been challenged. I have, however, for some years past, been acquainted with a copy of the same work under a different title, bearing date 1775, and have been somewhat puzzled by it; but as my studies have not hitherto necessitated a critical investigation of the work, I have not until quite recently taken up the question seriously. In doing so, however, I find sufficient evidence to be worthy of publication, and by the advice of Mr. John Hartley Durrant, with whom I have been in correspondence on the subject, I have prepared the following notes.

In the library of the British Museum (Bloomsbury) is the copy which first arrested my attention, coming from the library of Sir Joseph Banks, and quite accurately catalogued by Dryander in 'Bibl. Banks.' ii. p. 254. The title reads "Ankündigung | eines | systematischen Werkes | von den Schmetterlingen | der Wienergegend | herausgegeben | von einigen Lehrern | am k. k. Theresianum. | Wien, | verlegt Augustin Bernardi Buchhändler. 1775." Another copy, identical with this, was acquired by Smith in 1784 from Linné's library, and is, of course, preserved by the Linnean Society; this latter is of considerable interest, as it is still in the original boards, while that at Bloomsbury has been re-bound, and lettered on the back "Ankündigung eines Werkes von den Schmetterlingen der Wienergegend. Wien. 1775." With the exception of the titlepage and the frontispiece, this early issue is identical with the well-known 'Systematisches Verzeichniss' of 1776, so that, as Mr. Sherborn says (*in litt.*, 13th Feb. 1900), "there was only one printing of the body of the work—the same broken letters occur in every copy." Mr. Sherborn further writes:—"Note that the 1775 T.P. is a 'woodblock,' not type set, and the 1776 T.P. is engraved on copper." The frontispiece and plates are *coloured*, but the former is arranged as in the *uncoloured* 1776 copies. A third issue (1776 also) has coloured plates, but the frontispiece is somewhat differently designed. I have seen no copy of the 'Ankündigung' excepting the two above mentioned, but the following bibliographical references deal with it.

Mr. Durrant called my attention to the fact that Eiselt, 'Ges. Syst. Lit. Ins.' 203 (1836), and Percheron, ii. 39-40 (1837), both

cite ed. 1775—the latter, however, under the title ‘Systematisches Verzeichniss’ &c. This latter, perhaps, accounts for Hagen’s slip (i. 167), where, under Denis, he gives nearly the 1776 title, with the 1775 date. Engelmann (505) falls into just the opposite error, citing the 1775 title with date 1776.

Hagen (ii. 122), under Schiffermüller, gives “i. Ankündigung . . . 1775,” but only at second hand, as he had not seen it.

Percheron (*l. c.*) quotes among the reviews of the work “Jena gel. Zeit. 1775, p. 825.” As there is no copy of the ‘Jenaische Zeitungen von Gelehrten Sachen’ in this country, I wrote to Dr. O. Taschenberg, in Halle, who very obligingly sent for a copy from Jena and wrote me out the review verbatim. It appeared in “LXXXVIII Stück. Freytags den 8 December 1775,” pp. 825–826, and described the work as “Ankündigung . . . 1775. 322 S. in gr. 4. nebst 8 Kupfertafeln,” quite accurately, except that I suppose 8 to be a typographical error for “3,”—an error, however, which has been followed by Schröter and by “L’Esprit des Journaux.” The reviewer says, “Dieses hier angekündigte fürtreffliche Werk haben wir vorzüglich den Herren Professoren Schiffermüller [*sic*] und Denis zu danken,” and goes on to discuss appreciatively the authors’ plan. The title “Ankündigung” was of course indicative of the fact (well-known to lepidopterists) that even this great catalogue of 322 pp. was only intended as the precursor of a much greater work which never appeared. But the title in question has given rise to much confusion, and it is highly probable, as Dr. Taschenberg suggests, that it was changed in 1776 to “Systematisches Verzeichniss” &c. because its scope had been misunderstood. It is quite obvious, as Mr. Durrant points out, that there cannot “have been such a demand for this work in 1775 as to necessitate a second edition in 1776” (*in litt.*, 9 Feb. 1900); moreover, Mr. Sherborn has shown from internal evidence that there is only one printing in question. Mr. Durrant inclines to regard the 1775 copies as “advertisement advance-copies with a temporary title.”

Other contemporary references to the “Ankündigung” may be briefly noted as follows—I give nothing which I have not personally verified:—

Schröter, “Abhandlungen über verschiedene Gegenstände der Naturgeschichte,” erster Theil, 1776, “Vorrede” (dedication is dated 28 Feb. 1776): “Mein Manuscript war bereits in den Händen meines Herrn Verlegers, als mir noch eine Arbeit zu Gesichte kam die ich nicht übergehen kan.” He then gives the title “Ankündigung” &c., 1775, and remarks that the book might appear to many too detailed for a mere “Ankündigung,” &c., &c.

‘L’Esprit des Journaux’ for April 1776, p. 400, gives “Ankündigung [*sic*] einer systematischen werks von der sehmerligen” [*sic*!], &c., 1775, very probably merely after the account in the ‘Jena. Zeit.’

Schulze, in ‘Neue Mannigfaltigkeiten,’ iv. pp. 26 (*bis*—recte 28) *et seq.* (Berlin, 1st June, 1776), reviews the “Ankündigung . . . 1775” very fully.

Berlinische Sammlungen,’ ix. p. 219 (recte 303), 1777, refers to

both issues, apparently assuming that of 1775 to be a true Ankündigung.

Cobres, 'Deliciae Cobresianæ,' p. 387 (1782), gives "Syst. Verzeichniss . . . 1776," but adds, "Anfänglich kam es unter dem Titel Ankündigung eines systematischen Verzeichnisses [*sic*] . . . heraus."

Pirange, 'Verz. Schrift. Naturgesch.' p. 207, copies Cobres.

The earliest review which I have seen of the issue entitled 'Systematisches Verzeichniss' &c., is Erxleben's, in his 'Physikalische Bibliothek,' iv. Stück 2, pp. 190-207 (1777); but others soon follow. In Denis's own work on 'Die Merkwürdigkeiten der k. k. garelischen öffentl. Bibliothek am Theresiano' (Wien, Bernardi, 1780), of which the preface is dated 3rd Nov., 1778, we find (pp. 16-32) a chronological list of works in the library which appeared from 1747 to 1778. Under 1775 there is no mention of the 'Ankündigung,' but under 1776 the Syst. Verz. is duly registered, with the comment "durch des ersten [*i. e.* Schiffermüller's Beförderung zum Directorate des so genannten nordischen Collegiums in Linz ist die Fortsetzung dieses Werkes wenigstens auf einige Jahre gehemmet worden."

Mr. Durrant calls my attention to a possible further complication. Engelmann, 514, and Hagen, ii. 122, quote the 1776 edition as "Wien (Beck)"; but all the copies which I have seen or which are noticed in the early writers were published by Bernardi; and Dr. Taschenberg explains to me that the fact that Engelmann places "Beck" in brackets indicates that that name will *not* be found on the titlepage, but that "das ist entweder der Commissions verlag oder der Eigentümer der Firma Bernardi" (*in litt.*, 8 Mar., 1900).

I have at present quite an open mind as to whether the date 1775 should be accepted for this work or not; but in the meanwhile I venture to make a practical suggestion that for "priority" rank it should be placed *after* the other 1775 literature (Fabricius, Syst. Ent.; Naturforscher vi., vii., &c.), but *before* that of 1776 (Sulzer, Abgek. Geschichte; Müller, Zool. Dan. Prodr.; Naturforscher viii. &c.). I also gladly follow Mr. Sherborn's suggestion (*in litt.*), and recommend that henceforth it be cited as "Schmett. Wien," as this does not cause any confusion in the title.

246 Richmond Road, N.E.,
16th March, 1900.

Abundance of the Greater Sil-Smelt (Argentina silus, Ascan.) on the Market of Boston, Lincolnshire. By G. A. BOULENGER, F.R.S.

The Natural History Museum has received, through the kindness of Mr. W. H. Shrubsole, F.G.S., specimens of this rare fish, measuring up to 14 inches, which had been sent to him by Mr. F. Kime, with the information that great numbers had been brought on the 25th June to Boston and sold in every direction. The only record of the capture in English waters of this deep-sea fish well known from the coast of Norway is of a quantity taken on the 15th June, 1898, off the south coast of Ireland (*cf.* Holt, Journ. Mar. Biol. Assoc. v. 1898, p. 341). Mr. Kime writes to me that these fish, which excited great curiosity on the market, were caught in deep water somewhere about the coast of Norway.

THE ANNALS

AND

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[SEVENTH SERIES.]

No. 32. AUGUST 1900.

XVI.—*Notes on Diptera from South Africa (Tabanidæ and Asilidæ).* By Miss GERTRUDE RICARDO.

THE Diptera treated of in this paper are those collected by Mr. Distant, chiefly from the Transvaal, but a few come from Angola and Nyasaland. The new species will be figured later in his work on the insect fauna of the Transvaal. The other families represented in his collection will be described on a future occasion.

Tabanidæ.

PANGONINÆ.

Cadicera nigrescens, ♀, sp. n.

One female from Zomba, British Central Africa (*Rendall*).

This species, rather resembling *C. rubra-marginata*, Macq., differs from it in the following particulars:—The antennæ are imperfect in this specimen. The red colouring on the abdomen is not so widespread, there is *no* central dorsal red stripe on the first three segments, the red at the sides is less marked and does not begin till the third segment, on the ventral side it extends as a band on the last segment. There is a greyish band on the forehead behind the antennæ, extending to the sides, plainly visible when viewed from behind. The palpi

are not quite so thick. The wings are rather darker and the insect is smaller.

Length 15 millim.

Type (female), Zomba, British Central Africa (*Rendall*).

PANGONIA, Rond.

Pangonia biclausa, ♀, Loew, Dipt. Südafrik. p. 19 (1860).

One male from Pretoria (*W. L. D.*).

This agrees with the description of the female given by Loew; it is one of the species with the fourth posterior cell closed (see Ricardo, *Ann. & Mag. Nat. Hist.* (7) v. p. 109, and remarks on *P. brevis*, Loew, which will also apply to this species).

Pangonia chrysopila, Macq., *Hist. Nat. Dipt.* i. p. 194 (1834);
Walker, *List Dipt.* pt. v. Suppl. 1, p. 137 (1854).

One female from Pretoria (*Rendall*).

Probably belongs to this species. Macquart's description is very meagre; if correct, it belongs to *Pangonia*, Rondani, the eyes being bare.

Pangonia angulata, Fabr., *Syst. Antl.* p. 91. 5 (1805);
Wiedem., *Auss. zweifl. Ins.* i. p. 97 (1828); Macq., *Ann. Soc. Ent. Fr.* vi. p. 429, tab. xv. fig. 4 (1837); Loew, *Dipt. Südafrik.* p. 20 (1860).

Pangonia obesa, Walker, *List Dipt.* pt. v. Suppl. 1, p. 135 (1854);
Schiner, *Reise der Novara*, p. 99 (1866).

One female from Stellenbosch, 1888.

Corixoneura varicolor, Wiedem., *Auss. zweifl. Ins.* i. p. 98 (1828); Walker, *List Dipt.* pt. i. p. 134 (1848), pt. v. Suppl. 1, p. 137 (1854); Loew, *Dipt. Südafrik.* p. 17 (1860).

One female from Pretoria (*W. L. D.*); two males and two females from Namaqualand (*Cochrane*); two males from Barberton (*Rendall*); one female from Kowie, Jan. 1895 (*F. Pym*); one male from Pretoria (*W. L. D.*), Oct. 1895.

The female from Kowie has the first posterior cell closed and pedunculated, similar to a female in the British Museum collection; there is no doubt these belong to the above species, which evidently must be added to those other species of *Pangonia* which vary in this particular in different individuals.

The males have the prolongations on the fore tarsi (see

Ann. & Mag. Nat. Hist. (7) v. p. 110); one male is very dark in colouring, and all the males have the thorax darker than in the females.

Corizoneura suavis, ♀, Loew, Dipt. Südafrik. p. 17 (1860).

One female from Pretoria (*W. L. D.*).

Corizoneura lateralis, Fabr., Syst. Antl. p. 91. 4 (1805); Wiedem., Auss. zweifl. Ins. i. p. 101 (1828); Walker, List Dipt. pt. i. p. 134 (1848), pt. v. Suppl. 1, p. 135 (1854); Loew, Dipt. Südafrik. p. 17 (1860).

One male from Cape Town.

The stripes on the thorax are not distinct, nor is the white spot on the wing, but the eyes not quite meeting agree with Loew's description.

Rhinomyza denticornis, Wiedem., Auss. zweifl. Ins. i. p. 111 (1828); Walker, List Dipt. i. p. 192 (1848); Loew, Dipt. Südafrik. p. 21 (1860).

Silvius denticornis, Wiedem., *l. c.*

Dichelacera binotata, Macq., Dipt. Exot. i. p. 113.

One female from Barberton (*Rendall*); two females from Pretoria, one male from Rustenburg (*W. L. D.*).

Chrysops stigmatalis, Loew, Dipt. Südafrik. p. 29, tab. i. fig. 18 (1860).

Three females, all from Pretoria.

TABANINÆ.

Tabanus biguttatus, Wiedem., Auss. zweifl. Ins. ii. p. 623 (1828); Walker, List Dipt. pt. v. Suppl. 1, p. 231 (1854); Loew, Dipt. Südafrik. p. 37 (1860); Karsch, Berlin. ent. Zeit. xxxi. p. 370 (1887).

Tabanus cilipes, Macq., Dipt. Exot. i. p. 120 (1838); Walker, *l. c.* p. 236.

Tabanus cerberus, Walker, *l. c.* pt. i. p. 48 (1848).

Tabanus tripunctifer, Walker, Zool. viii. Appendix 95 (1850).

Tabanus noctis, Walker, Dipt. Saund. pt. i. p. 42 (1850).

One female from Graham's Town, June 1893 (*Rev. Wallace*); one female from Fort Johnston, Nyasaland (*Rendall*); one female from Namaqualand (*Cochrane*).

Tabanus sagittarius, Macq., *l. c.* p. 123; Walker, List Dipt. pt. v. Suppl. 1, p. 228 (1850).

Tabanus socius, Walker, *l. c.* pt. i. p. 160.

Tabanus serratus, Loew, *l. c.* p. 39, tab. i. fig. 21.

Nine females from Pretoria (*W. L. D.*); eight females from Fort Johnston, Nyasaland (*Rendall*); one female from Uganda (*Ansorge*).

Tabanus latipes, Macq., *l. c.* i. p. 119; Loew, *l. c.* p. 36; Peters, Reise nach Mossambique, Zool. v. 2 (1862).

Tabanus latipes, Walker, List Dipt. pt. i. p. 236, pt. v. Suppl. 1, p. 328 (1854).

Tabanus fenestratus, Walker, Zoologist, viii. Appendix 67 (1850); List Dipt. v. Suppl. 1, p. 219 (1854).

Tabanus africanus, Gray.

One female from Zomba, British Central Africa; three females from Angola (*Monteiro*).

Tabanus nyasæ, ♀, sp. n.

One female (type) from Fort Johnston, Nyasaland (*Rendall*).

Belongs to division B A b 3 of Loew. Eyes naked. No appendix. Fore tibiæ not thickened. Wings clear.

Brown. Face and palpi greyish, the latter with short black pubescence on the upperside. Forehead yellowish grey, with a shining reddish oblong spot above antennæ, a stripe of the same colour about half as long again proceeding from it towards the vertex. Antennæ with the first joint on its upper half thickly covered with black hairs, the second reddish, the third on first annulation greyish. Thorax with grey tomentum and five grey stripes. Abdomen with triangular greyish spots on segments 2-5 forming an irregular stripe; on the side of each segment a greyish oblong spot, not reaching the anterior margin; the posterior margins of segments are narrowly grey; the extreme lateral margins of fifth and sixth segments are fulvous; the dorsum of abdomen covered with short black pubescence. The ventral part of abdomen is reddish, with an indistinct black stripe in the centre. Legs with long grey and some black hairs on anterior femora and tibiæ; the posterior tibiæ have shorter pubescence, chiefly black. Wings hyaline, the fore border and base brownish yellow, veins brown. Halteres brown, with yellowish club.

Length $15\frac{1}{2}$ millim.; width of head 5 millim.

Tabanus nigrohirtus, ♀, sp. n.

One female in British Museum Coll., labelled "Bonny, July 1872, 73. 66"; two females in Mr. Distant's Coll., labelled "Bonny, July 1872."

Belongs to division B A b 2 of Loew. Eyes naked. No appendix. Fore tibiæ not thickened. Wings shaded.

Reddish brown. Face red, with white pubescence; palpi yellow, with black pubescence. Beard white. Forehead greyish, with a long red-brown stripe in the centre. Antennæ red, the apex of the joints black; pubescence on the first two joints black, on the third greyish. Thorax with three indistinct black stripes, the middle one divided by a narrow median line; covered with hoary tomentum and short black pubescence, with longer black hairs on the sides; breast red, with grey pubescence and tomentum. Scutellum red, with some hoary tomentum. Abdomen dark red, with a narrow dorsal greyish line extending from the first to the fifth segment; the whole surface of the abdomen is covered with short black pubescence, which is usually thickest on the fourth and following segments; on the extreme lateral margins there are some white hairs; in one specimen the median line is indistinct; the underside of abdomen is lighter red, with less black pubescence and some white hairs; the posterior margins of the segments are lighter in colour and only the extreme apex dark.

Legs reddish yellow, the coxæ with grey pubescence; the anterior femora, the apical half of the tibiæ, and all the tarsi are blackish, and sometimes the posterior femora; the hairs on the outer edge of the femora are white, and there is some white pubescence on the tibiæ, elsewhere it is black.

Wings grey, on fore border yellowish, veins brown; no appendix on fork of third longitudinal vein.

Length 16 millim.; width of head 3 millim.

Type (female), Bonny, July 1872, 73. 66, in British Museum Coll.

Atylotus nigromaculatus, ♀, sp. n.

Thirteen females; five from Pretoria, the rest from Fort Johnston, Nyasaland.

Resembles *Tabanus bipunctatus*, Wulp ('Notes Leyden Museum,' vii. p. 72, 1885), from West and South Africa, in having two black spots on the forehead; but the eyes have a band which Wulp expressly mentions as non-existent in his species, and the abdomen does not agree with his description. I therefore venture to make it a new species.

Dark grey. Face and palpi whitish, with white hairs; some black pubescence on the upperside of the latter, more marked in some of the series than in the type. Beard scanty and whitish. On the forehead are two distinct black shining spots, the upper one near the antennæ heart-shaped, with a longitudinal groove, the other oval. The pubescence on the eyes is very slight, hardly perceptible; there is a cross-band extending to opposite the cordiform spot. The antennæ are light yellow, the first joint greyish, with some black hairs; the apex of the third joint is more orange in colour. Thorax with greyish or light yellow short pubescence. Abdomen with a distinct central grey stripe extending from the first to the sixth segment; this is not so distinct in those from Nyasaland; on each side is another stripe more yellow in colour, not extending beyond the fifth segment. The ventral side has no stripes, clothed with short light yellowish pubescence. Legs reddish yellow, the coxæ with light grey pubescence, the anterior tibiæ at their apex and the tarsi dark fuscous; on the posterior legs only the last four joints of the tarsi are darker.

Wings hyaline, the fore nerves yellow; a short appendix on the fork of the third vein, not always present.

Length $12\frac{1}{2}$ millim.; width of head 4 millim.

Type (female), Pretoria (*W. L. D.*).

Asilidæ.

Laparus albicinctus, ♀, sp. n.

One female from Barberton (*P. Rendall*).

This species will belong to Loew's division *A b* (see Dipt. Südafrik.). Fore tibiæ having an end spur and four to six bristles on the anterior margin of the mouth.

Black. Face brown, shining, with testaceous tomentum at the sides, bordering the eyes, and round the mouth. The four large bristles near the mouth are black, with a few black hairs below. Antennæ red, the first joint and the base of the second blackish, a large bristle on the latter. Forehead black, with some greyish-red tomentum; a short central longitudinal furrow extends from the antennæ to the ocelligerous tubercle. The bristles and hairs on the hind part of head are black. Proboscis and palpi black, the latter with black hairs.

The thorax is black, with a whitish band on each side extending the whole length, and three faint white stripes on the dorsum, only noticeable on the anterior border. Scutellum

bordered with grey. The breast-sides shining black, with very faint reddish-grey tomentum. Abdomen blue-black, shining. Halteres brown. Legs dark red, the coxæ and last joints of tarsi, the fore femora, and the base of the posterior femora black; there are no bristles on the fore femora; all the bristles and pubescence on the legs black.

Wings light brown, lighter at the apex, the opening of the fourth posterior cell is a little narrowed.

Length 14 millim.

Type (female), Barberton (*P. Rendall*).

Microstylum dispar, Loew, Dipt. Südafrik. p. 78 (1860).

Four males from Rustenburg, two males from Pretoria.

Microstylum nigribarbatum, Bigot, Ann. Soc. Ent. Fr. (5) viii. p. 408 (1878).

One male from Pretoria probably belongs to this species, though the third joint of antennæ is reddish, not black, and the hind tibiæ have white hairs on the underside, extending nearly halfway, of which no mention is made by Bigot.

Microstylum acutirostre, Loew, Ber. d. Akad. d. Wissensch. zu Berlin, p. 658 (1852); Dipt. Südafrik. p. 79 (1860); Peters's Reise, p. 7, tab. i. figs. 5, 6 (1862).

One male from Fort Johnston, Nyasaland.

The third joint of palpi is red on its apical half, not wholly black; the last segment of abdomen has an orange-yellow border; the double black stripe on the thorax is not wider anteriorly, nor reddish; and the wings are not so dark as in Loew's description.

Microstylum rufinevrum, Macq., Dipt. Exot. Suppl. v. p. 49 (1850).

One female from Barberton (*Rendall*).

The pubescence on the first joint of tarsi is orange-red instead of white; the wings are hardly brown as in Macquart's description, but greyish. Macquart's type came from Gaboon.

Microstylum spurinus, Walker, List Dipt. pt. ii. p. 308 (1849).

Dasypogon spurinus, Walker, *l. c.*

One female from Pretoria.

This differs from the type in having stiff black bristles on the thorax, instead of long white hairs, otherwise it seems identical with Walker's type.

Microstylum glabrum, ♀, sp. n.

One female from Pretoria (*W. L. D.*); one female from Zoutpansberg (*Kæssner*).

This species closely agrees with Loew's description of *M. gulosum*, ♂, but is probably a distinct species; it differs in the following particulars from *M. gulosum*:—

The abdomen is dull black on the first four segments, shining black on the last four; there is no pubescence on the dorsum of abdomen, and only some on the first segment of the underside. Legs black; the pubescence on the femora and the posterior tibiæ white, on the anterior tibiæ black. The first posterior cell of the wings is not narrowed at the apex; the 4 spines at the apex of the tibiæ are very stout.

Length 26 millim.

Type (female), Pretoria (*W. L. D.*).

Microstylum elegans, ♂ & ♀, sp. n.

Three males and two females from Pienaars River (*W. L. D.*); two females from Pretoria (*W. L. D.*).

Belongs to division *Ba* of Loew.—Moustache confined to the lower part of the face, thick, with no stout bristles intermixed.

Black. Face with yellowish-white tomentum; the moustache composed of long white hairs; palpi black, covered with long white hairs; beard white; antennæ black, with black hairs on the first two joints. Forehead with two whitish spots reaching from the eyes towards the centre, the remaining portion black; at the sides are long white hairs reaching to the antennæ; on the posterior half they are black; on the hind part of head and on the collar white. Thorax brown, with a broad grey stripe on each side, clothed with long white hairs and bristles, which extend to the posterior part of the thorax; scutellum grey, with long white pubescence; breast-sides brown, with white tomentum and a few white hairs.

Abdomen black, with very distinct grey-white bands on the posterior border of each segment, narrowest on the last one, extending up the side of each segment; they are bordered by a slight fulvous edge, more noticeable when viewed from behind; the whitish pubescence on the abdomen is short and sparse, except at the sides of the first two segments, where

it is long; the underside of abdomen is grey, with some scattered white hairs. Legs black; the coxæ grey, with long white hairs; the femora and tibiæ with short white pubescence; all the bristles on legs are white, with the exception of some on the last four tarsal joints. Halteres brown. Wings clear, grey shading on the fore border as far as the second longitudinal vein, extending into the submarginal cells, where it gradually ends in a point; it also fills the centre of the first and fourth posterior cells, and there is a small irregular patch of it in the basal half of the second posterior cell; veins yellow; the first posterior cell is nearly closed in some specimens, in others hardly narrowed.

Length 27 millim.

Type (female), Pienaars River (*W. L. D.*).

The female is very similar, but the last three segments of the abdomen are wholly black, though on the side of the sixth the grey stripe is present; the abdomen is more shining and less pubescent. The pubescence on the legs is a little slighter. The first posterior cell of the wings varies as above.

Length 30 millim.

Type (female), Pienaars River (*W. L. D.*).

These fine flies were found flying near the ground, on bare open veldt. One female was caught attacking a grasshopper.

Microstylum nigrescens, ♂ & ♀, sp. n.

Two males and two females from Angola, in British Museum Coll., 76. 55 and 73. 66; one male and two females from Angola (*Monteiro*), in Mr. Distant's Coll.

Belongs to division *B b* of Loew.—Moustache confined to the lower part of the face, thin, with very stout bristles intermixed.

♂. Black. Face brown, with yellowish or whitish tomentum; the moustache consists of four large black bristles, intermixed with a very few black hairs; palpi black, the tips reddish, clothed with black hairs. Beard black. Antennæ black, the first and second joints more or less red with black hairs and bristles. Forehead with an oblong shining black spot on the vertex, continued as a narrow black line to the antennæ, sides greyish with black hairs and bristles. The hind part of head grey, with black hairs. The collar covered with greyish tomentum, reddish on the posterior half in the centre. Thorax black; the shoulders, sides, and posterior half reddish, with greyish tomentum, forming one central broad stripe divided in the middle, and one on each

side, not attaining the fore border; all the bristles and the short hairs on the dorsum are black. Scutellum red, with grey tomentum.

Abdomen dull black, some dull reddish colour on the second, third, and fourth segments, becoming more or less distinct bands on the posterior margins; some very short black pubescence on the sides; genital organ red, with black pubescence. Halteres red. Legs bright red, with black pubescence and bristles; the coxæ are brown, with greyish tomentum. Wings light brown, veins yellowish red.

Length 20 millim.

Type (male), Angola, 73. 66 in British Museum Coll.

♀. The greyish stripes on the thorax are not so distinct. The last three segments of abdomen are shining black, the extreme edge of the last one reddish. Wings in the type are brownish, but one female has almost clear wings; the veins are yellowish red in all, those on the fore border deepest in colour.

Length 26 millim.

Type (female), Angola 73. 66 in British Museum Coll.

Scylaticus rufescens, ♀, sp. n.

One female from Barberton (*P. Rendall*).

Allied to *S. costalis*, Wiedem., but distinguished from it by the orange-red moustache, wholly red antennæ, and the presence of grey spots on the second segment of the abdomen.

Black. Face with white tomentum. The moustache, which extends nearly halfway up the face, consists of bright orange-red hairs. Palpi and proboscis black, with reddish pubescence. Beard reddish. Antennæ red, the first two joints with red hairs. The forehead black with reddish hairs. The hind part of head bordered with orange-red hairs. Collar and thorax black, the latter with the shoulders and posterior margin red, covered with yellowish pubescence. Scutellum red, with some long reddish bristles. Abdomen with the first segment black, the anterior border of the second black, with an oblong grey spot on each side, the space between and behind the spots is red, and the posterior border of the segment consists of a light yellow continuous band; the third, fourth, and fifth segments are orange-red, bordered with a zigzag black band, and on their lateral margins the light yellow band appears; the sixth and seventh are almost wholly orange-red; the pubescence on the abdomen consists of sparse light reddish hairs, longer and lighter in colour at the sides: on the underside the

yellow bands are continuous on the second, third, and fourth segments. Legs red; the coxæ black with grey tomentum, the hairs and bristles on the legs are whitish yellow. Halteres red. Wings hyaline, on the fore border brown, reaching to the discal cell, but not extending to the base of the wing; the fourth posterior cell is slightly narrowed at the opening.

Length $13\frac{1}{2}$ millin.

Type (female), Barberton (*P. Rendall*).

Damalis speciosa, ♂, Loew, Dipt. Südafrik. p. 108 (1860).

One female from Barberton (*P. Rendall*). Is apparently the female of this species.

The third joint of the antennæ, which was wanting in Loew's type, is black, with the long bristle black, and white towards the tip. The pubescence on the dorsum of the abdomen is sparse, so that the ground-colour is seen, dark reddish with transverse black bands.

Lamyra gulo, Loew, Bemerk. über Fam. Asiliden, p. 19 (Berlin, 1853); id. Dipt. Südafrik. p. 113 (1860).

One male from Lydenburg District (*Zutrzenka*); one male from Waterberg District (*Wilde*); two males from Angola (*Monteiro*).

The above specimens have *three* white bands on the abdomen, the first segment having a rather narrower one than the other two, leaving the anterior border free, but almost reaching the posterior border; it is not visible on the underside. In 'Bemerk. über Fam. Asiliden,' Loew mentions the three bands, but in his 'Dipt. Südafrik.' he only mentions two bands. The third joint of the antennæ is somewhat grey. In every other particular these specimens agree with the description. They vary from 20-32 millim. in length. The two from Angola are both injured and have lost the third joint of antennæ.

Laphria aureopilosa, ♂, sp. n.

One male from Durban (*W. L. D.*).

Blue-black, shining. Face covered with yellowish tomentum, the lower part is occupied by a large black tubercle; below the antennæ are black bristles and hairs, with a few long golden-yellow hairs, which extend down each side of the face. The moustache is composed of black bristles and some light yellowish ones on the lower half. Beard yellowish. Palpi small, black. Antennæ black, the first two

joints with thick black pubescence. Forehead black, with black bristles and hairs. Thorax covered with short dense yellow hairs. Breast-sides have some grey tomentum and black pubescence. Scutellum and abdomen have similar pubescence to that of the thorax; genital organ black, shining, with black pubescence. Underside of abdomen black, with yellow hairs. Legs black; the anterior and middle coxæ covered with grey tomentum; the pubescence on the legs consists of long light yellowish hairs, except on the apex of tibiæ and first joint of tarsi, which are clothed underneath with dense fulvous pubescence, and the last four joints of all the tarsi, which have black pubescence; hind tibiæ much thickened, red at the extreme base, no bristles on the underside. Halteres yellow. Wings dark brown, clear on the basal half, veins dark brown.

Length 13 millim.

Type (male), Durban (*W. L. D.*).

Hephistomera nobilis, Loew, Dipt. Südafrik. p. 120 (1860).

Two males and two females from Fort Johnston, Nyasaland (*P. Rendall*); one male from Lydenburg District (*Zutrzenka*).

Laxenecera zonata, Loew, Dipt. Südafrik. p. 123 (1860).

(One female from Pretoria (*W. L. D.*).

Laxenecera albicincta, Loew, Dipt. Südafrik. p. 122 (1860).

One female from Pretoria (*W. L. D.*).

Dasythrix brachyptera, Loew, Bemerk. über. Fam. Asiliden, p. 21 (Berlin, 1853); id. Dipt. Südafrik. p. 126 (1860).

D. brachyptera, ♀, Loew, and *D. stenura*, ♂, Loew (Dipt. Südafrik. p. 125), are probably the male and female of one species, as Loew himself suggests, and Gerstäcker, in Decken's Reisen in Ost-Afrik., concurs; if this is the case, *brachyptera* having priority must be adopted.

One male from Pretoria (*W. L. D.*); two females from Pretoria (*W. L. D.*).

These three specimens from the same place seem to confirm the above supposition, being very similar in general appearance.

Promachus fulvipes, Macq., Dipt. Exot. i. (2) p. 93 (1838); Loew, Dipt. Südafrik. p. 132 (1860).

One male from Pretoria (*W. L. D.*).

Promachus albicinctus, ♂ & ♀, sp. n.

One male and three females from Pretoria (*W. L. D.*).

Allied to *fulvipes*, but easily distinguished from it by the wholly black antennæ.

♂ and ♀. Grey. Face brown, covered with dense yellow tomentum. The moustache consists of yellow bristles, from which there extends up each side of the face a row of long yellow hairs reaching to the antennæ, and ending with a few black bristles and hairs. Palpi black, with long yellow hairs. Beard white. Forehead with black bristles and hairs on the anterior half, the posterior with yellow ones. Antennæ black, the first two joints with yellow pubescence. Hind part of the head in the centre with yellow bristles, at the sides yellow and black intermixed, with long white hairs. Thorax brown, with the central stripe rather lighter; the shoulders, sides, and anterior half covered with dense reddish-brown tomentum, which borders the side-stripes and runs between their several divisions as a narrow line; the pubescence is black on the dorsum, with a fringe of longer white hairs on the fore border, some scattered ones on the sides and on the posterior part. Scutellum brown, with grey tomentum, black bristles, and white hairs. Breast-sides brown, with reddish-brown tomentum and sparsely scattered black and white hairs; the tuft over the halteres is red.

Abdomen grey, with transverse black bands, which take up more than the anterior half of each segment, not reaching the side border, with rounded corners; the pubescence whitish yellow, thicker on the first three segments; the underside grey, with white pubescence; the genital organ shining black. Legs chestnut-red; the coxæ black, with grey tomentum and long white hairs; the anterior and middle femora with a black stripe on the upperside; knees black; the pubescence on the legs is white, and all bristles black. Wings clear, yellowish at the extreme base; veins brown, those on the fore border red.

Length 20 millim.

Types (male), Pretoria (*W. L. D.*); (female), Pretoria (*W. L. D.*)

Promachus bicolor, ♀, sp. n.

One female from Pretoria (*W. L. D.*).

Black. Face red on the lower half, with yellowish tomentum, above black. Moustache extending halfway up the face consists of yellow bristles below and black bristles

above, from it extends on each side of the face to the antennæ a line of short yellow and black bristles. Palpi black, with white hairs. Forehead black, with black hairs on the anterior half, a few white hairs on the vertex. Antennæ black; the pubescence on the first two joints is black above, white below. Beard white. Hind part of head clothed with black bristles. Thorax black, the shoulders and posterior corners bright red; some fulvous tomentum on the shoulders and sides of thorax; pubescence black, white hairs on the sides and posterior part. Scutellum black, with black bristles and white hairs. Breast-sides black, with stripes of grey tomentum and some sparse white hairs, those over the halteres fulvous. Abdomen iron-grey, with black bands on the segments nearly reaching to the posterior border, not attaining the sides, with rounded corners; the pubescence on the bands is black, with a fringe of longer white hairs on the posterior borders of each segment, and some grey tomentum on the sides of abdomen; viewed from above the abdomen appears black, with narrow bands of white hairs; the underside is black, with white pubescence. Legs red; coxæ, knees, apex of tibiæ, and tarsi black; a faint indication of a black stripe on the underside of the anterior and middle femora; pubescence on the legs white, longest on the anterior coxæ; all bristles black. Wings clear; veins brown, those on the fore border and at base red. Halteres red.

Length 22 millim.

Type (female), Pretoria (*W. L. D.*).

Alimus rubiginosus, Gerst., Decker's Reisen in Ost-Afrik. p. 387 (1873), tab. xvi. fig. 5.

Two females from Zomba, British Central Africa (*P. Rendall*); two females from Uganda (*Ansorge*); two males from Zomba, British Central Africa (*P. Rendall*).

Gerstäcker described the female. In the above specimens the thorax varies from dark red-brown with black stripes to fawn-colour with the central stripes a little darker and only the side-stripes black; the former and Gerstäcker's type have probably become denuded of tomentum, leaving the ground-colour (reddish brown) prominent. The only other differences between these females and the description of the type are the following:—The pubescence on the anterior part of the scutellum is white; the last segment of the abdomen is black, shining. The fore femora have black bristles on the underside, with a few white ones intermixed and have no fringe of long white hairs; there are white bristles on the tarsi of

the two anterior pairs of legs, besides the one at the tip of the tibiæ.

In the two male specimens there are no bristles on the fore femora, but a few long yellowish hairs, there are some black bristles on the side of abdomen, the male organ is blackish with short white pubescence, and the anal appendage bright red.

Alcimus longurio, Loew, Dipt. Südafrik. p. 137 (1860).

Two females from Durban (*W. L. D.*) are evidently the female of the above. Loew described the male only. They differ from his description thus:—

The thorax in one of the specimens has the median black stripes very narrow, posteriorly merged in one broad black stripe; in the other it is divided by only a narrow umber-brown line. The fore tibiæ and the apical half of the posterior ones, and the first joint of the fore and posterior tarsi, clothed with short fulvous pubescence on the inner side; the basal half of the tarsal joints is dark red. The moustache extends to the antennæ, with a few black bristles intermixed with some long yellow hairs. The last segment of abdomen is wholly black, shining.

Alcimus tristigatus, ♂, Loew, Dipt. Südafrik. p. 134, tab. i. fig. 51 (1860).

One male from Pretoria (*W. L. D.*).

The third joint of antennæ, which was wanting in the type, is black, and the bristle the same.

Two females from Pretoria (*W. L. D.*).

Though these vary somewhat from the male, I feel convinced they are the same species, their general appearance being identical. They differ from the description of the male in the following particulars:—

Antennæ wholly black, the moustache continued to the antennæ as a few scattered white hairs; cheeks black; palpi black, with yellow hairs. The middle stripe of thorax is darker, the two narrow black lines on the side-stripes of the male here become respectively a triangular and an oblong spot; the bristles on the posterior half are black instead of yellow; the hairs on the scutellum are all yellow. On the abdomen the dark spots become a broad band on each segment, not reaching to the posterior margin; the last segment is wholly black, shining; the pubescence on the bands is yellowish, giving them a fulvous appearance, elsewhere whitish. Legs black, the tibiæ on basal half reddish; the

pubescence white, becoming fulvous on the basal inner edge of fore tibiæ and of the first joint of fore tarsi and on the inner and under side of the posterior tibiæ and of the first joint of tarsi.

Wings with grey shading at the apex, extending to the first posterior cell, and continuing in a narrow line to the base of the first submarginal cell.

Alcimus cinerascens, ♂ & ♀, sp. n.

Three males and four females from Fort Johnston, Nyasaland (*P. Rendall*).

♂.—Grey. Face brown, with whitish tomentum; palpi black, with white hairs; the moustache consists of a row of black bristles above the mouth, then of long white hairs, which from halfway up the face dwindle into a few short ones reaching to the antennæ. Forehead with a few black hairs at the sides. Antennæ red; the third joint black, with grey tomentum, the bristle black; the first two joints with black hairs. The hinder part of head bordered with black bristles intermixed with white ones, the hairs on sides of head and the beard white. Thorax and scutellum brown, with grey tomentum; the median stripe of the former blackish brown, divided on its whole length by a narrow brown stripe; the side-stripes brown, with an ill-defined black oblong spot on the last three divisions; the shoulders reddish; the bristles on the posterior part of thorax are black, the pubescence on the scutellum white; the breast-sides are brown, with grey tomentum and scanty white pubescence; the bristles near the halteres white.

Abdomen reddish brown, with darker bands on the segments, bordered posteriorly by narrow bands of white tomentum, and a stripe of white tomentum on each side; the pubescence on the dark bands is black, elsewhere white; the bristles on the sides of the first four segments are white, on the remaining ones black; the underside cinereous, with grey tomentum.

Legs red, the fore coxæ with grey tomentum and long white hairs; the posterior coxæ partly black, with black bristles on the outer edges; the inner side of the femora and of the anterior and middle tibiæ, the posterior tibiæ except at the extreme base, and all the tarsi black; the pubescence on the legs white; the fore femora on the basal half and the fore tibiæ with long white hairs on the underside; the posterior tibiæ and the first joint of the posterior tarsi clothed with dense fulvous pubescence on the underside; bristles on the legs black, with some white ones intermixed.

Wings clear, a grey shadow in the extreme apex extending to the third longitudinal vein; the veins brown.

Length 18 millim.

Type (male), Fort Johnston, Nyasaland (*P. Rendall*).

♀.—The black bristles of the moustache are only at the sides of the mouth, those on the back of the head are mostly white. The last segment of the abdomen is wholly black, shining; the bristles on the side of abdomen are wanting, those on the posterior coxæ and the greater number on the legs are white.

Length 22 millim.

Type (female), Fort Johnston, Nyasaland (*P. Rendall*).

Ommatius fuscovittatus, ♂, sp. n.

One male from Pretoria (*W. L. D.*).

In general appearance this resembles *O. jaculator*, Walker, but is distinguished by the first two joints of the antennæ being red.

Brownish grey. Face clothed with silvery-white tomentum; moustache composed of white hairs, with two black bristles on each side; a few white hairs on the middle of the face, reaching to the antennæ. Palpi black, with white hairs. Beard white. Antennæ red, the last joint and the bristle black; the hairs on the first two joints are black. Forehead grey, with yellowish tomentum, the hairs on the vertex and at the sides black. The hind part of the head with a row of black bristles. Thorax covered with silvery-grey tomentum; the stripes very distinct, brown; the median stripe appears widened at its anterior border and is divided in the centre by a greyish line; the short pubescence and the bristles black. Scutellum brown, with two black bristles. Breast-sides covered with silvery-grey tomentum, slightly fulvous in the centre; the scattered hairs are white.

Abdomen brown, with cinereous segmentations; the pubescence white, the small bristles on the sides of the last segments black; the genital organ shining black, the underside brown. Legs light yellow; the coxæ the same colour as the breast-sides, with white pubescence; the knees, the apex of the first four tarsal joints, and the fifth joint black; the fore and middle femora with white hairs on the underside, the middle and posterior femora armed with short black bristles; the short pubescence on the legs is black; the bristles on the outer edge of the anterior tarsi and on the first joint of the middle tarsi are white, elsewhere black.

Wings clear, veins brown; yellowish at the base and the whole of the first longitudinal vein.

Length $10\frac{1}{2}$ millim.

Type (male), Pretoria (*W. L. D.*).

Lophonotus albofasciatus, ♂, sp. n.

Two males from Pretoria (*W. L. D.*).

Belongs to division I. 2. a of Loew. The abdomen with bristles before the segmentations, the underside with bristles, the thorax with long hairs or bristles reaching to the anterior border.

Brown. Face pale yellow; moustache black, reaching to the antennæ, a few white hairs on the upper half. Forehead brown anteriorly, fawn-coloured posteriorly, with black bristles and a few white hairs near the antennæ. Beard white. Antennæ black. Palpi black, with black hairs. Hind part of head bordered with black bristles, then white hairs. Thorax bronze-coloured, with some white tomentum on the sides, stripes indistinct; the mane composed for two thirds of its length of short black hairs, the last third of longer white hairs, on its whole length bordered by black bristles, thicker at each end; some short white hairs are scattered on the sides and posterior border. Scutellum the same colour as the thorax, clothed with long white hairs and a double row of long black bristles. Abdomen with a black central stripe and irregular black spots, and reddish-brown tomentum on the sides; the pubescence on the first segment consists of long white hairs in the centre and black ones at the sides; elsewhere the pubescence is black, except at the sides of the apical half, where are some white hairs; the bristles are black; the genital organ brown above, red below, with black and white pubescence, longer on the underside; the underside of abdomen brown, with some greyish tomentum.

Legs black, metallic, the basal half of the tibiæ chestnut-brown; the bristles black, with the exception of some on the apex of the tibiæ and on the first three joints of the tarsi, which are white; the pubescence of legs white, thickest on the tibiæ and tarsi. Halteres brown.

Wings clear; veins brown, red on the fore border.

Length $15\frac{1}{2}$ millim.

Type (male), Pretoria (*W. L. D.*).

One specimen is labelled "Caught while attacking common Geometer, Sept. 1895."

XVII.—*Note on a Hermaphrodite Frog.*

By R. C. PUNNETT, B.A.

[Plate IX.]

LAST February my attention was called to an anomalous condition of the genital organs in a frog which was being dissected by a member of the practical class in this University (St. Andrews). The specimen was preserved for future examination, the results of which are now given.

Right Side.

The Müllerian duct was well developed and considerably convoluted. It possessed a small uterine dilatation, an opening into the body-cavity, and was slightly pigmented here and there. The ureter expanded to form a vesicula seminalis, though this was hardly so well developed as in the male frog at this period. The ureter and Müllerian duct were bound together near the cloaca by some connective tissue, but possessed separate openings into the cloaca. The genital gland was a well-developed testis. On the side furthest from the vena cava and about one third of the distance from the anterior end a small pigmented patch was seen, containing two white specks (Pl. IX. fig. 1, *). Sections through the gland showed that this pigmented portion contained a single normal ovum (Pl. IX. fig. 2, *ov.*), whilst the rest of the gland was purely male and showed no traces of ova either normal or degenerate. Vasa efferentia were present, and some of them entered into close relation with the small pigmented ovarian patch (Pl. IX. fig. 2, *ef.*). The fat-body was well developed.

Left side.

The Müllerian duct was developed as in the normal female and was slightly larger than that on the opposite side. It possessed a well-marked uterine dilatation (Pl. IX. fig. 1, *ut.*). The ureter showed a small vesicula seminalis and bore the same relations to the Müllerian duct as its fellow on the opposite side. The genital gland from external appearance was an unmistakable ovary, though in size it was slightly smaller than in the normal females which were dissected at the same time. At about the middle of the gland and on the side nearest the inferior vena cava was present a small yellowish patch, resembling the testis in its external appearance. Sections showed that this small patch consisted of testis tissue, containing, like the testis on the opposite side, nearly ripe

spermatozoa. The patch was almost isolated from the rest of the gland, and at one spot (Pl. IX. fig. 3, *ov.*) contained a well-developed ovum. It was also devoid of pigment except near its attachment to the main gland. The vasa efferentia entered into functional relation with it. With the exception of this small patch the gland consisted entirely of ovarian tissue containing ova up to .7 millim. in diameter. Vasa efferentia passed to it as well as to the small testis portion. The fat-body was well developed. Lastly, it should be mentioned that the male glandular enlargement on the fore foot was well marked on both sides.

One of the chief points of interest with regard to this specimen lies in the completeness of the hermaphroditic condition in the ducts, associated with a sharp distinction between the sexual characters of the glands. This is the more remarkable, as at the time the animal was killed (the middle of February) the breeding-season was not far distant, and yet neither gland appears to show any very marked preponderance over the other. Though on the whole the testis seems more developed than the ovary, it is possible that the peculiar sexual manifestation of activity in this specimen would, had life continued, have been determined by chance in the shape of the sex of the first frog which happened to cross its path.

A full bibliography on this subject is given by F. J. Cole in the *Anat. Anzeiger*, Bd. xi. (1895).

Gatty Marine Laboratory,
St. Andrews.

EXPLANATION OF PLATE IX.

Fig. 1. Dissection of the generative organs, slightly enlarged. The upper portions of the kidneys are not shown. The Müllerian ducts have shrunk in the spirit and are not so thick as in the fresh state.

<i>fb.</i> Fat-body.	<i>t.</i> Testis.
<i>vc.</i> Inferior vena cava.	<i>ve.</i> Vasa efferentia.
<i>k.</i> Kidney.	<i>vs.</i> Vesicula seminalis.
<i>o.</i> Ovary.	<i>ut.</i> Uterine dilatation.
<i>ovd.</i> Oviduct.	* Ovarian patch on testis.
<i>ovdo.</i> Opening of oviduct.	† Testicular patch on ovary.
<i>r.</i> Rectum.	

Fig. 2. Section through the o n patch on the testis. × 30.

<i>bv.</i> Blood-vessel.	<i>pg.</i> Pigment.
<i>do.</i> Degenerate ovum(?).	<i>st.</i> Seminal tubules.
<i>ov.</i> Ovum.	<i>ve.</i> Vasa efferentia.

Fig. 3. Section through the testicular patch on the ovary. × 30. Letters as in preceding figure.

XVIII.—*Descriptions of new Batrachians and Reptiles collected by Mr. P. O. Simons in Peru.* By G. A. BOULENGER, F.R.S.

Nototrema peruanum.

Tongue subcircular, slightly nicked and free behind. Vomerine teeth in two short, straight, transverse series between the choanæ. Head moderate, broader than long; snout rounded, as long as the diameter of the orbit; loreal region slightly concave; canthus rostralis distinct; interorbital space narrower, or at most not broader, than the upper eyelid; tympanum distinct, two thirds the diameter of the eye. Fingers with a very slight rudiment of web; toes one-third webbed; disks of fingers and toes smaller than the tympanum; subarticular tubercles moderate; a fold along the inner edge of the tarsus. The tibio-tarsal articulation reaches the tympanum or the eye. Upper parts covered with smooth warts of unequal size, the largest of which are parotoid-like or may be confluent into longitudinal folds; lower parts granulate. Greenish above, with insuliform black-edged dark spots, most of which correspond to the larger glandular tubercles; limbs with dark transverse bars; whitish beneath. Male with a subgular vocal sac.

From snout to vent 43 millim.

Several specimens from Carao, 7000 feet altitude.

Very closely allied to *N. marsupiatum*, D. & B. Distinguished by the narrower interorbital region and the extraordinary development of the dorsal glands.

Bufo cophotis.

Crown without bony ridges; snout short, blunt; interorbital space as broad as the upper eyelid; tympanum quite hidden, but eustachian tubes perfectly developed. Fingers and toes short, flattened, blunt, with double subarticular tubercles; first finger extending a little beyond second; toes one-third webbed; two moderate, feebly prominent metatarsal tubercles; no tarsal fold. The tarso-metatarsal articulation reaches the eye. Upper parts covered with smooth tubercles of different sizes, pierced with large pores, many of which are comparable to so-called parotoid glands; such a large gland on the middle of the upper surface of the leg or crus. Dark olive; upper parts speckled with black, lower parts marbled with greyish white. Male without vocal sacs,

with blackish nuptial asperities on the upper and inner sides of the three inner fingers.

From snout to vent 55 millim.

A single male specimen from Paramo, Cajamarca, 9000 feet. Several smaller specimens from Carao, 7000 feet.

Nearest allied to *B. variegatus*, Gthr. Distinguished by the well-developed eustachian tubes and the somewhat longer inner finger.

Paludicola Simonsii.

Tongue oval, entire. Vomerine teeth none. Snout rounded, as long as the diameter of the orbit; canthus rostralis distinct; nostril a little nearer the tip of the snout than the eye; interorbital space as broad as the upper eyelid; no tympanum; no eustachian tubes. Fingers and toes moderate, slightly swollen at the end; first finger not extending as far as second; toes free; subarticular tubercles moderate; two rather large, feebly prominent metatarsal tubercles. The tibio-tarsal articulation reaches the angle of the jaws. Upper parts with porous smooth warts, some of which are confluent into longitudinal folds on the body; throat, belly, and lower surface of thighs coarsely granulate. Olive-brown above, whitish beneath; a dark brown canthal and temporal streak; a blackish band in the groin, another on the inner side of the femoro-tibial articulation, and a third on the outer side of the tibio-tarsal articulation; a few blackish spots on the sides.

From snout to vent 30 millim.

Two specimens from Paramo, Cajamarca, 9000 feet.

Allied to *P. marmorata*, D. & B., but tympanum absent and first finger shorter than second.

Stenocercus melanopygus.

Pterygoid teeth. Anterior border of ear denticulated. Upper head-scales very feebly keeled, without transversely enlarged supraoculars; occipital not enlarged; temporal scales very feebly keeled. Side of neck with a very short curved antehumeral fold. Body a little depressed. No dorsal crest or denticulation. Dorsal scales large, strongly imbricate, sharply keeled, sharply pointed; the keels forming continuous lines, which are slightly oblique on the posterior part of the back; lateral scales smooth or feebly keeled, passing gradually into the ventrals, which are rounded, smooth, and considerably smaller than the dorsals; 46 to 50 scales round the middle of the body. The adpressed hind

limb reaches the ear or not quite so far; fifth toe not extending as far as second. Tail nearly twice as long as head and body, tapering, scarcely compressed, scaled like the body, the scales forming rings. Dark olive-brown above, with more or less numerous small yellow spots; young with a light dorso-lateral streak; lower parts whitish, tinged with green or blue; anal region, lower surface of thighs, and of base of tail black in the males.

	millim.
Total length	187
Head	17
Width of head	12
Body	50
Fore limb	26
Hind limb	43
Tail	120

A larger specimen, with reproduced tail, measures 85 millim. from snout to vent.

Several specimens from Baños, Cajamarca, 9000 feet. *Stenocercus Simonsii*, Blgr., described from the Andes of Ecuador, occurs in the same locality.

Stenocercus chrysopygus.

Pterygoid teeth. Anterior border of ear denticulated. Upper head-scales smooth or feebly keeled, some of the supraoculars feebly enlarged transversely; occipital not enlarged; temporal scales feebly keeled. Side of neck with folds enclosing shallow pockets covered with granular scales; antehumeral fold much stronger than in the preceding species, with a serrated edge on its lower half, as in *S. cupreus*, Blgr. Body depressed. No dorsal crest or denticulation. Dorsal scales rather large, strongly imbricate, sharply keeled, sharply pointed; the keels forming continuous lines, which are parallel or slightly oblique on the posterior part of the back; lateral scales passing gradually into the smaller smooth ventrals; 54 to 60 scales round the middle of the body. The adpressed hind limb reaches the humeral fold or between it and the ear; fifth toe not extending as far as second. Tail about twice as long as head and body, tapering, scarcely compressed, scaled like the body, the scales forming rings. Bronzy or greyish brown above, with darker or lighter spots, which may be confluent into longitudinal streaks; a more or less distinct light dorso-lateral streak constantly present; lower parts whitish, sometimes bluish

grey, the throat usually with a dark grey network; anal region and lower surface of hind limbs bright yellow in the males.

	millim.
Total length.....	238
Head.....	20
Width of head.....	14
Body.....	63
Fore limb.....	30
Hind limb.....	51
Tail.....	155

Numerous specimens from Carao, 8000 feet, Huaras, 10,000 feet, and Recuay, 11,000 feet.

Distinguished readily from the preceding species by the granular patches on the sides of the neck.

Tropidurus Thomasi.

Upper head-scales smooth; a series of four to seven transversely enlarged supraoculars; occipital very large, broader than long, at least as broad as the supraocular region; nostril above the canthus rostralis; ear-opening with a fringe of long pointed scales; temple granulate. A strong curved antehumeral fold, nearly meeting its fellow on the throat; latter with more or less distinct cross folds; sides of neck minutely granulate, strongly plicate. Body depressed, with a more or less distinct fold along the side, and a vertebral series of enlarged tectiform scales, forming a low crest on the nape; dorsal scales very small, juxtaposed, feebly keeled, smaller still, granular, and smooth on the sides; ventrals larger, imbricate, smooth. The hind limb reaches the ear or between it and the antehumeral fold. Tail about once and a half as long as head and body, rounded or feebly compressed, with a low serrated dorsal ridge; caudal scales much larger than dorsals, keeled and shortly mucronate. Grey above, dotted with blackish and yellowish white, the dots having a tendency to forming transverse series; antehumeral fold black; throat and breast black in the males.

	millim.
Total length.....	165
Head.....	15
Width of head.....	13
Body.....	51
Fore limb.....	27
Hind limb.....	45
Tibia.....	99

Several specimens from Eten, coast of Peru.

This species, named in honour of my colleague Mr. Oldfield Thomas, is allied to *T. peruvianus*, Wieg., from which it is well distinguished by the shorter hind limbs and the stronger auricular fringe.

Proctoporus ventrimaculatus.

Body elongate, limbs weak. Fronto-nasal much longer than broad, much larger than the frontal; fronto-parietals forming a long suture; interparietal narrower and a little shorter than the parietals, widening posteriorly; three subequal occipitals; three supraoculars; no loreal; a series of very small infraorbitals; temple with large irregular shields; chin-shields, one anterior and three pairs; gular scales subquadrangular, in 9 transverse series between the chin-shields and the collar; 10 collar-shields. Dorsal scales elongate-quadrangular, smooth, juxtaposed; 31 series between the occiput and the base of the tail. Ventral plates quadrangular, in 10 longitudinal and 22 transverse series. Two large præanal shields in the first row, four in the second. Limbs with smooth shields. Three femoral pores on each side. Tail thick, scaled like the body. Uniform brown above; white beneath, with large black spots.

	millim.
Head	9
Width of head	5
From end of snout to fore limb.....	12
From end of snout to vent.....	34
Fore limb	9
Hind limb	10

A single specimen from Cajamarca, 10,000 feet.

Philodryas Simonsii.

Eye three fifths length of snout. Rostral broader than deep, just visible from above; internasals shorter than the præfrontals; frontal once and two thirds as long as broad, longer than its distance from the end of the snout, slightly shorter than the parietals; loreal longer than deep; one præocular, not reaching the frontal; two postoculars; temporals 2 + 3; eight upper labials, fourth and fifth entering the eye; four lower labials in contact with the anterior chin-shields, which are nearly as long as the posterior. Scales smooth, with single apical pits, in 19 rows. Ventrals rounded, 182; anal divided; subcaudals 105. Greenish yellow above, with three olive longitudinal stripes and a dark brown vertebral

line; the lateral stripe extending forwards to the nostril, passing through the eye; upper lip yellowish white; yellowish white beneath, speckled with olive.

Total length 780 millim.; tail 240.

A single specimen from Cajamarca, 9000 feet.

Closely allied to *P. elegans*, Tsch. Distinguished by the shorter snout and the shorter frontal shield.

XIX.—*Descriptions of new Batrachians and Reptiles from the Larut Hills, Perak.* By G. A. BOULENGER, F.R.S.

I AM indebted to Mr. A. L. Butler, Curator of the Selangor Museum, for an opportunity of examining a number of batrachians and reptiles collected by him in the Larut Hills, among which I was pleased to find examples of several undescribed species. Unless otherwise stated, types of these new species are preserved both in the British Museum and in the Selangor Museum at Kuala Lumpur.

Leptobrachium heteropus.

Tongue large, pyriform, feebly notched behind. Vomerine teeth none. Head moderate, as long as broad; snout short, truncate at the end; canthus rostralis strong; loreal region concave; interorbital space as broad as the upper eyelid; tympanum distinct, half the diameter of the eye. Fingers moderate, blunt, first and second equal; toes moderate, blunt, webbed at the base only, the web continued as a slight fringe along each side of the toes; a strong dermal ridge or keel, formed by a modification of the subarticular tubercles, runs along the lower surface of the third and fourth toes, which thus appear to be compressed; a small oval inner metatarsal tubercle. The tibio-tarsal articulation reaches the centre of the eye. Skin smooth, with small tubercles on the upper eyelids. Grey above, with darker light-edged symmetrical markings, the largest occupying the middle of the back; a black lumbar spot; a black canthal and temporal streak; black spots on the sides; dark cross-bars on the limbs; lower parts grey, speckled with black; a round whitish spot on each side of the breast, at the base of the arm, another on the back of each thigh.

From snout to vent 33 millim.

A single specimen was obtained in the Larut Hills at an altitude of 3500 feet. Selangor Museum.

This species is closely allied to *L. pelodytoides*, Blgr., from which it may be distinguished by the lesser web and the extraordinary dermal ridges under the toes, a point of structure which is only foreshadowed in the types of *L. pelodytoides*.

Ixalus larutensis.

Snout rounded or obtusely pointed, as long as the diameter of the orbit; canthus rostralis distinct; loreal region concave; nostril a little nearer the end of the snout than the eye; interorbital space as broad as the upper eyelid; tympanum moderately distinct, half the diameter of the eye. Fingers free; toes half-webbed; disks of fingers as large as the tympanum; subarticular tubercles moderate; a small inner metatarsal tubercle. The tibio-tarsal articulation reaches between the eye and the tip of the snout. Upper parts smooth or with small flat warts; throat, belly, and lower surface of thighs granulate. Grey-brown or reddish brown above, with dark brown symmetrical markings, a cross-band between the eyes being constant; usually a)(or)-(shaped marking on the anterior part of the body; sides of body and of thighs with white spots between a brown network; limbs with dark cross-bands; lower parts white, spotted or speckled with brown.

From snout to vent 35 millim.

Several specimens from the Larut Hills at 4000 to 4500 feet.

Ixalus vermiculatus.

Head large, broader than long; snout rounded, as long as the diameter of the orbit; canthus rostralis distinct; loreal region concave; nostril a little nearer the end of the snout than the eye; interorbital space as broad as the upper eyelid; tympanum distinct, two fifths the diameter of the eye. Fingers with a rudiment of web; toes half-webbed; disks of fingers as large as the tympanum; subarticular tubercles moderate; a small inner metatarsal tubercle. The tibio-tarsal articulation reaches between the eye and the tip of the snout. Upper parts smooth; throat, belly, and lower surface of thighs granulate. Olive-green above, closely vermiculate with black; upper surface of thighs with a series of large black blotches; sides of thighs and anal region orange-yellow; white beneath. Male with a large gular vocal sac.

From snout to vent 33 millim.

Three specimens from the Larut Hills at 4000 feet.

Microhyla Butleri.

Habit slender. Snout rounded, as long as the orbit; inter-orbital space broader than the upper eyelid. Fingers and toes rather slender, the tips dilated into small but well developed disks; first finger much shorter than second; toes webbed at the base; subarticular tubercles small; two very small metatarsal tubercles. The tibio-tarsal articulation reaches the eye. Skin smooth. Grey on the back, pale reddish on the sides and limbs, with symmetrical dark brown markings forming bars on the limbs; some small scarlet spots on the sides; a whitish oblique streak from the eye to the base of the fore limb and a whitish spot on the end of the snout; whitish beneath, throat and breast speckled with dark brown.

From snout to vent 21 millim.

A single specimen from the Larut Hills at 4000 feet. Selangor Museum.

Closely allied to *M. achatina*. Distinguished by the shorter limbs.

Microhyla annectens.

Habit slender. Snout rounded, as long as the orbit; inter-orbital space broader than the upper eyelid. Fingers and toes moderately slender, the tips dilated into rather large disks; first finger much shorter than second; toes half-webbed; subarticular tubercles feebly prominent; a very small inner metatarsal tubercle. Hind limb remarkably long, the tibio-tarsal articulation reaching far beyond the tip of the snout; tibia two thirds length of head and body. Skin smooth. Brown above, with symmetrical blackish light-edged markings, a large one on the back being produced to between the eyes, where it expands into a transverse bar; side, from the shoulder to the lumbar region, black, with sharply defined upper outline; an oblique whitish streak from below the eye to the base of the fore limb; a blackish spot at the knee, a dark cross-bar on the thigh, another on the femur, and a third on the tarsus; lower parts closely marbled with dark brown.

From snout to vent 15 millim.

Several specimens from the Larut Hills at 4000 feet.

This species connects *M. achatina* with *M. Berdmorii*.

Gehyra larutensis.

Body and limbs moderately elongate. Head oviform; snout a little longer than the distance between the eye and

the ear-opening, which is small and round; head covered with finely granular scales, which are larger on the snout; rostral twice as broad as deep, with a short median cleft above; nostril pierced between the rostral, the first upper labial, and three nasals, the upper of which is the largest and separated from its fellow behind the rostral by several minute granules; 9 upper and 9 lower labials; symphyisial truncate behind; a series of small chin-shields, the median pair largest, scarcely longer than the symphyisial. Scales uniformly granulate on the back, limbs, and throat, larger, flat, and imbricate on the belly. Digits free, strongly dilated, with entire lamellæ, the largest of which are angulated or chevron-shaped; these chevron-shaped lamellæ number one under the hallux, three under the third toe, four under the fourth. Tail subcylindrical, covered with small imbricate scales above and beneath. Male with a long continuous series of 42 femoral and præanal pores. Grey-brown above and beneath, tail yellowish, with small darker spots on the back and a vertebral series of small blackish spots widely separated from each other; a dark line on each side of the head, passing through the eye.

	millim.
Total length	69
Head	10
Width of head	6.5
Body	27
Fore limb	10
Hind limb	13
Tail	32

A single specimen from the Larut Hills, under a house, at 3500 feet altitude. Selangor Museum.

Draco punctatus.

Head moderate; snout as long as the diameter of the orbit; nostril lateral, directed outwards; tympanum naked, nearly as large as the eye-opening. Upper head-scales very unequal, keeled; two subtriangular, compressed, enlarged, erect scales on the posterior part of the supraciliary region; 10 or 11 upper labials. The male's gular appendage a little shorter than the head. Male with a very distinct nuchal crest. Dorsal scales unequal, keeled, not larger than ventrals; a lateral series of enlarged distant scales. The fore limb stretched forwards extends a little beyond the tip of the snout; the hind limb reaches the axilla or between the latter and the elbow of the adpressed fore limb. Tail with a dorsal

crest of distinct large, pointed, compressed scales. Dark grey above, with a paler, reddish, vertebral stripe; back, and head above and beneath, with large black dots; wing-membranes black above, with interrupted whitish streaks, colourless beneath; throat and belly pale blue; inner side of neck-lappets and extremity of gular appendage lemon-yellow.

	millim.
Total length.....	247
Head.....	18
Width of head.....	12
Body.....	73
Fore limb.....	37
Hind limb.....	45
Tail.....	156

A single male specimen obtained in the Larut Hills by Mr. A. L. Butler at an altitude of 3000 feet. I have also examined a male from Sarawak, collected by the late Mr. A. Everett, which I had referred to *D. cristatellus*.

Draco formosus.

Head small; snout slightly longer than the diameter of the orbit; nostril directed upwards, perfectly vertical; tympanum naked, smaller than the eye-opening; upper head-scales unequal, keeled; a prominent tubercle at the posterior corner of the orbit; nine or ten upper labials. The male's gular appendage as long as the head, very thin, translucent, covered with very large scales. No nuchal fold. Dorsal scales equal, very feebly keeled, not larger than ventrals; a few widely separated enlarged scales on the side of the back. The fore limb stretched forwards extends considerably beyond the tip of the snout; the adpressed hind limb reaches the axil. Brown above (in life), head greyer, with a few dark spots; wing-membranes olive above, edged with maroon or crimson, with five more or less regular black transverse bands, uncoloured beneath; throat of male, under the lappets and right to the base of the gular appendage, maroon or crimson, of female dark green.

	♂.	♀.
	millim.	millim.
Total length.....	272	?
Head.....	19	23
Width of head.....	12	15
Body.....	78	92
Fore limb.....	42	48
Hind limb.....	53	60
Tail.....	175	?*

* Reproduced.

Several specimens were obtained in the Larut Hills by Mr. A. L. Butler at elevations varying between 1500 and 3000 feet.

Intermediate between *D. Blanfordii*, Blgr., and *D. tenuipterus*, Gthr. *D. Blanfordii* occurs also in the Larut Hills.

Lygosoma præsigne.

Section *Hinulia*. Habit lacertiform; the distance between the end of the snout and the fore limb is contained once and a half in the distance between axilla and groin. Snout short, obtusely pointed. Lower eyelid scaly. Nostril pierced in a single nasal; no supranasal; rostral forming a straight transverse suture with the frontonasal, which is broader than long; præfrontals forming a median suture; frontal very narrow behind, as long as frontoparietals and interparietal together, in contact with the three anterior supraoculars; four supraoculars, followed by a very small fifth; nine or ten supraciliaries, first and last largest; frontoparietals and interparietal distinct, latter longer than former; parietals forming a very short suture behind the interparietal; three pairs of nuchals; fifth upper labial below the centre of the eye. Ear-opening oval, nearly as large as the eye-opening; no auricular lobules. 28 smooth scales round the middle of the body; dorsals largest, especially those of the two median series, which are more than twice as broad as long. A pair of enlarged præanals. The hind limb stretched forwards reaches the elbow of the adpressed fore limb. Digits rather long, compressed; subdigital lamellæ smooth, 20 under the fourth toe. Reddish brown above, with scattered black dots, grey on the sides, spotted with black and white; a series of large roundish black spots on each side of the neck on anterior part of body; lips spotted with black; tail black above and on the sides, with irregular annuli of whitish scales; lower parts white.

	millim.
Total length.....	240
Head.....	25
Width of head.....	17
Body.....	85
Fore limb.....	34
Hind limb	47
Tail (reproduced)	130

A single specimen from the Larut Hills at 4000 feet. Selangor Museum.

Lygosoma stellatum.

Section *Hinulia*. Habit lacertiform; the distance between the end of the snout and the fore limb is contained once and one fourth to once and one third in the distance between axilla and groin. Snout moderate, obtusely pointed. Lower eyelid scaly. Nostril pierced in a single nasal; rostral forming a straight transverse suture with the fronto-nasal, which is a little broader than long; præfrontals uniting or forming a short median suture (in one specimen separated by a small azygous shield); frontal as long as frontoparietals and interparietal together, in contact with the two or three anterior supraoculars; four supraoculars, followed by a very small fifth; eight supraoculars, first and last largest; frontoparietals and interparietal distinct, subequal; parietals forming a suture behind the interparietal; two or three pairs of nuchals; fifth upper labial below the centre of the eye. Ear-opening oval, a little smaller than the eye-opening; no auricular lobules. 24 smooth scales round the middle of the body, dorsals largest, those of the two median series more than twice as broad as long. A pair of enlarged præanals. The hind limb stretched forwards reaches the wrist or the elbow of the adpressed fore limb. Digits rather long, compressed; subdigital lamellæ smooth, 22 to 25 under the fourth toe. Bronze-colour above, spotted all over with black and white, the black spots preceding the white ones and more crowded on the sides; lips spotted with black; the spots disposed in transverse series on the tail; lower parts bluish or greenish white.

	millim.
Total length	173
Head	17
Width of head	10
Body	63
Fore limb	26
Hind limb	36
Tail	93

A specimen, badly preserved unfortunately, was brought home by Mr. S. S. Flower, who obtained it in the Larut Hills, at an altitude of 4400 feet, in April 1898. I have since examined two younger specimens from the same hills, forming part of Mr. A. L. Butler's collection. One was found in a rotten tree at 3500 feet altitude, the other in a house at 4000 feet.

Mr. Butler's collection also contains an example of *Lygosoma Bampfyldii*, E. Bartlett (Journ. Str. Br. As. Soc.

no. 28, 1895, p. 96), a species described from the Upper Rejang River, Sarawak, one of the types of which is now in the British Museum. This form is remarkable in establishing a connecting-link between the sections *Riopa*, Gray, and *Lygosoma*, Gray. It agrees with the former in the presence of supranasals, forming a suture behind the rostral, with the latter in the frontal shield being much broader than the supraocular region. In the Sarawak specimen the fifth upper labial is broken up into several shields, there are 38 scales round the body, and the upper parts are yellowish brown with a dark brown band across the frontal region and another across the occipital. In the Larut specimen the fifth labial is as large as the fourth and borders the eye, the scales number 40, and the dark brown of the occiput extends along the dorsal surface of the body and tail, the sides of which are reddish.

Lycodon Butleri.

Closely allied to *L. fasciatus*, Anderson, but with a larger eye and more strongly angulate ventral and subcaudal shields. Body slightly compressed. Rostral twice as broad as deep, hardly visible from above; internasals three fifths the length of the præfrontals; frontal a little longer than broad, as long as its distance from the end of the snout, shorter than the parietals; loreal more than twice as long as deep, bordering the eye below the single præocular; two postoculars; temporals 2+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 17 rows; dorsals very feebly keeled. Ventrals 224-228, strongly angulate laterally; anal entire; subcaudals 88-92 pairs. Blackish brown above and beneath, with 43 or 45 rather irregular annuli of whitish spots or edges to the scales.

Total length 540 millim.; tail 115.

Two female specimens from the Larut Hills at altitudes of 4000 and 5000 feet.

XX.—*Description of a new Lizard from Jamaica.*

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

Diploglossus Bakeri.

Lateral teeth obtusely tricuspid. Head small, not distinct from neck; snout short, with obtuse canthus; ear-opening

moderately large, smaller than the eye-opening; a large azygous præfrontal, broader than and in contact with the entire anterior border of the frontal, in contact with the loreal and separated from the rostral by two pairs of shields; frontal once and one third as long as broad; parietal on each side separated from the frontal and supraoculars by three shields; occipital much smaller than the interparietal; internasal in contact with the first labial; a single postnasal; two consecutive loreals; rostral twice as broad as the symphyseal; the suture between the fifth and sixth upper labials falls below the centre of the eye; four chin-shields on each side, the first three in contact with the lower labials. Body elongate, cylindrical. 39 scales round the middle of the body, dorsals strongly striated. Limbs very short; the fore limb stretched forwards extends scarcely beyond the ear; the hind limb measures one third the distance between axilla and groin. Tail cylindrical; only the basal scales striated. Bronzy brown above, with small black spots, which are more crowded on the sides and limbs; a black dorso-lateral line, light-edged above, widening on the neck, and extending, through the eye, to the end of the snout; belly whitish, throat speckled with black.

	millim.
Total length.....	151
Head.....	11
Width of head.....	8
Body.....	57
Fore limb.....	10
Hind limb.....	13
Tail.....	83

A single specimen, a gravid female, was sent from Jamaica by Mr. C. H. Baker to the Corporation Museum of Leicester, through the kindness of whose curator, Mr. Montagu Browne, it has been presented to the British Museum.

XXI.—*Description of a new Lizard from British East Africa.* By G. A. BOULENGER, F.R.S.

Lygosoma clathrotis.

Section *Liolepisma*. Body elongate, limbs short. The distance between the end of the snout and the fore limb is contained twice in the distance between axilla and groin. Snout short, rounded. Lower eyelid with an undivided transparent disk. Nostril pierced in the nasal; no supranasal;

frontonasal broader than long, forming a broad suture with the rostral and with the frontal; præfrontals small; four supraoculars; seven supraciliaries; frontoparietals distinct, much larger than the interparietal, behind which the parietals form a suture; a pair of nuchals; third and fourth upper labials under the eye. Ear-opening small, with six interlocking pointed lobules within the meatus, three pointing downwards and three pointing upwards. 22 subequal smooth scales round the body. A pair of feebly enlarged præanals. Fore limb, stretched forwards, reaching the ear; hind limb half as long as the distance between axilla and groin. Digits short; 12 smooth lamellæ under the fourth toe. Tail rather thick, once and two thirds the length of head and body. Brown above, yellowish beneath; sides dotted with black.

	millim.
Total length.....	167
Head	11
Width of head	7
Body.....	49
Fore limb.....	10
Hind limb	16
Tail	107

A single specimen from the foot of Mount Kenia. Presented to the British Museum by Lord Delamere.

XXII.—*On a new Species of the Genus Alepas (A. Lankesteri), from the Collection of the British Museum.* By A. GRUVEL, Chargé de Cours à la Faculté des Sciences de Bordeaux.

[Plate VIII.]

DIAGNOSIS.—Capitulum swollen laterally, covered with a thick transparent cuticle, without plates. Orifice slightly tubular and projecting. No crests on the median dorsal line, but a slight continuous ridge extending from the orifice to the peduncle.

The peduncle is nearly as long as the capitulum, without visible ornamentation, with the exception of irregular transverse folds.

Mandibles with four teeth. Inner branch of the 5th and 6th pairs of cirri atrophied and unequal.

Distribution.—West Indies, Mona Channel, 814 fathoms. Collected by Captain Cole. British Museum Collection.

Capitulum.—The capitulum, entirely devoid of plates, is covered with a thick chitinous envelope, extremely transparent even after prolonged immersion in alcohol, and ornamented with transverse folds which are especially numerous near the orifice. It is swollen towards the median and lateral regions, and then strongly retracts to form a kind of short, tubular duct in which the cirri are set. The capitulum has no dorsal crests, but simply a slight continuous ridge which follows the median dorsal line from the opening of the capitulum to the commencement of the peduncle.

Seen in profile, the general form of the capitulum is that of a semicircle, of which the anterior part, forming the base, is straight, and the posterior part regularly curved.

The dimensions of the capitulum of the largest specimen are as follows:—Height 20 mm., breadth 18.50 mm., thickness 8.5 mm.

Peduncle.—The peduncle continues the capitulum without a break. At first broad, it contracts and is almost cylindrical towards its middle part; then it broadens again to its base to form its surface of attachment. The cuticle is the direct prolongation of that of the capitulum.

This cuticle of the capitulum and peduncle presents some interesting features. It is composed of chitinous processes separated by somewhat irregular spaces. Some are wide at their base, and their summit terminates in three or four pointed branches which are recurved and divergent, forming hooks (Pl. VIII. fig. 2); others are shorter and simply conical (fig. 3). These processes have nearly the same height in the same zone, and this height varies from 4.8μ to 24μ . Near the middle of each of these zones is a sensory bristle receiving at its base a nerve-filament which is very distinct, long, slender, and terminates in a fine point. The average length is from about 95 to 100μ (fig. 4).

In general each zone of many-pointed hooks is surrounded by a zone of conical spines, and it is usually also in the zone of hooks that the sensory bristle is placed.

The opening of the capitulum is heart-shaped, presenting on the median dorsal line a circular protuberance delimitating a depression and not a true canal.

Mantle.—The mantle which clothes the chitinous cuticle on the interior is composed of the usual two epithelial layers, including between them two muscular layers, the one longitudinal, the other oblique, crossing at various angles and together forming a kind of very elegant tessellation, these bundles being separated one from another by a distance of about 70μ . There is, moreover, quite a system of branching

elastic fibres, obliquely binding the epithelial surfaces one to the other.

The chitinous cuticle which clothes the inner part of the mantle is thin, transparent, and interspersed with comb-shaped chitinous ornaments with a greater or less number of teeth, sometimes one only, irregularly placed and serving to retain the ovigerous sac in the intrapallial cavity.

Mouth.—The labrum has on its free margin fourteen short, strong, and blunt chitinous teeth, separated into two series of seven by a smooth space; the lateral parts are furnished with stiff and short but fine bristles.

The *palpi* are flattened and provided with long barbed bristles over about half their length (fig. 5).

The *mandibles* have four strong teeth on their free margin. The distance between the first and second slightly exceeds that between the points of the second and fourth (fig. 6).

The median dorsal region is covered with short, stiff, but rather fine bristles; the lateral faces of the teeth are furnished with strong, short, and pointed bristles, especially well developed in the vicinity of the last three teeth.

The *maxillæ* have the free margin divided into two unequal parts by a deep notch. The upper part is furnished with a very strong chitinous tooth, which continues the dorsal margin, and a smaller one. The lower part is scalariform and bears three short and thick projections, between which are finer bristles, uniformly not barbed, which likewise cover the lateral parts of the maxilla (fig. 7).

The *labial palpi* of the lower lip are broad, nearly square in shape; the anterior free margin is divided by a notch into two unequal parts, the upper part about three times as broad as the lower. The upper dorsal region of the palp is covered with long fine bristles collected in a thick tuft. These bristles become shorter and stiffer on the lower parts. Finally, on the posterior part are irregular bristles, bent and few in number (fig. 8).

Cirri.—The cirri are generally very long, covered with long fine bristles, especially long towards the free extremity of the rami. The first pair is somewhat sharply separated from the others.

1st pair.—This is much the shortest. The two rami are unequal. The anterior ramus, formed of 13 rather short joints (the basal joint being almost equal to four ordinary joints), bears numerous long, fine, and barbed bristles on its posterior border; these being much fewer on the anterior border. The posterior ramus is formed of 21 joints (the first being nearly equal to four ordinary joints). The hairs

are longer than those of the anterior ramus and the terminal joints are thinner, while keeping about the same length.

2nd pair.—The rami are nearly equal to each other and about twice as long as the posterior ramus of the first pair; that is to say they attain 12 millim. with 50 to 55 joints, the joints at the base not being very distinct. These segments are short, straight, and each bears some long anterior bristles and some shorter and finer posterior bristles only at the border of the segments.

The *3rd* and *4th pairs* are almost exactly similar to the 2nd.

The *5th pair* has the inner ramus atrophied. The length of this ramus does not exceed 3.5 to 4 millim.; the number of joints is 19, long and slender towards the extremity, bearing some long fine bristles on the anterior margin and two or three very short bristles on the posterior margin, at the border of the segments. The normal ramus is similar to the preceding.

Finally, the *6th pair* of cirri have also the inner ramus atrophied, similar to the preceding, however, but shorter (16 joints) (fig. 10).

Caudal appendages.—These are long, slender, and cylindrical (1.5 millim. in length, with 10 joints). The basal joints are very broad compared with the superior (fig. 9). The last joint is furnished with fine bristles longer than itself; but these diminish rapidly in length as they approach the base until they become simple spines.

Filamentary appendages.—A single very short pair at the base of the first pair of cirri.

Penis.—The penis, which is about 4.5 millim. in length, is nearly regularly cylindrical, terminating at its extremity in a blunt point (fig. 11). It is covered with a thin transparent cuticle having annular parallel folds in the depressions, between which are placed, quite irregularly, long fine bristles more or less bent, which form at the apex a somewhat irregular tuft.

This new species, to which I propose to attach the name of the Director of the British Museum, approaches in some of its characters *A. cornuta*, Darw., and *A. japonica*, Aurivillius, but it has most affinity with the first-mentioned species.

Bordeaux,
7 May, 1900.

EXPLANATION OF PLATE VIII.

Fig. 1. *Alepas Lankesteri*, sp. n.

Fig. 2. Hook-shaped processes on the cuticle of the capitulum.

Fig. 3. Conical processes on ditto.

- Fig. 4. Sensory bristles situated in the midst of the preceding structures.
 Fig. 5. Left palp.
 Fig. 6. Right mandible.
 Fig. 7. Left maxilla.
 Fig. 8. Right labial palp.
 Fig. 9. Caudal appendages.
 Fig. 10. Cirrus of the 6th pair of cirri.
 Fig. 11. Penis (free extremity).

XXIII.—*Two Spiders new to the British Fauna.* By GEORGE H. CARPENTER, B.Sc. Lond., of the Science and Art Museum, Dublin.

DURING the past few years I have received consignments of spiders for identification from Mr. A. Randell-Jackson, of Southport, collected by him in various parts of Northern England and the Isle of Man. Many of his captures are of considerable faunistic interest, and these will be duly recorded in local lists. Two species, however, are of particular importance, being undoubtedly additions to the British fauna, and one of them seems to be new to science. Both were obtained in the neighbourhood of Southport.

Family Agelenidæ.

Genus AGELENA, Walck.

Agelena longipes, sp. n. (Figs. 1-5.)

Female.—Length 12·5 millim.; length of carapace 5·5 millim.; breadth 4 millim.; length of legs i., ii., iii., iv. respectively 20, 18·5, 18, 24 millim.

Eyes of hind row equal to each other; centrals a diameter apart, each lateral a diameter and a half from its neighbouring central. Front lateral eyes of same size as hind laterals, which they almost touch, each a diameter from neighbouring front central. Front centrals larger than the other eyes, half a diameter from each other, a diameter from the hind centrals (figs. 2, 3).

Epigyne forming a simple deep rounded depression, broader than long, with thickened edges; a dark horseshoe-shaped area in front of it (fig. 4).

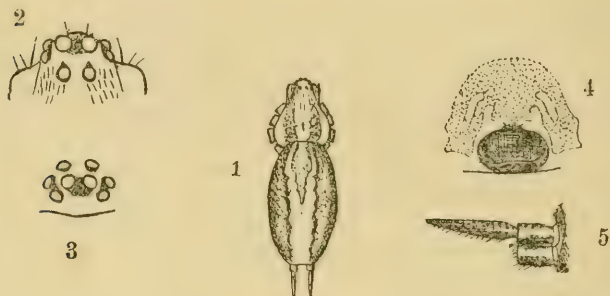
Upper spinnerets with the terminal segment flattened and pointed and fully twice as long as the proximal (fig. 5).

Carapace yellowish brown, with a fine black marginal line and a broad brown band with black markings on either

side. *Sternum* reddish brown, with a black horseshoe-shaped marking, open in front, drawn out behind, and reaching to the apex.

Legs remarkably long, the hindmost being nearly twice as long as the body; reddish brown, with a few dark markings on the thighs.

Abdomen dark brown above, with a central clear yellowish longitudinal band, bounded by a waved black line, and slightly expanded in front, where it encloses a lance-shaped red marking with serrate edges (fig. 1). Abdomen beneath yellowish white, with central black longitudinal band. *Spinnerets* reddish brown, the terminal segment in the upper pair darker.



Agelena longipes, sp. n.

Fig. 1.—Female (without appendages), dorsal view, $\times 2$.

Fig. 2.—Head-region and eyes, dorsal view, $\times 7$.

Fig. 3.—Eyes, face view, $\times 7$.

Fig. 4.—Epigyne, $\times 7$.

Fig. 5.—Spinnerets from side, $\times 7$.

Locality. Lancashire (Southport).

The specimen described above was taken on a bunch of flowers which had been brought indoors from a garden. It is possible therefore that the species may prove to be an introduced exotic; but I have failed to find a description of an *Agelena* from any part of the world that agrees with this form.

The genus *Agelena* has been hitherto represented in our fauna only by the well-known *A. labyrinthica* (Clerck); it is by no means impossible that *A. longipes* will turn out to be a truly indigenous species.

A. longipes may be distinguished at a glance from *A. labyrinthica* by its smaller size, brighter coloration, and relatively

longer legs and spinnerets, as well as by the altogether different form of the epigyne. The European species to which *A. longipes* comes nearest is *A. agelenoides* (Walck.) *, a South European spider showing a very similar abdominal pattern to that of the present species. But the female of *A. agelenoides* also has much shorter legs and spinnerets than *A. longipes* and a very differently shaped epigyne.

In the last-named character *A. opulenta*, L. Koch †, from Japan, shows considerable likeness to *A. longipes*, but this species again has relatively short legs and apparently a unicolorous yellowish-brown abdomen.

On the whole *A. longipes* seems most nearly related to the North American *A. nævia*, Walck. ‡, which has the legs relatively longer than in the European *Agelenæ*. But though the general structure of the epigyne is similar, none of its forms as figured by Emerton agrees with that of our spider, and the American species has no lance-shaped marking on the abdomen, while the terminal segments of its upper spinnerets are relatively short and cylindrical. I have to thank the Rev. O. P. Cambridge for kindly sending me Canadian specimens of *A. nævia* for comparison.

Family Argiopidæ.

Subfamily ERIGONINÆ.

Genus CNEPHALOCOTES, Simon §.

Cnephalocotes silus (Camb.). (Figs. 6-15.)

Erigone sila, Camb. Proc. Zool. Soc. 1872, p. 753, pl. lxxv. fig. 7.

Cnephalocotes pusillus, Simon, Arachn. France, v. (1884) pp. 706-7 (nec *Microneta pusilla*, Menge, Preuss. Spin.).

Cnephalocotes silus, Chyzer and Kulczynski, Aran. Hungar. ii. (1894) pp. 118-9, pl. iv. fig. 41.

Several specimens of this interesting addition to the British spider-fauna have been taken on the coast sandhills at Southport by Mr. Randell-Jackson during the early months of this year. Full descriptions of the species are given by the authors referred to in the above synonymy. A few structural figures may assist British students of spiders to discover fresh localities for it. Aspects of the male palp somewhat

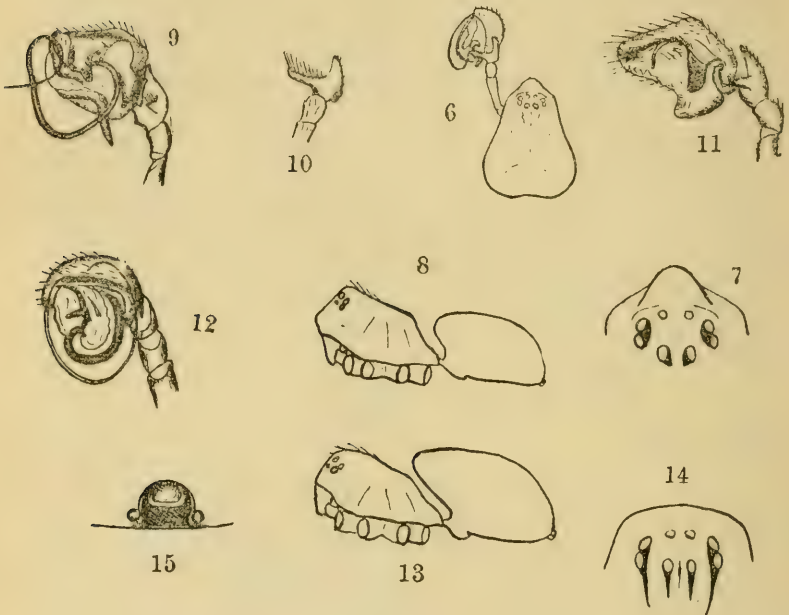
* Simon, Arachn. France, ii. pp. 115-6.

† Verh. zool.-bot. Gesell. Wien, xxvii. (1877) pp. 757-9.

‡ Emerton, Trans. Conn. Acad. viii. (1890) pp. 197-200, pl. viii. figs. 1-1 n. *A. californica*, Banks (Journ. N. Y. Ent. Soc. iv. (1896) pp. 89-90), seems a nearly allied form.

§ E. Simon, Arachn. de France, v. (1884) p. 699; Hist. Nat. Araignées, 2^e éd. (1892) tome i. p. 650.

different from those drawn by former observers are given (figs. 9-12). The female, fully described by M. Simon, is, I believe, now figured for the first time. The epigyne (fig. 15) is very characteristic, consisting of a simple semi-circular cavity, with a truncate tongue-like process within its forward region and a rounded tubercle on either side.



Cnephalocotes silus (Cb.).

- Fig. 6.—Carapace of male, with left palp, $\times 20$.
 Fig. 7.—Front end of carapace, showing eyes, $\times 60$.
 Fig. 8.—Side view of male without appendages, $\times 20$.
 Fig. 9.—Left palp of male from side-front, $\times 40$.
 Fig. 10.—Genua and tibia of left palp from above, $\times 40$.
 Fig. 11.—Left palp from side (spines removed), $\times 40$.
 Fig. 12.—Left palp from below, $\times 40$.
 Fig. 13.—Outline of female, $\times 20$.
 Fig. 14.—Eyes of female from above, $\times 60$.
 Fig. 15.—Epigyne, $\times 40$.

The type of this species (with which Mr. Cambridge has very kindly compared one of Mr. Randell-Jackson's specimens, confirming my identification) came from Nuremberg,

Bavaria. M. Simon records the spider from both the north and south of France and from Corsica, while MM. Chyzer and Kulczynski found it on the Croatian shore of the Adriatic (Fiume). It seems therefore to belong to a southern distributional type.

This is the fourth species of *Cnephalocotes* which has been added to the British list within recent years. The genus was represented in our fauna only by *C. obscurus* (Bl.) * until 1888, when Mr. Cambridge described as a new species *C. interjectus* † from Hertfordshire; this spider, lately recorded from the Edinburgh district ‡, is now believed to be identical with *C. laesus*, L. Koch §, from Central Siberia. In 1894 two more species of *Cnephalocotes*—*C. curtus*, Simon, and *C. elegans*, Camb.—were added to the British list ||, the former occurring on the shores of the Firth of Forth, the latter in Inverness-shire. *C. curtus* has since been found on the west coasts of Scotland and Ireland ¶. *C. silus* makes, therefore, the fifth species of the genus known to inhabit our islands.

The species of *Cnephalocotes* are small dark-coloured spiders with strongly chitinized skin and short blunt carapace; eyes small, those of the hinder row moderately procurved, the centrals nearer to each other than to the laterals **. The very wide sternum is produced between the hindmost haunches in a broad, blunt, rounded process. The legs are short and stout, the front tarsi being fusiform (especially in the male) and nearly as long as the metatarsi. The tibia of the male palp is usually broad and truncate, with one or two short processes; the tarsus is always large and the bulb prominent, with a free-ended, coiled, thread-like spine.

The males of our British species may be tabulated thus:—

- I. Head-region more or less elevated, distinct impressions running backward from lateral eyes.
1. Tibia of palp above with an internal blunt and

* Blackwall, Spid. Gt. Brit. Irel. (1864) pp. 297–8, pl. xx. fig. 212.

† O. P. Cambridge, Trans. Herts. Nat. Hist. Soc. v. (1888) p. 18; Proc. Dorset Field-Club, x. (1889) pp. 121–2, pl. A. fig. 6.

‡ O. P. Cambridge, Proc. Dorset Field-Club, xvii. (1896) p. 60.

§ L. Koch, Kongl. Svensk. Vetensk.-Akad. Handl. xvi. (1878) no. 5, p. 67, pl. ii. fig. 19. See W. Kulczynski, 'Fauna Araneorum Austriæ inferioris' (Cracow, 1898), pp. 63–4.

|| O. P. Cambridge, Proc. Dorset Field-Club, xv. (1894) p. 112, fig. 4; G. H. Carpenter and W. Evans, Proc. R. Phys. Soc. Edinb. xii. (1894) p. 572–3; Ann. Scot. Nat. Hist. 1894, p. 232.

¶ G. H. Carpenter, Proc. R. Irish Acad. (3) v. (1898) p. 162.

** In the large and closely allied genus *Lophocarenum*, Menge, the eyes of the hind row are equidistant and the row greatly procurved; also the skin in *Lophocarenum* is more strongly coriaceous.

- | | |
|---|---|
| a central tooth-like process. Cephalic lobe distinct | <i>obscurus</i> (Bl.). |
| 2. Tibia of palp above with a single, short, sharp process pointing outward. Cephalic lobe distinct | <i>elegans</i> (Cb.). |
| 3. Tibia of palp above with a rather long, sinuous, sharp-pointed process. Head-region only slightly elevated | <i>læsus</i> (L. K.), =
<i>interjectus</i> , Cb. |
| II. Head-region not elevated; no impressions behind lateral eyes. | |
| 1. Clypeus strongly conical | <i>silus</i> (Cb.). |
| 2. Clypeus vertical; tibia of palp above with a very short, straight, sharp-pointed process | <i>curtus</i> (Simon). |

XXIV.—*An undescribed Type of Rusine Deer.*

By R. LYDEKKER.

IN my work 'The Deer of All Lands' a brief notice *, together with a photograph, was given of three peculiar male Rusine deer at that time living in the collection of the Duke of Bedford at Woburn Abbey. They were of small size—a little larger than a hog-deer—and agreed in general character with the members of the Sambar group, although differing from all named forms by the complexity of the antlers. No name was given to these deer, on account of the possibility of their proving to be abnormalities or hybrids, or even the adult of *Cervus culionensis*. No definite information is available with regard to their place of origin, although it is very probable that they came from the Philippines.

One of the three specimens has since died and been presented by the Duke and Duchess of Bedford to the British Museum, where its skin is now mounted. A closer examination is now practicable than was the case during life, and as the result of this I feel justified in describing the mounted specimen as the type of a new species of Rusine deer, since it appears different from any named form, and there seems little probability that its peculiar characters are due either to abnormality or to hybridism.

As mounted, the specimen stands 30 inches in height at the withers. In general form, and especially in the large size of the face-glands, it agrees with the Rusine group (subgenus *Rusa*). From all the various races of the sambar (*Cervus*

* Page 171, fig. 45.

unicolor) it differs by the hairs being completely annulated with black and yellow, as it also does by the form of the antlers and their comparative slight degree of rugosity. These appendages are primarily of the three-branched Rusine type, with the inner or hinder tine of the terminal fork forming the continuation of the beam, and longer than the outer or front tine. The tail, too, is thinner and less bushy than in the sambar.

In all these three respects—namely, the annulated hair, the general form and slight rugosity of the antlers, and the relatively thin tail—the specimen agrees with the *rusa* (*C. hippelaphus*). It is, however, very considerably smaller than either of the three local races of the latter, from which it also differs by the complexity of the antlers. And here it may be mentioned that at the time of its death the animal was apparently bearing its third pair of antlers, those with which it was figured in 'The Deer of All Lands' having been shed and replaced; it is therefore approximately adult.

As regards their special characters, the antlers are more or less flattened throughout and display a marked tendency to palmation. This brow-tine is much flattened, with a sharp posterior edge, and on the right side is distinctly bifurcate, although only imperfectly so on the left. The outer tine of the terminal fork is likewise much flattened, sharp-edged behind, and trifurcate, but the inner tine on the right side is conical and simple, although showing a tendency to branch on the left side. The number of points on each antler is thus six.

The species may be shortly defined as allied to *C. hippelaphus*, but much smaller (30 inches at the shoulder), with flattened and somewhat palmated antlers, which, when fully developed, show at least six points on each side. This species I propose to call *Cervus (Rusa) tavistocki*, the mounted example in the British Museum being the type. In giving this name I must take the risk of the Woburn deer being identical with one of the numerous forms from the Philippines which have been described by Heude as species*.

I may take this opportunity of mentioning that specimens now at Woburn seem to indicate the identity of *Cervus Luedorfi*, Bolau (1880), with *C. xanthopygus*, Milne-Edwards (1867). When this year's antlers are shed the point can be definitely decided.

* See 'Deer of All Lands,' pp. 186, 187.

XXV.—On Two English Millipedes (*Iulus londinensis*, Leach, and *Iulus teutonicus*, sp. n.). By R. I. POCKOCK.

IULUS LONDINENSIS was originally described in Trans. Linn. Soc. Lond. xi. p. 378 (1815), and redescribed and figured in Zool. Misc. iii. p. 33, fig. 133 (1817). The type and two other specimens are in the British Museum.

Leach speaks of this species as occurring very commonly amongst moss in woods near London, but unfortunately does not say exactly where his specimens were actually collected—unfortunately, because the species has never, to my knowledge, been discovered since Leach's time either near London or in any other locality at home or abroad. It is true that there is an allied species, common in some parts of the south of England and of Western Europe, which passes as *londinensis* and has been more than once described under that name by students of European Millipedes. English specimens of this species taken in the vicinity of London have been compared by Dr. Carl Verhoeff with continental examples, and pronounced to be specifically identical with them. A comparison, however, between examples of this species and Leach's original examples of *londinensis* shows that the former has been wrongly determined. It therefore requires a fresh name. I propose to call it *Iulus teutonicus*, and to select as the type an example taken by myself at Sevenoaks in Kent.

Careful reading of Leach's description, brief as it is, of *I. londinensis* shows that this species differs from *I. teutonicus* in two important particulars. It is, in the first place, very much larger, and, in the second place, has the caudal process submucronate, the caudal process of *I. teutonicus* being in no sense describable as mucronate. This discrepancy was detected by Verhoeff (Berl. ent. Zeitschr. xxxvi. p. 137, 1891), who, however, passes it over as due to an error on Leach's part. As a matter of fact, Leach was correct.

Again, as to size. Leach states that his specimens were $2\frac{1}{4}$ inches (that is to say, 58 millim.) long. Meinert (Nat. Tidssk. v. p. 8, 1868), on the contrary, gives 34 millim. and Verhoeff 38 millim. as the maximum size of the species they identified as *I. londinensis*, neither of them paying heed to the dimensions given by Leach. In this case, however, Leach seems to have exaggerated considerably, since all of his specimens in the British Museum fall short of 2 inches long, and this is about the length of the specimen represented in the drawing in the 'Zoological Miscellany,' which purports to have been taken from life. It is of course possible that

Leach saw larger specimens than those that he placed in his cabinet. However that may be, there is no question that the true *I. londinensis*, judging from the only examples of it that are known, is a much larger species than the one that has been mistaken for it on the Continent. Add to this that the tergal striæ are much more numerous and close-set in *I. londinensis* than in *teutonicus*, and no one can doubt that the two are perfectly distinct species. It is safe, moreover, to prophesy that when fresh examples of *I. londinensis* come to hand for examination further differences will be found in the structure of its copulatory organs.

The differences between the two may be tabulated as follows:—

- a. Total length from about 38 to 48 mm., width 4; tergal striæ very numerous, fine, and close-set, the intervening spaces rarely exceeding and generally less than the diameter of the porous area; caudal process short, subcylindrical, blunt-pointed or obsolete (submucronate) *londinensis*.
- b. Total length from about 25 to 35 mm., width 2.5; tergal striæ much less numerous and further apart, the intervening spaces generally much exceeding the diameter of the porous area; caudal process obtusely angular, not even submucronate *teutonicus*.

I. teutonicus occurs in Scandinavia, Denmark, Western Germany, the north of France, and the south of England. The British Museum has specimens from Kent, Middlesex, Surrey, Hampshire, Oxford, and Warwickshire, but none from South Wales, Gloucestershire, Somerset, Devon, or Cornwall, although the Millipedes of these counties have been fairly well worked.

XXVI.—*Descriptions of Two Species of Cypræa, both of the Subgenus Trivia, Gray.* By JAMES COSMO MELVILL, M.A., F.L.S.

FOR the opportunity of examining the two cowries now thought worthy of description I am under much obligation to Mr. Frederick L. Button, of Oakland, California, a most enthusiastic cypræologist who has devoted especial attention to the *Trivia*. With much liberality he has from time to time forwarded me series of species, inhabitants of the Western American seas, including *fusca*, *californica*, and *sanguinea*, all of Gray, all three exhibiting much variation, with several

doubtful forms. Recently the authorities of Stanford University, California, organized a scientific expedition to the Galapagos Isles, and Mr. Snodgrass collected there one of the two following, a remarkable shell, on which I have obtained the opinion of Mr. Sowerby, Mr. Edgar Smith, Mr. E. R. Sykes, and others, they all confirming my own and Mr. Button's views that it could hardly be referred to any known species.

Cypræa (Trivia) galapagensis, sp. n.

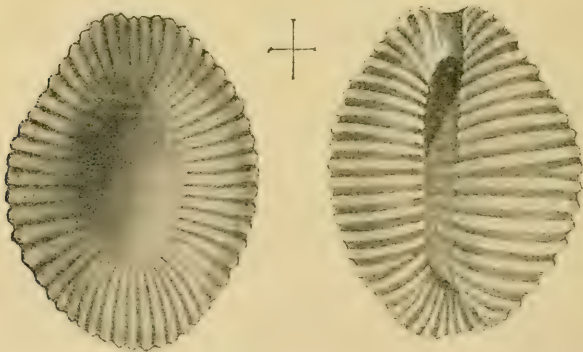
C. (Trivia) testa ovato-rotunda, parva, nigrescenti-purpurea, lateribus paullum dilatatis, extremitatibus vix productis, obtusis, costis numerosis, crassis, lævibus, pallide cinereis, dorsaliter apud medium superficie callosa omnino obtecta, versus extremitatem utramque callositatis, velut ocello, albo-maculata, nitidissima, basi convexiuscula; apertura arcuato-recta; columella haud varicosa.

Long. 8, lat. 5.75 mm. (spec. maj.).

„ 7, „ 5 „ (spec. min.).

Hab. Insula "Albemarle," e grege Galapagensi.

This particularly interesting and select form, of which I have seen three specimens, as just stated, collected for the Stanford University of California by Mr. Snodgrass, differs from *sanguinea*, Gray, in its much smaller size, distinct coloration, being blackish purple instead of madder-brown, and more numerous ribs, these being flatter and thicker in



Cypræa galapagensis.

proportion. But the chief peculiarity consists in the shining enamelled callosity over the whole centre of the dorsal region, completely obliterating the sulcus, if any exists, which I

doubt, and further rendered conspicuous by two white spots, one towards either extremity, at the point of junction of the ribs with the callosity, and both quite covered by it.

Affinity also exists between *galapagensis* and *pulla*, Gask., and likewise *subrostrata*, Gray, both inhabitants also of the Galapagos group. These small species are much of the same size, the latter possessing a decided sulcus, and with beaked extremities—hence its trivial name; whilst *pulla* is less globose, having fine ribs, with hardly any definition even of a sulcus.

No trace of any dorsal callosity has, so far as I am aware, ever been found in any other *Trivia* such as exists in the species before us.

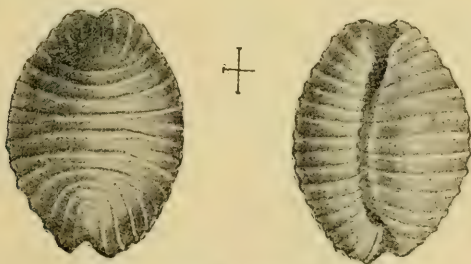
Cypræa (Trivia) Buttoni, sp. n.

C. (Trivia) testa parva, ovato-globosa, pallide straminea, apud latera paululum dilatata, costis ad quatuordecim, fortibus, continuis, hic illic interruptis vel subdivaricatis, ad dorsum præcipue latis, lævibus, albis, sulco nullo, apud extremitates paululum producta, basi subconvexa, dentibus labialibus ad octodecim.

Long. 5·50, lat. 4 mm.

Hab. — ? (*F. L. Button, Esq.*).

A small, globular, straw-coloured *Trivia*, few ribbed, these being continuous, occasionally interrupted or subdivaricate, broad, especially dorsally; there is no sulcus present; the shell is slightly produced at the extremities; labial teeth eighteen in number.



Cypræa Buttoni.

But few species are very comparable with this: *acutidentata*, Gask., may be akin, but the type is lost, and I have never seen anything but the original insufficient description; *pauci-*
Ann. & Mag. N. Hist. Ser. 7. Vol. vi. 14

lirata, Sowb., possesses a well-defined sulcus, and the ribs seem more acute than are those of *Buttoni*; *candidula*, Gask., is larger and whiter, with more frequent costæ; *producta*, Gask., as its name implies, is produced at its extremities, and the ribs are of a different character, very acute and thin. There is no sulcus, however, in this species. The ribs, likewise, of *pellucidula*, Gask., are far more numerous, and the substance more delicate than in our shell, which it affords me sincere pleasure to be able to dedicate to Mr. F. L. Button, its discoverer.

XXVII.—*Description of a new Species of Papilio from Bwool, North Celebes.* By H. GROSE-SMITH, F.E.S., F.Z.S., &c.

Papilio Dixoni.

♀.—*Upperside.* Anterior wings rather pale fuliginous brown, darker at the base and the costal and outer margins; the dark areas more restricted than in the same sex of *P. Kühni*, Honrath, the veins and rays in the cell and between the veins also dark fuliginous brown. Posterior wings pale fuliginous brown, with the base and outer third darker; the crimson markings on the underside showing indistinctly through the wings.

Underside. Anterior wings as above. Posterior wings brownish black, with a pale crimson irregular band a little beyond the cell, extending obliquely from near the abdominal margin to the upper median nervule, much narrower than the crimson band in a similar position on the underside of the posterior wings of *P. Kühni*; outside this band crossing the disk, between the veins, is a row of four large pale crimson lunules, of which the first and fourth are the narrowest.

Expanse of wings $4\frac{1}{2}$ inches.

In the collection of Mr. Grose-Smith.

Nearest to the female of *P. Kühni*, which it resembles in shape. This butterfly was captured by Mr. Frank Dixon about 30 miles inland at an elevation of 800 feet.

XXVIII.—Notes on the Collection of African Phasgonuridæ formed by Mr. W. L. Distant in the Transvaal &c., with Descriptions of Two new Species. By W. F. KIRBY, F.L.S., F.E.S., &c.

THIS collection (exclusive of the families Stenopelmatidæ, Gryllacridæ, and Hetrodidæ, which were discussed in the 'Annals' for June 1899, pp. 475-480) includes the following twenty species, belonging to various families. Two species of the genus *Tylopsis* are described as new.

ORTHOPTERA-PHASGONURIDÆ.

Dectidicidæ.

GAMPSOCLEINÆ.

Arytropteris, Herm.
basalis, Walk.

Sagidæ.

Clonia, Stål.
vittata, Thunb.
Wahlbergi, Stål.

Conocephalidæ.

CONOCEPHALINÆ.

Pseudorhynchus, Serv.
pungens, Schaum.
Conocephalus, Serv.
consobrinus, Walk.
tuberculatus, Rossi.

XIPHIDIINÆ.

Xiphidium, Serv.
iris, Serv.

Pseudophyllidæ.

PSEUDOPHYLLINÆ.

Zabalius, Bol.
orientalis, Karsch.
Bocagei, Bol.

CYMATOMERINÆ.

Cymatomera, Schaum.
denticollis, Schaum.
spilophora, Walk.

Mecopodidæ.

Anædopoda, Karsch.
latipennis, Burm.

Phaneropteridæ.

ACROMETOPINÆ.

Rhegmatopoda, Brunn.
Brunneri, n. n.

PHANEROPTERINÆ.

Phaneroptera, Serv.
nana, Charp.

TYLOPSINÆ.

Tylopsis, Fieb.
continua, Walk.
marginata, Brunn.
punctulata, sp. n.
rubescens, sp. n.

AMBLYCORYPHINÆ.

Amblycorypha, Stål.
cereris, Stål.
proserpinæ, Brunn.

Decticidæ.

GAMPSOCLEINÆ.

Arytropteris basalis.

Tlyrconotus basalis, Walk. Cat. Derm. Salt. ii. p. 247. n. 6 (1869).

Arytropteris angulosa, Heiman, Verh. zool.-bot. Ges. Wien, xliv. p. 204 (1874).

1, Zomba (*P. Rendall*).

Natal (B. M.); Zululand (*Herman*).

Thorancistus, Pictet, appears to me to be a different genus.

Sagidæ.

Clonia vittata.

Locusta vittata, Thunb. Nov. Ins. Spec. v. p. 102 (1789); Mém. Acad. Pétersb. v. p. 280 (1815).

Clonia vittata, Stål, Rec. Orth. p. 119 (1874).

Sagu maculosa, Walk. Cat. Derm. Salt. ii. p. 294. n. 16 (1869).

1, Pretoria (*Distant*).

Between Olyfants River and Slang River (*Thunberg*).

Clonia Wahlbergi.

Clonia Wahlbergi, Stål, Rec. Orth. ii. p. 119 (1874); Dist. Nat. in Transvaal, p. 83, cum fig. (1892).

1, Transvaal, Waterberg (*W. L. D.*); 2, Zomba (*P. Rendall*); 2, Barberton (*P. Rendall*).

Natal (*Stål*).

Conocephalidæ.

CONOCEPHALINÆ

Pseudorhynchus pungens.

Conocephalus pungens, Schaum, Monatsb. Akad. Berl. 1853, p. 778; Peters, Reise nach Mossamb. v. p. 126, pl. vii. fig. 12 (1862).

Pseudorhynchus pungens, Redt. Verh. zool.-bot. Ges. Wien, xli. p. 365, pl. iii. fig. 18 (1891).

2, Fort Johnston (*P. Rendall*).

Zanzibar, Mozambique (*Redtenbacher*).

Conocephalus consobrinus.

Conocephalus consobrinus, Walk. Cat. Derm. Salt. ii. p. 315. n. 4 (1869).

♀, Pretoria (*W. L. D.*); 1, Barberton (*P. Rendall*).

Natal (B. M.).

*Conocephalus tuberculatus.**Locusta tuberculata*, Rossi, Faun. Etr. i. p. 269 (1790).*Locusta mandibularis*, Charp. Hor. Ent. p. 106 (1825).*Conocephalus mandibularis*, Brunn. Prodr. Eur. Orth. p. 304 (1832);
Redt. Verh. zool.-bot. Ges. Wien, xii. p. 427. n. 101 (1891).1, Fort Johnston (*P. Rendall*).

Common in South Europe and almost throughout Africa.

XIPHIDIINÆ.

*Xiphidium iris.**Xiphidium iris*, Serv. Ins. Orth. p. 506 (1839).*Xiphidium iris*, Redt. Verh. zool.-bot. Ges. Wien, xli. p. 515 (1891).*Xiphidium punctipenne*, Walk. Cat. Derm. Salt. ii. p. 272. n. 14 (1869).*Xiphidium tenue*, Walk. l. c. n. 15 (1891).1, Pretoria (*W. L. D.*); 1, Fort Johnston, Nyasaland
(*P. Rendall*).Mauritius, Rodriguez, Madagascar, Gaboon, Zanzibar
(*Redt.*); S. Africa (*B. M.*).

Pseudophyllidæ.

PSEUDOPHYLLINÆ.

*Zabalius orientalis.**Mateus orientalis*, Karsch, Berl. ent. Zeitschr. xxxvi. p. 85 (1890);
Brunn. Mon. Pseud. p. 30 (1895).1, Barberton (*P. Rendall*).Usambara, Tanganyika (Berlin Museum); Zanzibar
(*Dohrn*); Bihe (?) (*Bolivar*).The descriptions of this species are very poor. Mr. Distant's specimen has broad oblique yellow lines, with slight pseudopodiform projections, and narrowly bordered on the outside with black. In fact it much resembles *Z. Bocagei*, but the thoracic granules are less numerous, and are yellow in front, and reddish behind instead of black.*Zabalius Bocagei.**Mustius Bocagei*, Bol. Journ. Sci. Lisb. (2) i. p. 221 (1890).1, Angola (*Monteiro*).

The Natural History Museum possesses a discoloured specimen from the Congo which agrees with Bolivar's description in having the inside of the hind femora blood-red. Mr. Distant's specimen is only slightly faded on the head &c., and is pale green, with the thoracic granules black. The

radial nervure of the tegmina is orange at the base, as well as the front border of the pronotum; the transverse nervures of the tegmina are broadly yellow, narrowly edged behind with black, and the inner marginal area is brownish yellow except at the base, but may be slightly discoloured. The hind femora are green, with a row of reddish-brown spots on the inner side, and a double row of short stout yellow spines beneath, most numerous on the outer carina. The tips of the femora and the whole of the tibiæ and tarsi are reddish. In the faded Museum specimen the pale transverse lines of the tegmina are bordered outside with pink.

Until a larger series of fresh specimens is received, I should not be justified in separating Mr. Distant's specimen as a distinct species.

CYMATOMERINÆ.

Cymatomera denticollis.

Cymatomera denticollis, Schaum, Monatsb. Akad. Berl. 1853, p. 778; Peters, Reise nach Mossamb. v. p. 123, pl. vii. fig. 9 (1862); Karsch, Berl. ent. Zeitschr. xxxvi. p. 97 (1891); Brunn. Mon. Pseud. p. 83 (1895).

Cymatomera Schaumi, Stål, Öfv. Vet.-Akad. Förh. xiii. p. 170 (1856).

2, Barberton (*P. Rendall*).

Mozambique (*Schaum*); Delagoa Bay, Tanganyika (*Karsch*); Zambesi (*Brunner*); Natal and Nyasa (B. M.).

Cymatomera spilophora.

Cymatomera spilophora, Walk. Cat. Derm. Salt. iii. p. 455. n. 3 (1870).

Cymatomera Brancsiki, Brunn. Mon. Pseud. p. 86, pl. iv. fig. 34 (1895).

1, Barberton, Zomba (*P. Rendall*).

Zambesi (*Brunner*); Bangani, German East Africa (Berlin Museum); East Africa (type); Mombasa, Nyasa (B. M.).

Mecopodidæ.

Ancedopoda latipennis.

Mecopoda latipennis, Burm. Handb. Ent. ii. p. 686. n. 2 (1839).

1, Zomba (*P. Rendall*).

Natal, Nyasa, Uganda, Sierra Leone (B. M.).

Phaneropteridæ.

ACROMETOPINÆ.

Rhegmatopoda Brunneri, n. n.

|| *Horatosphaga leptocerca*, Brunn. Mon. Phan. p. 89. n. 3, pl. i. figs. 9 a, b (1878).

Rhegmatopoda leptocerca, Brunn. Verh. zool.-bot. Ges. Wien, xli. p. 45 (1891).

1, Barberton (*P. Rendall*).

This cannot be *Horatosphaga leptocerca*, Stål (Æfv. Vet.-Akad. Förh. xxxiii. p. 59, 1876), in which the subgenital plate of the male is described as narrow.

PHANEROPTERINÆ.

Phaneroptera nana.

Phaneroptera nana, Charp. Fieber, Lotos, iii. p. 49 (1853); Brunn. Mon. Phan. p. 213 (1878).

|| *Phaneroptera bilineolata*, pt., Walk. Cat. Derm. Salt. ii. p. 337. n. 16 (1869).

Phaneroptera sparsa, Stål, Æfv. Vet.-Akad. Förh. xiii. p. 170 (1856).

Phaneroptera conspersa, Stål, Rec. Orth. ii. p. 29 (1874).

Phaneroptera tetrasticta, Gerst. Arch. f. Nat. xxxv. p. 215 (1869); Von der Decken's Reisen, iii. (2) p. 32 (1873).

1, Pretoria (*W. L. D.*); 4, Barberton (*P. Rendall*); 12, Fort Johnston, Nyasaland.

Portugal, Fernando Po, Cape, Uru, Zanzibar, Rio Janeiro (*Brunner*); Natal (*B. M.*).

TYLOPSINÆ.

Tylopsis continua.

Phaneroptera continua, Walk. Cat. Derm. Salt. ii. p. 337. n. 20 (1869).

Phaneroptera vicaria, Walk. *l. c.* p. 338. n. 22 (1869).

|| *Phaneroptera bilineolata*, pt., Walk. *l. c.* p. 337. n. 16 (1869).

Tylopsis longipennis, Stål, Æfv. Vet.-Akad. Förh. xxxiii. (3) p. 58 (1876).

Tylopsis vittata, Brunn. Mon. Phan. p. 229 (1878).

Tylopsis inhamata, Karsch, Berl. ent. Zeitschr. xxxii. p. 453 (1888).

1, Fort Johnston, Nyasaland (*P. Rendall*); 2, Masil Nek; 1, Pretoria (*W. L. D.*)

Damaraland (*Stål*); Cape (Berlin Museum); Delagoa Bay (*Karsch*); Natal, Zululand (*B. M.*).

I consider all the above names to refer to a single species.

Tylopsis marginata.

Tylopsis marginata, Brunn. Verh. zool.-bot. Ges. Wien, xli. p. 113 (1891).

1, Pretoria (*W. L. D.*); 2, Barberton (*P. Rendall*); 1, Zomba (*P. Rendall*); Natal (*Brunner*).

Apparently a rather scarce species.

Tylopsis punctulata, sp. n.

♂.—Long. corp. 18 millim., cum app. 21 millim.; long. tegm. 31 millim.; long. al. 38 millim.

♀.—Long. corp. 20 millim., cum ovip. 24 millim.; long. tegm. 32 millim.; long. al. 38 millim.; exp. tegm. 65 millim.; exp. al. 69 millim.

Brownish testaceous, probably green when living; antennæ reddish brown; a broad brown band runs from the occiput over the pronotum and the inner margin of the tegmina, extending over the basal area of the latter, for about one third of their length, where it narrows to a border for the rest of their length. Pronotum with a narrow yellow lateral line on each side of the brown band; the deflexed lobes are pale, a little longer than high, with both the lower angles rather obtusely rounded off; they are also marked with a rather large brownish blotch in the middle. Tegmina with rows of sub-obsolete small brown spots between the longitudinal and oblique nervures. Abdomen not denticulated on the median line; the last two segments with black spots in the male; subgenital lamina broad, upcurved, bifid; cerci curved round it, inwards and upwards, and waved towards the tips, which are attenuated and pointed. Female with the ovipositor short, broad, rugose-punctate, suddenly upcurved, and with a short rather abrupt point at the tip. Legs (especially the hind legs) very long and slender; femora unarmed; front and middle tibiæ sulcated, finely spinulose above and below; hind tibiæ closely and thickly set with short black-tipped spines on both carinæ above; below there is a row of spines placed more widely apart on the inner carina only.

3, Zomba (*P. Rendall*).

Distinguished from every other species by the dark spots on the tegmina.

Tylopsis rubescens, sp. n.

Long. corp. 16 millim., cum app. 20 millim.; long. tegm. 29 millim.; long. al. 35 millim.

Male.—Very similar to the last species, evidently green when alive, but except on the tegmina the colour in the only specimen before me has faded to yellowish. Antennæ and legs red. A broad reddish-brown band runs from the occiput over the pronotum and inner margin of the tegmina, as in the last species; on the pronotum it is darkest on the sides, the middle being marked by an obsolete pale line. The deflexed lobes are pale, bordered with a pale line (probably yellow in life) above and below. The lower mouth-parts are black. The dark edging of the inner margin of the tegmina is broadly bordered with reddish, shading into purplish brown beyond the middle, the colour being continued on the exposed part of the wings. There are a few small dark spots between the oblique nervures, but not more than one or two in each interspace. Front tibiæ apparently unarmed above; middle tibiæ with only a single spine visible above. Abdomen red above, with a central carina, but apparently not denticulated; slightly dusted with red on the sides. Cerci red, rather shorter than in *T. punctulata*.

1, Zomba (*P. Rendall*).

Apparently intermediate between *T. marginata*, Brunner, and *T. punctulata*.

AMBLYCORYPHINÆ.

Eurycorypha cereris.

Phylloptera cereris, Stål, Cefv. Vet.-Akad. Förh. xiii. p. 170 (1856).

Eurycorypha cereris, Stål, Rec. Orth. ii. p. 39 (1874); Brunner, Mon. Phan. p. 273 (1878).

|| *Phylloptera proteifolia*, Walk. (nec Burm.) Cat. Derm. Salt. ii. p. 378. n. 11 (1869).

1, Figtree Creek, Barberton (*P. Rendall*).

Caffraria (*Stål*); Grahamstown (*Brunner*); Natal (B. M.).

Eurycorypha proserpinæ.

Eurycorypha proserpinæ, Brunn. Mon. Phan. p. 274, pl. vi. fig. 83 (1878).

|| *Orophus gramineus* (?), Walk. (nec Serv.) Cat. Derm. Salt. iii. p. 434 (1870).

2, Barberton (*P. Rendall*).

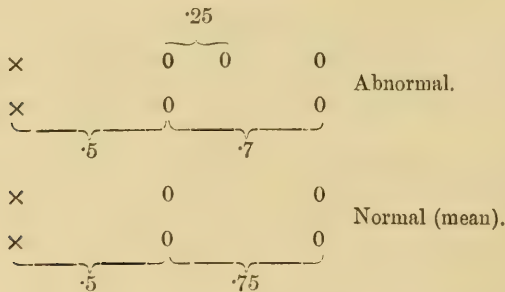
Natal (B. M.).

XXIX.—*Note on a Variation in the Number of Genital Pouches in Thalassema neptuni, Gaertner.* By F. H. STEWART, M.A., Gatty Marine Laboratory, St. Andrews.

WHILE dissecting a specimen of *Thalassema neptuni*, Gaertner, I observed that it varied from the normal in possessing five genital pouches instead of four, one being placed in the middle dorsal line, the remaining four lying, as usual, two on each side. But on examination by means of sections the pouch which appeared to be median proved to belong to the right side and to correspond to the anterior pouch on the left. Behind these on the right side came an unpaired nephridium, followed by a second normal pair.

The question then arose, In what relations did the five nephridia of this specimen stand to the normal four? Was the unpaired pouch interpolated between the normal two pairs, or did it represent the second normal pair, the fourth and fifth pouches being an additional pair? It was obviously impossible to obtain any direct proof on this point; but in order to obtain some indication I measured the distances between the successive nephridiopores in the abnormal and in several normal specimens, at the same time taking the distance between the genital hooks and the first pair of nephridiopores as a standard of comparison. In the abnormal specimen the distances were as follows:—(a) Genital hooks to first pair of pores .5 millim. (b) First pair to unpaired .25 millim. (c) First pair to second pair .7 millim. The relation of distance (a) to distance (b) is thus 2 : 1, while that of (a) to (c) is 5 : 7.

In the normal specimens the relation of the averages of the distances were:—Distance of genital hooks from first pair of pores to distance between two pairs as 2 to 3, *i. e.* .5 to .75.



(× = genital hooks; 0 = nephridiopores.)

This point is illustrated by the accompanying diagram.

It would appear from this comparison that the unpaired genital pouch is interpolated between the two normal pairs; and if this be granted it would have to be assumed either that a segment which does not normally bear pouches intervenes between the two which normally do, or that a partial duplication of the nephridia of one segment has occurred—a phenomenon which we find in its complete form in the family of the Capitellidæ.

Mr. Punnett, Assistant Professor of Natural History in the University of St. Andrews, who kindly gave me the abnormal and the various normal specimens, informs me that they were all obtained near Plymouth in the same locality. There can thus be no doubt that this case is an actual variation, not a local variety.

XXX.—*Description of a new Species of Buprestidæ.*

By CHAS. O. WATERHOUSE, V.P.E.S.

SPECIMENS of the species described below have been in the Museum collection for many years, separated as distinct from *Psiloptera quadrioculata*. A fresh specimen just brought from Upper Egypt by Mr. D. A. MacAlister shows that the differences between this and *P. quadrioculata* are constant, and I therefore venture to give it a name, and I propose to call it *P. MacAlisteri* after the donor.

Psiloptera MacAlisteri, sp. n.

P. quadrioculatae valde affinis; vitta obliqua thoracis, elytrorumque vitta laterali cupreo-rubris; corpore subtus tomento griseo-albo induto, utrinque maculis majoribus circularibus ornato.

Long. 20–27 mill.

Very similar to *P. quadrioculata*, but perhaps a little less convex. The general blackish-æneous colour is the same, but the impressions on the thorax and lateral stripe of the elytra are coppery red. The front of the head is clothed with pale yellow pile. The thorax is moderately closely and strongly punctured, with a slight raised median line, and four rotundate, smooth, black spots as in *P. quadrioculata*, but the rugose surface surrounding them is coppery red and forms a distinct oblique band from the anterior spot to the base, leaving a triangular space at the posterior angle slightly

raised, and smoother than in *P. quadrioculata*. The sculpture of the elytra is nearly the same, but the striæ are a little more strongly impressed, and, being filled (in fresh examples) with a sandy-white pile, are more conspicuous. The interstices are broken up into irregular quadrate spaces by rugose punctures; the smooth raised parts are more convex than in *P. quadrioculata*. The underside of the body is clothed (except along the median line) with whitish (or sandy coloured) pile; the first to fourth segments have each a round smooth spot on each side, and the terminal segment has an oblique smooth line.

Hab. Upper Egypt, Northern Etbai (*D. A. MacAlister*); White Nile (*Consul Petherick*); Nubia; Suez.

The specimens from Nubia and Suez have the pubescence on the underside of the body sandy coloured.

XXXI.—*Rhynchotal Notes*.—VI. Heteroptera: *Dinidorinæ*, *Phyllocephalinæ*, *Urolabidinæ*, and *Acanthosominæ*. By W. L. DISTANT.

THIS contribution completes the examination of the family Pentatomidæ, as contained in the British Museum, including the genera and species described by Walker in vols. i.—iii. of his 'Catalogue of Hemiptera-Heteroptera' (1867-8). Some recent acquisitions to the Museum and my own collection are also described.

DINIDORINÆ.

Genus *CYCLOPETA*.

Cyclopelta dorsalis.

Cyclopelta dorsalis, Walk. Cat. Het. iii. p. 478. n. 5 (1868).

Allied to *C. funebris*, Fabr., but not separable by the differential character given by Walker—"somewhat broader than *C. funebris*"—but by having the lateral margins of the pronotum much more oblique and less rounded than in the Fabrician species.

Cyclopelta parva, sp. n.

Closely allied to *C. obscura*, Lep. & Serv., but differing by its much smaller size and by the antennæ, which are shorter and broader than in that species.

Long. 10-12 millim.

Hab. China, Kiukiang (*Pratt*, Brit. Mus.); Shantung (Coll. Dist.); Rangoon and Pegu (*Atkins*, Coll., Brit. Mus.).

I have long possessed a single specimen from Shantung; and as the British Museum now contains six other specimens from Kiukiang, I have not hesitated to separate them, as constituting a distinct species. All the general characters are those of *C. obscura*. The connexivum is generally spotted with ochraceous and there is usually a small central basal ochraceous spot to the scutellum. The antennæ are shorter and the joints broader and more spatulate than in *C. obscura*.

Cyclopelta? vilis.

Cyclopelta vilis, Walk. Cat. Het. iii. p. 478. n. 6 (1868).

The typical and only specimen of this species which I have seen possesses merely the first, second, and third joints of one antenna. It may probably prove to be a species of the genus *Aspongopus*.

Genus ASPONGOPUS.

Aspongopus fuscus.

Aspongopus fuscus, Westw. in Hope Cat. i. p. 26 (1837).

Aspongopus marginalis, Dallas, List Hem. i. p. 350. n. 9 (1851).

Aspongopus cuprifer.

Aspongopus cuprifer, Westw. in Hope Cat. i. p. 25 (1837).

Aspongopus sepuichralis, Stål, Hem. Afr. i. p. 214. n. 5 (1864).

Aspongopus solitus, Walk. Cat. Het. iii. p. 484. n. 30 (1868).

Aspongopus patruelis.

Cyclopelta patruelis, Stål, Öfv. Vet.-Ak. Förh. 1853, p. 233. n. 1.

Cyclopelta dotata, Walk. Cat. Het. iii. p. 479. n. 7 (1868).

Aspongopus binotatus, sp. n.

Above dark castaneous; apical joint of antennæ and two small spots at apex of scutellum luteous; base of lateral margins of corium and body beneath ochraceous; legs dark castaneous.

Second joint of antennæ minute, third much longer than fourth. Pronotum obscurely transversely rugulose; scutellum distinctly wrinkled; corium very obscurely tomentose; femora with their inner margins spinous.

Long. 17-19 millim.; max. abd. lat. 11-12 millim.

Hab. Nyasaland (*Sir H. Johnston*, Brit. Mus.).

By the minute second joint of the antennæ this species is allied to *A. patruelis*, Stål.

Aspongopus figlinus, sp. n.

Testaceous, somewhat paler beneath; apical joint of the antennæ luteous.

Antennæ with the second joint minute, third not quite twice the length of fourth and subequal to fifth, third and fourth joints flattened and sulcate. Head with the lateral lobes convex at their apices, between which the anterior margin is distinctly cleft; the lateral margins sinuate. Pronotum with the lateral margins convex and slightly reflexed, its surface finely punctate and obscurely rugulose, especially near base. Scutellum transversely wrinkled and finely punctate. Corium obscurely wrinkled and finely punctate. Membrane dark ochraceous. Coxæ and disk of abdomen ochraceous.

Long. 17–18 millim.; exp. pronot. angl. 10–11 millim.; max. abd. lat. 12–12½ millim.

Hab. E. Africa; Livingstonia (*Simons*, Coll. Dist.); Nyasaland; Fort Johnston (*P. Rendall*, Coll. Dist.).

Allied by structure to the group of species having the second joint of the antennæ minute, viz. *A. patruelis*, Stål, *A. cyclopeltus*, Dist., and *A. binotatus*, Dist.

Aspongopus singhalanus, sp. n.

Bronzy brown; antennæ, eyes, rostrum, and legs piceous; apical joint of antennæ, base of rostrum, and the tarsi ochraceous.

Antennæ thick; the second, third, and fourth joints deeply sulcate; second and third joints subequal in length or third a little longer than second; fourth and fifth joints subequal, fifth joint narrowest and cylindrical. Body above finely rugulose and punctate; abdomen above reddish. Rostrum reaching about halfway between the anterior and intermediate coxæ.

Long. 18 millim.; exp. pronot. angl. 10 millim.

Hab. Ceylon (*Green*, Brit. Mus. and Coll. Kirkaldy; *Lewis*, Coll. Dist.).

Allied to *A. brunneus*, Thunb., and *A. obscurus*, Fabr., from both of which it differs by the thick and deeply sulcate antennæ.

Genus MEGYMENUM.

Megymenum dentatum.

Megymenum dentatum, Boisd. Voy. Astr., Ins. ii. p. 632, pl. xi. fig. 11 (1835).

Megymenum instructum, Walk. Cat. Het. iii. p. 502, n. 14 (1868).

Walker had confused *M. dentatum*, Boisd., with *M. semi-vestitum*, Voll., and then redescribed Boisduval's species.

PHYLLOCEPHALINÆ.

Genus DALSIRA.

Dalsira humeralis.*Phyllocephala humeralis*, Walk. Cat. Het. iii. p. 490. n. 22 (1868).*Basicryptus*? *humeralis*, Leth. & Sev. Cat. Gén. Hémi. t. i. p. 242 (1893).*Dalsira vicina*.*Phyllocephala vicina*, Sign. Rev. et Mag. Zool. 1851, p. 446. n. 13.*Phyllocephala funesta*, Walk. Cat. Het. iii. p. 490. n. 23 (1868).

Genus BASICRYPTUS.

Basicryptus distinctus.*Phyllocephala distincta*, Sign. Rev. et Mag. Zool. 1851, p. 446.*Phyllocephala impressa*, Walk. Cat. Het. iii. p. 489. n. 21 (1868).

Walker's type is a small specimen of Signoret's species. The series now before me varies in length from 17 to 22 millim.

Basicryptus diversus, sp. n.

Brownish ochraceous; inner lateral margins, a central anterior spot and a central transverse line to pronotum, a broad central longitudinal fascia to scutellum, inner margins, and a submarginal fascia to corium black. The divergent lateral lobes of head shorter than in preceding species; a distinct spine in front of eyes; antennæ mutilated. Pronotum moderately convex, the lateral angles subprominent, the lateral margins acutely dentate; two transverse levigate lines on disk, posterior half rugose and punctate. Scutellum with the basal and lateral margins and margins of the central black fascia raised and levigate; centrally thickly punctate, outwardly sparsely so. Corium sparsely punctate, membrane ochraceous. Sternum, rostrum, and legs ochraceous; abdomen beneath brownish ochraceous; stigmatal spots and a prominent spot on lateral areas of prosternum piceous.

Long. 15 millim.; exp. pronot. angl. $8\frac{1}{2}$ millim.

Hab. Australia; Swan River (Coll. Dist.).

Allied to *B. rugicollis*, Westw., and *B. Frenchi*, Bergr., but differing from both by the strongly serrate lateral margin to the pronotum, the non- or subprominent pronotal lateral angles, &c.

Basicryptus negus, sp. n.

Ochraceous, unicolorous; membrane greyish, with the nervures fuscous.

Antennæ pale luteous; second, third, and fourth joints almost subequal in length, fifth longest. Head long, the lateral lobes a little divergent at apices, their margins upwardly reflexed. Pronotum rugose, sparingly punctate, convex, without any central ridge, the lateral angles subacutely rounded, the anterior lateral margins strongly serrate. Scutellum rugose, scarcely so at apex, darkly and sparingly punctate. Corium sparingly punctate, the punctures in some places black and in small clusters. Body beneath and legs sparingly punctate.

Long. 16–20 millim.; max. lat. 10–12 millim.

Hab. Arabia; Hadramaut (*Dent Exped.*, Brit. Mus.); Abyssinia (Coll. Dist.).

Apparently most nearly allied to the West-African species *B. rugosus*, Fabr., from which it differs by the non-ridged pronotum &c.

Two Abyssinian specimens in my own collection reach the maximum in size.

Genus GONOPSIS.

Gonopsis, Amyot & Serv. Hem. p. 180 (1843).

Bessida, Walk. Cat. Het. iii. p. 577 (1868).

Lethierry and Severin in their Catalogue (t. i. p. 226) placed this proposed genus of Walker in the Tassaratominae, misled doubtless by the erroneous description of the head—"rounded in front."

Gonopsis coccinea.

Macrina coccinea, Walk. Cat. Het. iii. p. 497. n. 7 (1868).

Bessida scutellaris, Walk. *loc. cit.* p. 578.

Gonopsis angularis.

Macrina angularis, Dall. List Hem. i. p. 360 (1851).

Gonopsis mantis.

Macrina mantis, Stål, Cefv. Vet.-Ak. Förl. 1853, p. 225. n. 2.

Lichelrhinus indicator, Walk. Cat. Het. iii. p. 499. n. 4 (1868).

Gonopsis bantu, sp. n.

Pur lish black; head, anterior half of pronotum, a sub-

marginal crenulate line on each side of the scutellum (extending for about two thirds its length), and lateral margin of corium (excluding apex) pale ochraceous. Body beneath reddish ochraceous, a pale oblique lateral sternal fascia on each side extending through the pro- and mesosterna, on outer side of which are two piceous spots, a submarginal elongate black spot on each side of metasternum, and two submarginal black fasciæ on each side of abdomen.

Antennæ ochraceous, the second joint considerably longer than the third, which is a little shorter than the fourth; fifth joint mutilated. Head coarsely punctate. Pronotum rugulose, with a distinct central carination between the lateral angles, which are subacutely prominent. Scutellum strongly rugulose. Corium somewhat thickly punctate.

Long. 14 millim.; exp. pronot. angl. 8 millim.

Hab. Brit. E. Africa, Lake Kibibi (*Gregory*, Brit. Mus.).

Genus DIPLORHINUS.

Diplorhinus furcatus.

Atelocerus? furcatus, Westw. in Hope Cat. i. p. 20 (1837).

Diplorhinus sinensis, Walk. Cat. Het. iii. p. 494. n. 2 (1868).

Diplorhinus quadricornis, Stål.

Diplorhinus quadricornis, Stål, En. Hem. v. p. 122 (1876).

Diplorhinus furcatus, Dall. (nec Westw.) List Hem. i. p. 359. n. 1 (1851); Walk. Cat. Het. iii. p. 494. n. 1 (1868).

Genus TETRODA.

Tetroda histeroides.

Acanthia histeroides, Fabr. Ent. Syst., Suppl. p. 526. n. 24 (1798).

Tetroda bilineata, Walk. Cat. Het. iii. p. 494. n. 11 (1868).

Tetroda obtusa.

Tetroda obtusa, Dall. List Hem. i. p. 357. n. 6 (1851).

Gellia (?) obtusa, Stål, En. Hem. v. p. 124 (1876).

Gellia obtusa, Atkins. Notes Ind. Rhynch. v. p. 106 (1888).

FRISIMELICA, gen. nov.

Body elongate. Head broad, lateral lobes somewhat recurved upwardly, meeting in front of central lobe at about two thirds from base, which is moderately gibbous; antennæ with the second and fifth joints subequal in length, third shortest. Pronotum convexly gibbous, the lateral margins

moderately laminate; posterior margin not wider than the scutellum and inwardly angulated at centre; posterior angles broadly rounded, from thence slightly sinuate to posterior margin. Scutellum a little longer than half the length of abdomen, moderately deflected on each side, narrowed at about two thirds from base. Corium slightly and convexly rounded from near base; membrane with longitudinal veins extending slightly beyond apex of abdomen. Rostrum reaching anterior coxæ; second joint shortest, third joint a little longer than fourth. Mesosternum gibbous and with a central longitudinal levigate carination.

A genus to be placed near *Gellia* and *Megarhynchus*.

Frisimelica signata.

Cimex signatus, Fabr. Ent. Syst. p. 712. n. 76 (1775).

Phyllocephala signata, Dall. List Hem. i. p. 355. n. 10 (1851).

Hab. West Africa; Sierra Leone (Banksian Coll., Brit. Mus.); Gambia (Brit. Mus.).

UROLABIDINÆ.

Genus UROLABIDA.

Urolabida histrionica.

Urostylis histrionica, Westw. in Hope Cat. i. p. 46 (1837).

Urolabida binotata, Walk. Cat. Het. ii. p. 415. n. 4 (1867).

Genus UROCHELA.

Urochela quadripunctata.

Urochela quadripunctata, Dall. Trans. Ent. Soc. Lond. 1850, p. 3, pl. ii. fig. 1.

Urostylis lopoides, Walk. Cat. Het. ii. p. 414. n. 12 (1867).

Urochela distincta, sp. n.

Brownish ochraceous; lateral margins to pronotum and basal lateral margins of corium luteous; a spot on lateral margins of corium and a subbasal spot to lateral margins of corium piceous; two discal rounded piceous spots on each corium situate one above the other, the lower one near the apical margin; connexivum alternately luteous and black; membrane cupreous, its apex paler; antennæ piceous, the basal area of fourth and fifth joints luteous. Body beneath and legs brownish ochraceous, the spots on lateral margins of pronotum and corium as above.

Antennæ with the first and second joints subequal in length, third shortest, fourth longer than fifth; body above sparingly, coarsely, and darkly punctate; lateral margins of the pronotum oblique.

Long. 10–11 millim.; max. lat. 5 millim.

Hab. China; Kiukiang (Brit. Mus.).

Species wrongly included in the Urolabidinae.

Genus NOTIUS (*Pentatominae*).

Notius, Dall. List Hem. i. p. 155 (1851).

Ebora, Walk. Cat. Het. ii. p. 415 (1867).

In his description of the proposed genus *Ebora* Walker describes the rostrum as "extending a little beyond the fore coxæ," whereas the *intermediate coxæ* should have been written. Misled by Walker's differential comparison with the genus *Urochela*, Lethierry and Severin placed *Ebora* in the Urolabidinae.

Notius depressus.

Notius depressus, Dall. List Hem. i. p. 155. n. 1, t. iv. fig. 1 (1851).

Ebora circumdata, Walk. Cat. Het. ii. p. 416. n. 1 (1867).

ACANTHOSOMINÆ.

Genus ABULITES.

Abulites sparsus.

Cimex sparsus, Germ. Silb. Rev. Ent. v. p. 174. n. 111 (1837).

Rhaphigaster fusco-irroratus, Walk. (nec Stål) Cat. Het. ii. p. 362. n. 48 (1867).

Genus ANDRISCUS.

Andriscus armatus.

Rhaphigaster? *armatus*, Dall. List Hem. i. p. 291. n. 48 (1851).

Genus ACANTHOSOMA.

Acanthosoma vittata.

Cimex vittatus, Fabr. Ent. Syst. iv. p. 104. n. 96 (1794); Syst. Rhyng. p. 165. n. 52 (1803).

Acanthosoma vittatum, Dall. List Hem. i. p. 307. n. 13 (1851).

Anubis? *vittatus*, Leth. & Sev. Cat. Gén. Hémi. t. i. p. 250 (1893).

Genus *SASTRAGALA*.*Sastragala firmata*.

Cuspicona firmata, Walk. Cat. Het. iii. p. 569 (1868).

Sastragala murreeana, sp. n.

Ochraceous, coarsely black punctate; lateral pronotal spines red, blackly punctate, long, directed forwards and upwards. Body beneath and legs ochraceous, abdomen with reddish apical spots.

Antennæ with the second joint much longer than the third, apical half of third piceous; remaining joints mutilated. Pronotum and corium somewhat thickly and coarsely punctate, the scutellum more sparingly so.

Long. 14–15 millim.; exp. pronot. angl. $8\frac{1}{2}$ –10 millim.

Hab. N. India, Murree (Atkins. Coll., Brit. Mus., and Coll. Dist.).

Sastragala heterospila.

Acanthosoma heterospila, Walk. Cat. Het. ii. p. 394. n. 15 (1867).

Sastragala affinis, Atkins. Journ. Asiat. Soc. Beng. vol. lvii. p. 344 (1889).

Sastragala edessoides, sp. n.

Luteous, coarsely and darkly punctate. Antennæ luteous, apical half of third joint and fourth and fifth joints piceous.

Second joint of antennæ a little longer than the third; pronotum and scutellum somewhat sparingly punctate, the corium much more thickly so; pronotal angles long, robust, slightly ascending; abdomen above pale sanguineous, margins of connexivum ochraceous. Body beneath and legs ochraceous, small stigmatal black spots and two similar spots at posterior margin of apical segment.

Long. 14–15 millim.; exp. pronot. angl. $9\frac{1}{2}$ – $10\frac{1}{2}$ millim.

Hab. Sikkim (Atkins. Coll., Brit. Mus.); Naga Hills (*Doherty*, Coll. Dist.).

The long robust pronotal angles render this species distinct, and it has a striking structural resemblance to some species of the American genus *Edessa*.

Sastragala elongata.

Acanthosoma elongatum, Dall. List Hem. i. p. 309. n. 17 (1851).

Acanthosoma elongata, Atkins. Notes Ind. Rhynch. Het. v. p. 24 (1888).

Sastragala Hampsoni, sp. n.

Olivaceous, coarsely and darkly punctate; pronotal angles acute, directed outwardly; anal appendage provided with two long red forceps; antennæ olivaceous, apical half of third and the whole of fourth joint piceous; fifth joint mutilated.

Third joint of antennæ slightly longer than second; head impunctate, the pronotum, scutellum, and corium about equally coarsely and sparingly punctate; body beneath and legs very pale yellowish green.

Long. 13 millim.; exp. pronot. angl. 9 millim.

Hab. Nilgiri Hills (*Sir G. F. Hampson*, Coll. Dist.).

Genus ANAXANDRA.

Anaxandra alaticornis.

Acanthosoma alaticornis, Walk. Cat. Het. iii. p. 573 (1868).

Anaxandra lævicornis.

Acanthosoma lævicorne, Dall. List Hem. i. p. 311. n. 24 (1851).

Acanthosoma lævicornis, Notes Ind. Rhynch. Het. v. p. 23 (1888);

Leth. & Sev. Cat. Gén. Hém. t. i. p. 254 (1893).

Anaxandra nigricornis.

Acanthosoma nigricornis, Walk. Cat. Het. iii. p. 574 (1868).

Anaxandra nigrocornuta, Reut. Berl. ent. Zeitschr. xxv. p. 77 (1881).

Anaxandra bovilla, sp. n.

Brownish ochraceous, thickly and coarsely punctate; pronotal angles largely developed, slightly recurved, and pointed posteriorly at apices, which are a little paler in hue.

Antennæ with the second joint longer than the third; posterior area of the pronotum from between the lateral angles much more coarsely punctate; scutellum very coarsely punctate, the apical margins somewhat raised and levigate, a central levigate line traversing the pronotum and scutellum; corium more thickly and finely punctate, with a discal levigate spot, which in some specimens is very indistinct. Membrane pale brownish. Body beneath and legs brownish ochraceous.

Long. 10 millim.; exp. pronot. angl. 8 millim.

Hab. Assam (Atkins. Coll., Brit. Mus.); Naga Hills (*Doherty*, Coll. Dist.).

Genus *STICTOCARENUS*.*Stictocarenum placidus*.

Acanthosoma placida, Walk. Cat. Het. ii. p. 397. n. 26 (1867).

Stictocarenum chlorophilus.

Acanthosoma chlorophila, Walk. Cat. Het. ii. p. 398. n. 27 (1867).

Stictocarenum suffusus, sp. n.

Pale ochraceous; a basal fascia to pronotum, internal and external areas (excluding bases) and apical area (broadest at apex) of corium pale sanguineous. Body beneath and legs pale greenish ochraceous; tarsi testaceous; abdomen with a discal, longitudinal, pale greyish linear callus on each side.

Antennæ brownish ochraceous; second joint slightly longer than the third, fourth and fifth joints subequal in length and darker in hue. Pronotal angles distinctly subprominent, pronotal lateral margins moderately concavely sinuate; sanguineous fascia at base blackly punctate, remaining area (excluding that of callosities) coarsely and concolorously punctate. Scutellum coarsely punctate, but much less so at basal area. Corium thickly and coarsely punctate, the sanguineous internal area darkly punctate.

Long. 9 millim.; exp. pronot. angl. $4\frac{1}{2}$ millim.

Hab. King Island, South Seas (Brit. Mus.).

Apparently nearest allied to *S. nigropunctatus*, Reut., but differing by the absence of black punctures to the scutellum and also by the presence of the discal linear callosity to the abdomen.

Genus *ELASMOSTETHUS*.*Elasmostethus lineatus*.

Acanthosoma (Sastragala) lineata, Dall. Trans. Ent. Soc. v. p. 194 (1849).

Sastragala lineata, Atkins. Notes Ind. Rhynch. Het. v. p. 28 (1888).

Acanthosoma binotata, Walk. Cat. Het. ii. p. 395. n. 16 (1867).

Elasmostethus truncatulus.

Acanthosoma truncatula, Walk. Cat. Het. ii. p. 396. n. 18 (1867)

Elasmostethus asperus.

Acanthosoma aspera, Walk. Cat. Het. ii. p. 395. n. 17 (1867).

Elasmotethus nebulosus, sp. n.

Ochraceous, with coarse brown punctures; basal spot to head, two anterior marginal spots to pronotum, and marginal spots to connexivum black. Pronotum with brownish suffusions principally on posterior area and at lateral angles; scutellum much suffused with dark brownish at base, disk, and at each apical margin; a small pale levigate spot in each basal angle; corium with a transverse central and a broad apical brown suffusion; abdomen above reddish brown, with the extreme apex piceous.

Antennæ with the two basal joints ochraceous, the remaining joints fuscous, second joint subequal to or slightly shorter than the third. Body beneath and legs ochraceous; prosternum and femora darkly punctate; sternal spots near coxæ, stigmatal spots, and outer marginal spots at segmental incisures black.

Long. 10 millim.; exp. pronot. angl. $5\frac{1}{2}$ millim.

Hab. N. India, Naga Hills (*Doherty*, Coll. Dist.).

Elasmotethus nilgirensis, sp. n.

Ochraceous; basal areas of pronotum and scutellum, claval and apical marginal areas of corium, castaneous or reddish castaneous; pronotal angles, a basal submarginal line to corium, and apical angle of corium black; membrane hyaline, fuscous at base and apex; abdomen above reddish, with the apical area black; lateral margins of the pronotum, a small spot in each basal angle of the scutellum, and a faint longitudinal central line traversing the pronotum and scutellum levigate pale ochraceous.

Antennæ brownish ochraceous, second joint distinctly longer than the third, apical joint somewhat infuscated; pronotum, scutellum, and corium coarsely and sparingly punctate, the central marginal area of corium much less punctate. Body beneath and legs pale luteous; the odoriferous apertures and two small subapical abdominal spots black; apex of abdomen reddish.

Long. 9 millim.; exp. pronot. angl. $4\frac{1}{2}$ millim.

Hab. Nilgiri Hills (*Sir G. F. Hampson*, Coll. Dist.); Utakamand (Brit. Mus.).

Allied to the Chinese *E. nubilus*, Dall., but differing structurally by the much greater length of the second joint of the antennæ.

Elasmostethus Lewisi, sp. n.

Ochraceous; pronotum, scutellum, and corium coarsely and darkly punctate; scutellum with a central cordate levigate spot surrounded by castaneous shading, in which is a short central dark lineate spot above and beneath; extreme apices of pronotal angles, apical margins or only angles of corium, a small spot at base of membrane, and the apical abdominal segmental angle black; abdomen above reddish, with its lateral margins ochraceous; membrane hyaline, slightly brownish on inner and outer margins.

Antennæ ochraceous, second joint distinctly longer than the third, apical joint somewhat infuscated; head transversely wrinkled; pronotum with two transverse levigate callosities on anterior area; corium with the whole marginal area very finely and concolorously punctate.

Long. 8 millim.; exp. pronot. angl. $4\frac{1}{2}$ millim.

Hab. Ceylon; Punduloya (Atkins. Coll., Brit. Mus.; G. Lewis, Coll. Dist.); Nilgiri Hills; Utakamand (Brit. Mus.).

Elasmostethus delicatulus.

Acanthosoma delicatula, Walk. Cat. Het. ii. p. 397. n. 24 (1867).

Mormidea erythrospila, Walk. loc. cit. iii. p. 555 (1868).

Elasmostethus lineus.

Acanthosoma linea, Dall. List Hem. i. p. 308. n. 15 (1851).

Elasmostethus emeritus.

Cimex emeritus, Fabr. Syst. Ent. p. 705 (1775).

In Banksian Coll. (Brit. Mus.).

*Summarized Disposition of Walker's Genera and Species.***Dinidorinæ, Phyllocephalinæ, Urolabidinæ, and Acanthosominæ.***Genera considered valid.*

Enada, Walk. Cat. Het. iii. p. 485 (1868) (*Tessaratomina*).

Thalma, Walk. loc. cit. p. 503.

Urusa, Walk. loc. cit. p. 504.

Genera treated as synonymic.

Erga, Walk. Cat. Het. iii. p. 485 (1868), = Gen. *Axona*, Stål.

Ucia, Walk. loc. cit. ii. p. 407 (1867), = Gen. *Panætius*, Stål.

Ebora, Walk. loc. cit. iii. p. 415 (1868), = Gen. *Notius*, Dall. (*Pentato-*

Bessida, Walk. loc. cit. p. 577, = Gen. *Gonopsis*, Amy. & Serv. [*minæ*].

Species considered valid and described under correct Genera.

- Cyclopelta dorsalis*, Walk. Cat. Het. iii. p. 478. n. 5 (1868).
 — *? vilis*, Walk. loc. cit. n. 6.
Aspongopus circumcinctus, Walk. loc. cit. p. 483. n. 28.
 — *ceneus*, Walk. loc. cit. p. 484. n. 29.
Enada rosea, Walk. loc. cit. p. 485. n. 1 (*Tessaratominae*).
Megymenum basale, Walk. loc. cit. p. 502. n. 13.
Thalma biguttata, Walk. loc. cit. p. 503. n. 1.
Urusa crassa, Walk. loc. cit. p. 504. n. 1.
Urolabida octomaculata, Walk. loc. cit. p. 576.
Urochela discrepans, Walk. loc. cit. ii. p. 411. n. 4 (1867).
Urostylis lateralis, Walk. loc. cit. p. 412. n. 7.
 — *sinensis*, Walk. loc. cit. n. 8.
 — *lygoides*, Walk. loc. cit. n. 9.
 — *fumigata*, Walk. loc. cit. p. 413. n. 10.
 — *philoides*, Walk. loc. cit. n. 11.

Species considered valid, but requiring generic revision.

- Phyllocephala humeralis*, Walk. Cat. Het. iii. p. 490. n. 22 (1868), belongs to gen. *Dalsira*, Amy. & Serv.
 — *albidicosta*, Walk. loc. cit. p. 491. n. 24, belongs to gen. *Basicryptus*, Herr.-Schäff.
 — *subtruncata*, Walk. loc. cit. n. 25, belongs to gen. *Basicryptus*, Herr.-Schäff.
Schimatops insignis, Walk. loc. cit. p. 495. n. 2, belongs to gen. *Schizops*, Spin.
Macrina coccinea, Walk. loc. cit. p. 497. n. 7, belongs to gen. *Gonopsis*, Amy. & Serv.
Megarhynchus diversus, Walk. loc. cit. p. 498. n. 4, belongs to gen. *Gonopsis*, Amy. & Serv.
Cuspicona firmata, Walk. loc. cit. p. 569, belongs to gen. *Sastragala*, Amy. & Serv.
Acanthosoma truncatula, Walk. loc. cit. ii. p. 396. n. 18 (1867), belongs to gen. *Elasmostethus*, Fieb.
 — *subducta*, Walk. loc. cit. n. 23, belongs to gen. *Sastragala*, Amy. & Serv.
 — *delicatula*, Walk. loc. cit. p. 397. n. 24, belongs to gen. *Elasmostethus*, Fieb.
 — *placida*, Walk. loc. cit. n. 26, belongs to gen. *Stictocarenum*, Stål.
 — *chlorophila*, Walk. loc. cit. p. 398. n. 27, belongs to gen. *Stictocarenum*, Stål.
 — *alaticornis*, Walk. loc. cit. iii. p. 573 (1868), belongs to gen. *Anaxandra*, Stål.
 — *nigricornis*, Walk. loc. cit. p. 574, belongs to gen. *Anaxandra*, Stål.

Species treated as synonymic.

- Cyclopelta dotata*, Walk. Cat. Het. iii. p. 479. n. 7 (1868), = *Aspongopus patruelis*, Stål.
Aspongopus solitus, Walk. loc. cit. p. 484. n. 30, = *Aspongopus cuprifer*, Westw.

- Erga roseoflua*, Walk. *loc. cit.* p. 486. n. 1, = *Axona longitudinalis*, Westw. (*Tessaratominae*).
- Phyllocephala impressa*, Walk. *loc. cit.* p. 489. n. 21, = *Basicryptus distinctus*, Sign.
- *funesta*, Walk. *loc. cit.* p. 490. n. 23, = *Dalsira vicina*, Sign.
- Tetroda bilineata*, Walk. *loc. cit.* p. 494. n. 11, = *Tetroda histeroides*, Fabr.
- Diplorhinus sinensis*, Walk. *loc. cit.* n. 2, = *Diplorhinus furcatus*, Westw.
- Macrina scita*, Walk. *loc. cit.* p. 496. n. 6, = *Macrina juvenca*, Burm.
- *vacillans*, Walk. *loc. cit.* p. 497. n. 8, = *Gonopsis affinis*, Uhler.
- Dichelorhinus indicator*, Walk. *loc. cit.* p. 499. n. 4, = *Gonopsis mantis*, Stål.
- Megymenum instructum*, Walk. *loc. cit.* p. 502. n. 14, = *Megymenum dentatum*, Boisid.
- Ucia mutilata*, Walk. *loc. cit.* ii. p. 408. n. 1 (1867), = *Panætius lobulatus*, Stål.
- Urostylis lopoïdes*, Walk. *loc. cit.* p. 414. n. 12, = *Urochela quadripunctata*, Dall.
- Urolabida semicircularis*, Walk. *loc. cit.* n. 2, = *Urolabida histrionica*, Westw.
- *binotata*, Walk. *loc. cit.* p. 415. n. 4, = *Urolabida histrionica*, Westw.
- Ebora circumdata*, Walk. *loc. cit.* p. 416. n. 1, = *Notius depressus*, Dall. (*Pentatominae*).
- Bessida scutellaris*, Walk. *loc. cit.* iii. p. 578 (1868), = *Gonopsis coccinea*, Walk.

Species the types of which are supposed to be in Australia.

- Acanthosoma immunda*, Walk. Cat. Het. iii. p. 573 (1868). National Museum, Melbourne.
- Ebora postica*, Walk. *loc. cit.* ii. p. 416. n. 2 (1867). Nat. Mus., Melbourne.
- ? *plana*, Walk. *loc. cit.* n. 3. " "
- ? *patula*, Walk. *loc. cit.* p. 417. n. 4. " "

XXXII.—ASIATIC TORTRICIDÆ.

By the Rt. Hon. LORD WALSHINGHAM, M.A., LL.D., F.R.S.

[Continued from p. 137.]

ARGYROPLOCE, Hb.

925. *Argyroploce profundana*, F.

Penthina profundana, Stgr. & Wk. Cat. Lp. Eur. 247. No. †625 [†925] (1871)¹; Chr. Hor. Soc. Ent. Ross. XII. 225 (1876)².

Hab. EUROPE¹. TRANSCAUCASIA — Lenkoran², 24 VI. 1874 (*Christoph*). JAPAN (*Pryer*, 1886).

927 (1). *Argyroploce vicinana*, Rag.

Penthina vicinana, Rag. Ann. Soc. Ent. Fr. LXIII. (1894) 200-1.
No. 927 bis (1894)¹.

Hab. AMUR¹. JAPAN—YESSO (Pryer, 1882).

926. *Argyroploce dimidiana*, Cl.

n. syn. = *Schreberiana*, L.

[*Phalæna* (*Tortrix*)] *dimidiana*, Cl. Ic. Ins. I. Pl. VIII. 10 (1759).

Phalæna (*Tortrix*) *Schreberiana*, L. Fn. Suec. (2 edn.) 348. No. 1338 (1761). [*Phalæna* (*Tortrix*)] *Schreberiana*, Cl. Ic. Ins. II. Register, p. (3) (1764). *Penthina Schreberiana*, Stgr. & Wk. Cat. Lp. Eur. 247. No. 926 (1871).

Hab. EUROPE. JAPAN—HONDO—Oiwake, VI.-VII. 1887 (Pryer).

Staudinger and Wocke quote this species thus:—" *Schreberiana* (Cl. Ic. 8. 10. Figura sine nom. typogr.) L. F. S. p. 348." In the Berlin, Tring, and Merton copies of Clerck's 'Icones,' Pl. VIII. f. 10 has the ENGRAVED name "*dimidiana*."

In the following copies "*dimidiana*" has been erased, "*Schreberiana*" being substituted in MS.: Mus. Br. (NH), Herrich-Schäffer, and Freyer (teste Zeller), Lin. Soc. Lond. (Linnæus's own copy), Oxford Mus. (Radcliffe Library). In two copies, Mus. Br. (Banksian Library) and Mr. Godman's, "*Schreberiana*" occurs in MS., and in the Zool. Soc. Lond. copy the name is "*Schreberiana*" in MS.

This figure is indexed as "*Schreberiana*, 8. 10," in the register to the 'Icones,' II. p. (3).

In the 'Fauna Suecica' citations from Clerck's 'Icones' occur (e. g. *gelatella*, Cl. VIII. 3); precedence must therefore be given to Clerck's names, and since at least three copies are still extant with *dimidiana* engraved on the plate, this name must be accepted as valid. Linnæus omits to cite Clerck's figure, and Clerck probably adopted Linnæus's name when he issued his second part in 1764, but neither he nor Linnæus (in 1761) had the power to change a name which had become established in 1759.

931. *Argyroploce capreana*, Hb.

Penthina capreana, Stgr. & Wk. Cat. Lp. Eur. 247. No. 931 (1871)¹;
Fern. Tr. Am. Ent. Soc. X. 31. No. 189 (1882)².

Hab. EUROPE¹. JAPAN (Pryer, 1886). LABRADOR².

931 (1). *Argyroploce basipunctana*, sp. n.

Antennæ brownish grey. *Palpi* white. *Head* and *thorax* brownish grey, the latter with a raised chestnut-brown tuft posteriorly. *Fore wings* mottled with bluish grey and dark fuscous, some obscure chestnut-brown patches interspersed across the middle, followed by a rather shining white tornal patch produced upward nearly to the costa, but not reaching the apex, which is occupied by a triangular chestnut-brown patch; there is some greyish fuscous mottling on the inner and outer sides of the white patch; on the costa are five pairs of oblique geminated white streaks, two before and three beyond the middle, the latter followed by two single ones before the apex; at the base is a conspicuous white spot on the cell; cilia pale cinereous, mottled with brown and fuscous, a dark brown line along the termen at their base, preceded by a narrow white streak along the upper half of the termen. *Exp. al.* 22 mm. *Hind wings* greyish brown; cilia pale cinereous, a greyish brown line running through them near their base. *Abdomen* and *legs* brownish grey.

Type, ♀ (70135) Mus. Wlsm.

Hab. JAPAN (*Pryer*, 1886). Two specimens.

931 (2). *Argyroploce lactefacies*, sp. n.

Antennæ brownish grey. *Palpi* short, porrect, median joint rather thickly clothed, terminal joint small and partly concealed; white, shaded with greyish brown externally at their base. *Head* greyish brown above, face white. *Thorax* greyish brown, sprinkled with white, with a moderately developed tuft posteriorly. *Fore wings* milky white, strongly shaded with bluish grey and greyish fuscous along the costa and dorsum to two-thirds the wing-length, the costal shade narrower at the base and widening outwards, the dorsal shade wider at the base and narrowing outwards, both sprinkled with whitish scales and with some whitish geminations on the costa; there is a slight olivaceous tint at the outer portion of these costal and dorsal shades passing across the pale space between them, and below the middle of the wing beyond it is a mixed blue-grey and greyish fuscous spot; the apical third white, with a slight olivaceous hue, an olivaceous grey shade curving inwards and upwards from below the middle of the termen, with three olivaceous grey costal streaks above it; cilia greyish, sprinkled with white, a greyish fuscous line along their base. *Exp. al.* 17 mm. *Hind wings*

greyish brown; cilia pale whitish cinereous, with a slender greyish brown shade running through them near their base. *Abdomen* greyish brown. *Legs* whitish, hind tarsal joints faintly spotted.

Type, ♂ (60059) Mus. Wlsm.

Hab. JAPAN (*Pryer*, 1886)—HONDO—Yokohama (*Manley*, 1888). Four specimens.

This species appears to be allied to *corticana*, Hb., but the pale ground-colour of the wing almost obliterates the central fascia below the middle; the apical markings also are somewhat different and the palpi are white instead of dusky.

933 (1). *Argyroploce auricristana*, sp. n.

Antennæ subochreous, basal joint white. *Palpi* white. *Head* hoary grey above, white in front. *Thorax* olive ochreous mixed with white, with a conspicuous golden olive crest posteriorly. *Fore wings* olive ochreous, shading to olive-brown, especially along the costa; apical third of the wing snow-white, the apex slightly tinged with brownish grey; the olive ochreous colour is irrorated with lustrous chalybæous scales which extend as shining silvery streaks along the inner margin of the white space and around the termen; cilia shining whitish, slightly clouded with grey. *Exp. al.* 19–20 mm. *Hind wings* greyish brown; cilia shining pale cinereous. *Abdomen* greyish brown. *Legs* shining cinereous, hind tarsal joints spotted with brownish.

Type, ♂ (70137); ♀ (70138) Mus. Wlsm.

Hab. JAPAN (*Pryer*, 1886)—KIVSIU (*Leech*, 1890). Ten specimens.

934 (1). *Argyroploce geminata*, sp. n.

Antennæ (♂) simple; greyish. *Palpi* porrect, with the tuft on the underside of the median joint considerably developed; whitish, shaded with greyish fuscous externally. *Head* whitish ochreous. *Thorax* with the tuft scarcely developed; whitish, mixed with greyish fuscous and olivaceous. *Fore wings* white, much mottled, streaked, and clouded with greyish fuscous, grey, and olivaceous; an irregular curved band of mixed greyish fuscous and olivaceous within the basal third, further from the base on the dorsum than on the costa, encloses a speckled and striated basal patch, in which is a tuft of olivaceous ochreous scales on the dorsum; the

space beyond this basal patch corresponds in colour with the extreme base, and is followed by another oblique band, greyish fuscous towards the costa, containing a few blackish scales about its middle, with an olivaceous spot near the end of the cell and a larger one below the fold, its outer edge biangulated about the middle; beyond this the apical third of the wing is white shaded with greyish, the apex and termen mottled with olivaceous in a triangular form, with three small elongate spots of black scales at its inner edge on veins 6, 7, and 8; the costa with a series of white geminated streaks throughout, more plainly visible on the outer than on the basal half of the wing and separated and divided by greyish fuscous and olivaceous spots and streaklets; cilia greyish fuscous sprinkled with white, at the tornus white, tipped with olivaceous immediately above the angle. *Exp. al.* 16 mm. *Hind wings* brownish grey; cilia slightly paler, with a darker shade running through them near their base. *Abdomen* brownish grey. *Legs* whitish.

Type, ♂ (70084); ♀ (70144) Mus. Wlsm.

Hab. JAPAN (*Pryer*, 1886)—*KIVSIV* (*Leech*, 1890). Five specimens.

This species greatly resembles *sororeculana*, Zett., but differs in the more streaky appearance of the basal two-thirds of the fore wings, in the less developed thoracic tuft, and the longer clothing of the median joint of the palpi; the antennæ also are somewhat stouter and the costal geminations are more numerous and more clearly defined.

937. *Argyroploce variegana*, Hb.

Penthina variegana, Stgr. & Wk. Cat. Lp. Eur. 247. No. 937 (1871)¹; Stgr. Hor. Soc. Ent. Ross. XV. 249 (1879)².

Hab. EUROPE¹. ASIATIC TURKEY—*KHUDAVENDIKIAR*—Brussa, VI.–VII.²; *AIDIN*—Smyrna^{1,2}; *HALEB*—Shar Devesy (*Native Coll.* 1890); *ARMENIA*¹.

938. *Argyroploce pruniana*, Hb.

β. *pruniana*, Hb. + *pruneticolana*, Z.

Penthina pruniana, Hb., var. *pruneticolana*, Stgr. & Wk. Cat. Lp. Eur. 248. No. 938 a (1871)¹; Chr. Hor. Soc. Ent. Ross. XII. 225 (1876)²; Stgr. Hor. Soc. Ent. Ross. XV. 249 (1879)³.

Hab. EUROPE¹. ASIATIC TURKEY—Brussa, V.³; Taurus³;

Amasia, VI.³; Goelkutschuk³; Aintab, 10 V. 1892 (*Native Coll.*). N. PERSIA—Asterabad, V.²

940. *Argyroploce atropunctana*, Zett.

=§ *dimidiana*, Sdf.

Penthina dimidiana, Stgr. & Wk. Cat. Lp. Eur. 248. No. 940 (1871)¹;
Stgr. Hor. Soc. Ent. Ross. XV. 249 (1879)²; Fern. Tr. Am. Ent.
Soc. X. 31-2. No. 190 (1882)³.

Hab. EUROPE¹. ASIATIC TURKEY—*SIVAS*—Amasia, V.—
VII.² UNITED STATES—Missouri³.

The adoption of *dimidiana*, Cl., in lieu of *Schreberiana*, L., renders *dimidiana*, Sdf., a homonym, and the name *atropunctana*, Zett., should be used for this species.

943. *Argyroploce oblongana*, Hw.

Penthina oblongana, Stgr. & Wk. Cat. Lp. Eur. 248. No. 943 (1871).

Hab. EUROPE. ASIATIC TURKEY—*HALEB*—Shar Devesy
(*Native Coll.* 1893).

945. *Argyroploce gentianana*, Hb.

Penthina gentiana, Stgr. & Wk. Cat. Lp. Eur. 248. No. 945 (1871)¹;
Stgr. Hor. Soc. Ent. Ross. XV. 249 (1879)².

Hab. EUROPE¹. ASIATIC TURKEY—*KHUDAVENDIKIAR*—
Brussa, VIII.² JAPAN (*Pryer*, 1886).

946 (1). *Argyroploce* (?) *catapittoma*, sp. n.

Antennæ smoky black, paler beneath; basal joint with a white spot at its apex. *Palpi* black; the terminal joint and the apex of the median joint white. *Head* black; face white. *Thorax* black, with a white transverse band anteriorly and a white patch posteriorly. *Fore wings* smoky black for two-thirds their length, the outer third white, a large white patch on the dorsum at one-fourth, and some small white spots along the costa before the middle; there is a white spot at the end of the cell near the edge of the black suffusion, and for a little space beyond and below it, between the black and white portions, occurs a patch of brownish purple accompanied by a few black scales; cilia white, with two costal, one apical, and three terminal black streaks running through them, some black scales are also scattered along the margin at their base;

underside dark fuscous, with a slight purplish reflection (on both wings), the tessellated white cilia showing very clearly. *Exp. al.* 22 mm. *Hind wings* cupreous; cilia brownish grey. *Abdomen* cupreous. *Legs*: posterior pair coppery brownish, the tarsi blackish, with three or four white annulations.

Type, ♀ (61150) Mus. Wlsm.

Hab. CHINA — Pan-tse-Fang, VI.-VII. 1892 (*Leech*).

Unique.

A very distinct species, not closely allied to any known European form. The male is unknown, but it will probably be found to belong to the genus *Argyroploce*.

963. *Argyroploce Branderiana*, L.

Penthina Branderiana, Stgr. & Wk. Cat. Lp. Eur. 249. No. 963 (1871).

Hab. EUROPE. JAPAN—*Yesso* (*Pryer*, 1882).

963 (1). *Argyroploce inornata*, sp. n.

Antennæ dull cinereous. *Palpi* appressed to the face, terminal joint short, concealed; pale ochreous at the sides, touched with fuscous above. *Head* fuscous. *Thorax* crested; greyish fuscous, slightly mottled with subochreous. *Fore wings* greyish fuscous, indistinctly mottled with grey, subochreous and olive-brown to two-thirds the wing-length, the apical third subochreous, shaded with olive-brown; on the costa are five or six pairs of pale ochreous geminated streaks, separated and divided by greyish fuscous, a slender slaty grey line running from the pair nearest the middle of the costa to the termen; below this line is a series of inconspicuous narrow fuscous lines crossing the paler portion of the wing towards the termen, but interrupted below the middle by an elongate upright slaty grey patch, forming the outer edge of the ocelloid spot; cilia pale ochreous, much mottled and speckled with brownish fuscous, and with a brownish fuscous line along their base. *Exp. al.* 24-25 mm. *Hind wings* brownish fuscous; cilia very pale ochreous, with a brownish fuscous line running through them near their base. *Abdomen* brownish fuscous. *Legs* subochreous, hind tarsi barred with dark fuscous.

Type, ♀ (70161); ♂ (70162) Mus. Wlsm.

Hab. JAPAN (*Pryer*, 1886). Six specimens.

966 (1). *Argyroploce major*, sp. n.

Antennæ and *palpi* cinereous. *Head* brownish ochreous. *Thorax* dark fuscous, tegulæ brownish ochreous. *Fore wings* brownish ochreous, tending to olive-brown across the middle, much shaded with dark fuscous to two-thirds the wing-length and crossed by numerous irregular waved pale steel-blue bands, or chains of connected spots, beyond the base; the fuscous shading occurs for the most part along the dorsum, obliquely across the middle of the wing to near the tornus, at the base of the extreme costa and below it at a little distance from it, the apical third of the wing showing scarcely any fuscous scales; the pale shining steel-blue bands are distributed from the costa before the middle to the dorsum beyond it, and profusely also on the pale apical third, where they follow the outer margin of the oblique dark shade which precedes it, and are carried round the costa and termen, but a little within them; cilia light brownish ochreous along their basal half, their outer half pale ochreous. *Exp. al.* 20 mm. *Hind wings* dark brownish fuscous; cilia whitish cinereous, tinged with ochreous at the apex. *Abdomen* dark brownish fuscous. *Legs* whitish cinereous.

Type, ♀ (70232); ♂ (70565) Mus. Wlsm.

Hab. JAPAN (*Pryer*, 1886)—Yesso (*Pryer*, 1882). Four specimens.

In the hind wing veins 3 and 4 are normally connate, but sometimes stalked.

970. *Argyroploce stibiana*, Gn.

Penthina stibiana, Stgr. & Wk. Cat. Lp. Eur. 249. No. 970 (1871)¹; Stgr. Hor. Soc. Ent. Ross. XV. 250 (1879)².

Hab. EUROPE¹. ASIATIC TURKEY—SIVAS—Ak-Dagh, 13 VII.²; HALEB—Shar Devesy, 15-18 VI. 1890 (*Native Coll.*).

984. *Argyroploce lacunana*, Schiff.

Penthina lacunana, Stgr. & Wk. Cat. Lp. Eur. 250. No. 984 (1871)¹; Stgr. Hor. Soc. Ent. Ross. XV. 251 (1879)².

Hab. EUROPE¹. ASIATIC TURKEY—Brussa, V.-VI.² CHINA—Chang Yang, 4000-6000 feet (*Pratt*, 1886); Mupin, 21 V. 1890 (*Leech*).

989 (2). *Argyroploce obovata*, sp. n.

Antennæ brownish grey. *Palpi* whitish ochreous. *Head* rust-brown. *Thorax* brownish grey, mottled with rust-brown

and pale cinereous. *Fore wings* rather short and stumpy, with rounded costa, obtuse apex, and rather obliquely convex termen; pale cinereous, mottled with grey, based and banded with rust-brown, shaded with grey; the basal patch ill-defined, its outer edge dilated a little inward on the fold; the median band wide, attenuated inward to the middle of the costa, beyond which are five oblique pale ochreous geminated costal streaklets, a sinuous steel-grey line from the first pair meeting a line from the apex a little above the middle of the termen; cilia pale ochreous, a rust-brown line along their base. *Exp. al.* 14 mm. *Hind wings* brownish grey; cilia pale cinereous, a shade-line near their base. *Abdomen* brownish grey. *Legs* pale cinereous.

Type, ♂ (60386) Mus. Wlsm.

Hab. JAPAN (Pryer, 1886)—HONDO—Foochau, IV. 1886 (Leech). Four specimens.

998 (2). *Argyroploce humeralis*, sp. n.

Antennæ fuscous. *Pulpi* pale cinereous. *Head* and *thorax* fuscous. *Fore wings* with a basal patch extending to one-fourth, bent outward about the middle, fuscous mottled with leaden grey; the space beyond it is pale ochreous, a slender fuscous line running through it parallel to the outer edge of the basal patch; the outer portion of the pale space is diffused and strongly tinged with ferruginous; along the costa a series of fuscous spots alternate with oblique geminated pale ochreous streaks; from the third spot, about the middle, arises a fuscous shade, dilated outward and downward to the dorsum before the tornus and much mottled with leaden grey, a larger patch of which occurs at its outer edge above the tornus; the outer portion of the wing is bright ferruginous, a slender leaden grey line running from the fifth costal spot to the termen below the apex; cilia pale ochreous, based (and tipped along the middle of the termen) with greyish fuscous. *Exp. al.* 17 mm. *Hind wings* dark greyish brown; cilia pale cinereous, with a dark line running through them near their base. *Abdomen* greyish brown. *Legs* pale cinereous, with four blackish spots on the hind tarsi.

Type, ♂ (70532) Mus. Wlsm.

Hab. JAPAN (Pryer, 1886). Unique.

1003 (1). *Argyroploce* (?) *acharis*, Btl.

Penthina acharis, Btl. Ill. Typ. Lp. Het. B. M. III. 80, Pl. LX. 9 (1879)¹.

Hab. COREA—Gensan, VI. 1886 (Leech). JAPAN (Pryer,

1886)—*Yesso*—Hakodate, VIII. 1886 (*Leech*). *HONDO*—Yokohama¹. *KIUSIU* (*Leech*, 1890)—Satsuma, V. 1836 (*Leech*).

This is not a true *Argyroploce*, as it does not possess a thoracic tuft; it cannot be referred to *Enarmonia*, as at present constituted, since veins 3 and 4 of the hind wings are connate, not stalked.

[To be continued.]

XXXIII.—*Note on Variation in the Weasel and Hedgehog.*
By G. E. H. BARRETT-HAMILTON.

I HAVE read with much interest the two notes by Dr. Einar Lönnberg which appeared in the 'Annals' for May and June 1900. In these days of much writing and little attention it is pleasant to find that one's work attracts notice, even if that notice be critical or condemnatory. It is doubly valuable to receive criticism from one who resides in Scandinavia, a country whose climate and configuration lends itself in a very peculiar manner to the formation of local subspecies of mammals, or, in other words, to variation.

Before noticing Dr. Lönnberg's remarks I may say, by way of preface, that in my studies of European mammals my main object has been, first to record, and secondly to throw light, however dimly, upon the origin of the numerous variations which occur. The making of species or subspecies is therefore to me of quite subsidiary importance, and I care not a jot whether the forms upon which I find it necessary to bestow technical names be styled species, subspecies, races, forms, or phases. On the whole I incline to the latter word; but the use of the term subspecies is now so general and, I had thought, so well understood that I have found it convenient. No one who works for any little time at such matters can fail to meet with numberless difficulties or to notice the inequality between the various subspecies. That, however, is the fault of the system, or, if you like, of the animals themselves, which refuse to accommodate themselves to any scheme which man can invent, and which consequently excite the frequent protests of those who fail to see the troubles which must beset any system of minute inquiry. Even, however, if I were to find that I had made numerous

bad subspecies, I would vastly prefer to be on the side of those who attempt to unravel the mysteries of variation (it may be a task heavier than the cleaning of the Augean stables) rather than to cultivate the icy scepticism of the modern school of "lumpers," to whom the many phases of animal variation are like the ripples of the ocean to the sailor—things to be detested in proportion as their magnitude makes them troublesome. By such a school no real progress can now or ever be made.

Let us look at Dr. Lönnberg's criticisms. Admitting that the meaning of a subspecies varies somewhat with different authors, he supposes "that even in a subspecies the distinguishing characteristics (although they are of less importance than specific ones) must be constant to a certain degree and inherited from one generation to another; in the opposite case it is only an individual variety. Such independent individual varieties must not be called subspecies, in my opinion, even if they are numerous and dominate in some region."

Reading my introductory remarks, it is easy to understand where Dr. Lönnberg and I differ and where we agree. Finding that the weasels of the far north turn white in winter, while those of the south do not, I apply to each of these, in their extremes highly distinguishable, phases of the same animal a different trinomial name. This I find to be the best method at my disposal of calling attention to such differences. Dr. Lönnberg, on the contrary, prefers to minimize the importance of these really important colour changes by refusing to accord them the hall-mark of nomenclatural distinction.

But it is not this which puzzles and annoys Dr. Lönnberg so much as the existence in Scandinavia of weasels belonging to both of these forms. Well, why not take things as they are, and admit the difficulty, with the impossibility of ever completely surmounting it? Is it altogether preposterous that, while we have the regularly white-turning *Putorius nivalis typicus* in North and Middle Sweden, and the always brown *P. n. vulgaris* in Scania (connected, as we know they are, by various intermediates), we should similarly find the *P. n. typicus* on a mountain-top and the *P. n. vulgaris* in the valley of the same parish? Is not all this due to the same laws of climatic variation, and need it deter us from further investigation to find that such variation is in the highest degree perplexing? Shall we not rather do well to

accept the situation, pregnant as it is with interest, and to welcome each step in the road to its explanation?

It is, in fact, only to be expected that a mountainous country like Scandinavia, with one flank fully exposed to the damp blasts of the Atlantic, the other chilled by the near proximity of a vast continent, should present us with at least two or even more phases of each common mammal. This is certainly the case, as Dr. Lönnberg points out, with the polar hare, *Lepus canescens*, and I have shown that it is so also with the squirrel and also probably with the long-tailed field-mouse, *Mus sylvaticus*. Why, then, should Dr. Lönnberg be at such pains to demonstrate the occurrence of the "vulgaris" form together with the "typicus," an incident which was not only probable but necessary for the proper appreciation of their rôle as subspecies? And why should Dr. Lönnberg regard such intergradation both of colour and size as rendering the distinguishing characteristics derived from them unimportant, when in the very same paragraph he shows his thorough agreement with me that "the variation of the weasel certainly does not lack significance, because intermediate stages occur which unite the extreme forms"?

Of Dr. Lönnberg's second paper—"Note on the Individual Variation of the Common Hedgehog"—I have less to say. I had found what I thought to be solid points of differentiation between the skulls of hedgehogs from England and Scandinavia, whereby all the examples included in a fair series contained in the British Museum of Natural History were readily distinguishable. Relying on the rule, soon learnt in working at mammals, that such differences, even if slight, are usually not meaningless, I assumed that they would be borne out by a larger series of specimens than I at that time had before me. Dr. Lönnberg finds that this is not so; and I can only say that, while I am sorry that my opinion seems to have been erroneous, I am only too glad to find here in the hedgehog another check to those who, while refusing to recognize colour differences, pin their faith with an inconsistent fidelity on what are frequently the shadowy characters of the cranium. Such characters of the cranium, as every year only seems to teach us, may be full of value or worthless just according to the individual idiosyncrasy of the animal in which they occur. They are in many cases not one bit more reliable than those presented by colour, proportions, or size. In fact, in regard to some of the more important cranial characters, such as those of the

dentition of the vole *, 25 per cent. of specimens examined may be abnormal, a fact which, when still larger numbers are available, may yet prove the saving of my subdivision of the hedgehogs.

In conclusion, I must thank my critic for the exceedingly temperate and forbearing way in which his remarks are couched. Criticisms thus conscientiously formed and fairly expressed cannot surely fail to advance our science.

BIBLIOGRAPHICAL NOTICES.

Zoological Results based on Material from New Britain, New Guinea, Loyalty Islands, and elsewhere, collected during the Years 1895, 1896, and 1897, by Arthur Willey, D.Sc. Lond., Hon. M.A. Cantab. Part IV. Cambridge, May 1900.

THE long-delayed fourth part of Dr. Willey's 'Zoological Results' is now before us and proves fully equal, both in interest and in the general excellence of its contents, to its predecessors. It contains ten memoirs, the majority of which are devoted to reports on the collections made by Dr. Willey in various groups of the animal kingdom. Three, however, are on subjects of morphological interest. The first of these is the opening paper of the volume by Mr. J. Stanley Gardiner, "On the Anatomy of a supposed new Species of *Cænopsammia* from Lifu." Mr. Gardiner divides his subject into four heads, dealing respectively with the general anatomy of the skeleton and specific description, the general anatomy of the polyps, minute anatomy, and some conclusions relating to the body-layers in the Actinozoa. He comes to the conclusion that the whole filament of the primary and secondary, and probably also that of the tertiary, mesenteries is ectodermic in origin, and that the whole of the digestion of the animal is performed by these filaments, and draws the important deduction that the stomodæum of Actinozoa is not comparable with that of the Triploblastica, but is rather, with the mesenterial filaments, the homologue of the whole gut. The so-called endoderm is homologous with the mesoderm of Triploblastica, and the Actinozoan polyp ought to be regarded as a Triploblastic form.

The second of the morphological papers is by Mr. J. J. Lister on *Astrosclera Willeyana*, the type of a new family of sponges. This is a very remarkable organism, with a massive calcareous skeleton of polyhedral elements united to form a rigid skeleton and excluding the soft parts, an arrangement which is only approached among living sponges in the genus *Petrostoma*. Among several points in which *Astrosclera* differs from the rest of the Porifera may be mentioned the absence of a central atrial space, the minute size of the flagellated chambers, and the peculiar form of the flagellated cells,

* As shown by Mr. G. S. Miller, Jun.

which appear to be without "collars" and to taper gradually into the flagellum.

The skeleton of *Astrosclera* in many ways recalls that of the extinct *Pharetrones*, and Mr. Lister devotes a considerable space to the consideration of the possible relationship of the two groups, but comes to the conclusion that there is no clear affinity between them.

The paper on *Astrosclera* is followed in the volume by a memoir by Mr. W. P. Pycraft, "On the Pterylography of the Megapodii," dealing with the pterylosis of the adult, the nestling, and the embryo. In the course of some remarks on the nature of the nestling plumage, Mr. Pycraft advances the view that this does not, in *Megapodius*, consist of true neossoptiles, but of a growth of feathers intermediate between the latter and the definitive contour feathers of the adult. Similar feathers are found in the nestling owl. There are no preplumulæ and the true prepennæ are shed during embryonic life.

The remaining papers in the volume are respectively by Dr. D. Sharp on the Insecta from New Britain, by Mr. L. A. Borradaile on the Stomatopoda and Macrura, by Mr. Walter Collinge on the Slugs, Miss Philipps on the Polyzoa, Miss Thornely on the Hydrozoa, Professor Hickson and Miss Hiles on the Stolonifera and Alcyonacea, and Dr. Ashworth on the Xeniidæ, the whole series forming a valuable addition to our knowledge of the zoology of the regions visited by Dr. Willey.

A Monograph of the Coleopterous Families Corylophidæ and Sphæriidæ. By the Rev. A. MATTHEWS, M.A. Edited by PHILIP B. MASON, M.R.C.S., F.L.S., F.Z.S., &c. London: O. E. Janson, 1899.

THIS work is published in the same form as the author's previous monograph on the Trichopterygidæ. It consists of 220 pages of letterpress, and is illustrated with nine plates in outline, with details of structure. One hundred and sixty-nine species are described. The author concludes that the affinity of the Corylophidæ is with the Silphidæ and Leptinidæ, and places the families thus:—Leptinidæ, Corylophidæ, Phænocephalidæ, Silphidæ.

The Phænocephalidæ consists of a single genus, *Phænocephalus*, separated from the Corylophidæ on account of the maxillæ having two lobes, &c. *Aphanocephalus*, originally described as a member of the Corylophidæ, is separated as a distinct family, Pseudocorylophidæ, chiefly on account of the maxillæ having "three lobes," somewhat as in the Trichopterygidæ. The family is placed between the Corylophidæ and Phænocephalidæ in the work, but the author would "retain it in the position now occupied by the whole family, in the vicinity of the Coccinellidæ." This is a most interesting point, for the Coccinellidæ, formerly placed at the end of the Coleoptera entirely away from the Clavicornia, are now by some eminent Coleopterists located with them.

The various genera included in the Corylophidæ are so diverse

that the author divides them, and we think rightly, into five tribes. This diversity gives the study of this family great interest, as light may be thrown on some of the difficult problems connected with the classification of the Clavicornia, and may determine the proper position of the Coccinellidæ, which is still somewhat doubtful.

Those who are acquainted with the author's work on the Trichopterygidæ will not, we feel sure, be disappointed with the present volume, which shows everywhere the great care that has been taken in its preparation. The small size of these insects (apparently nearly all considerably less than two millimetres in length) has deterred many from examining them; but this work has rendered the study of the group possible even to an outsider, as the figures of details are very good. The plates are admirably executed, but we cannot help regretting that only half-figures are given: these do not satisfactorily convey to the eye the form of the insect, and there is room on the plates for complete figures.

The editor and publisher are both to be congratulated on the publication of this work; they seem to have spared no pains to make it worthy of the author. We presume the wing of *Trichopteryx* on the cover, as it does not in any way indicate the contents of the book, is to be regarded as the author's entomological coat of arms.

MISCELLANEOUS.

Priority or Usage.

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

GENTLEMEN,—Many who, like myself, had "the advantage of a classical education" must remember the joy, alike of master and scholar, when the "note" said that a given word was an ἀπαξ λεγόμενον. It was as water in a dry land, as the word Mesopotamia to the historical old woman.

And now to think of the joy of it! ἄπος (see Sharpe, Preface to 'Hand-list of Birds,' ii. p. vi) is found to be a Greek word meaning "weariness." Whether Euripides ever used this word is very doubtful; but it seems certain that he never used it twice, and that no other known Greek author ever used it at all. It is a true ἀπαξ λεγόμενον, a gem of the purest water!

But see to what shifts the priority-purist who wants to apply *Apus* to the swift (see the preceding volume of these 'Annals,' p. 480) is reduced! At first sight it is astounding; on reflection it is seen to be appropriate; for, after all, what is the priority-purist but a searcher after ἀπαξ λεγόμενα—names used once and decently buried in some dusty magazine, which he drags to the light and uses to eject world-known terms. Let these purists beware lest, when the history of zoology be written, they find themselves ἀπαξ λεγόμενοι, and not too politely at that!

Your faithful Servant,

F. JEFFREY BELL.

14th July, 1900.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 33. SEPTEMBER 1900.

XXXIV.—*On some Malacostracous Crustaceans from Malaya in the Collection of the Sarawak Museum.* By W. F. LANCHESTER, M.A., King's College, Cambridge.

[Plate XII.]

THE Crustaceans with which I deal in this paper were sent to me by Mr. R. Shelford, B.A., Curator of the Sarawak Museum, when I was at Singapore in the early part of 1899, and I am greatly indebted to him for giving me the opportunity of identifying them. He has, further, been kind enough to let me retain all but two of the specimens, and those that may be desiderata to the Natural History Museum at South Kensington will be deposited there. It is a small collection of 38 species (27 genera), and only one of these is new; but some, in particular the Potamons, of which there are five species, have only been recently described. This *Potamon* group, which seems to be especially well represented in Borneo, and which ranges there from sea-level to 6000 feet, numbers many species of more or less definiteness, and greater additions to our collections will no doubt enable us to reduce the number of these somewhat and at the same time to get a clearer idea of their mutual affinities. There is also a specimen of a *Callianassa*, unfortunately somewhat damaged, but almost certainly identical with *C. Martensi*,

first described from Mauritius by Mr. Miers and later from Amboina by Dr. de Man, which, if my diagnosis be correct, would point to a disappearance of the eyes in this species; for the corneæ, which in Mr. Miers's younger example are of normal size, are in this one small and out of all proportion to their peduncles, which are flattened and produced, so as to overlap them on all sides.

Since my return from the Straits I have been occupied in describing the *Brachyura* collected there by Mr. Bedford and myself: the paper dealing with these was read to the Zoological Society in June, and will appear in the 'Proceedings' of that Society later in the year. This being so, I have contented myself with giving references to that paper in cases where, in this, species are mentioned which I have already described.

As regards what few measurements I have taken, I should say that, except where otherwise stated, I have measured the breadth between the bases of the last antero-lateral spines and the length between the posterior margin and a line joining the bases of the internal supraocular spines; my reasons for this I have given in my earlier paper.

It may perhaps be advisable to add that the numbers given in Roman figures with each species correspond to labels affixed by Mr. Shelford, and are inserted for his better convenience in identifying the corresponding examples in his museum.

BRACHYURA.

I. Genus *ATERGATIS*, de Haan.

1. *Atergatis integerrimus*, Lam.

Cancer integerrimus, Lam. Hist. Anim. sans Vert. t. v. p. 273 (1818).
Atergatis integerrimus, de Haan, Crust. Jap. p. 45, pl. xiv. fig. 1 (1839); A. M.-Edw. Nouv. Arch. Mus. t. i. p. 235 (1865).

Distr. Philippines, Malaysia, Siam, Java, Tuticorin.
 No. CCLXXII. *Hab.* Singapore.

A female.

Dim.: Length 34·5 millim., breadth (greatest) 55·5.

2. *Atergatis floridus*, Rumph.

Cancer floridus, Rumphius, d'Amboinsche Rariteit-Kammer, p. 16, pl. viii. fig. 5 (1705).

Cancer ocyroë, Herbst, Naturgesch. d. Krab. pl. liv. fig. 2 (1798).

Atergatis floridus, A. M.-Edw. Nouv. Arch. Mus. t. i. p. 243 (1865).

Distr. Ceylon, Malay Archipelago, Duke-of-York Island, Samoa, Clairemont.

No. CCCX. *Hab.* Pulau Satang.

A female.

Dim.: Length 30 millim., breadth (before last tooth) 43·5.

II. Genus CARPILODES, Dana.

3. *Carpilodes socius*, Lanchester.

Carpilodes socius, Lanchester, P. Z. S. Lond. (1900).

Distr. Singapore.

No. CCCL. *Hab.* Singapore.

A fine male specimen, quite agreeing with my original description. Colour deep red above, a lighter brown-red below; fingers brown, with dirty-white tips.

Dim.: Length 17·25 millim., breadth 29·25.

III. Genus ACTÆA, de Haan.

4. *Actæa areolata*, Dana.

Actæa areolata, Dana, U.S. Expl. Exp., Crust. vol. i. p. 162, pl. viii. fig. 1 (1852); A. M.-Edw. Nouv. Arch. Mus. t. i. p. 264 (1865).

Distr. Port Molle, Mergui Is., Sooloo Sea.

No. CLXXII. *Hab.* Singapore.

A male, in which, as with other specimens from Singapore, the internal lobule of the protogastric lobe is no broader than the mesogastric; front only moderately prominent.

Dim.: Length 9 millim., breadth 15·5.

5. *Actæa pulchella*, var. *modesta*, de Man.

Actæodes modestus, de Man, Arch. f. Naturgesch. Jahrg. liii. Bd. i. p. 257, pl. ix. fig. 2 (1887).

Actæa pulchella, Lanchester, P. Z. S. Lond. (1900).

Distr. Singapore, Amboina.

No. CCCXCI. *Hab.* Singapore.

A female. I cannot quite convince myself of the specific distinctness of *Actæodes modestus* and *Actæa pulchella*. The genus at least cannot be sustained, based as it is practically on the one character of the greater or less emargination of the finger-tips. But it is, again, more particularly on this character that Dr. de Man has formed his species—"Es scheint mir nun, dass sich die *pulchella* von unserer Art gleichfalls durch die Scheerenfinger unterscheidet." These differences are:—in *A. pulchella* the fingers meet along their length, are only slightly emarginate, and the dactyl *slants obliquely*; in *A. modestus* the fingers gape a little, the tips are strongly

emarginate, and the dactyl *curves* downwards. Now this example and two males which I have already described from Singapore (*t. c.*) show the *modestus* arrangement pretty clearly, though even in this small number one may see a degree of gradation, though a slight one, to the *pulchella* form; while a fourth example, a female, rather smaller (already described, *t. c.*), shows the *pulchella* arrangement, not perfectly, but distinctly. There are no other noticeable differences between the two forms ("sonstige Unterschiede giebt es kaum," de Man, *t. c.*), and I do not think the slight variations in the hand-structure are as yet more than variations. It is true that three distinctions are noticed, but these three are really only one variation, the curvature of the dactyl and the gape of the fingers being implied by the emargination of the finger-tips. And the amount of this emargination, even in my four examples, is not at all constant, the two smaller examples having sharper finger-tips in proportion. It seems to me, therefore, better to retain Dr. de Man's specific name in a varietal sense for those forms of *A. pulchella* in which the spoon-shaped arrangement is well marked, while leaving it open to decision as to whether the difference is truly varietal, or only one of age, sex, or both.

Dim. : Length 11 millim., breadth 16.25.

IV. Genus ETISODES, Dana.

6. *Etisodes anaglyptus*, M.-Edw.

Etisus anaglyptus, M.-Edw. Hist. Nat. Crust. t. i. p. 411 (1835).

Etisodes anaglyptus, Lanchester, P. Z. S. Lond. (1900).

Distr. Philippines, Clairemont, Torres Strait.

No. CCLI. *Hab.* Pulau Satang.

A female. I have already (*t. c. supra*) given a fuller description of this species, as a supplement to M.-Edwards's short diagnosis.

Dim. : Length 35 millim., breadth 52.

V. Genus PILUMNUS, Leach.

7. *Pilumnus vespertilio*, Fabr.

Cancer vespertilio, Fabr. Suppl. Entom. p. 338 (1798).

Pilumnus vespertilio, M.-Edw. Hist. Nat. Crust. t. i. p. 418 (1835);

Haswell, Catal. Austr. Crust. p. 65 (1882).

Distr. Seychelles, Tuticorin, Malay Archipelago, N.W. Australia, New Zealand, Samoa.

No. CCCLXV. *Hab.* Singapore.

A female.

Dim.: Length 11 millim., breadth 14.5.

VI. Genus ERIPHIA, Latr.

8. *Eriphia laevimana*, var. *Smithii*, McLeay.

Eriphia Smithii, McL. Annul. in Smith's Zool. S. Africa, p. 60 (1838).

Eriphia laevimana, v. *Smithii*, Miers, Ann. & Mag. Nat. Hist. ser. 5, vol. v. p. 237 (1850).

Distr. Natal, Kurrachee, Singapore, New Guinea, off Madagascar.

No. CCLVI. *Hab.* Natunas.

A female.

Dim.: Length 39.5 millim., greatest breadth 54.

VII. SCYLLA, de Haan.

9. *Scylla serrata*, Forskål.

Cancer olivaceus, Herbst, Naturg. d. Krab. ii. p. 157, pl. xxxviii. fig. 3 (1796).

Lupea tranquebarica, M.-Edw. Hist. Nat. Crust. t. i. p. 448 (1835).

Scylla serrata, de Haan, Faun. Japon. Crust. p. 44 (1839); Haswell, Cat. Austr. Crust. p. 79 (1882).

Distr. Cape of Good Hope, Natal, India, Malay Archipelago, China, New Caledonia.

No. LXXXIX. *Hab.* Moratabas.

A young female.

Dim.: Length 48.5 millim., breadth 73.

VIII. Genus NEPTUNUS, de Haan.

10. *Neptunus pelagicus*, Linn.

Cancer pelagicus, Linn. Syst. Nat. (ed. xii.) p. 1042 (1766).

Lupea pelagica, M.-Edw. Hist. Nat. Crust. t. i. p. 450 (1835).

Neptunus pelagicus, Hasw. Cat. Austr. Crust. p. 77 (1882).

Distr. Muscat, Persian Gulf, India, Malay Archipelago, Port Curtis, Sydney, Shanghai, Zanzibar.

No. CCCLXVI. *Hab.* Buntal.

A female.

Dim.: Length 28 millim., breadth 52.5.

No. CCCXXX. *Hab.* Santubong.

A male.

Dim.: Length 16·25 millim., breadth 28.

	L.	R.
Length of last lateral teeth in ♀	= 5 mm.	9·5 mm.
" " "	♂ = 4·5 "	4·5 "

IX. Genus GONIOSOMA, A. M.-Edw.

11. *Goniosoma affine*, Dana.

Charybdis affinis, Dana, U.S. Expl. Exp., Crust. vol. i. p. 286, pl. xvii. fig. 2 (1852).

Goniosoma affine, A. M.-Edw. Arch. Mus. t. x. p. 384 (1861); de Man, Mergui Crust. p. 80, pl. v. fig. 2 (1888).

Distr. India, Mergui Is., Singapore.

No. CCCXXXI. *Hab.* Buntal.

A female, in which the two median lobes of the front are broken off. I can detect no signs of teeth on the posterior margins of the penultimate joints of the natatory (last) legs.

Dim.: Length 23·5 millim., breadth 37.

12. *Goniosoma rosæum*, Jacq. et Lucas. (Pl. XII. fig. 1.)

Thalamita rosæa, Jacq. et Luc. t. iii. p. 5, pl. v. fig. 11 (=Hombron et Jacq. Voy. au Pôle Sud, Crust. 1853).

Goniosoma rosæum et *rostratum*, A. M.-Edw. Arch. Mus. t. x. pp. 378-9, pl. xxxv. fig. 2 (1861).

Distr. Mouths of Ganges, Calcutta, Gulf of Martaban, New Guinea.

No. IX. *Hab.* Buntal.

A male, in which there is a small distinct tooth on the base, posteriorly, of each first antero-lateral tooth, and a slight pubescence on the branchial regions. *G. rostratum* differs only in being less orbicular, in having the two median teeth of the front more advanced, and in the possession of only two spines on the hand, and I do not think it is specifically distinct.

Dim.: Length 17·5 millim., breadth 24·5.

X. Genus THALAMITA, Latr.

13. *Thalamita Danæ*, var. *Stimpsoni*, A. M.-Edw.

Thalamita Stimpsoni, A. M.-Edw. Arch. Mus. t. x. p. 362, pl. xxxv. fig. 4 (1861).

Thalamita Danæ, de Man, Mergui Crust. p. 78, pl. iv. figs. 8, 9 (1888).

Distr. Torres Strait, Sandwich Islands, W. Australia, Malay Archipelago.

No. CCCLII. *Hab.* Singapore.

A young female.

Dim.: Length 8 millim., breadth 12·5.

XI. Genus POTAMON, Sav.

14. *Potamon (Perithelphusa) Büttikoferi*, de Man.

Potamon (Perithelphusa) Büttikoferi, de Man, Notes from the Leyden Museum, vol. xxi. pts. i.-iii. pp. 80-86, pl. vi. fig. 6 (1899).

Distr. Sintang.

No. CCXCII. *Hab.* Mt. Matang, 3000 feet.

A male. Dr. de Man describes the "ischial line" on the posterior maxillipedes as being parallel to the inner margin of the ischial joint; in this example it is oblique, slanting away from it from before backwards.

Dim.: Greatest length 28·5 millim., greatest breadth 35.

15. *Potamon (Perithelphusa) borneense*, var. *hilare*, de Man.

Potamon borneensis, var. *hilaris*, de Man, Notes Leyden Mus. vol. xxi. pts. i.-iii. p. 71, pl. v. fig. 4 (1899).

Distr. Sintang.

No. XCVIII. *Hab.* Kuching: freshwater.

A male.

Dim.: Greatest length 18·5 millim., greatest breadth 23.

16. *Potamon (Parathelphusa) tridentatum*, var. *incertum*, Lanchester. (Pl. XII. fig. 2.)

Potamon (Parathelphusa) tridentatum, var. *incertum*, Lanchester, P. Z. S. Lond. (1900).

Distr. Singapore (Botan. Gardens).

No. CXXXVI. *Hab.* Kuching: presumably freshwater, but I have no note to that effect.

A male, quite agreeing with the forms I have already described from Singapore; though in this specimen the lobulation of the extraorbital tooth is even more striking, giving it all the appearance of having four antero-lateral teeth, such that the second is truncated, while the rest are sharp.

Dim.: Length (including rostrum) 30·5 millim., breadth between last teeth 37·5.

17. *Potamon (Geothelphusa) Bürgeri*, de Man.

Potamon (Geothelphusa) Bürgeri, de Man, Notes Leyd. Mus. vol. xxi. pts. i.-iii. pp. 121-127, pls. xi., xii. fig. 14 (1899).

Distr. Mount Liang Koeboeng.

No. xcv. *Hab.* Kuching.

A female example, quite agreeing with Dr. de Man's description of a male, except in regard to the following points:—The *left* chelipede is the larger, and not the right; the fingers, moreover, which on the right side meet all along their length, are somewhat widely separate on the left. The mesogastric groove is continued faintly on to the front, and shows a tendency to bifurcation behind; there is also a faint oblique depression between the gastric and branchial regions on each side.

Dim.: Greatest length 15.5 millim., greatest breadth 21.

18. *Potamon (Thelphusa) bidiense*, sp. n.

(Pl. XII. fig. 3.)

No. CCCLXXVII. *Hab.* With this specimen I have the following note from Mr. Shelford:—"Caves at Bidi in pools; the caves were absolutely dark. Body pale brown, legs white."

A male. This form is closely related to one obtained by Dr. de Man from the Dutch Expedition to Central Borneo, and named by him *P. Melanippe*, which is itself allied to *P. Austenianum*, a form described by Wood-Mason from Assam. Like them, this specimen is most noticeable for the length and slenderness of its legs; but the penultimate pair are a little *more* than three times as long as the carapace, and their meri are also longer than the carapace by nearly a fifth of their length. In this, too, they differ from *P. Melanippe* in that the meri of the last four legs are armed with a small blunt spine anteriorly, quite close to the distal end. The external maxillipeds are precisely similar to those of *P. Melanippe*; the chelipedes, too, are essentially similar, except that the fingers do not quite meet along their length and their tips decussate. The shape of the male abdomen is, however, quite different: the sixth segment is indeed quite similar to that of *P. Melanippe*; but the fifth, instead of being narrower at its base than at its extremity, is, if anything, ever so little broader, with its sides straight and practically parallel; as a consequence of this, the transition from the narrower terminal to the broader basal segments is much less marked than in Dr. de Man's form.

Epigastric lobes very prominent; no crest parallel to the anterior margin of the front, general surface of the carapace rather thickly punctate than granular. Upper surface of meri of ambulatory legs with two granular eminences. There is a minute epibranchial tooth as in *P. Melanippe*, behind which the sides are obliquely rugose.

In regard to the habitat from which it was taken, there is no evidence to show that this species is essentially a cave-dwelling one; though its occurrence in a dark cave is very interesting, and shows the possibility of such being the case. The eyes in this individual are normal; its colour is perhaps paler than in the *Thelphusidæ* generally (but cf. *Potimon bicristatum*, de Man: "carapace lead-coloured, legs yellowish marmorate"). But a loss of colour of this nature is not necessarily a permanent feature, and proves very little as to the ways of the species as such. The possibility must always be borne in mind that a particular habitat, such as this, may be one temporarily acquired by certain, possibly locally limited, members of a species; should this residence become permanent, a local race may be formed. But in this case, at least, the evidence is very little, and not much can be deduced from it in either direction.

Dim.: Greatest length 12.25 millim., greatest breadth 14; length of penultimate pair of legs 40, length of merus of penult. pair 15.

XII. Genus SESARMA, Say.

19. *Sesarma calypso*, de Man.

Sesarma (*Parasesarma*) *calypso*, de Man, Zoolog. Jahrb. Syst. Bd. ix. pp. 185-9, fig. 34 (1896).

Sesarma calypso, Lanchester, P. Z. S. Lond. (1900).

Distr. Atjeh, Singapore.

No. XXXVIII. *Hab.* Buntal.

A female. Superior border of hand raised to a strong crest on its inner side, against which the four pectinated ridges abut. Fingers with seven or eight of the characteristic "Treppen-förmig" tubercles.

Dim.: Greatest length 16 millim., breadth (including external orbital angles) 20.5.

20. *Sesarma quadrata*, Fabr.

Cancer quadratus, Fabr. Ent. Syst. Suppl. p. 341 (1798)

Grapsus (*Pachysoma*) *quadratus*, de Haan, Crust. Jap. p. 222, pl. viii. fig. 3 (1839).

Distr. Malay Archipelago, Japan.

No. LXXXIII. *Hab.* Santubong.

A small female.

Two obscure pectinated ridges, and 8-10 low tubercles on the dactyl.

Dim.: Greatest length 9.25 millim., breadth (including external orbital angles) 12.

XIII. Genus OCYPODE, Fabr.

21. *Ocypode ceratophthalma*, Pallas.

Cancer ceratophthalmus, Pall. Spic. Zool. ix. p. 83, pl. v. fig. 17 (1772).

Ocypode ceratophthalma, Fabr. Suppl. Ent. Syst. p. 347 (1798); Miers, Ann. & Mag. Nat. Hist. ser. 5, vol. x. p. 379, pl. xvii. fig. 1 (1882).

Distr. Very wide; from E. Africa to the Pacific.

Nos. LXXXVI, CCCLXI, CCXC. *Hab.* Santubong, Buntal.

A male, with styles 11.5 millim. long (breadth of carapace at epibranchial angles 36); a female, with styles .75 long (breadth of carapace 28); and a small male, with no ocular styles (breadth of carapace 18.5).

	♂ 1. millim.	♂ 2. millim.	♀. millim.
<i>Dim.</i> : Greatest length of carap.	32	15.5	24.5
Greatest breadth of carap.	36	18.5	28

XIV. Genus UCA, Leach (= *Gelasimus*, Latr.).

22. *Uca annulipes*, M.-Edw.

Gelasimus annulipes, M.-Edw. Hist. Nat. Crust. t. ii. p. 55 (1837); de Man, Mergui Crust. p. 118, pl. viii. figs. 5-7 (1888), ubi syn.

Distr. Zambesi, Durban, India, Malay Archipelago, Samoa, Lu-chu (China).

No. XXVIII. *Hab.* Santubong.

A male, left-handed.

Dim.: Greatest length 7.5 millim., breadth (with external orbital angles) 13.5.

XV. Genus MACROPTHALMUS, Latr.

23. *Macrophthalmus carinimanus*, M.-Edw.

Macrophthalmus carinimanus, M.-Edw. Hist. Nat. Crust. t. ii. p. 65 (1837); Miers, Ann. & Mag. Nat. Hist. ser. 5, vol. v. p. 306 (1880); Haswell, Cat. Austr. Crust. p. 88 (1882).

Distr. Malaysia.

No. CCCLVI. *Hab.* Santubong.

A male.

Dim.: Greatest length of carapace 9.5 millim., breadth (across ext. orb. angles) 21.

24. *Macrophthalmus depressus*, Rüppell.

Macrophthalmus depressus, Rüpp. Beschreib. 24 Art. kurzschw. Krab. p. 19, pl. iv. fig. 6 (1830).

Macrophthalmus affinis, Guérin, Crust. 'Favorite,' p. 172, pl. 1. fig. 2 (1839).

Macrophthalmus depressus, Hend. Trans. Linn. Soc., 2nd ser. Zool. v. p. 389 (1893); de Man, Zoolog. Jahrb. Syst. Bd. viii. p. 578 (1895).

Distr. Pamban, Rameswaram, Bombay, Red Sea, North Australia.

No. XIV. *Hab.* Buntal.

A male. The granulations on the carapace are very fine, distinctly visible under the lens; and there is a well-marked mesial groove on the front, extending back to the level of the external orbital angles. In a smaller female specimen Dr. de Man found no spine on the merus of the last leg; there is one present in this example, which is a little larger. Prof. Henderson (*t. c.*) says: "The ambulatory legs are pubescent, with a single tooth near the anterior distal end of merus,"—making no exception as regards the last pair.

I note, in addition, in my specimen the presence of a thick hairy tuft on the anterior surface of the merus of the chelipedes, and another at the base, internally, of the fingers.

Dim.: Greatest length of carapace 11.25 millim., breadth (across orbital angles) 14.

Prof. Henderson gives the length of a male as 11 millim., and its breadth 17; Dr. de Man's specimen is given as 8.25 millim. long and 12.2 broad.

XVI. Genus CALAPPA, Fabr.

25. *Calappa hepatica*, Linn.

Cancer hepaticus, Linn. Syst. Nat. p. 1048 (1766).

Calappa tuberculata, Fabr. Ent. Suppl. p. 345 (1798); Herbst, Naturg. d. Krab. i. pl. xiii. fig. 78 (1796).

Calappa hepatica, Hasw. Cat. Austr. Crust. p. 136 (1882).

Distr. Red Sea, E. Africa, Natal, India, China, Sandwich Is., Australia.

No. CCCXXVII. *Hab.* Natunas.

A male.

Dim.: Length 35 millim., greatest breadth 55.

XVII. Genus MATUTA, Fabr.

26. *Matuta victrix*, Fabr.

Cancer victor, Fabr. Ent. Syst. ii. p. 449 (1793).

Matuta victor, id. Ent. Suppl. p. 369 (1798).

Matuta victrix, Miers, Trans. Linn. Soc., 2nd ser. Zool. vol. i. p. 243, pl. xxxix. figs. 1-3 (1877).

Distr. Red Sea, E. Africa, Natal, Madras, Japan, Port Jackson, Fiji Is.

No. VI. *Hab.* Santubong.

A young male.

Dim.: Length 26 millim., breadth 28·5.

ANOMURA.

XVIII. Genus CÆNOBITA, Latr.

27. *Cænobita spinosus*, M.-Edw., var. *olivieri*, Owen.

Cænobita olivieri, Ow. Crust. 'Blossom,' p. 84; Dana, U.S. Expl. Exp.

Crust. vol. i. p. 470 (1852); Hasw. Cat. Austr. Crust. p. 160 (1882).

Cænobita spinosa, var. *olivieri*, Ortmann, Zool. Jahrb. Syst. Bd. vi. p. 318, pl. xii. fig. 24 (1892).

Distr. Madras, Nicobar, Tahiti, N.W. Australia.

No. CCCXIX. *Hab.* Santubong.

A male. Fore part of carapace much less tumid than in the species; outer surface of penultimate joint of the left third leg with a rounded crest in its distal half. It is possible that this variety is the young stage of the species. A specimen in the Museum collection at S. Kensington, labelled "*C. olivieri*, Pelew I.," should, I think, be referred to *C. perlata*. Length of carapace 27·5 millim.

XIX. Genus PETROLISTHES, Stimpson.

28. *Petrolisthes hastatus*, Stm.

Petrolisthes hastatus, Stm. Proc. Ac. Nat. Sci. Philad. p. 241 (1858).

Porcellana inermis (Heller), de Man, Merg. Crust. p. 212 (1888).

Petrolisthes hastatus, Ortmann, t. c. p. 260 (1892).

Distr. Mergui, Nicobar, Noordwachte I. (Java), Japan.

No. CCLXIV. *Hab.* Pulau Satang.

A female. I have compared this with Dr. de Man's slightly smaller specimens, and find the following differences:—The antero-lateral margin in this female is grooved in its anterior third, this groove passing up and obliquely backwards

on the carapace. This groove is less conspicuous in Dr. de Man's examples according to their smaller size. In the Sarawak form also the tooth at the end of the posterior margin, and the three teeth on the anterior margin of the carpus of the chelipedes, are reduced in size; in fact, the foremost tooth on the anterior margin, and the one just behind it, are only just visible. These distinctions I consider to be, without doubt, due to age only.

Length 8.5 millim., breadth 8.25.

MACRURA.

XX. Genus CALLIANASSA, Leach.

29. *Callianassa Martensi*, Miers. (Pl. XII. figs. 4, 4 a.)

Callianassa Martensi, Miers, P. Z. S. Lond. (1884) p. 13, pl. i. fig. 1; de Man, Arch. f. Naturg. Jahrg. 53, Bd. i. p. 482, pl. xxi. fig. 1 (1887).

Distr. Mauritius, Amboina.

No. LXVI. *Hab.* Buntal.

A male. This specimen, though rather damaged—having, in particular, lost both chelipedes—I believe to be a representative of Mr. Miers's species. It exhibits certain differences on a comparison with the type specimen, but these seem to be explained by the greater size of this example, *i. e.*, they are differences of age. The most striking difference is in the frontal region; the rostrum is shorter than in the type, in which latter it reaches to the middle of the corneæ of the eyes, while in this it barely reaches halfway to the corneæ. These corneæ are themselves much reduced in size in proportion to their peduncles, while the latter have become very acutely angulated at their antero-internal angles, now *in front* of the corneæ, so that the two peduncles form in front a short blunt tooth in the median line. From this angle to their antero-external angles the border is concave, there being another tooth, smaller than the median one, at the latter angle. The whole peduncle is very flattened and the cornea appears only as a small black spot just in front of the centre of its upper surface. Besides this, the ischium and merus of the third maxillipedes form a broad opercular plate, and the dactyl is bent back on the greatly enlarged propodos, so as to make this appendage subchelate. Both these points are more prominently developed in the larger animals than in Mr. Miers's smaller one. In other respects these two forms agree.

Dim.: Length from tip of rostrum to tip of telson about 81 millim.

XXI. Genus SENEX, Pfeffer (= *Panulirus*, Gray).30. *Senex ornatus*, Fabr.

Panulirus ornatus, Fabr. Suppl. Ent. Syst. p. 400 (1798); Hasw. Cat. Austr. Crust. p. 171 (1882).

Senex ornatus, Ortmann, t. c. p. 34 (1892), ubi syn.

Distr. East Africa, Ceylon, Malay Archipelago, N. Australia, Hongkong, Japan, Samoa.

No. xc. *Hab.* Pulau Satang.

A male of this very variable species. On the antennal segment are four forwardly-directed teeth arranged in a square, the two anterior being larger; between these latter, but nearer to the left one than the right, is a small "Nebendorn." In a larger specimen in the Museum collection, from Natunas, there are two "Nebendornen" halfway between each of the anterior and posterior teeth. The second and third abdominal segments are marked with an interrupted transverse hirsute furrow; the specimen from Natunas is without these, but has a deep furrow on the first abdominal segment, without hairs, as in this specimen.

Dim. : Base of eyes to posterior margin of carap. 37 millim.

XXII. Genus ATYA, Leach.

31. *Atya armata*, A. M.-Edw.

Atya armata, A. M.-Edw. Ann. Soc. Entom. France, ser. 4, t. iv. p. 149 (1864).

? *Atya moluccensis*, de Haan, Crust. Jap. p. 186, pl. O (1839).

Atya moluccensis, de Man, Weber's Zool. Ergebn. p. 357, pl. xxi. fig. 20 (1892).

Distr. Malay Archipelago, Samoa, New Caledonia.

No. LXX. *Hab.* Simanggang.

A male, which is certainly identical with *A. armata*. Whether it is the same as de Haan's species, as Mr. Miers seems to think (Ann. & Mag. N. H. (5) v. p. 382), is rather more difficult to determine, for de Haan's description is too brief. I have compared the mouth-parts of this specimen with de Haan's figures (*vide* pl. O), but the latter are too diagrammatic for an accurate comparison; as far as I can determine, however, the two are essentially similar.

Dim. : Length from orbital margin to tip of telson 50 millim.; length from orbital margin to posterior margin of carap. 15.5.

XXIII. Genus ALPHEUS, Fabr.

32. *Alpheus gracilipes*?, Stimpson.

Alpheus gracilipes, Stm. Proc. Ac. Nat. Sci. Philad. p. 100 (1860); Sp. Bate, 'Challenger' Macrura, p. 561, pl. ci. fig. 3 (1888); Ortmann, *op. cit.* v. p. 488 (1891).

Distr. Zanzibar, S.W. Japan, Tahiti, Samoa, Bass Strait.
No. CCXXII. *Hab.* Singapore.

A male. The chelipedes are lost, so that I cannot be quite certain of its identity with Stimpson's species.

Dim.: Base of rostrum to posterior margin of carap. 5.25 millim.; base of rostrum to tip of telson 13.5.

XXIV. Genus PALÆMON, Fabr.

33. *Palæmon carcinus*, var. *Lamarrei*, M.-Edw.

Palæmon Lamarrei, M.-Edw. Hist. Nat. Crust. t. ii. p. 397 (1837); de Haan, Crust. Jap. p. 171 (1839); Ortmann, *t. c.* p. 701, pl. xlvii. fig. 2 (1891).

Palæmon carcinus, Hend. Trans. Linn. Soc., 2nd ser. Zool. vol. v. p. 441 (1893).

Distr. India, Malay Archipelago, Ecuador, Amazon.

No. XXVII. *Hab.* Kuching, freshwater.

Dental formula $\frac{1}{1} \frac{2}{0}$, and there is a wide gap between teeth 8-9 above. The rostrum exceeds the scaphocerite by one fourth of its own length, while the second pair of pereopods exceeds the scaphocerite by half the carpus and the hand. The carpus and hand are covered with minute teeth at moderately wide intervals.

Dim.: Orbital margin to posterior margin of carap. 36.5 millim.; length of second pair of legs 105, of merus 18, of carpus 25, of palm and fingers 42.

XXV. Genus PENÆUS, Fabr.

34. *Penæus velutinus*, Dana.

Penæus velutinus, Dana, U.S. Expl. Exp., Crust. p. 604, pl. xl. fig. 4 (1852); Sp. Bate. Chall. Macr. p. 253, pl. xxxiii. fig. 1 (1888); Ortmann, *t. c.* p. 452, pl. xxxvi. fig. 6 (1891); Henderson, Trans. Linn. Soc., 2nd ser. Zool. vol. v. p. 449 (1893).

Distr. Red Sea, Mauritius, Malay Archipelago, India, Japan, N. & W. Australia, Sandwich Is.

No. CXXX. *Hab.* Singapore.

A male. The tip of the telson is broken off in this specimen, but there is no doubt that it belongs to this species; the form of the male appendage is very characteristic. Dental formula $\frac{8}{0}$; the peduncle of the antennules just reaches the tip of the scaphocerite.

Dim.: Length from orbital margin to posterior margin of carap. 9.5 millim.

35. *Penæus indicus*, M.-Edw.

Penæus indicus, M.-Edw. Hist. Nat. Crust. t. ii. p. 415 (1837);

Sp. Bate, Chall. Macr. p. 248, pl. xxxiii. fig. 2 (1888); Hend. Trans. Linn. Soc., 2nd ser. Zool. vol. v. p. 447 (1893).
Peneus merguiensis, de Man, Merg. Crust. p. 287, pl. xviii. fig. 8 (1888).

Distr. India and Malay Archipelago.

No. LXXV. *Hab.* Buntal.

A female. Dental formula $\frac{8}{4}$; rostrum just overreaches the scaphocerite. The first tooth is situated behind the level of the hepatic spine; antennular peduncle shorter than scaphocerite.

This specimen is certainly identical with Dr. de Man's species; but I do not separate it from *P. indicus* because, on a comparison of some examples of the latter in the Museum collection with two of Dr. de Man's specimens and my own, I find them essentially similar in all respects but two—the proximal half of the rostrum is raised into a very prominent crest and its first tooth is situate *behind* the hepatic spine. The first of these distinctions is certainly a very obvious one and very striking; the second less so. It is hard to decide whether these characters are of specific importance; for myself, should a larger series demonstrate their constancy, I should still be inclined to consider *P. merguiense* as a variety only, though a well-marked one, of *P. indicus*.

Dim.: Orbital margin to posterior margin of carap. 17 millim.

STOMATOPODA.

XXVI. Genus SQUILLA, Fabr.

36. *Squilla scorpio*, Latr.

Squilla scorpio, Latr. Encycl. Méth. x. p. 472 (1825); Miers, Ann. & Mag. Nat. Hist. ser. 5, vol. v. p. 18, pl. ii. fig. 7 (1880); Hend. Trans. Linn. Soc., 2nd ser. Zool. vol. v. p. 453 (1893).

Distr. Madras, Singapore, N. Australia, Shanghai.

No. VII. *Hab.* Buntal.

A young female. Length about $2\frac{1}{2}$ inches.

37. *Squilla raphidea*, Fabr.

Squilla raphidea, Fabr. Ent. Syst. Suppl. p. 416 (1798); Miers, Ann. & Mag. Nat. Hist. ser. 5, vol. v. p. 27 (1880).

Squilla harpax, de Haan, Crust. Jap. p. 222, pl. li. fig. 1 (1839).

Distr. Zanzibar, Madras, Indian Ocean, Mergui Is., Singapore, Borneo, China, Japan.

No. XIII. *Hab.* Moratabas.

A female. Length about $4\frac{3}{4}$ inches.

ISOPODA.

XXVII. Genus NEROCILA, Leach.

38. *Nerocila depressa*, M.-Edw. (Pl. XII. fig. 5.)

Nerocila depressa, M.-Edw. Hist. Nat. Crust. t. iii. p. 254, pl. xxxi. fig. 17 (1839); Schiödte & Meinert, Naturhist. Tidsskrift, Krøyer, Raek. iii. Bd. 13, p. 15, pl. i. figs. 10-11.

Distr. Penang, Zamboango, Amoy.

No. XXIX. *Hab.* Buntal.

A female.

The figure given by Schiödte and Meinert exaggerates, I think, the relative proportions of the telson, which appears to be too short for its breadth (*vide* text, p. 16, where the proportions are given as 8:7). The exterior branch of the uropods, which is long and styliform, is pigmented with black, and this pigmentation is continued up along the sides of the abdomen, though it fades away on the sides of the thorax.

Dim. : Greatest length 17·5 millim., greatest breadth 11 ; breadth of telson 3·5, length of telson 4·25.

EXPLANATION OF PLATE XII.

Fig. 1. *Goniosoma rosæum*. Antero-lateral border showing reduplicated first tooth.

Fig. 2. *Potamon tridentatum*, var. *incertum*. Antero-lateral border.

Fig. 3. *Potamon bidiense*.

Fig. 4. *Callianassa Martensi*. Frontal region and eyes. 4a. Third maxillipede.

Fig. 5. *Nerocila depressa*. Abdomen and telson.

XXXV.—On new Species of Histeridæ and Notices of others.
By G. LEWIS, F.L.S.

[Plate X.]

THIS is the eighteenth paper of a series on the *Histeridæ* published in this Magazine, and in these various memoirs I have described about 360 new species, and in other publications, during the same period, I have noticed 150 more. In and between the years 1884 and 1897 Herr J. Schmidt described about 230 species, and after the year 1868, the date of the Munich Catalogue, Marseul described about 185, Mr. L. Casey 48, and other authors about 157 species. These figures represent in all 1130 species, which, with those of the Munich Catalogue, 1151, bring the present number of species recognized up to 2281. I have a new Catalogue in MS. which I hope to publish shortly after a few points of synonymy

Ann. & Mag. N. Hist. Ser. 7. Vol. vi. 18

are settled and the lineal arrangement of the genera somewhat adjusted.

The genus *Probolosternus* founded here is a remarkable one, and as three species of it have been recently discovered (one in Guinea and two others in the French Congo), it is highly probable that many more exist in Central Africa, and the species also vary so much in size, which increases the probability that intermediate forms exist. It is also likely, from the form of the sterna, that the species have the same habits as those of *Pachycrærus*, which are known to follow the xylophagous beetles, feeding on the euphorbiæ and other African shrubs and trees.

There are two species of the genus *Hister* noticed here (*H. Marshalli* and *H. augoniensis*) which have the inner subhumeral striæ complete, and a reference to them will show how essential it is at times to recognize the importance of the basal oblique humeral stria of the elytra. Sometimes, although rarely, the inner humeral stria is so similar to the first dorsal stria that it is impossible to distinguish the one from the other without noting their position in regard to it.

List of Species.

- | | |
|-------------------------------------|--------------------------------------|
| Holepta dyak. | *Phelister festivus, <i>Lew.</i> |
| — syntexis. | *Notolister sulcicollis, <i>Lew.</i> |
| *Placodes opacus, <i>Lew.</i> | Hister monbasanus. |
| Apobletes parallelus. | — zambesius. |
| — cavifrons. | — augoniensis. |
| — macilentus. | *— Marshalli, <i>Lew.</i> |
| — platessæ. | — brahminius. |
| Liopygus chalcis. | — frontalis. |
| *Platylister mirabilis, <i>Lew.</i> | *Coproxenus Marshalli, <i>Lew.</i> |
| *— extrarius, <i>Lew.</i> | Stictostix parra, <i>Mars.</i> |
| — cathayi. | Notocelis satur. |
| — enodis. | Sitalia Severini, <i>Lew.</i> |
| Platysoma assamense. | Homalopygus remex. |
| — disparile. | Terapus muricatus. |
| Pachycrærus chlorites. | Saprinus punctisternus. |
| Probolosternus africanus. | — castanipes, <i>Curtis.</i> |
| — permundus. | — læsus. |
| — minor. | Teretrius Braganzæ. |
| *Baconia loricata, <i>Lew.</i> | Epiechinus Marseuli. |
| Epitoxus corycæus. | |

Holepta dyak, sp. n.

Oblongo-ovalis, depressa, nigra, nitida; fronte impressa, mento haud carinato; thorace lateribus sparse punctulato; elytris striis dorsalibus brevissimis, 1^a appendice curvata; propygidio

* Species with an asterisk are not described in this paper, but are figured in the Plate.

extus sparse punctato : pygidio dense ocellato-punctato ; prosternolato ; tibiis anticis 4-dentatis.

L. 10 mill. (absque mandibulis).

Oblong-oval, depressed, black and shining ; the head smooth, impressed between the mandibles ; mentum in male concave and smooth, not carinate : the thorax, lateral stria complete and similar to that of *H. Baulnyi*, Mars. ; there is a band of fine, not conspicuous, punctures scattered along the sides ; the anterior angle has a small emargination and close to the emargination there is a deep oval, somewhat oblique, fossette : the elytra, lateral furrow widest in the middle and abbreviated a little before and behind ; striæ, first dorsal is one fourth of the elytral length and has a short bent appendage, second shorter, not quite half the length of the first : the propygidium is sparsely punctured on the outer edges, but not at the base ; the pygidium is densely and ocellately punctate, with the posterior border narrowly smooth ; the prosternal keel is broad and scarcely narrowed at or before the coxæ.

This insect is very similar to *H. Baulnyi*, Mars., but it differs from it in the thoracic auriculiform fovea being deeper, more circular in outline, and in its position being nearer the angular emargination, the apical elytral stria is bent, not straight, and the pygidium is distinctly ocellately punctured.

Hab. Borneo.

Hololepta syntexis, sp. n.

Oblongo-ovata, subdepressa, nigra, nitida ; fronte inconspicue bistriata ; pronoto impunctato, stria laterali in angulo antico desinente ; elytris striis 1-2 brevibus, 3 vix conspicua ; propygidio apice bifoveolato, punctis sparsis late cincto.

L. 8 mill. (absque mandibulis).

Oblong-oval, depressed, black and shining ; the forehead smooth, with two very short, almost obsolete, transverse striæ, ♂ mentum with a short but distinct carina ; the thorax is impunctate, marginal stria very fine, lateral stria well marked, especially at the anterior angles, both striæ terminate behind the angle, male has no thoracic emargination or fovea ; the elytra, lateral fossette reaches the base, but it is shortened before the apex, 1 dorsal stria is about a fourth of the elytral length, 2 half the length of the first, 3 is just visible as a rudiment, there is no appendage ; the propygidium is bifoveolate at the apex, with a border of scattered punctures, except between the foveæ, where the surface is smooth ; the pygidium is rather closely punctured, the punctures varying somewhat in size and leaving the posterior edge narrowly

smooth; the prosternum is not very wide between the coxæ, but at the base it widens out considerably and is somewhat triangular (in this character it agrees with *H. striatidera*, Mars.); the mesosternum has a short curved sulcus at each anterior angle; the anterior tibiæ are 4-dentate, the two apical teeth are robust and near together.

Hab. S. Thomas I, Gulf of Guinea (*Mocquerys*).

Apobletes parallelus, sp. n.

Oblongus, planatus, parallelus, brunneus, nitidus; fronte punctulata, stria transversa utrinque interrupta; pronoto, stria marginali antice late interrupta; elytris striis 1-2 integris, 3 late interrupta, humerali externa completa, interna in medio separata; prosterno lobo antico immarginato.

L. $3\frac{1}{2}$ mill.

Oblong, flat, parallel at the sides, brown and shining; the head slightly impressed anteriorly, punctulate, also the epistoma, striate over the eyes, transverse stria rather wide and shallow and confined to the frontal impression; the thorax, lateral stria continues round the anterior angle to a point behind the eye and it is equally strong there as at the sides, at the base on either side opposite the second dorsal stria is a shallow, somewhat transverse fovea, in lieu of a scutellar fovea there is a minute tubercle, along the thoracic border, but well away from the edge, is a longitudinal cluster of punctures; the elytra, striæ, outer humeral complete, inner humeral separated in the middle, each part extending to a point transversely opposite to each other, oblique basal rather long and very fine, dorsal 1-2 complete, 3 widely interrupted in the middle, the apical edge is narrowly rugosely punctured; the propygidium is punctured throughout, in the centre and along the posterior edge the punctures are fine, but otherwise the punctures are shallow, irregular, and imbricate, in no part are they dense; the pygidium is flat, surface more densely punctate than the propygidium, and the punctures appear ocellate under the microscope; the prosternum, anterior lobe immarginate anteriorly, but behind the middle it is striate on either side, the surface of it and the keel is finely punctulate; the mesosternum is very distinctly bisinuous, so that the middle of the anterior edge is slightly acuminate, on either side is a curved marginal sulcus, but there is no marginal stria; the anterior tibiæ are 3-4-dentate.

This species is more parallel than any other known species and its specific characters generally do not correspond with any other.

Hab. Sumatra.

Apobletes cavifrons.

Ovalis, planatus, niger, nitidus; fronte excavata, stria transversa nulla, mandibulis distincte punctatis; pronoto lateribus rugoso punctato, stria marginali post caput interrupta; elytris striis 1-3 integris, 4 apicali; pygidio dense et fortiter punctato.

L. $3\frac{1}{2}$ - $3\frac{3}{4}$ mill.

Oval, flat, black and shining; the head, forehead excavated and evenly, not closely, punctured, the stria over the eyes is strong and bent, there is no transverse stria, but the suture dividing the forehead and the epistoma is straight and clear; the labrum is punctured like the forehead and is minutely strigose at the base; the mandibles are densely and rather rugosely punctured; the thorax, marginal stria strong laterally, but fine behind the head, and it does not meet in the middle, lateral borders are rugosely and densely punctured, especially behind the anterior angles; the elytra, the outer humeral stria is wide, basal, and dimidiate, inner humeral is wanting, oblique basal fine but clear, 1-3 dorsal complete, 4 apical and very short. The elytra, striæ are almost similar to those of *A. Schaumi*, Mars., and also closely similar to those of *A. tener*, Mars., but in the last the third dorsal stria is interrupted in the middle. The propygidium is somewhat impressed and punctate on either side, with the middle and posterior border smooth; the pygidium is deeply punctate, punctures clear and of equal size, set close together, the posterior margin is slightly elevated; the prosternum, the anterior lobe is marginate, and in this and other respects it is similar to that in *A. tener*; the mesosternum also resembles that of *A. tener*, but the anterior border is more distinctly bisinuous; the anterior tibiæ are 4-5-dentate.

This is a very distinct species, but resembles the species named superficially.

Hab. Patkai Mountains, Assam (*Doherty*).

Apobletes macilentus, sp. n.

Oblongo-ovatus, parallelus, depressus; fronte sat dense punctulata; pronoto lateribus punctulato, stria integra; elytris striis 1-3 integris, 4 apicali; pygidio subconvexo, dense punctato.

L. $2\frac{3}{4}$ -3 mill.

A. macilentus differs from *A. nirvana*, Lew., in being smaller, more depressed and more parallel laterally, the head and thoracic borders are much less distinctly punctured, the elytral striæ are finer and nearer to each other, the fourth stria is short and apical and the fifth is either wholly wanting or

represented by a very rudimentary line or one or two punctures. The pygidium is less convex and somewhat less coarsely punctured. Beneath the punctuation in *A. macilentus* is more fine, especially as it is visible on the anterior lobe of the prosternum, and the posterior lobe of the prosternum is wider than in *A. nirvana*.

This is evidently the species referred to by Herr J. Schmidt as *A. nirvana*, Lew., in the Ann. Mus. Genova, ser. 2, xvii. p. 286 (1897).

Hab. Si-Rambe, Sumatra (*Modigliani*). I possess six examples with the label of the Genoa Museum attached to them.

Apobletes platessæ, sp. n.

Oblongus, parallelus, planatus, piceo-niger, nitidus; fronte punctulata, stria transversa utrinque interrupta; pronoto stria marginali antice interrupta; elytris striis 1-3 integris, 4 basi abbreviata; propygidio utrinque imbricato-punctato; pygidio parum dense et subocellato punctato.

L. $2\frac{3}{4}$ mill.

Oblong, parallel at the sides, flat, pitchy black and shining; the head impressed anteriorly, distinctly but not densely punctulate, lateral stria strong and does not pass beyond the eye, transverse stria very feebly sinuous and on either side rather widely separated from the lateral stria; the thorax, lateral stria well marked, but fine anteriorly and ceasing behind the eyes, lateral border with a few small scattered punctures, base with a small scutellar fovea; the elytra, outer humeral stria complete, inner wanting, oblique basal fine and relatively rather long, 1 dorsal complete but not quite so long apically as the second, 2-3 complete, 4 shortened by about one fifth at the base, all the striæ are nearly parallel one to another, 5 obsolete or consisting of 2 or 3 punctures, sutural absent; the propygidium has a lateral cluster of rather large, shallow, imbricate punctures, with a few very fine points in the centre; the pygidium is somewhat densely punctured, punctures somewhat ocellate and each one clearly separate from another; the prosternum widens out broadly before the coxæ and the anterior lobe is margined at the sides only by a fine stria; the mesosternum is anteriorly bisinuous, but the marginal stria neither meets in front nor does it continue along the sides; the anterior tibiæ are 3-4-dentate.

Hab. Nguela, Usambara.

Liopygus chalcis, sp. n.

Ovatus, depressus, piceo-brunneus, nitidus; fronte punctulata, stria

transversa utrinque interrupta; pronoto lateribus inconspicue punctulato, stria integra; elytris striis 1-3 integris, 4-5 apicalibus; propygidio transversim punctato; prosterno haud striato; mesosterno lato, distincte marginato; tibiis anticis 4-5-dentatis.
L. 3 mill.

Oval, depressed, pitchy brown and shining; the head punctulate, but not closely, slightly impressed behind the transverse stria, which is straight with the ends on either side turned backwards, and it is not connected with the lateral striæ, which are bent and do not extend beyond the eye; the thorax, surface microscopically punctured, punctures more visible along the lateral borders, marginal stria strong laterally and continued behind the head, the stria leaves the margin at the angle, cutting off a triangular space, it then passes along the margin until it passes the eye, when it again leaves the margin and behind the neck leaves a fairly wide border between it and the edge, there is no scutellar fovea. The elytra, there are no humeral striæ except the oblique basal, which is very fine, dorsal striæ, 1 a little abbreviated at the apex, 2 complete and turning a little away from the first at the base, 3 complete but extremely fine at the base, the interstice between it and the second is of the same width throughout, 4 apical and one third of the elytral length, 5 shorter with a wider interstice, sutural wanting. The propygidium has rather large shallow punctures; the pygidium rather deeply bifoveolate and smooth; the prosternum, the anterior lobe is broad, with a marginal stria, which is, however, interrupted at the suture before the keel, keel without striæ; the mesosternum is wide, very feebly sinuous anteriorly, and clearly marginate; the metasternum has a shallow median furrow; the anterior tibiæ are 4-5-dentate.

This species is somewhat similar to *L. Gestroi*, Lew., but the latter is less oval, the thorax more distinctly punctured laterally, the apical margin of the elytra narrowly punctulate, the second dorsal stria widens out at the base from the first in a similar manner, and the second and third are similarly parallel to each other, but the two apical striæ are shorter and the fifth is more distant from the suture. In *L. chalcis* the foveæ in the pygidium are nearly round, in *L. Gestroi* they are transverse.

Hab. Sipora, Mentawai Islands, Sereinu, 5th June, 1894 (*Modigliani*). Two examples, and I have a third labelled "Perak" by Herr J. Schmidt.

Platylister cathayi, sp. n.

Oblongo-ovatus, subdepressus, niger, nitidus; fronte impressa, stria

fere recta; pronoto stria integra; elytris striis 1-3 integris, 4 valde abbreviata, 5 dimidiata, suturali brevissima vel obsoleta; pygidio margine anguste lævi haud conspicue elevato.

L. 5-5½ mill.

Oblong-oval, rather depressed, black and shining; the head impressed anteriorly, transverse stria feebly sinuous, labrum transverse and narrow; the thorax widest at the base, anterior angles moderately depressed, marginal stria complete; the elytra, striæ 1-3 complete, 4 apical, short, and sometimes broken, 5 apical and dimidiate, sutural short, much abbreviated apically, and not reaching the middle of the elytron; the propygidium punctured, the punctures vary in size and are not closely set; the pygidium, the punctures are larger, nearly equal in size, and much more closely and evenly set, the outer margin is smooth but scarcely elevated; the prosternum, anterior lobe striate, stria arched and only marginal anteriorly; the mesosternum, anteriorly rather widely but not deeply emarginate, stria complete; the anterior tibiæ rather strongly 4-dentate.

Differs chiefly from *P. suturalis*, Lew., in its labrum being much more transverse, in its shorter and less defined sutural stria, and in the posterior margin of the pygidium being smooth and scarcely elevated.

Hab. Kuantun, China. Three examples.

Platylister enodis, sp. n.

P. abrupti persimilis, sed differt pygidio fere impunctato et lobo prosterni marginato.

L. 5½ mill.

This species is extremely like *P. abruptus*, Er., the elytral striæ are exactly similar, viz. 1 and 2 complete, 3 interrupted near the middle, but the thorax is rather more transverse, the lateral outline rather less parallel, and there is a conspicuous fovea before the scutellum. The propygidium is smooth, with a shallow impression on either side near the posterior edge, in which there are a few small punctures, and the pygidium on either side near its base has a small cluster of punctures, but it is otherwise smooth and flat. In *P. enodis* the stria of the prosternal anterior lobe is marginal; in *P. abruptus* it is an independent arched stria not following the margin; in *P. enodis* the mesosternum has a slightly wider emargination and the marginal stria is more marked than in *P. abruptus*.

Hab. Mailu, British New Guinea (*Anthony*, July 1897).

Platysoma assamense, sp. n.

Oblongo-ovatum, depressum, nigrum, nitidum; fronte concava, punctata, stria integra; pronoto lateribus dense punctato; elytris striis 1-3 integris, 4 dimidiata, 5 apicali, subhumerali externa brevi, interna punctiformis; pygidio convexo, grosse et dense punctato.

L. $3\frac{1}{2}$ mill.

Oblong-oval, rather flat, black and shining, legs somewhat reddish; the head, forehead and epistoma concave, clearly and evenly, not densely, punctate, stria complete, transverse part nearly straight; the thorax, marginal stria complete, narrowly canaliculate at the sides, fine behind the head, and behind the neck it deviates from the edge, the disc is microscopically and sparsely punctured, but the lateral borders are widely and conspicuously punctate and many of the punctures are much larger than those on the head. The elytra, lateral margins clearly but finely punctulate, striæ, external humeral short and relatively deep and is seen just below the shoulder, the inner humeral is punctiform and evanescent at both ends, 1-3 dorsal complete, 4 dimidiata or faintly traceable beyond the middle, 5 apical and nearly one third of the elytral length, apical margin punctured and very minutely strigose. The propygidium and pygidium are punctate, punctures round and deep, closely set together on the pygidium, less regularly on the propygidium, the pygidium is convex; the prosternum, anterior lobe is marginate and clearly punctured over the whole of its surface, at the base beyond where the marginal stria terminates are some large shallow punctures, and on either side of the keel before the coxæ are similar punctures; the mesosternum anteriorly is widely sinuous, the sinuosity extending almost from angle to angle, anteriorly the marginal stria is fine and close to the edge, the under surface generally is finely punctulate; the anterior tibiæ are 4-dentate.

P. novum, Lew., and *rimarium*, Mars., resemble this species; all have a convex pygidium and the thorax similarly punctured.

Hab. Khasia Hills, Assam.

Platysoma disparile, sp. n.

Oblongo-ovale, subdepressum, piceum, nitidum; fronte leviter impressa, stria transversa utrinque interrupta; pronoto impunctato; elytris striis 1-2 integris, 3 late interrupta; pygidio punctato; tibiis anticis obtuse dentatis.

L. $3\frac{2}{3}$ mill.

Oblong-oval, rather depressed, piceous, shining; the head faintly impressed anteriorly, transverse stria not well-marked and interrupted on either side; the thorax gradually narrowed from the base to the anterior angles, marginal stria extremely fine and continued round the angle to a point behind the eye, lateral stria almost reaches the marginal behind the anterior angles, surface smooth, with a very small anti-scutellar puncture; the elytra, humeral striæ wanting, save the oblique basal which is very fine, dorsal 1-2 complete and parallel one to another, each turning in a little at the base, 3 widely interrupted in the middle and extremely fine, only seen in certain lights, at the base; the propygidium is transversely and irregularly punctured; the pygidium is more regularly punctate, but the basal edge is narrowly smooth, the sides are a little raised; the prosternum, anterior lobe marginate, keel rather wide; the mesosternum with a well-defined marginal stria and anteriorly widely sinuous; the anterior tibiæ have three large blunt teeth, resembling those of *Hololepta obtusipes*, Mars., and a rudiment of a fourth at the base.

There is no known species of *Platysoma* to which this can well be compared, but it may be placed near *P. sincerum*, Sch.

Hab. Lombok. "Sapit, 2000 feet, April 1896" (*H. Fruhstorfer*).

Pachycærus chlorites, sp. n.

Oblongo-ovatus, subconvexus, viridi-cyanus, nitens; fronte impressa, stria interrupta; pronoto stria marginali integra; elytris striis 1-3 integris, cæteris nullis; pygidio punctato; prosterno bistriato; mesosterno valde prominulo, stria marginali antice interrupta; tibiis anticis 5-dentatis.

L. $5\frac{1}{2}$ mill.

Oblong-oval, rather convex, greenish blue, shining, beneath black; the head rather feebly impressed anteriorly, lateral stria narrowly interrupted over the eyes, oblique anteriorly and not joining in front, surface with some very small scattered irregular punctures; the thorax, marginal stria complete but fine behind the head and close to the margin, surface with a few punctures chiefly at or just behind the anterior angles; the elytra, striæ, outer humeral complete and very distinct, inner basal and dimidiate, oblique basal very fine, dorsal 1-2 complete and not very deeply impressed, 3 finer and although almost complete has a tendency to be evanescent behind the middle, 4, 5, and sutural are wanting; the propygidium is faintly impressed on either side of the posterior edge, surface distinctly but not closely punctured;

the pygidium similarly but rather more evenly punctured; the prosternum is bistriate, striae rather fine, scarcely divergent anteriorly, but widen out a little behind, keel, anterior lobe smooth, a few fine punctures only are seen under the microscope; the mesosternum is markedly prominent anteriorly and has a lateral well-defined marginal stria, but it is not continued along the projection; the anterior tibiæ are 5-dentate.

This species should be placed close to *P. elegans*, Lew., both having a very prominent mesosternum, but superficially it resembles *P. chalybeus* in colour and outline, being in the first character somewhat bluer and in the second somewhat more oval. It is remarkable in having only three dorsal striae.

Hab. S. Thomas I., Gulf of Guinea (*Mocquerys*, 1900). One example.

PROBOLOSTERNUS, gen. nov.

Body oval, rather convex; head retractile, forehead without a transverse stria, labrum transverse, mandibles acute at the tips; antennæ inserted below the frontal margin, club oval, and when at rest is received into a fovea under the thoracic angle like that in the genus *Pachycærus*; the thorax is transverse, arched at the sides, gradually narrowed to the anterior angle, anterior angles somewhat acute, marginal stria extremely fine and not passing behind the head, lateral stria complete close to the edge, leaving only a narrow lateral rim; the elytra, epipleuræ finely striate, the interstice between the inner humeral and first dorsal stria is wide at the base; the propygidium is very large, hexagonal, and convex; the pygidium is also rather large and semicircular in outline behind, but being deflected it is invisible from above; the prosternum, the keel is narrow, bistriate, and incised at the base; the mesosternum is very prominent anteriorly, and from its base is arched at its sides and is sharply pointed anteriorly where it fits into the base of the narrow prosternal keel, the marginal stria is more or less fine but entire; the tibiæ are all dilated, the outer edge of the anterior pair is bowed and multidentate; the tarsi are short with two claws and the tarsal grooves are nearly straight. The curious form of the mesosternum is shown in fig. 1 (p. 277), which is drawn from an example of *P. permundus*.

Probolosternus africanus, sp. n.

Ovalis, parum convexus, niger, nitidus, supra leviter punctulatus; elytris striis dorsalibus 1-3 integris, 4 antice interrupta, 5 apicali,

suturali basi abbreviata; prosterno bistriato; mesosterno stria marginali antice tenuissime impressa; tibiis anticis multidenticulatis.

L. 7 mill.

Oval, rather convex, black and shining; the head rather finely and rather closely punctulate, epistoma transverse and flat, lateral stria fine and not passing behind the epistoma; the thorax, lateral stria close to the margin and continued behind the head, surface clearly punctulate, but the punctures are rather less dense than those of the head. The elytra, surface punctulate like that of the thorax; striæ, outer humeral fine and complete, inner also complete with its outer edge at the base a little raised, 1-3 dorsal complete with the outer edges somewhat raised, especially those of the first and second striæ, 4 fine and shortened before the base, 5 apical evanescent and punctiform, sutural fine and evanescent before the base and in the middle it bends a little away from the suture. The propygidium and pygidium are much more distinctly punctured than the head; the prosternum is bistrate, striæ are fine and gradually diverge posteriorly along the narrow keel; the mesosternum is acutely pointed in front fitting into the incision in the prosternum; there is a very fine marginal stria only to be seen in front in certain lights; the metasternum has a well-marked lateral stria and the suture is shown by a straight stria; the tibiæ are all dilated, anterior pair bowed on the outer edge, along which are small, evenly set denticulations (about 16 or 17 in number); intermediate and posterior tibiæ are spinose, the spines are somewhat irregular and not closely set together.

The size and the incomplete sutural stria will distinguish this species from the two following.

Hab. W. Guinea.

Probolosternus permundus, sp. n. (Pl. X. fig. 4.)

Ovalis, parum convexus, niger, nitidus; fronte punctulata, antice leviter impressa; elytris striis 1-4 suturalique integris, 4 cum suturali arcuatim connexa, 5 antice abbreviata; prosterno bistriato, striis basi divergentibus; mesosterno stria marginali integra.

L. $4\frac{1}{2}$ mill.

Oval, rather convex, black and shining; the head lightly impressed behind the epistoma, surface punctulate, lateral stria fine; the thorax, lateral stria continued behind the head, surface punctulate. The elytra sparsely punctulate especially in the apical region; striæ, outer humeral very fine and

complete, inner humeral and 1-3 dorsal strong, complete, and similar in having the outer edge somewhat elevated, the third dorsal is rather less strong than the second, 4 dorsal and the sutural are fine and almost complete, being joined anteriorly, but they are slightly shortened apically, 5 dorsal is apical,

Fig. 1.



Probolosternus permundus, Lew.

fine, and reaches just beyond the middle. The propygidium and pygidium are clearly punctulate; the prosternum is bistriate, striæ divergent posteriorly; the mesosternum is like that of the last species, except that the fine marginal stria is conspicuously complete anteriorly; the metasternum is striate laterally and the suture is marked by a fine transverse stria; the legs are similar to those of *P. africanus*.

Hab. Kuilu, French Congo (*Mocquerys*, 1892).

Probolosternus minor, sp. n.

Ovalis, parum convexus, niger, nitidus; fronte punctulata, stria laterali perspicue angulata; pronoto stria laterali integra; elytris striis 1-4 suturalique integris, 4 cum suturali arcuatim connexa, 5 basi abbreviata; prosterno bistriato, striis utrinque divergentibus; mesosterno stria marginali antice integra.

L. 3 mill.

Oval, rather convex, black and shining; the head punctulate, punctures varying in size, with very minute points intermixed, lateral stria rather strong and very distinctly angulate in the middle, area behind the epistoma is very faintly impressed; the thorax punctured like the head, except along the base, where the punctures are larger, lateral stria entire and feebly crenulate behind the neck; the elytra, the striæ resemble those of *P. permundus*, except that the fourth and sutural are not shortened at the apex, the surface punctuation is only seen under the microscope and consists of extremely fine points; the propygidium is margined laterally with a very fine stria, surface clearly not closely punctate, with very fine points intermixed; the pygidium is curiously

punctured, the punctures are very irregular, some crescent-shaped, some semicircular but not close together, and these again are mixed with fine points, the apex is margined by a fine stria; the prosternum is bistriate, the striæ are divergent before and behind; the mesosternum is outwardly margined by a rather fine stria complete anteriorly, the suture between it and the metasternum is marked by a straight crenulate stria, the latter segment has a few imbricate punctures along its base, the punctures being most numerous at the sides; the legs are similar to those of the last species.

The small size, prosternal striæ divergent at both ends, and the crenulate metasternal stria are characters which easily separate this species from the last. The stria on the pygidium is not very easy to see.

Hab. Kailu, French Congo (*Mocquerys*, 1892).

EPITOXUS, gen. nov.

Body oval or suborbicular, convex; the head retractile, frontal stria complete; the thorax with an impression before the scutellum more or less distinctly arcuate or biarcuate; the elytra with six dorsal striæ, the fourth and sutural sometimes joining at the base; the propygidium is transverse, the pygidium semicircular and declined, the prosternum bistriate, and the anterior tibiæ multispinose. The other characters agree with those of *Phelister*. Type *Phelister circelifrons*, Mars.

There are five species known which should be placed in this genus: three have the sutural dorsal striæ shortened, viz. *Phelister circelifrons*, Mars., *hilarulus*, Lew., and the species described below; while *P. brevisculus*, Fähr., and *nitidus*, Lew., have the fourth and sutural dorsal striæ complete and joined at the base. Of *P. circelifrons* and *brevisculus* there are excellent figures in Marsuel's monograph.

Epitoxus corycaeus, sp. n.

Ovalis, parum convexus, niger, nitidus; fronte stria integra, antice fere recta; pronoto lateribus punctato, ante scutellum biarcuatim impresso; elytris striis 1-3 integris, 4-5 brevibus, suturali paululum obliqua, dimidiata; pygidio punctulato; prosterno bistriato; mesosterno marginato.

L. $4\frac{3}{4}$ mill.

Oval, rather convex, black and shining; the head, forehead smooth, stria complete, not strong, feebly sinuous behind the mandibles, almost straight anteriorly; the thorax, marginal stria complete, lateral border with a band of punctures,

punctures most conspicuous behind the anterior angles, fine at the base, on the basal edge before the scutellum are two arched impressions free of punctures; the elytra, outer humeral stria apical and scarcely dimidiate, inner wanting, oblique basal very fine and close to the first dorsal, dorsal 1-3 complete, 4 apical but reaching the middle and it has a short basal appendage, 5 apical very short and somewhat punctiform, sutural apical but reaching quite to the middle and from the apex the striæ diverge from the suture, its base is indicated by a puncture; the propygidium is distinctly punctured at the sides and minute punctures are intermixed with the larger ones, the minute punctures alone extend over the disc; the pygidium is similarly but less conspicuously punctured, and on either side near the middle of the margin is a fovea; the prosternum is bistrate, the striæ do not meet anteriorly and they diverge posteriorly from the coxæ to the base; the mesosternum is bisinuous anteriorly and narrowly transverse, its posterior limit is marked by a bent not crenulate stria.

Differs from *circulifrons*, Mars., in size, more oval outline, less convex form above, frontal stria less strong and not semicircular, and the thoracic scutellar impression is distinctly biarcuate and free of punctures.

Hab. Kuilu, French Congo (*Mocquerys*, 1892).

Hister mombasanus, sp. n.

Oblongo-ovalis, convexus, niger, nitidus; fronte punctata, stria integra antice recta; pronoto lateribus bistrate; elytris striis 1-3 integris, 4 apicali dimidiata, 5 brevissima, suturali utrinque abbreviata; propygidio pygidioque dense punctatis; mesosterno antice marginato; tibiis antice 3-dentatis.

L. 7 mill.

Oblong-oval, convex, black and shining; the head punctulate at the base, rather densely and rugosely punctate behind the stria, stria complete and straight anteriorly, epistoma and mandibles also densely and rugosely punctured, the last are not marginate; the thorax, lateral marginal stria extremely fine, external lateral ceasing behind the eye, interstice narrow, internal, feebly sinuous laterally, complete behind the head, and distinctly sinuous behind the eyes, interstice rather wide and punctulate, with some irregular striæ or rugosities at and behind the anterior angle, the sides are microscopically punctulate; the elytra, striæ, external humeral wanting, internal apical and dimidiate, oblique basal extends outwardly beyond the inner humeral, dorsal striæ 1-3 complete and rather wide, best marked on the edge,

interstices distinctly punctulate, 4 much less in width, apical and dimidiate, 5 represented by a short apical line or puncture, sutural shortened a little before the apex, extending just beyond the middle and slightly turning from the suture at either end; the propygidium and pygidium are wholly and coarsely punctured, but without impressions; the prosternum, the lobe is partly punctured and has a bordering stria, which is close to the edge at the apex; the mesosternum is very feebly sinuous anteriorly and the marginal stria is complete; the anterior tibiæ are punctured and 3-dentate.

This species belongs to the *H. longicollis*, Mars., group.

Hab. Makeré, Mombasa.

Hister zambesius, sp. n.

Ovalis, convexus, niger, nitidus; fronte impunctata, stria integra; pronoto lateribus bistriato; elytris striis 1-4 integris, 5 basi abbreviata, suturali vix abbreviata; propygidio pygidioque dense punctatis; tibiis anticis 3-dentatis.

L. 7-7½ mill.

Oval, convex, black and shining; the head impunctate, stria strong and complete, anteriorly nearly straight, labrum transverse, mandibles impunctate; the thorax, marginal stria very fine, outer lateral stria terminates after passing the anterior angle, feebly sinuous in the middle, outer interstice impunctate, inner lateral straight and continued behind the head, interstice roughly punctate behind the anterior angle and there is a small cluster of punctures anteriorly just within the inner thoracic stria, the scutellar fovea is fine and linear; the elytra, striæ, outer humeral is represented by a very short median sulcus, inner humeral is complete, oblique basal inconspicuous, 1-4 dorsal complete, somewhat wide, with all the interstices more or less irregularly punctured, especially near the apices, 5 stria is straight and shortened before the base, sutural is bent and a little longer; the propygidium and pygidium are evenly and closely punctured, both are without impressions; the sterna resemble those in the last species; the anterior tibiæ are 3-dentate.

This, like the last species, also belongs to the *H. longicollis* group.

Hab. N. Batoka, Zambesi: December 1895.

Hister angoniensis, sp. n.

Suborbiculatus, convexus, niger, nitidus; fronte biimpressa, punctulata, stria carinata antice recta; pronoto striis 2 lateralibus

validis, integris; elytris striis 1-3 et subhumerali interna similiter integris; mesosterno in medio foveolato; tibiis anticis valde 3-dentatis.

L. $5\frac{3}{4}$ mill.

Suborbicular, convex, black and shining; the head, surface uneven and punctulate, with two impressions behind the frontal stria, frontal stria cariniform and straight anteriorly, epistoma transversely concave, labrum robustly carinate, mandibles concave above with the rims elevated; the thorax gradually narrowed from base to anterior angles, angles depressed and somewhat acute, marginal stria fine, somewhat carinate, especially behind the anterior angles, and ceasing anteriorly behind the eyes, there are two lateral striæ parallel to one another, both strong, with the interstices a little raised, the outer lateral ceases after passing the anterior angle, the inner continues as far behind the head as the marginal stria, and where the two ends overlap they enclose a narrow space in which there is a small but well-marked puncture. The elytra are wider than the thorax and have each four strong and complete striæ with crenulate edges; the outer of these striæ is evidently the inner humeral stria, because the short oblique basal stria is seen between it and the next stria, the four striæ all widen out a little at the base, stria 4 is indicated by a short apical line only, 5 wanting, sutural faint, not reaching the base but extending to the middle. The propygidium and pygidium are rather densely punctured, but the apex of the latter is narrowly smooth; the prosternum, lobe punctured, the lateral striæ meet at the apex; the mesosternum is truncate, the marginal stria complete and in the middle there is a conspicuous oval fovea; the anterior tibiæ are 3-dentate, the apical tooth being very broad and prominent.

This is a remarkable species, both from its general form and also for the inner subhumeral stria being similar to the first dorsal stria. Its position in the genus should be near *H. ignavus*, Mars., and *H. Marshalli*, Lew. The latter figured here (Pl. X. fig. 8) also has an inner subhumeral stria similarly formed to the first dorsal.

Hab. Zomba, Upper Shire River, Angoni, 3000 feet: 10th Dec., 1895 (*Dr. P. Rendell*).

Hister brahminius, sp. n.

H. pteromalo simillimus, sed major, elytris striis subhumerali interna vix dimidiata, 1-2 dorsalibus integris, 3 postice abbreviata, et mesosterno antice distincte emarginato.

L. 10 mill.

This species very closely resembles *H. pteromalus*, Mars., but it is considerably larger, the external thoracic lateral stria is longer, the inner subhumeral elytral stria is rather fine but distinct, it does not quite reach the apex and anteriorly it does not quite reach the middle, the second dorsal stria is complete, and the mesosternum anteriorly is very distinctly emarginate. It also very closely resembles *H. divisifrons*, Sch., but it again differs as regards size; it agrees with the latter in having rather a longer external thoracic stria behind the anterior angle, and in having an internal subhumeral elytral stria. In *H. divisifrons* the subhumeral stria is longer and much deeper. The dorsal striæ in Schmidt's species are much stronger, and the third dorsal is widely interrupted in the middle; in *H. brahminius* the third dorsal is only basal, that is, there is no appendage. The mesosternum is anteriorly sinuous in *H. pteromalus*, slightly emarginate in *H. divisifrons*, and distinctly emarginate in *H. brahminius*.

Hab. Ceylon (*Andrew Murray*).

Hister "*nanus*, Mars.," Reitt. Deutsche ent. Zeit. p. 209 (1879). E. Siberia.

This species is, I have no doubt, the same as *H. niponicus*, Lew., 1895. Reitter's name of *nanus* is a misprint for *navus*, Mars.

Hister frontalis, sp. n.

Ovalis, parum convexus, niger, nitidus; fronte biloba, stria valida antice recta; pronoto stria marginali antice interrupta, interna sinuata basi adunca; elytris striis 1 et 3 integris, 2 et 4 basi haud attingentibus, 5 apicali, suturali dimidiata; mesosterno emarginato, stria marginali integra; tibiis anticis 3-dentatis.

L. $5\frac{1}{4}$ mill.

Oval, rather convex, black and shining; the head is feebly divided into two lobes by a median impression, which widens out triangularly behind the stria, stria strong and straight anteriorly, surface inclosed by the stria is punctulate; the thorax, marginal stria fine and interrupted in front behind the head, outer stria very short, little irregular, and confined to the region behind the anterior angle, inner stria complete, rather strong, and sinuous laterally, and at the base it turns away from the posterior angle, the scutellar point is small and on the basal edge; the elytra, striæ, outer humeral wanting, oblique basal fine and nearly reaching the middle, a line of

rather obscure punctures represents the inner humeral, 1 and 3 dorsal complete, the first turning inwards at the base, 2 and 4 nearly complete, being a very little shortened at the base, 5 nearly dimidiate and apical, sutural nearly twice the length of the fourth; the propygidium is impressed on either side, clearly but not densely punctate; the pygidium, the punctures are similar but are arranged chiefly along the base; the prosternum, the anterior lobe at the apex is margined with a stria, but the stria leaves the edge laterally and passes obliquely down the sides; the mesosternum is rather widely emarginate and the marginal stria is complete; the metasternum is longitudinally sulcate in the middle; the anterior tibiæ are 3-dentate.

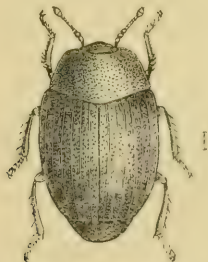
Hister bifrons, Mars., agrees with this species in the form of the head, but in *H. frontalis* the thorax is not bisinuous, there is a short stria at the angle, the outer subhumeral stria is wanting, the pygidium is not so densely punctured, and the mesosternum is emarginate not straight.

Hab. Khasia Hills, Assam.

Stictostix parra, Mars. Ann. Soc. Ent. Belg. xiii. p. 92 (1870).

As there are now four species assigned to the genus *Stictostix* from Australia and two from North America, I have thought it desirable to give a figure of the type of the genus, *S. parra*, Mars. (fig. 2). All the species are highly sculptured, but nothing as yet has been recorded of their habits.

Fig. 2.



Stictostix parra, Mars.

NOTOCÆLIS, gen. nov.

Body oblong, gibbous in the dorsal region; head retractile and declivous, frontal stria carinate; the thorax contracted at the base, with the disk almost wholly excavated; the elytra

costate; propygidium very large and hexagonal; prosternum narrow and bistriate; mesosternum anteriorly truncate, stria complete on the margin; the tibiæ are all widely dilated. This genus may be placed near to *Discoscelis*. In establishing a genus on a single species it is impossible to give many generic characters.

Notocælis satur, sp. n. (Pl. X. fig. 9.)

Oblongus, postice gibbus, rufo-brunneus; fronte striata, stria marginali carinata; pronoto disco perample excavato; elytris 4-costatis; propygidio longitudinaliter striato; pygidio punctulato; tibiis valde dilatatis.

L. $2\frac{1}{2}$ mill.

Oblong, gibbous in the dorsal region, dark reddish brown, somewhat shining; the head declivous and not visible from above, forehead transverse and flat, anterior edge sinuous before the eyes, frontal stria complete and carinate anteriorly, surface with fine, irregular, transverse striæ and some obscure shallow punctures chiefly visible at the sides; the thorax, when viewed from the front a stria is seen behind the neck shaped like a widened-out **V**, and on either side of it are two longitudinal striæ, the thorax viewed from above is seen to be rather spread out and thickened at the sides, marginal stria complete, behind the anterior angles the thorax is longitudinally impressed, and inside the impression is a lateral stria, the disk of the thorax is wholly and deeply excavated except in front of the scutellum, where there is a protuberance, feebly convex on its vertex and ridged and inclined anteriorly, the anterior rim of the excavation is carinate, the excavation is nearly smooth; the scutellum is somewhat elongate, with its base narrowly transverse; the elytra, striæ, outer humeral fine and complete, dorsal are represented by four thick costæ which are punctured along their ridges, the first and second costæ are conspicuously sinuous, the third less so and the sutural costa is only feebly turned from the suture at either end, there is a fine stria along the sutural margin and the apices are rounded off at the suture; the propygidium is large and hexagonal, about half its surface can be seen from above, and it is conspicuously and longitudinally striated; the pygidium is clearly punctulate, but not striate; the prosternum, the keel is narrow and bistriate, the striæ are parallel at the sides and joined at both ends, the anterior lobe is marginate and in front of the coxæ are two semicircular striæ stretching outwards; the mesosternum is straight anteriorly and the marginal stria is strong and continues unbroken along

the base of the metasternum, in the centre of which it is angulate, the suture of the mesosternum is invisible; the legs, anterior tibiæ dilated, external edge nearly semicircular, intermediate and posterior tibiæ externally triangularly dilated, tarsi short with two claws.

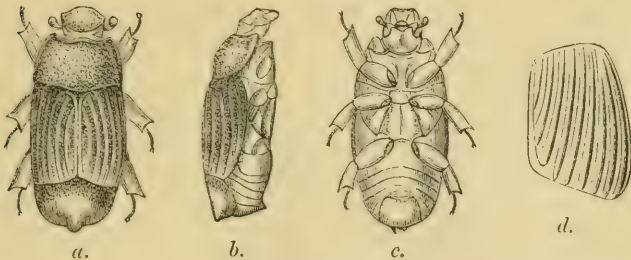
Hab. Paraguay (*Dr. J. Bohls*). Two examples found on the 5th October, 1892, while it was running over a mound made by termites.

SITALIA, gen. nov.

Corpus oblongum, subparallelum, convexum, brunneum; caput inter oculos planum, antennis funiculo brevi sensim incrassato, clava ovali haud compressa; pronotum supra convexum; elytris carinatis (fig. 3 *d*); propygidium postice acuminatum; pygidium declive; prosternum basi incisum, bistriatum; mesosternum in medio minute productum; tibiæ latæ, fossa tarsali parum lata, subrecta, leviter exarata.

While establishing the above genus for the reception of *Paratropus Severini*, Lew. (*Ann. Soc. Ent. Belg.* xxxvi. p. 142, 1892), I have availed myself of M. G. Severin's kind

Fig. 3.



Sitalia Severini, Lew.

loan of the blocks to reproduce the woodcuts made of the species from his original drawings. Only one example of this curious insect is known and no dissections have been made of it.

Homalopygus remex, sp. n. (Pl. X. fig. 10.)

Oblongus, subdepressus, piccus, nitidus; fronte abrupta, tenuissime punctulata; pronoto stria marginali basi abbreviata, laterali obliqua; elytris striis 1 integra, 2-4 inæqualiter abbreviatis, suturali geminata; pygidio punctulato; prosterno bistriato; mesosterno antice biemarginato, stria marginali integra; tibiis valde dilatatis.

L. $2\frac{1}{2}$ mill.

Oblong, rather depressed, piceous, shining; the head very finely punctulate, abruptly declivous anteriorly; the thorax, sides impressed, especially behind the anterior angles, marginal stria very fine, shortened before the base and continued round the anterior angle, behind the neck there is a fine detached stria, not quite close to the edge (this stria appears to be an appendage to the lateral stria), the lateral stria is also fine, commencing at the base a little within the angle and passes obliquely inwards for about three fourths of the thoracic length, on the inside of this stria is another very fine and very short stria, slightly bent; the elytra, striae, outer humeral is shortened apically after passing the middle, inner humeral is complete, both are very fine, dorsal 1 complete, 2-4 are shortened apically, 4 is rather longer than the third, 3 longer than the second, 5 rudimentary or more usually wanting, sutural is geminate and resembles those figured for *H. latipes*, Bohem. (Mars. Mon. 1861, fig. 1); the pygidia are finely and evenly punctulate; the prosternum, keel bistriate, striae divergent anteriorly, less divergent at the base, anterior lobe has a fine marginal stria and a transverse stria marks the suture between the lobe and the keel; the mesosternum is biemarginate, the marginal stria is fine and complete, but it is only near the edge behind the emarginations, at the sides it joins the lateral metasternal stria; the legs are similar to those of *H. latipes*, Bohem.

Marseul's figure of *H. latipes* suggests the idea that the elytral striae are costate, whereas they are very fine, and it is evident that Marseul mistook the inner part of the sutural stria, which is geminate or double, for the fifth stria. In some of my specimens of *H. remex* the fifth stria is represented by a rudiment midway between the sutural and fourth stria. Both species are similar to each other, especially in the form of the mesosternum and legs.

Hab. Paraguay. I have eleven examples, taken by Dr. J. Bohls on the 5th Oct., 1892. "The beetles were running about on the mounds made by termites, some were *in copulâ* and were fairly numerous. Afterwards Dr. Bohls searched several hundreds of termite-mounds, but failed to find other examples either on their surfaces or in the interiors." *Notocelis satur* occurred at the same time.

Terapus muricatus, sp. n. (Pl. X. fig. 12.)

Oblongus, cinereo-niger, undique muricatus; fronte concava; pronoto antico ad angulos explanato; elytris leviter costatis; pygidio in medio conspicue muricato.

L. 4 mill.

Oblong, ashy black, body and legs densely muricate, antennæ obscurely red; the head, forehead concave, concavity somewhat smooth, with a lateral stria on either side which becomes carinate anteriorly and terminates in a tubercle, the mandibles are microscopically striate; the thorax is cut out behind the head in a semicircular form, and the anterior angles are explanate, the marginate stria is visible on the anterior edges of the angles, but it is obliterated laterally by the muricate sculpture; the elytra are costate, the first costa represents the inner humeral stria, the three next the 1-3 dorsal, the fourth is faint, the fifth and sutural are almost obliterated; the propygidium is sculptured like the thorax and the pygidium also, except in the middle where there is a bunch of longer sharp-pointed cones and behind them two lines of small tubercles; the prosternum, the keel is bordered laterally by two rough ridges, which widen out a little from the coxæ to the base, on either side of the keel there is a scooped-out lobe-shaped space which is free of tubercles or muricate sculpture and it is bordered outwardly by a carina, the anterior lobe is rough and tuberculate, the keel has an arch-like incision extending across its base; the mesosternum is bisinuous and bordered by a rough muricate ridge; the legs, anterior tibiæ are straight on the inner edge, somewhat sinuous on the outer, which is armed with 6 or 7 irregular denticulations; the intermediate tibiæ are angulate in the middle of the outer edge, to which point the tarsal grooves extend, outer edge with 11 or 12 irregular teeth, inner edge with small, evenly set, denticulations, posterior tibiæ also angular in the middle and denticulated, the thighs on their upper surface are conspicuously muricate.

This curious species differs much from *Terapus Mniszechi*, Mars., but I do not think it necessary to establish another genus for it. The chief important differences are in the sculpture, in the thorax having explanate angles and not being bisinuous behind the head, in the intermediate and posterior legs being angulate in the middle, and as these angulations are at a point where the tarsal grooves end, the tarsi are relatively longer than in Marseul's species, where the angles are nearer to the tarsal end. In *T. bicarinatus*, Lew., the thorax is not bisinuous and the tarsal grooves are much shorter than those of *T. Mniszechi*, but there is no doubt these last two species are congeneric.

Hab. Paraguay (*Dr. J. Bohls*). One example only.

Saprinus punctisternus, sp. n.

Obscure viridi-æneus, nitidus; fronte transversa, utrinque punctata,

stria integra ; pronoto lateribus basi que punctato ; clytris striis 1-4 dorsalibus in medio postice abbreviatis, suturali basi abbreviata ; prosterno striis integris, subparallelis ; mesosterno marginato, parce et grosse punctato.

L. 9 mill.

Oval, convex, with a slight greenish brassy tinge ; the head and epistoma transverse (like that of *S. semipunctatus*, F.), frontal stria well-marked and complete, vertex punctured, punctures particularly conspicuous near the eyes ; the thorax, marginal stria complete, along the sides is a broad band of rather coarse punctures, which terminate behind the eyes but continue more narrowly along the base nearly to the scutellum, there is a small antiscutellar puncture ; the elytra, dorsal striæ are rather oblique and punctured and in form otherwise closely resemble those of *S. splendens*, Er., figured in Marseul's monograph, fig. 22, but the second and third interstices are smooth, the basal half of each elytron is rather coarsely and closely punctured ; the propygidium is chiefly punctured at the sides ; the pygidium has a fine median raised line and is closely punctured, except at the apex which is nearly smooth ; the prosternum, keel is parallel and formed like that of *S. semipunctatus*, F., lateral striæ are complete and feebly widen out at the base ; the mesosternum is marginate and sparingly but coarsely punctured ; the metasternum has a band of points along its base.

The species belongs to the *semipunctatus*-group, but the punctuation of its mesosternum resembles that of *S. optabilis*, Mars. In most of the large *Saprinini* the mesosterna are smooth. The type specimen of this species is the largest *Saprinus* I have seen.

Hab. Tai-yuen-fu, Shansi : 5th June, 1897. Collector unknown to me.

Saprinus castanipes, Curtis, Trans. Linn. Soc. xix. p. 442 (1845).

An examination of the type specimen in the British Museum proves this species to be the same as *S. fulvopterus*, Mars. Curtis's name has the priority of ten years. Two other species described by Curtis at the same time are *S. Matthewsii* = *S. bisignatus*, Er., 1834, and *S. furcatus* = *S. connectens*, Payk., 1811.

Saprinus læsus, sp. n.

Ovalis, supra æneus, nitidus ; fronte dense punctata ; pronoto haud ciliato ; clytris macula humerali rufa, stria suturali apice

abbreviata antice hamata; mesosterno stria marginali haud interrupta.

L. $3\frac{2}{3}$ mill.

Oval, convex, æneous above and shining, black beneath; the head is closely not coarsely punctured and without frontal striæ; the thorax, marginal stria entire, punctured on the lateral borders, with a small impression behind the eye, much narrowed anteriorly and not ciliate at the sides. The elytra, the humeral area is red, the dorsal striæ, except the sutural, are very short, or wanting (as the fifth), the sutural is shortened before the apex, otherwise it is similar to the sutural stria figured by Marseul for *S. bisignatus*, Er. (Mon. 1855, fig. 13); on either side of the sutural stria, just behind the middle, is a small fovea, the elytral apices are moderately, not densely punctured, the epipleural stria is continued round the apex of each elytron, but it does not quite reach the suture. The prosternum, the striæ on the keel are strong and anteriorly diverge (similarly to those of *S. bisignatus*); the mesosternum is faintly and sparingly punctulate, the marginal stria is complete and widely sinuous, but it is not quite close on the anterior edge; the anterior tibiæ are 7-8-dentate.

This species is easily distinguished from its congeners, *S. bisignatus*, Er., *S. lepidus*, Er., and others, by its red shoulder and complete mesosternal stria.

Hab. Ecuador.

Teretrius Braganzæ, sp. n.

Cylindricus, niger, nitidus, undique punctatus; pronoto stria marginali antice interrupta; prosterno valide bistriato, striis antice sensim divaricatis, lobo antice marginato; mesosterno antice obtuse producto et immarginato; mesosterno metasternoque in medio canaliculatis.

L. 2 mill.

Cylindrical, black and shining, legs and antennæ reddish, surface above rather densely and strongly punctured, many of the punctures appear under the microscope minutely ocellate; the head is rather convex; the thorax, lateral stria well-marked, but it is not continued behind the neck, on the edge before the scutellum there is a cluster of dense punctures; the elytra, the smooth humeral space is very distinct; the prosternum, there is a transverse marginal stria along the apical margin of the anterior lobe, but down the sides there are only a few marginal punctures, the keel and lobe have a very few but conspicuous and irregular punctures, the striæ on the keel are very conspicuous and posteriorly do not quite reach the

base, from the base they are gradually divergent until they cease near the edge of the lobe, the base of the keel is impressed triangularly; the mesosternum is strongly and obtusely produced in front, the projection is immarginate, but at the sides there is an oblique stria which is not, however, joined to the metasternal lateral stria, there is a median canaliculation common to both the meso- and meta-sterna and there is no visible suture between these two segments, the punctures on the sternal plates are large, sparse, and very irregular; the anterior tibiæ are 6-dentate.

This is a very distinct species, but in size and form it resembles *T. Walkeri*, Lew. The chief distinguishing specific characters of all the *Teretrii* are in the sternal plates. I have compared it with the type of *T. corticalis*, Woll.; the last is smaller and of a lighter colour.

Hab. S. Thomas I., Gulf of Guinea (*Mocquerys*, 1900).

Epiechinus Marseuli.

This name is given to *E. hispidus*, Mars., it being clearly evident that the species described as *hispidus*, Payk., in the 'Abeille,' i. p. 70 (1864), cannot be the same as Paykull's species. The latter is described (Mon. p. 98) as having five frontal longitudinal carinæ; the first has the frontal lateral borders raised and one median carina. In my collection there are six Asian species of this genus; Marseul apparently only knew one.

EXPLANATION OF PLATE X.

- Fig.* 1. *Placodes opacus*, Lew.
- Fig.* 2. *Platylister mirabilis*, Lew.
- Fig.* 3. ——— *extrarius*, Lew.
- Fig.* 4. *Probolosternus permundus*, sp. n.
- Fig.* 5. *Baconia loricata*, Lew.
- Fig.* 6. *Phelister festivus*, Lew.
- Fig.* 7. *Notolister sulcicollis*, Lew.
- Fig.* 8. *Hister Marshalli*, Lew.
- Fig.* 9. *Notocaelis satur*, sp. n.
- Fig.* 10. *Homalopygus remex*, sp. n.
- Fig.* 11. *Coprovenus Marshalli*, Lew.
- Fig.* 12. *Terapus muricatus*, sp. n.

Except the new species, those figured in the Plate are described in former numbers of the Ann. & Mag. Nat. Hist.

XXXVI.—Description of Five new Species of Pangoninæ from South America. By Miss GERTRUDE RICARDO.

THE following species were among some Tabanidæ sent me by Dr. K. Kertész, of the Budapest Museum, for comparison with the Walker types in the British Museum collection. He has kindly allowed me to describe these Pangoninæ before returning them to him.

Subfamily PANGONINÆ.

Scione fuscus, ♀, sp. n.

Brown. Face reddish brown, shining and bare. Proboscis more than half as long as the body. Antennæ red, with a green tinge on the first two joints and apex of third; a few short black hairs on the first two joints, chiefly on the underside. Forehead brown, with greyish-red tomentum, and a dark brown central stripe; pubescence short and brown; the ocelli are very distinct. Palpi yellow, the second joint brownish; the two joints about equal in length, the second curved and tapering. Beard white. Eyes hairy. Thorax reddish brown, with two narrow red stripes, at the sides lighter in colour; pubescence brown, longer on the sides. Breast-sides light yellow, with white pubescence and a few brown hairs in the centre. Scutellum reddish brown. Abdomen brown, the first two segments light yellow, with a few irregular black spots, the third yellow on its anterior margin, its posterior half and the remaining ones brown, with irregular black markings; the posterior half of the last segment is yellow; the dorsum of abdomen covered with short black hairs, at the sides a few silvery-white hairs are intermixed with the black ones, beginning from the third segment; the underside of abdomen is light yellow, with a few small, round, black spots. Legs yellow, apex of tarsal joints brown. Wings smoky brown, fore border yellow; there is a clear band across the middle of wing tinged with yellow, comprising the basal half of the marginal and submarginal cells, three quarters of the first posterior cell, and the whole of the discoidal cell; veins brown. Halteres yellow, somewhat brown on the head of club.

Length 11 millim.

Type (♀) from Bolivia (*Songo*).

Scione claripennis, ♀, sp. n.

This species is allied to *S. maculipennis*, Schiner (*Dichia maculipennis*), but differs in having clear wings, cross-veins not shadowed, and no spots.

Brown. Face brown, greyish on the lower part near mouth and at the sides, with brown pubescence. Antennæ brown, the basal half of the third joint bright red, the first two joints with long brown hairs. Forehead fawn-coloured, with a large, almost square, dark brown spot, not reaching the sides; a central dark line extends from it to the ocelligerous tubercle, which is also brown, as is the pubescence on the forehead. Palpi red, the two joints about equal in length, the second curved and tapering. Beard white. Eyes hairy. Thorax with three grey stripes; the side ones do not reach the border, but join the central stripe; at about half their length a branch stripe begins, which is extended to the shoulders; pubescence on dorsum and sides brown, yellowish-white tufts at base of wings; breast-sides brown, with tufts of white and brown hairs. Scutellum brown, grey in the middle and on the margin, with white hairs in the centre and brown ones on the margin. Abdomen brown, with tufts of white hairs on the posterior borders of segments in centre, forming an irregular stripe; the first three segments are yellowish, with dark markings, the posterior borders of the following dark brown segments are lighter in colour; the pubescence consists of black hairs, except on the posterior border of second segment, where they are white; the sides of segments 2, 3, 4, 5 have white hairs; underside of abdomen yellow, with dark markings and bands of yellow on the posterior borders, the last segments almost wholly black. Legs black, knees yellow, the basal half of the anterior and middle tibiæ brown, coxæ and femora clothed with long black hairs. Wings hyaline; at the base and on the fore border, extending also to the cross-veins of the basal cells, is a slight yellowish tinge.

Length $10\frac{1}{2}$ millim.

Type (♀), Peru (*Callanga*).

PANGONIA, Latr.

Erephrosis niger, ♂, sp. n.

Black. Antennæ black, the third joint dull red, with black segmentations, first and second joints with black hairs. Palpi and face black, the latter with the second joint longer

than the first, tapering to a point. Proboscis nearly as long as body. Beard brown above, grey below. Thorax and scutellum dull brown, with sparse black pubescence and a white tuft of hairs at the base of wings; the pleuræ fringed with white hairs. Abdomen black and shining; a white tuft of hairs on the lateral margins of the last two segments, the other segments bordered at the sides with black hairs. Legs black, the fore tibiæ and tarsi dull brown, with fulvous pubescence on the underside of the first tarsal joint; the last tarsal joint of posterior legs is reddish. Wings grey, at base and on fore border yellowish; a white oblong spot at the extreme base of the wing, another at the root of the first basal cell, and a short white line between the first and second longitudinal veins, starting from the root of the latter; veins yellow, no appendix.

Length 14 millim.; proboscis 11 millim.

Type (♂) from Surinam, S. America.

Erephrosia rufopilosis, ♀, sp. n.

Dark brown. Antennæ and face black, the latter with a band of ashy-grey tomentum below the antennæ. Palpi black, long, extending far beyond the face; the second joint nearly twice as long as the first, broad at the base, with a deep furrow on the outer side, tapering to a point, edged with black pubescence. Forehead brown, covered with rather long black pubescence. Beard black. Thorax with long brown hairs on the anterior half and on the sides; scutellum reddish brown; a thick tuft of black hairs at base of wings. Abdomen dark brown, the first three segments somewhat reddish; with bright orange-red pubescence on the sides of the segments, widest on the second segment, becoming a transverse fringe on the posterior margins of the fourth and fifth segments, and appearing as scattered hairs on the dorsum of the posterior segments; underside black and shining, the orange hairs appearing on the extreme lateral margins only. Legs black, the anterior coxæ with greyish pubescence; the femora and tibiæ fringed with long black hairs, thickest on the anterior ones, some fulvous pubescence on the underside of the tarsi. Wings brown, yellow on fore border and at base, with lighter centres to the cells on the posterior border and two white spots at the base of the wing, besides a white streak between the first and second longitudinal vein; an appendix on the branch of the third longitudinal vein.

Length 16 millim.; proboscis 8 millim.

Type (♀) from Bolivia (*Songo*).

This species resembles *Erephrosis rufo-hirta*, Walker, and other Brazilian species in the shape of the abdomen and general appearance (see Ann. & Mag. Nat. Hist. (7) v. p. 175, 1900).

Erephrosis rufescens, ♀, sp. n.

Two females from Peru (*Callanga*) and Bolivia (*Songo*).

This species should belong to *Scione*, Walker (*Diclisia*, Schiner), having the fourth posterior cell closed; but as it does not agree with the description of the genus in any other particulars and has all the appearance of a true *Pangonia* (Latr.), it seems best to include it for the present under *Pangonia* (Latr.) (see Ann. & Mag. Nat. Hist. (7) v. p. 104, for similar cases).

Reddish brown. Antennæ dull red, lighter at the apex, with black segmentations; the first joint stout, nearly three times as long as the second, both with black hairs at the sides. Face and palpi brown, with fawn-coloured tomentum, the latter curved; the second joint longer than the first, broad, ending in a point bordered with black pubescence. Forehead reddish, fulvous at the sides bordering the eyes, with short black pubescence. Beard black, thin, with a few red hairs. Thorax brown; scutellum red: both with short fulvous pubescence. Abdomen red, shining, with irregular black markings and orange-red pubescence on the lateral margins, becoming thicker on the apex. Legs red; the coxæ brown, with black pubescence; the femora reddish brown, with short black pubescence; the anterior and posterior tibiae and tarsi with some reddish pubescence. Wings hyaline, tinged with yellow on the fore border; no appendix; fourth posterior cell closed.

Length 17 millim.; proboscis 7 millim.

Type (♀) from Peru (*Callanga*).

XXXVII.—*Descriptions of new Rodents from Western South America.* By OLDFIELD THOMAS.

Sciurus (Microsciurus) Simonsi, sp. n.

Size as usual in this group. General colour above grizzled olivaceous, about as in *S. Alfari*, though slightly darker. Under surface also very much as in that species, the hairs tipped with buffy, not ferruginous. Sides of nose yellowish.

Eyes with marked yellowish rings round them. Ears well-haired, without lighter spots behind them, dark rusty red. Feet grizzled yellowish. Tail fairly long-haired, the hairs ringed black and reddish basally, with black subterminal and dull yellow terminal rings.

Skull slightly larger than in *S. Alfari*; nasals decidedly shorter, their posterior edge directly transverse, some distance in front of the termination of the premaxillary processes. Molars larger than in the allied species.

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

Head and body 138 millim.; tail 112; hind foot, s. u. 35, c. u. 38; ear 16.

Skull: greatest length 38·8; basilar length 29; greatest breadth 23·5; nasals 9·4 × 5; interorbital breadth 14; tip to tip of postorbital processes 20; palate length from henselion 16; diastema (to front of *p.*⁴) 9; length of tooth-series (excluding the minute *p.*³) 6·3.

Hab. Porvenir, near Zaparal, Province of Bolivar, Ecuador. Altitude 1500 m.

Type. Female. B.M. no. 99. 9. 9. 12. Original number 261. Collected 16th March, 1899, by Mr. Perry O. Simons.

Of the seven species and subspecies of the subgenus *Microsciurus* represented in the British Museum, *S. Simonsi* is undoubtedly nearest to the Costa-Rican *S. Alfari*, Allen, but differs by its rusty red ears, more prominent eye-rings, shorter nasals, larger molars, and widely different locality.

Sciurus (Microsciurus) peruanus napi, subsp. n.

Quite like *S. peruanus* of N.W. Peru in the general olivaceous colour, absence of eye-rings, white patches on and behind ears, and other characters, but distinguished by the coloration of the belly, which, instead of being fairly defined yellowish rufous, is only faintly and indistinctly suffused with the same colour, the dark bases to the hairs giving the general tone to the under surface.

Skull as in true *S. peruanus*, but the nasals apparently rather shorter and more oval.

Dimensions of the type (measured in skin):—

Head and body 157 millim.; tail (broken at tip); hind foot s. u. 34; ear 12.

Skull: greatest breadth 21; nasals 9 × 5; interorbital breadth 13; diastema 8; length of upper tooth-series (excluding *p.*³) 6.

Hab. Mouth of Coca River, Upper Rio Napo.

Type. Female, slightly immature. B.M. no. 0. 6. 3. 6.

Collected June 1899 and presented by Walter Goodfellow, Esq. A second specimen, labelled as from the Rio Napo, has been in the Museum since 1875.

Phyllotis amicus and its subspecies.

After obtaining the specimens of this species—at Eten, Reque, and Tolon—mentioned in the original description*, Mr. Simons collected a number further inland and higher up at Uramarca, on the River Ushpe, not far from Pallasca. The three localities (for Eten and Reque may be treated as one) are all approximately at the same latitude; but the first is on the coast, in the desert region, at an altitude of only 20–50 metres, the second, Tolon, about 60 miles inland at 100 metres, and the last is at about 1200 metres on the Andean chain.

On comparing the three sets it proves that the coast specimens are smaller and paler in colour than the middle, typical, set from Tolon, while, on the other hand, those from Uramarca are larger, with longer tails and, especially, much larger ears. Further south, on the Shigray River, Tambo (1600 metres), and at Marca (2000 metres), the same large long-eared form occurs, while at Chosica, near Lima, at 850 m., the local representative of *Ph. amicus* is again much like that found at Tolon.

It would therefore seem that along the higher level (1200–2000 m.) from about lat. 7° to 12° S., the long-eared form occurs, that the intermediate typical one ranges along the middle altitudes (100–850 m.), while the Eten one may also hereafter be found to occur further southwards along the coast, perhaps to Callao.

The subspecies may be briefly distinguished as follows:—

Phyllotis amicus maritimus, subsp. n.

Size small (head and body averaging 78·5 millim. in six specimens); tail short (96·6); ears short (22·25).

Colour paler and more sandy than in the typical form, especially posteriorly; approximating to the darker specimens of the desert species *Ph. gerbillus*.

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

Head and body 80 millim.; tail 100; hind foot 22; ear 22·5.

Skull: basilar length 17·1.

* Ann. & Mag. Nat. Hist. (7) v. p. 355 (1900).

Hab. Eten, coast of N.W. Peru. Altitude 20 m.

Type. Male. B.M. no. 0. 3. 1. 62. Original number 589. Collected 16th September, 1899, by Mr. P. O. Simons.

Phyllotis amicus (typical).

Average measurements of five specimens from the type locality, Tolon, altitude 100 m. :—

Head and body 85·2 millim.; tail 100; hind foot 22·6; ear 22·6.

Colour rather darker than in either of the other subspecies.

Phyllotis amicus montanus, subsp. n.

Size comparatively large (average of four specimens: head and body 90 millim.; hind foot 24); tail long (average 117·5); ears very large (average 24·75).

Colour about as in the typical subspecies or slightly paler.

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

Head and body 93 millim.; tail 122; hind foot 24; ear 26.

Skull: basilar length 19·3.

Hab. Uramarca, near Pallasca, N.W. Peru. Altitude 1200 m.

Type. Female. B.M. no. 0. 6. 6. 28. Original number 760. Collected 7th December, 1899, by Mr. P. O. Simons.

The four Tambo and Marca specimens of *Ph. a. montanus* have the following average measurements :—

Head and body 90 millim.; tail 111; hind foot 22·75; ear 24·75.

The two from Chosica, near Lima, which I refer to the typical *Ph. amicus* :—

Head and body 85 millim.; tail 107·5; hind foot 23; ear 22·5.

Eligmodontia sorella, sp. n.

A medium-tailed fawn-coloured species with long soft hair.

Size rather less than in *Mus musculus*. Fur long, smooth, very soft and fine, the ordinary fur about 9 millim. long on the back and 6–7 millim. on the belly, and profusely mixed with longer hairs about 16 millim. in length. General colour sandy fawn, darker and closely lined with black on the back, clearer on the sides, where there is a well-defined fawn-coloured line edging the white of the belly. Tips of

the longer dorsal hairs shining silvery. Under surface whitish, the hairs visibly slaty grey basally, white terminally; line of demarcation on sides well marked. Face slightly greyer than back. Ears of medium length, their visible surface when folded brownish fawn; a marked white patch behind their posterior bases. Upper surface of hands and feet uniformly pure white; proximal third of soles thinly hairy; fifth hind toe reaching to the middle of the basal phalanx of the fourth. Tail rather shorter than head and body, uniformly closely haired, so as to hide the scales, not pencilled; brownish fawn above, darkening nearly to black at the tips, white below and on the sides.

Skull delicate and papery; nasals and premaxillary processes of equal extension behind; interorbital region flat, its edges square but not beaded; palatal foramina long, reaching backwards to the middle of *m.*¹; bullæ small.

Dimensions of the type (which is adult, but not old), measured by collector in the flesh:—

Head and body 72 millim.; tail 62; hind foot 18 (c. u. 19.5); ear 17.

Skull: greatest length 22.7; basilar length 17.2; zygomatic breadth 10.7; nasals 8.8 × 3; interorbital breadth 3.7; breadth of brain-case 11.0; interparietal 2.2 × 8.5; diastema 5.7; palatine foramina 5.5 × 2; length of upper molar series 3.5.

Hab. Eight miles south of Huamachuca, N.W. Peru. Altitude 3500 m.

Type. Female. B.M. no. 0. 6. 6. 29. Original number 741. Collected 28th November, 1899, by Mr. Perry O. Simons.

This pretty little mouse has no near relationship to the *E. lepida** of Central Peru, which is one of the very short-tailed species, but is most closely allied to the Argentine and Paraguayan *E. lancha*, Desm., from which it differs by its longer and softer fur, more fawny colour, longer and slenderer feet, and other details.

Oxymycterus inca, sp. n.

Size rather large, not quite equal to the large Brazilian species, but greater than in *O. rufus* of Paraguay or La Plata. Fur coarse, rather short; hairs on back 11–12 millim. in length. General colour rufous chestnut, more grizzled into black along the centre of the face and dorsal area, more

* *Hesperomys bimaculatus*, var. *lepidus*, Thos. P. Z. S. 1884, p. 454, pl. xlii. fig. 2.

uniform reddish on the sides. Ears well haired, blackish brown. Chin prominently contrasted white; whole remainder of under surface rich ochraceous rufous, not defined laterally from the red of the sides; bases of the hairs indistinctly plumbeous. Upper surface of hands and feet blackish brown. Tail well haired throughout, blackish brown, slightly lighter along the median line below.

Skull long, the muzzle of the peculiar trumpet-shape characteristic of the large Brazilian species of the *O. hispidus* group. Nasals long, broadest anteriorly, reaching backwards to the level of the front edge of the anteorbital bridge; supra-orbital edges as usual, not beaded or ridged, but there is a slight angular projection in the position of the postorbital processes, whence parietal ridges run nearly directly backwards, giving the brain-case an oblong parallel-sided appearance; interparietal well developed; anterior zygoma-root much slanted backwards; palatal foramina large, widely open, extending backward to the middle of *m*.¹.

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

Head and body 135 millim.; tail 105; hind foot, s. u. 30, c. u. 33; ear 21.

Skull: greatest length 38; basilar length 30; zygomatic breadth 18; nasals 14.3×5 ; interorbital breadth 6.7; tip to tip of rudimentary postorbital processes 11.7; interparietal 2.6×6 ; diastema 9; palatal foramina 8×3.2 ; length of upper molar series 5.7.

Hab. Perené, Ucayali watershed, Department of Junin, E. Peru. Altitude 800 m.

Type. Male. B.M. no. 0. 7. 7. 45. Original number 925. Collected 10th April, 1900, by Mr. P. O. Simons. Four specimens examined.

This is the first Peruvian *Oxymycterus* described. Its size and cranial characters will readily distinguish it from any known species.

In the same collection, Mr. Simons secured at Galéra, the highest point of the Oroya railway, altitude 4800 m., an example of the remarkable *Neotomys ebriosus*, Thos., described in 1894* from a specimen collected by Mr. J. Kalinowski in the Valley of Vitoc. Mr. Simons's skin shows that the underside of the tail is not white but dull buffy, and that the chest is dirty brownish, a colour which runs backward a short distance along the centre of the belly.

* Ann. & Mag. Nat. Hist. (6) xiv. p. 348.

Proechimys Simonsi, sp. n.

Size rather smaller than in *P. chrysæolus*, its nearest ally. Rump practically spineless; nape and sides also much less spinous than the centre of the back. Spines short, only about 15 millim in length, and narrow (0·6–0·8 millim. in breadth). General colour above very like that of *P. rosa*, with the same grizzled mixture of black and fulvous. Head rather darker and less fulvous. Under surface and inner sides of limbs pure sharply defined white, much more sharply defined than in the allied species. Upper surface of feet dull brown, lighter along the inner margins. Tail of about the same length as in *P. rosa* and *chrysæolus*, but much less hairy, the hairs not hiding the scales; scales unusually large, the rings running about 8 to the centimetre; its colour prominently bicolor, black above, white below.

Skull remarkably like that of *P. brevicauda*, Günth., although in external characters the species has little resemblance to that animal. In size it is smaller than in any of the species mentioned. Nasals long, narrow, rounded behind, extending about 2·5 millim. beyond the premaxillæ posteriorly. Interorbital region narrow. Parietal ridges almost obsolete, a faint indication of them in the positions described in *P. chrysæolus*, not continuous as in *P. rosa*. Palatal foramina broad and rounded, almost as broad as long, the ridges on the palate just behind them nearly obsolete. Palate emarginate to the back of *m*.². Pterygoid processes narrow, curved, not spatulate. Molars small and rounded.

Dimensions of the type (measured by Mr. Simons in the flesh):—

Head and body 210 millim.; tail 165; hind foot, s. u. 47, c. u. 49; ear 26.

Skull: greatest length 53·2; basilar length 36·5; zygomatic breadth 25·3; nasals 20 × 5·5; interorbital breadth 11·3; greatest breadth on parietal ridges 20; interparietal 7·5 × 12·2; diastema 10·4; palatal foramina 4·3 × 3·5; length of molar series 7·5.

Hab. Perené River, Junin Province, Peru. Altitude 800 m.

Type. Adult male. B.M. no. 0. 7. 7. 50. Original number 942. Collected 14th April, 1900, by Mr. Perry O. Simons. "Eaten by natives. Found in deep woods. Native name 'Pericota.'"

This species presents the curious anomaly of being closely similar externally to *P. chrysæolus* and *rosa*, while its skull is scarcely distinguishable from that of the outwardly very

different *P. brevicauda*, Günth. Its most obvious diagnostic characters are its thinly haired, large-scaled tail, its sharply defined white belly, its small skull, suppressed parietal ridges, and short open palatal foramina.

In his description of *P. brevicauda* * Dr. Günther speaks of "an adult male in spirit and the skin of an adult female brought by Mr. E. Bartlett from Chamicuros, Huallaga River"; but, as a matter of fact, it is only the skin (received in 1869) that is labelled as from Chamicuros, and the spirit-specimen is merely recorded from the Upper Amazon, and was received by the Museum three years before, in 1866. It is therefore probable that they are from different localities, and there is unquestionably great doubt as to their specific agreement. Under these circumstances it would be advisable to treat the skin by itself, accurately labelled and with good skull, as the type, and to ignore the second specimen, which has no exact locality and whose skull is broken to pieces.

Ctenomys tucumanus, sp. n.

Size small, about as in *C. talarum*. General colour above brownish fawn, with a faint reddish suffusion; middle line of face blackish. Cheeks like back, a faint lighter patch below ear. Under surface pale buffy, the hairs plumbeous basally; large white axillary and inguinal patches present, the former almost extending across the chest (but this may be due to the great age of the specimen, which is also becoming hoary on the back). Upper surface of hands well haired, whitish, of feet nearly naked, the few hairs also white. Tail practically naked, a few whitish hairs forming a slight terminal crest. This nakedness of hind feet and tail is possibly due to age and wear.

Skull broad and flattened, much more so than in *C. mendocinus*, and still more different to the lumpy rounded skull of *C. Perrensi*. Nasals evenly tapering backwards, their posterior end behind the level of the anteorbital bridge. Interorbital region flat, shorter and broader than in *C. talarum*, as also is the brain-case. No interparietal discernible. Malar less heavily ridged than in *C. talarum*. Posterior nares broad and open, the pterygoid ridges much further apart than in the allied species.

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

Head and body 172 millim.; tail 71; hind foot, s. u. 27, c. u. 30·5; ear 6.

* P. Z. S. 1876, p. 749.

Skull: greatest length in middle line 43·3; basilar length 38; zygomatic breadth 27·7; nasals 16 × 6·4; length of frontal suture 10·2; interorbital breadth 9·1; breadth across postorbital processes 11·1; least posterior breadth across brain-case 17; greatest posterior breadth on meatus 27·5; palate length from hensenion 20·2; diastema 12; length of upper molar series (crowns) 9·5; greatest diameter of anterior tooth ($p.^4$) 4.

Hab. Tucuman. Altitude 450 m.

Type. Old male. B.M. no. 0. 7. 9. 14. Original number 133. Collected 25th September, 1899, by Signor Luis Dinelli.

Although geographically nearest to *C. mendocinus*, Phil., and *C. Perrensi*, Thos., this Tuco-Tuco is probably most nearly allied to *C. talarum*, with which it shares the small size and flattened shape of the skull. It differs, however, from that species by its broader skull, especially the broader interorbital region, more open choanæ, and much paler coloration.

Signor Dinelli also obtained at Tucuman an example of the rare armadillo *Dasyypus vellerosus*, Gray, and of the Chilian opossum *Marmosa elegans*, Waterh., not hitherto known from Argentina.

Cyclopes * *didactylus ida*, subsp. n.

General colour of the more greyish type characteristic of the typical *C. didactylus* from Guiana, not yellowish or golden as in the Mexican and Central-American *C. d. dorsalis*, Gray. Rump, legs, and tail grey, not yellow. Dorsal stripe indistinct, irregular, almost lost in the coarse marblings of the back. Under surface uniform dull yellowish or buffy, without any trace of the dark sternal line present in the other subspecies.

Skull very like that of the Guianan form; edges of interorbital region similarly evenly diverging backwards.

Dimensions of the type, in skin:—

Head and body (c.) 180 millim.; tail (c.) 198.

Skull: greatest length 49; greatest breadth of brain-case 23·5; length of nasals (laterally) 13·5; interorbital breadth 9·6; length of frontal suture 23·6, of parietal suture 8·7; length of lower jaw 33.

Hab. Oriente of Ecuador. Type from Sarayacu, Upper Pastasa River; another specimen from the Rio Napo.

Type. Female. B.M. no. 80. 5. 6. 69. Collected by Mr. Clarence Buckley. Four specimens from Sarayacu examined and one from the Napo.

* Gray, 1821. *Cyclothurus*, Gray, 1825, auctorum.

XXXVIII.—On the “Tohi,” the East-African Reedbuck currently known as *Cervicpra bohor*. By OLDFIELD THOMAS.

MESSRS. ROWLAND WARD have recently put into my hands three Reedbuck skulls which, collected some twenty or thirty years ago, had become scattered into different collections, but which, noticing their peculiarity, Messrs. Ward had kept in touch with and have now brought together again in order that I might examine and report upon them.

They were obtained in some part of the Upper Nile, and, according to one account, at Kassala. Their collector was a Herr Essler, by whom a number of other large mammals now in the British Museum were procured at the same time.

Their northern locality has still more recently been confirmed by Dr. Donaldson Smith, who obtained several specimens of the same form during his recent journey from Lake Rudolf to the Nile, in about 5° N. latitude.

Now these specimens all agree among themselves, and differ from all the species recognized in the ‘Book of Antelopes,’ by the peculiar graceful curvature of their horns, which, while first sloping backwards and then outwards somewhat as in *C. arundinum*, are distinctly (though not abruptly) recurved forwards and inwards terminally. As a result their back view is not altogether unlike the more distant figure of *C. arundinum* in the ‘Book of Antelopes,’ pl. xliii., though the tips approach each other terminally much more, while their side view is similar both to those of the East-African antelope currently known, since Dr. Günther’s paper on the subject *, as *C. bohor*, and also to Rüppell’s figure of “*Antilope redunca*” †, afterwards the type of his *C. bohor*.

The side view of the horn-curvature being therefore the same, Dr. Günther, in the absence of Abyssinian material, not unnaturally assigned the East-African animal, the “Tohi” of Mr. Jackson in ‘Big Game Shooting,’ to Rüppell’s species; but it is now quite clear, both by locality and by some details about the type kindly sent me by Dr. Kobelt, that Messrs. Ward’s specimens are the true Bohor, being the first examples of it that have come to this country. By their aid we see that it is a peculiar northern species, most nearly allied to *C. arundinum*, to which it approximates in size, but is distinguished by its terminally incurved and recurved horns.

* P. Z. S. 1890, p. 604.

† N. Wirb. Abyss. pl. vii. fig. 1 (1835).

A second name applicable to it is "*Cervicapra? odrob*," Heuglin*, based on an antelope observed by him on the River Setit.

But if this antelope, with its widely expanded semilyrate horns, is the true *C. bohor*, the question arises as to what is the proper appellation for the very different Reedbuck from East Africa which has of late been known by that name.

That animal, as is shown in the 'Book of Antelopes' †, is closely allied to the West-African Nagor (*C. redunca*, Pall.), being distinguished from it merely by its greater size, the difference there quoted being 9 inches as compared to 8 in the basal length of the skull.

A renewed comparison not only confirms the alliance of the two forms, but shows that the difference is even less than we then supposed; for Messrs. Ward, who had already helped so materially in this matter, have lent me the skull of an unusually fine Nagor which had been shot by Lieut. A. A. E. Ellison, R.N., 160 miles up the River Gambia, and this skull measured no less than 8.65 inches (220 millim.) in basal length, nearly as much as in ordinary East-African Reedbucks. The fur, at least of the head, is closer and finer than that of East-African specimens, but is quite similar in colour.

These being the facts, it would appear better to treat the Tohi as a subspecies of *C. redunca*, and in recognition of the help received from Messrs. Ward I would suggest the name

Cervicapra redunca Wardi, subsp. n.

Size rather larger than in the typical subspecies, basal length of skull 9 inches or more. Hair coarser and shaggier. Colour similar.

Skull of the type (an old male):—

Basal length 234 millim. (9.2 inches); greatest breadth 114 (4.48); muzzle to orbit 138 (5.45). Horns: length round curve in front 235 (9.25), circumference at base 146 (5.75), breadth across most distant points externally 190 (7.5), tip to tip 143 (5.6).

Hab. East Africa. Type from the Mau Plateau.

Type. Male (skin and skull). B.M. no. O. 8. 15. 1. Collected by Mr. F. J. Jackson. Presented by Mr. Rowland Ward.

* Reise N.O.-Afr. ii. p. 109 (1877).

† Vol. ii. p. 155, synopsis.

XXXIX.—New Species of Eastern and Australian Moths.

By Colonel C. SWINHOE, M.A., F.L.S., &c.

Family Syntomidæ.

Eressa catoria, nov.

♂. Fore wings as in *E. confinis*, Walker: hind wings all black, with one small circular hyaline spot beyond the cell, with indications of a smaller spot below it; in many specimens both these small spots are indistinct. Antennæ white at the tips; a large orange spot on the prothorax, orange streak on metathorax; abdomen with a line of orange spots on vertex, on the sides, and also underneath.

Expanse of wings 1 inch.

Jaintia Hills. Many examples, all males.

Allied to *E. musa*, Swinh., and *E. confinis*, Walker. Differs from the former in having white tips to the antennæ, and from the latter in the orange streak on metathorax, and from both in having the hind wings all black.

Family Chalcosiidæ.

Pidorus leno, nov.

♂ ♀. Antennæ, body, and wings deep black, with an olive tinge, collar crimson; face, body below, and the underside of fore legs white. Fore wings with a wide oblique yellowish-white band from the costa beyond the middle to the hinder angle, touching neither: hind wings with a yellowish-white costal band extending round the apex, showing a whitish apical narrow patch: underside of both wings paler, with the basal portions greyish.

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

Jaintia Hills. Three males and one female.

Superficially like a very small *P. geminus*, Walker, but the white costal band of the hind wings above and the different colouring below are very striking, the underside of the wings in *P. geminus*, Walker, being streaked and shot with blue.

Isbarta curiosa, nov.

♂ ♀. Antennæ, head, thorax, and abdomen black, slightly metallic; antennæ white at the base, a white spot behind the head, and a white spot on each tegula; face white, body and legs also white on the underside. Wings dull black, with

yellowish-white spots and streaks in the interspaces, the female with the spots and streaks somewhat as in *I. imitans*, Butler; the spots, however, are shorter, and the three long streaks below the cell are disjointed outwardly: the hind wing is also somewhat similarly marked, but the basal streaks fill up the whole of the interspaces, leaving no black except on the veins, and the colour is rather deep yellow. The male differs from the female in being much smaller; the wings are almost entirely black, there being little more than indications of the spots and streaks.

Expanse of wings, ♂ $2\frac{1}{10}$, ♀ $2\frac{6}{10}$ inches.

Malang, Java. One pair.

Family Drepanulidæ.

Deroea hidda, nov.

♂ ♀. Shaft of antennæ, head, thorax, and abdomen white, branches of antennæ dark grey. Wings semihyaline, two sinuous grey bands close together before the middle on the fore wings, three similar bands close together before the outer margin of both wings, marginal space grey, or it might be described as having three sinuous white bands before the outer margin on a grey ground; the hind wing has also indications of a band before the middle, marginal line black, veins grey and more or less prominent.

Expanse of wings $1\frac{2}{10}$ – $1\frac{4}{10}$ inch.

Jaintia Hills. Two males and three females.

Much smaller than *D. hyalina*, Walker; wings better clothed, no marginal spots.

Family Lymantriidæ.

Gazalina intermixta, nov.

♂. Head white, collar and thorax pale rufous; abdomen white, with black segmental thin bands. Wings pure white; fore wings with two medial, oblique, thick, black transverse lines, the outer one outwardly elbowed beyond the cell; a subbasal black line; three or four short black streaks on the veins between the outer line and the margin: hind wings without markings. Underside pure white, both wings with black central, transverse, thin bands.

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

Jaintia Hills. Two examples.

Allied to *G. chrysolopha*, Kollar; differs in its white

abdomen and in the absence of the black streak along the median vein of fore wings, and the black streaking of all the veins outside the outer transverse line.

Lælia adalia, nov.

♂ ♀. Shaft of antennæ pale pink, branches dark grey; male with the head, thorax, and fore wings dark red-brown, in the female paler and more red; a black lunule at the upper end of cell, a pale streak through the lower half of cell; the median vein and its veinlets lined with black, and a black streak opposite the lunule: abdomen and hind wings red-grey, paler and more red in the female; without markings in both sexes. Underside paler; both wings uniformly coloured; fore wings with all but the borders suffused with brown.

Expanse of wings, ♂ $1\frac{8}{10}$, ♀ $2\frac{1}{10}$ inches.

Jaintia Hills. One male and six females.

The male somewhat like *L. atestacea*, Hmps., but differently marked; the female of *L. atestacea* is, however, of a uniform pale yellowish white, with internervular grey streaks.

Family Epiplemidæ.

Epiplema kohistaria, nov.

♂. Hind wings with slight tails at veins 4 and 7, with lesser productions on all the other veins; long stiff hairs on the basal half of costa beneath. Upperside dark greyish purple; abdomen with a broad purple band near the base: fore wings with a purple line edged with ochreous on both sides, from costa one sixth from apex to hinder angle, the upper half curved to an angle near the outer margin at the middle, then sharply bent inwards, then again straight to the hinder angle: hind wings with a somewhat similar line, but farther away from the outer margin, marked with black on the inside and with some black streaks on the outside; there are also several black patches inside the wing somewhat in the shape of an antemedial band; both wings with black marginal lunules and ochreous cilia. Underside nearly white, suffused in places with purple.

Expanse of wings 1 inch.

Port Blair, Andamans. Two examples.

Family **Boarmiidæ.**Subfamily *BOARMINÆ.**Boarmia delatina*, nov.

♀. Of a uniform pale greyish fawn-colour: fore wings with three outwardly curved indistinct grey lines, antemedial, medial, and discal, the last two meeting rather close together on the hinder margin; all three lines marked with black spots on the costa and with some black points on the veins: hind wings with two grey similar lines, one central, the other from three fourths of costa, much curved, terminating on abdominal margin rather closer to the central line than it is on the costa. Underside greyish white, with two lines across both wings, broad marginal grey borders, with two large white spots on outer margin of both wings, apical and medial.

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

Koni, Shan States (*Manders*). One example.

Subfamily *ENNOMINÆ.**Anaxa kaluga*, nov.

♀. Pale yellow; wings sparsely irrorated with pinkish atoms: fore wings with a thin pinkish band from costa, quite close to apex, to hinder margin, just beyond the middle, the space beyond being filled in with pinkish except at the hinder angle: hind wings with the thin pinkish band across its centre, but obsolete towards the costa. Underside as on upperside, but slightly paler.

Expanse of wings $1\frac{8}{10}$ inch.

Jaintia Hills. Four examples, all females.

Closely allied to *A. cesadaria*, Walker, = *A. sulphurea*, Butler, of which I have a fine series of both sexes; the apex of fore wings is more produced and the band is straight and very nearly touches the apex instead of curving inwards in a sinuous form one fifth before apex, as in *A. cesadaria*, Walker.

Hypephyra etawa, nov.

♂. Above olive-brown, with a decided pinkish tinge: fore wings with the apical portion paler, containing three or four brown spots: hind wings with a broad marginal even band of pale pinkish; both wings crossed by ante- and postmedial

zigzag pale pinkish thin bands; cilia brown, with pinkish tips. Underside uniform pale pinkish grey, without markings.

Expanse of wings $1\frac{3}{10}$ inch.

Jaintia Hills. One example.

Allied to *H. subangulata*, Warren, = *Stegania micans*, Hmps.

Genus PRISTOPERA, nov.

Fore wing with costa nearly straight, apex minutely acute, outer margin curved and very strongly crenulate: hind wing with outer margin also strongly crenulate, the apex truncate: palpi upturned, second joint slightly hairy, third joint short. Antennæ bipectinate with fascicles of cilia; the branches rather short; tongue and frenulum present. Fore wings with fovea, cell more than half the length of the wing, discocellular concave; vein 2 at three fourths, 3 close before end of cell, 4 from the end, 5 a little below centre of discocellulars, 6 from upper angle of cell, 7, 8, and 9 stalked from shortly before end of cell, 10 anastomosing with 11, which is given off from 12: hind wing with vein 3 from before end of cell, 4 from end, 6 from upper end, 7 from before end, 8 anastomosing with 7 till near middle of cell.

Type *P. hepaticata*, nov.

Pristopera hepaticata, nov.

♂. Of a uniform dark red-brown colour; costa of hind wings whitish. Fore wings with pale dots on the costa and crossed by two central oblique pale lines, the inner one bent inwards on the costa: hind wing with one central pale transverse line, in continuation of the outer line of the fore wing. On the underside the colour is also uniform and more red, with two black transverse central lines across both wings, obsolete on the hinder margin of fore wings, which is whitish.

Expanse of wings $1\frac{3}{10}$ inch.

Central China. One example.

The shape of the wings is somewhat similar to *Ocœlophora basipuncta*, Moore, from Sikkim.

Subfamily MACARIINÆ.

Calletæra schistacea, nov.

♂. Of a uniform dark shining lilac-grey; costa of fore wings with many ochreous specks; a brown spot at end of

each cell, lines across both wings brown, dentated—first ante-medial, second discal, third submarginal, the two latter running evenly and rather close together, marginal line black; cilia ochreous, with brown spots opposite the angles of the crenulated border. Underside pure dark grey; costa of fore wings marked with black and ochreous; cell-spots and cilia as above; one transverse dentated line a little beyond the middle.

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

Sarawak, Borneo. Two examples.

Family Larentiidæ.

Cryptoloba etaina, nov.

♂. Dull cinereous grey: hind wings as dark as the fore wings, the latter with white specks on the costa and two transverse nearly upright brown lines, angled outwards above their centre and sinuous—the first from the costa before the middle to the hinder margin at the middle, the second from the costa at two thirds to the hinder angle—the space between the first line and the base ochreous in all three examples; cilia ochreous, marked with grey.

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

Khasia Hills. Three examples.

Allied to *C. cinerea*, Butler; lines somewhat similar, but the wing-colour is very different and the insect is very much smaller.

Family Sterrhidæ.

Perixera maculifera, nov.

♀. Uniform ochreous grey, sparsely irrorated with brown; a large round brown spot at the end of each cell; a large brown spot midway between the cell-spot and the outer margin on the hind wings, the irrorations collected and formed into small clusters on various parts of both wings, and black marginal dots in the interspaces.

Expanse of wings $1\frac{3}{10}$ inch.

Dawson, Queensland. One example.

Placed provisionally in the genus *Perixera* until a male is procured to determine it properly; it is, however, such a curiously marked insect it deserves a description.

Family **Quadrifidæ.**Subfamily *POLYDESMIINÆ.**Melioptis ankara*, nov.

♀. Head, thorax, and fore wings olive-grey, the latter with a large black spot touching the costa a little before the apex; a small spot in the middle below it and another near hinder angle; a grey suffused band across the wing, its outer edge touching the three spots; a grey lunule at the end of cell and two outwardly curved sinuous grey lines—ante- and postmedial—each terminating in a black spot on the costa; marginal lunules grey: hind wings grey; a medial brown thin band corresponding to the outer line of the fore wings; a broad blackish marginal band; the space between the bands white; cilia of both wings grey, with a pale basal line. Underside nearly white; fore wing with a brown spot at end of cell; both wings with a central, outwardly curved, thin brown band and broad brown marginal borders and white cilia.

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

Quetta, one example; Kandahar, one example.

Family **Hypenidæ.**Subfamily *DELTOIDINÆ.**Catada charalis*, nov.

♂. Of a uniform pale purplish-brown colour; palpi with a white band and end of second joint and a thin white collar: fore wings with three rather prominent, upright, dark brown bands—first antemedial, second a little beyond the middle, third submarginal; the first irregularly outwardly curved, the second and third with two blunt outward angles and outwardly edged with white; a brown spot at the end of cell: hind wings without markings. Underside much paler; fore wings with a white streak at costa representing second band, submarginal white dots and white dots on cilia; hind wings with discal and submarginal sinuous brown bands, outwardly edged with white, and white dots on cilia; both wings with white lunules at the end of each cell.

Expanse of wings 1 inch.

Coomoo, Queensland. Five examples.

Allied to *Catada vagalis*, Walker.

Subfamily *HYPENINÆ*.Genus *ABRIESA*, nov.

Fore wing with costa nearly straight, apex minutely pointed, outer margin acutely angled at vein 4, concave between the angle and apex, nearly straight to hinder angle, which is well angled; hind wing with the outer border crenulate; fore wing with veins 3, 4, and 5 from lower angle of cell, 6 and 7 from upper angle, 8 and 9 anastomosing to form the areole, 10 from 9 near apex, 11 from centre of cell, 12 free; hind wing with 3 and 4 from lower angle of cell, 6 and 7 from upper angle, 8 free, straight; palpi upturned far above head, second joint well clothed, with long hair above, third joint as long as second, with short stiff hairs below and very long tufts of hairs towards extremity above; hind tibiæ with a pair of stout terminal spurs, one short, the other very long; legs well clothed.

Type *A. derna*, nov.

Abriesa derna, nov.

♀. Pale pinkish fawn-colour above; palpi with brown bands, the tufts of hairs white: fore wings thickly striated with grey, collected together in places, forming several incomplete transverse bands, and having three oblique white transverse streaks towards the base; a brown straight line inwardly edged with white near the outer margin from the costa close to the apex to the hinder angle: hind wings with a brown spot at end of cell suffused with reddish grey; a broad discal brown band and marginal black lunules on both wings. Underside nearly white; fore wings suffused with pink; hind wings striated with brown; both wings with two indistinct brownish bands, central and discal; fore wings with a white band from near apex to hinder margin.

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

Dawson, Queensland. One example.

Family *Thyrididæ*.*Rhodoneura melilialis*, nov.

♂. Costa straight, outer margin oblique, evenly curved, shape as in *R. bastialis*, Walker. Pure white; antennæ red, as is also the top of head, fore part of thorax, and a broad costal stripe on fore wings, the latter, however, becomes obsolescent on the apical third; both wings striated with ochreous; on the fore wings the striations are very uniform; there is another more indistinct red stripe below the costal

stripe, terminating in a red spot at end of cell; on the hind wings the striations form a rather prominent and broad central band, and on both wings are submarginal red dots. Underside as above, but the striations are darker, more red, and more diffuse.

Expanse of wings $\frac{7}{16}$ inch.

Dawson, Queensland. One example.

Family Schœnobiidæ.

Cirrhochrista rauma, nov.

♂. Antennæ and palpi chestnut-brown; a stripe on palpi above and top of head white; a large chestnut-brown spot behind the head; body and wings shining white: fore wings with a broad costal chestnut-brown stripe, which becomes thin towards the apex; a large wedge-shaped spot of the same colour attached to the costal stripe, descending to the end of the cell, a stripe of same colour on the outer margin, and a chestnut cilia: hind wings with some chestnut-red on a small portion of the outer margin and cilia below the middle. Underside and legs pure white, without markings.

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

Brisbane. Two examples.

Allied to *C. ætherialis*, Led.

Family Pyraustidæ.

Subfamily *DICHOCROCIINÆ*.

Hedylepta vildersalis, nov.

♂ ♀. Of a uniform olive-grey, glossy and nearly semi-hyaline: fore wings with a brown dot in the cell outside the first line, a brown lunule at the end: fore wings crossed by two brown lines, the outer one crenulated, deeply bent inwards underneath the cell-lunule, then straight to hinder margin beyond the middle; the inner line at one third, outwardly curved: hind wings with the inner line from costal third straight to anal angle; the outer line from the costa beyond the middle straight down to vein 3; both wings with a brown marginal line and brown cilia, interlined with white.

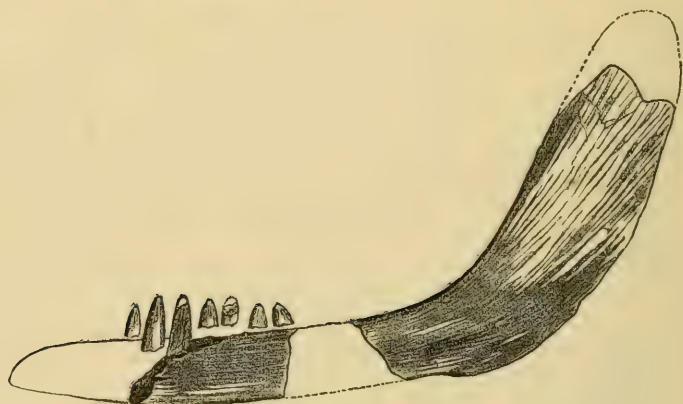
Expanse of wings 1 inch.

Cherra Punji. Twenty-two examples.

The lines are disposed as in *H. cuprealis*, Moore, from the Andamans, of which I have many examples, but the lines are crenulated and not smooth as in that species, and the coloration is altogether different.

XL.—On a new *Theriodont Reptile* (*Ictidosuchus primævus*)
 from the Karoo Beds, South Africa. By R. BROOM, M.D.,
 B.Sc.

IN the lower beds of the Karoo formation near Pearston I have been fortunate in recently discovering the remains of a small *Theriodont* reptile of a remarkably generalized type. The remains were met with in the beds of indurated shale, and though, unfortunately, much of the skeleton has been weathered away and irretrievably lost, sufficient has been left in the rock to give a very good idea of the type. The parts discovered consist of a moderately complete lower jaw, a considerable portion of the maxilla with teeth, and a number of other portions of the skull; the almost perfect scapula, coracoid, and precoracoid; the humerus and radius; a femur and a tibia and fibula; two or three imperfect vertebræ and ribs; and a number of other fragmentary remains. Unfortunately the various bones are mingled together in almost inextricable confusion—the tibia and fibula lying across the scapula and the femur right across the humerus—so that it is a matter of great difficulty to develop the one bone without injuring the other. As the form is of much interest, and the thorough examination of the remains will necessarily take considerable time, I have thought it advisable to give a short preliminary account of the animal.



Lower jaw of *Ictidosuchus primævus*, nat. size.

The lower jaw resembles much more the *Theriodont* jaws from the Upper Karoo beds than any of those hitherto found

in the Lower. In its general form and proportions the resemblance to the jaw of *Tribolodon* from Lady Frere (Phil. Trans. 1894, B, pl. lxxxviii. fig. 6) is very marked. The horizontal ramus of the jaw is long and rather slender and moderately uniform in depth. The coronoid process is very well developed, long and fairly thick, and makes an angle of about 120° with the ramus. Almost the whole lower jaw appears to be formed by the dentary, the splenial being a feeble splint and the articular, which is lost, probably not large.

Perhaps the most remarkable feature of the form is the simple structure of the teeth. Seven teeth still remain in the jaw, and though it is possible that one or two others are lost, those that remain show that there is no marked distinction between incisors, canines, and molars, all the teeth being modifications of the simple pointed Saurian type. All the teeth are feebly ribbed, and the anterior teeth differ from the posterior only in being longer and moderately sharp, while the latter have rounded apices.

The fragment of the maxilla shows the upper teeth to be very similar to those of the lower jaw.

The scapular arch resembles that of *Rhopalodon* (Phil. Trans. 1894, B, p. 703) more closely than that of *Dicynodon*. The scapula, while expanded and flat above, is narrow in the middle. There is no very distinct acromion. Inferiorly the scapula is much expanded and forms a large articulation with the precoracoid. The precoracoid is considerably larger than the coracoid and differs from that in *Dicynodon* in not entering into the glenoid cavity and in completely surrounding the precoracoid foramen. The coracoid closely resembles that in *Dicynodon*.

The humerus is very mammal-like and bears considerable resemblance to that of *Gomphognathus* (Phil. Trans. 1895, B, p. 29), though less robust. There is a large epicondylar foramen, and the whole lower half of the bone so far as is preserved is much like that of the Phalangians. Above, there is a sharp delto-pectoral crest, somewhat less prominent than that in *Gomphognathus*, because less directed outwards from the bone.

The femur is slightly longer than the humerus, and, like it, shows much resemblance to the mammalian types. There is a well-marked great trochanter, which forms a prominent trochanteric ridge more resembling the condition in some of the Edentates and Marsupials than that of either of the Monotremes. On the whole, however, the affinities of the bone are mainly with the type seen in *Echidna*; and if the

femur of this Monotreme were a rounded instead of a flattened bone, the general resemblances between it and that of the fossil form would be very marked. The lower end of the femur especially is flattened and quite Monotreme-like.

The tibia and fibula are both long simple bones, considerably longer than the radius. The fibula is only about half the thickness of the tibia.

As soon as a thorough examination has been made of the more fragmentary remains, and the more perfect elements more thoroughly cleared of matrix, an endeavour will be made to describe in detail, with figures, the various remains of this primitive type, for which I propose the name *Ictidosuchus primævus*, gen. et sp. n.

The following are some of the principal measurements of the bones:—

	millim.
Lower jaw : symphysis to coronoid process	94+
Depth of jaw at largest tooth (canine ?)	10
Height of largest tooth	5
Antero-posterior diameter of largest tooth	2.3
Length of scapula	73+
Width of upper part of scapula	19
Width in narrow middle region	9
Width at base	28
Length of humerus (72 millim.+)	probably 82
Width of humerus near middle	9
Length of femur (86 millim.+)	probably 90
Width of femur near middle	8
Length of tibia	94
Width of tibia at lower third	9×5

Pearston, S. Africa.

XLI.—*Some new Arachnida from Cape Colony.*

By R. I. POCKOCK.

Order SOLIFUGÆ.

Genus SOLPUGA, Licht.

Solpuga Schönlandi, sp. n.

♂.—*Colour* a uniform pale yellow, as in *S. venator*; width of head less than tibia of palp and than patella or tibia of fourth leg. Form of mandible recalling that of *S. Darlingii*, but with upper jaw armed with only one minor tooth in front of and remote from the two large distal teeth; the

terminal fang shorter, directed more upwards, and less curved at the tip, its upperside more strongly hollowed at base; basal portion of flagellum high, conical, with rounded summit and straight anterior border; distal portion of flagellum rising above the proximal terminal tooth, short, scarcely surpassing the basal portion when reclining backwards, lightly curved or narrowed distally, with apex truncate and furnished with a minute process; on the jaw in front of the base of the flagellum there is a small upstanding tooth.

Total length 35 millim.; width of head 9.5; length of patella of palp and also of tibia and tarsus 14, patella and tibia of fourth leg 12.

Loc. Grahamstown (*Dr. Schönland*).

Genus DÆSIA, C. Koch.

Dæsia Bernardi, sp. n.

♀.—Prevailing colour yellow, clouded with greyish black laterally; tubercle black; mandibles with faint fuscous lines; palp infusate, with the basal three fourths of the femur yellow; apex of femur and base of patella of third and fourth legs lightly infusate.

Abdomen with three narrow dorsal stripes.

Mandible with upper jaw furnished with two minor teeth, the distal major teeth subequal; lower jaw with one minor tooth close to base of posterior major tooth.

Palp with tibia lightly fusiform, armed as in *D. Leipoldti*, Purc.; tarsus rather more than one third the length of the protarsus; patella armed below with two stout setæ inside and three thinner setæ outside.

Carapace as long as patella of palp, a little shorter than its tibia and tarsus and than patella of fourth leg.

Abdomen: third segment furnished beneath on each side of the median sternal plate close to the posterior border with a transverse series of four slender but strong and sharp, curved, claw-like spines raised on low elevations of the integument. Immediately adjacent to these on the anterior portion of the underside of the fourth abdominal segment there is a transverse row of six or seven smooth, shining, subcylindrical ridges, separated by deep intervening grooves.

Total length 13 millim.; width of head 3; length of palp 10.

Loc. Hex River Valley, Cape Colony (*H. M. Bernard*).

No structure on the abdomen resembling that described above has been mentioned in the diagnoses of any of the previously described South-African species of *Dæsia*.

Order ARANEÆ.

Family Theraphosidæ.

Genus PTERINCHILUS, Poc.

Pterinochilus Lugardi, sp. n.

♂.—*Carapace* distinctly longer than patella, tibia, and tarsus of palp, shorter than patella and tibia of first leg, subequal to those of fourth and only just exceeding protarsus of fourth.

Ocular tubercle and clypeus practically as in *P. vorax*, Poc.

Front leg with tibia not inflated, the spur projecting internally in such a way that a large space is left between the spur and the base of the protarsus when the latter is flexed on the tibia.

Palpal organ much like that of *P. vorax*, but with the base of the spine less stout.

Protarsus of leg lightly sinuous, not nearly so strongly as in *P. vorax*.

Total length 24 millim.; carapace 12, first leg 41, second 37, third 34, fourth 43.

Loc. Kwebe Hills, near Lake Ngami (*Capt. E. J. Lugard, D.S.O.*).

Pterinochilus Schönlandi, sp. n.

♂.—*Carapace* about as long as patella, tibia, and tarsus of palp, shorter than patella and tibia of fourth leg, just equal to those of second, not or scarcely exceeding protarsus of fourth, equal to protarsus and half the tarsus of the third.

Legs with patella and tibia of fourth scarcely longer than protarsus and tarsus of first; tibia of first not inflated; the spur directed forwards in such a way that it is almost in contact with the inner side of the base of the protarsus when the latter is flexed; protarsus not sinuous.

Spine of *palpal organ* stouter than in the preceding species, compressed, distally sinuous, and suddenly narrowed to a point just before apex.

Total length 18 millim.; carapace 9, first leg 30, second leg 29, third leg 25, fourth leg 33.

Loc. Grahamstown (*Dr. Schönland*).

Longer in the leg than *P. nigrofulvus*, Poc., and with different palpal organ.

Family Ctenizidæ.

Genus STASIMOPUS, Simon.

Stasimopus Schönlandi, sp. n.

Nearly allied to *S. oculatus*, Poc., in disposition of eyes &c., but recognizable by the absence of the apical band of spines on the lower side of the protarsus of third leg and by the restriction of the spinules on the lower side of the protarsus of fourth leg to a small posterior tuft.

Total length up to 35 millim.

Loc. Grahamstown (*Dr. Schönland*).

Genus HERMACHASTES, nov.

Allied to *Hermacha* and *Nemesia*.

Fovea large, transverse, or a little recurved.

Rastellum consisting of numerous close-set stout bristles and spines.

Labium armed with a row of cusps; *coxa* of palp with about 20–25 strong short scattered cusps; inferior claw of all the legs long and distinct; superior claws with two rows of strong teeth.

Posterior sternal *sigilla* submarginal.

Apical segment of posterior *spinners* about half as long as the second.

Male with longer legs than female; labium and maxillæ unarmed. Tibia of first leg armed on the inner side with two low prominences, each bearing a stout curved spine. Tarsus of palp short, truncate.

Hermachastes collinus, sp. n.

♀.—Colour olive-yellow or brown on carapace and limbs; femora darker than the rest of the leg-segments; abdomen ashy black, variegated above with pale patches and spots, paler below.

Carapace longer than patella, tibia, and tarsus of palp, and than patella and tibia of first or fourth leg. *Palp* with tibia and tarsus spined. Patella and tibia of first and second *legs* weakly, protarsus more strongly spined; patella, tibia, and protarsus of third spined; patella of fourth unspined.

Tarsi of legs unspined.

♂.—*Carapace* as long as patella and tibia of first leg, shorter than those of fourth.

Palpi unspined; tibia swollen, bristly below; bulb subglobular, spines short, stout, lightly curved, pointed at apex; protarsus of first leg lightly sinuous at the base.

Measurements in millimetres.—♀. Total length 18; carapace 7, first leg 15, second leg 14, third leg 12, fourth leg 17.5.

♂. Total length 12; carapace 6.5, first leg 19, fourth leg 23.

Loc. Table Mountain (*J. Hull*).

Genus BESSIA, nov.

Carapace smooth, fovea deep, procurved; ocular area transversely oblong, more than twice as wide as long, parallel-sided; lateral eyes narrowly separated; eyes of anterior line procurved, medians a little smaller, with their anterior edges on a line with the centres of the laterals.

Rastellum consisting of many long slender spines overhanging the base of the fang.

Mandible armed below with a single row of about 15–16 teeth, a few smaller cusps at the posterior end of the row; fang long and slender.

Labium twice as wide as long, armed, like the base of the maxilla, with many close-set cusps; maxillæ lightly impressed.

Sternum with posterior sigilla of medium size, elongate, about their own length from the margin of the sternum and twice that distance apart.

Legs not scopulate, anterior pairs weaker than posterior, with protarsi much longer than tarsi; first leg scarcely spined; protarsus of second with some strong spines below; third leg with a few spines on patella and tibia above, about 6 in two rows on protarsus; fourth with protarsus numerous spined; claws armed with 3–4 basal teeth. Posterior spinner with apical segment small, much smaller than second.

According to Simon's tabulation of the genera of "Cyrtachenicæ," this new genus seems allied to *Amblyocarenum* and *Aptostichus*, especially to the latter.

Bessia fossoria, sp. n.

Colour of carapace and legs pale mahogany-red.

Measurements in millimetres.—Total length 12; carapace 6, palpus 7, first leg 10, second leg 9, third leg 11, fourth leg 14.

Loc. Port Elizabeth (*Dr. Broom*).

Family Scytodidæ.

Genus SICARIUS, Walck.

Sicarius spatulatus, sp. n.

♂.—Integument of carapace and sternum castaneous; legs yellower; abdomen testaceous; in nature the whole body is covered with particles of sand &c. and presents a uniform greyish-black tint.

Width of *carapace* about equal to length of patella and tibia of third leg, a little longer than tibia of first; median eyes on a distinct tubercle, longitudinally elliptical, space between them less than their transverse diameter; lateral angles of head prominent, interval between the lateral eyes less than their diameter.

Legs strong, first more than three times as long as width of carapace, third less; femur of first narrowed at base, swollen in middle.

Palpi short; tibia globular; tarsus short; spine of palpal organ stout, curved, distally expanded, and triangularly spatulate, with truncate extremity.

♀.—Like male, but with legs shorter, first less than three times the width of the carapace, which is about equal to the patella and tibia of the second.

Total length (♂) 9 millim., width of carapace 4, length of first leg 14.

Loc. Port Elizabeth (*H. A. Spencer, Dr. Broom*).

Differs entirely from *S. Hahnii*, Karsch (sec. Simon), in the form of the palpal organ.

Family Caponiidæ.

Genus CAPONIA, Sim.

Caponia secunda, sp. n.

♀.—Resembling *C. natalensis* (Cambr.) in colour and most structural features.

Carapace rugulose, the anterior median and anterior lateral eyes forming a line which is distinctly recurved, the posterior edge of the medians being on a level with the centres of the laterals; the three eyes which form the curved lateral line very unequal in size, the anterior lateral being the largest and the posterior lateral the smallest, the latter being only about half the area of the former.

According to Cambridge, in *C. natalensis* the anterior medians and anterior laterals form a straight transverse line.

Simon represents this line as slightly procurved. Moreover, the latter author declares the lateral eyes to be equal, the former says "nearly equal."

Total length 8 millim.

Loc. Grahamstown (*Dr. Schönland*).

Family Eresidæ.

Genus ERESUS.

Eresus Spenceri, sp. n.

Much smaller than *E. fumosus* and differently coloured. Hairy clothing olive-grey; integument of carapace and mandibles deep brown, of legs deep reddish, of abdomen olive-yellow; narrow white rings round the dorsal sigilla.

Carapace as long as tibia, protarsus, and tarsus of first leg; width of head about equal to patella and tibia of first leg; posterior median eyes large, about two diameters apart.

Vulva with large subcircular lateral pits, which are at least equal to the width of the median septum.

Total length 13 millim.

Loc. Port Elizabeth (*H. A. Spencer*).

Genus DRESSERUS, Sim.

Dresserus Darlingi, sp. n.

Allied to *D. obscurus*, Poc., but with shorter legs, the width of the head being distinctly greater than the patella and tibia and than tibia and protarsus of first leg; head also noticeably higher above the line of eyes; median septum of vulva with its lateral edges more converging posteriorly.

Total length 14 millim.; carapace 6.3.

Loc. Mashonaland: Enkeldoorn and Mazoe (*J. ff. Darling*).

Dresserus olivaceus, sp. n.

Allied to *D. Darlingi*, but much darker in colour above and below, being of a silky greenish black. Head less flat above, more evenly convexly rounded from before backwards; the sides of the median sclerite of vulva more parallel and the lateral impressions narrower.

Total length 14 millim.

Loc. Grahamstown (*Dr. Schönland*).

Dresserus collinus, sp. n.

Differing from *D. obscurus*, *olivaceus*, and *Darlingi* in having the posterior median eyes very large and separated from the anterior laterals by a space which is only about equal to twice the diameter of the medians; width of head slightly exceeding length of patella and tibia of first leg. Median area of cribellum subequal to the external area.

Total length 11 millim.

Loc. Table Mountain (*H. A. Spencer* and *J. Hull*).

Family Amaurobiidæ.

Genus AUXIMUS, Sim.

Auximus capensis, sp. n.

♀.—*Colour.* Carapace and limbs pale castaneous, the latter infuscate distally, hairy clothing pale olive; mandibles black; abdomen symmetrically spotted above; legs palely castaneous, clothed with pale olive hairs, the anterior pairs distally infuscate.

Eyes of posterior line slightly procurved, medians smaller than laterals and slightly nearer each other than to the laterals; eyes of anterior line slightly procurved, medians smaller, about a radius apart and a diameter from the laterals.

Mandibles with posterior border of fang-groove armed with 5–8 teeth, those in the middle of the row largest.

Legs 1, 4, 2, 3.

Vulva consisting of a large, shallow, transversely elliptical pit, the rim of which is semicircularly incurved on each side behind.

Total length 13 millim.

Loc. Port Elizabeth (*H. A. Spencer*); Cape Town (*H. A. Spencer*); Table Mountain (*J. Hull*).

Auximus hottentottus, sp. n.

Smaller than the preceding; the head darker posteriorly and at the sides than in the middle; sternum darker than coxæ; legs indistinctly annulate below.

Eyes a little more widely separated, the whole ocular area thus wider; eyes of anterior line subequal.

Vulva consisting of a large transverse lightly convex plate, marked on each side at the margin with a circular pit and in the middle by a longitudinal groove, bordered behind by an anteriorly emarginate crest.

Total length 10 millim.

Loc. Little Namaqualand, Garies (*Dr. Broom*).

Family Argiopidæ.

Genus GASTERACANTHA, Sund.

Gasteracantha Spenceri, sp. n.

Colour. Carapace and mandibles deep red; sternum black, with anterior yellow spot; legs with coxæ, trochanters, and femora red, the remaining segments black; abdomen black below, with yellow spots; uniformly yellow above, with dark sigilla, and slightly clouded with fuscous at the base of the anterior spine and posteriorly at base of median spine; spines reddish, with black tips.

Abdomen not twice as wide as long; posterior spines as large as in *G. ensifera*, Thor. (? = *G. versicolor*, Walck.); anterior and median spines much shorter than in that species; the medians scarcely as long as the posteriors, straight and strong, and about four times as long as the anteriors.

Loc. East London (*H. A. Spencer*); also a closely allied form from Grahamstown (*Schönland*).

Genus ARANEUS, L.

Araneus mensamontis, sp. n.

♀.—*Colour* much as in *A. Rumpfi* or *A. nauticus*; carapace yellowish or red, darker at the sides; legs banded, femora of anterior pairs reddish or black; abdomen black below, with a pair of large yellow spots in front of spinners.

Eyes of anterior line straight, medians about three times as far from the laterals as from each other.

Tibia and protarsi of anterior *legs* armed with many spines; tarsi also spined.

Vulva somewhat as in *A. haploscapus*, but the scape shorter and not bent at right angles, but meeting the basal portion at an obtuse angle.

Total length up to 15 millim.

Loc. Table Mountain (*J. Hull*); Port Elizabeth (*Dr. Broom*).

Araneus Graemii, sp. n.

♀.—*Colour.* Carapace yellow, black on thoracic portion and on middle of head; legs yellow, banded with black; patella and tibia of anterior legs black below; abdomen olive, varied with black and white above, black below, with a broad yellow band on each side of the middle.

Eyes of anterior line strongly procurved. Carapace about

as long as patella and tibia of first leg; tibia of first armed with about 6 spines in front below, protarsus with about 8.

Vulva with its basal portion very short and projecting distally on each side of the base of the scape as a distinct horny process; scape rather short, lightly constricted laterally near its base.

Total length 10 millim.

Loc. Grahamstown (*Dr. Schönland*).

Family Zodariidæ.

Genus CYDRELICHUS, nov.

Allied to *Cydrela* and *Cæsetius*, with the eyes of the anterior line approaching those of *Cæsetius*, the laterals being from three to four diameters apart; those of the posterior line recurved to about the same extent as in *Cydrela*.

Type *C. Spenceri*.

Cydrelichus Spenceri, sp. n.

♀.—*Colour.* Carapace deep castaneous; legs clearer, scantily clothed with whitish and blackish hairs; abdomen ashy black, covered above and below with a scanty clothing of whitish and darker hairs and ornamented beneath with four pale lines.

Palpi strongly spined distally.

Anterior two pairs of *legs* weakly spined, posterior two pairs very strongly spined.

Vulva (? subadult) consisting of a small transversely oblong plate, impressed with a pair of deep irregularly oval pits, separated by a partition and defined externally by a dark rim.

Total length 10 millim.; carapace 4, first leg 8, fourth 10.

Loc. Port Elizabeth (*H. A. Spencer*).

Genus CHARIOBAS, Simon.

Chariobas lineatus, sp. n.

Colour. Carapace bright reddish yellow, with a median longitudinal black band and a much narrower black marginal band; sternum black at the sides, with a median pale stripe; abdomen chalky grey, with a median longitudinal dorsal black band extending to the spinners and continuing the black band on the carapace; in the ventral median line a similar stripe which gradually expands posteriorly; spinners

black; legs orange-yellow, darker apically, and with black tarsal and protarsal scopulæ.

Carapace about as long as tibia and protarsus of first leg.

Measurements in millimetres.—Total length 11·5; length of carapace 4, width 1·6; length of abdomen 7·5, width 2; length of first leg 7·5, of second 6·5, of third 5, of fourth 7.

Loc. King Williamstown (*Stenning*).

Family Agelenidæ.

Genus AGELENA.

Agelena ocellata, sp. n.

♀.—*Colour.* Integument ochre-brown; carapace with indistinctly defined broad median and lateral white bands; legs with white hairs, the femora distinctly banded; sternum with pale median stripe; abdomen rubbed; the dorsal integument ornamented with a pair of bright yellow spots, some black spots arranged in two longitudinal lines, and some small dark spots laterally.

Anterior median *eyes* a little longer than laterals, their inferior borders on a level with the superior borders of the laterals.

Vulva marked with a pair of obliquely oval pits separated by a broad posteriorly clavate partition.

Total length 7 millim.; carapace 3·2; first leg 9.

♂.—With much longer legs than female. *Palp* with patella short, armed externally with a pair of subequal short apophyses, the upper of which is more acute than the under; tibia shorter than patella, but higher, armed below externally with a slender tooth-like process; tarsus much longer than patella and tibia taken together.

Total length 6 millim.; carapace 3; first leg 13.

Loc. Table Mountain (*J. Hull*).

Genus ROTHUS, Sim.

Rothus auratus, sp. n.

♀.—Much paler than *R. vittatus*, Sim. Integument testaceous; carapace covered with yellowish hairs, with a paler median brown-bordered band; legs covered with yellowish hairs; abdomen similarly covered, without bands.

Head less constricted and frontal line of eyes less prominent than in *R. vittatus*.

Vulva very similar to that of *R. vittatus*, but the median sclerite marked with a deep median longitudinal impression.

Total length 14 millim.; carapace 5·5; first leg 20·5.

Loc. Little Namaqualand, Garies (*Dr. Broom*).

Genus LYCOSA, Latr.

Lycosa hectoria, sp. n.

♀.—Colouring apparently as in *L. capensis*, Simon, but with tibia of fourth leg strongly banded below with black at base and apex; tibia of third leg similarly but much less distinctly banded; tibia of second and first legs yellowish brown below, with pale base; sternum, coxæ, and lower side of abdomen clothed with yellowish-grey hairs, the abdomen with faintly defined median band behind the vulva.

Structurally also apparently as in *L. capensis*, except that the teeth of the posterior border of the fang-groove are subequal in size.

Vulva wider than long, the median keel about half the length of the transverse bar, the pits subcircular and defined by a ridge curved like a ram's horn.

Total length 16–19 millim.; carapace 10; first leg 23, fourth leg 30.

Loc. Table Mountain (*J. Hull*).

Lycosa subvittata, sp. n.

♀.—Smaller than *L. hectoria*, but very similar in colour on the dorsal side, though perhaps on the whole darker; the two yellow stripes on the abdomen strongly defined; ventral surface of abdomen with a median longitudinal black stripe, broader in front behind the vulva and narrowing posteriorly and defined on each side by a broad yellow stripe, which is itself defined by a darker stripe composed of blackish spots; coxæ infuscate like the sternum; legs infuscate below, scantily clothed with pale hairs, the tibiæ not distinctly banded.

Structurally as in *L. hectoria*, but with *vulva* longer than broad, the median keel broad in front, narrowed behind, and as long as the transverse bar, the depressions longitudinally ovate, three times as long as wide.

♂.—Like female in coloration, except that the black on the ventral surface of the abdomen spreads laterally behind the epigastric fold so as to cover the underside, the epigastric area being black in the middle, pale at the sides; coxæ much paler than sternum, as in young female.

♀.—Total length 14 millim.; carapace 7; first leg 19, fourth 16.

♂.—Total length 11 millim.; carapace 6·5; first leg 19, fourth 23.

Loc. Port Elizabeth (*H. A. Spencer*); Table Mountain (*J. Hull*).

Lycosa Schönlandi, sp. n.

♀.—General colour reddish yellow, carapace with two dark stripes; abdomen mottled black above and at sides, greyish below, with median and lateral blackish stripes, much as in *L. Spenceri*, Poc.; coxæ and legs reddish, clothed with pale hairs; legs spotted and irregularly banded with black; base of mandible covered with yellowish hairs of the same colour as those on the face.

Eyes of anterior line lightly procurved, their inferior edges in a straight line, medians a little longer than the laterals, posterior median separated by a space which is much less than their diameter.

Vulva with very narrow median keel and stout, posteriorly convex, and projecting cross-bars, on each side of the median keel there is a narrow outwardly curving crest, forming the inner border of the shallow oval longitudinal impression.

Measurements in millimetres.—Total length 15; carapace 6·5; first leg 16, fourth leg 21.

Loc. Grahamstown (*Dr. Schönland*).

Lycosa promontorii, sp. n.

Allied to *L. Schönlandi*, but darker in colour, carapace with narrower whitish submarginal stripe; abdomen dark reddish grey above, mottled with black and marked with a short paler median stripe in front; entirely black below, coxæ and sternum deep blackish brown; legs mottled with darker and lighter spots; base of mandible scantily clothed with yellow hairs.

Eyes of anterior line straight by their lower borders, medians noticeably the larger; posterior medians scarcely wider than anterior line, separated by considerably less than their diameter; distal tooth on posterior border of fang-groove very much smaller than the others.

Vulva with rim thick and curved like a horseshoe, the median bar very broad in front, narrow behind, about half the length of the transverse bar.

Measurements in millimetres.—Total length 13; carapace 6; first leg 14·5, fourth leg 17·5.

Loc. Wynberg (*H. A. Spencer*); Table Mountain (*J. Hull*).

Lycosa algoensis, sp. n.

Colour. Carapace normally coloured, but the lateral stripes not so distinct as in *L. Schönlandi*; upperside of abdomen black in the middle, with a yellow stripe formed of two pale patches, recalling the markings on *Ocyale atalanta*, on each side; ventral surface banded as in *L. Schönlandi*; coxæ and sternum yellowish red; legs pale, obscurely mottled; mandibles covered with greyish hairs at base.

Posterior median *eyes* very large, scarcely a radius apart; anterior medians much larger than anterior laterals.

Vulva very abnormal, consisting of a narrow median keel, which posteriorly runs out into a strong conical process and is flanked on each side by a subspherical black prominence, which is bordered externally and below by a sinuous ridge continuous in the middle line with the anterior end of the median keel.

Measurements in millimetres.—Total length 13; carapace 7; first leg 15.5, fourth leg 19.

Loc. Port Elizabeth (*H. A. Spencer*).

Lycosa bessiana, sp. n.

♂. Resembling *L. algoensis*, but with the whole of the ventral surface of the abdomen olive-black, the sternum also infusate with a central darker line; the legs uniformly yellowish red, not banded or mottled with dark spots; upperside of abdomen marked with two very distinct, broad, yellowish bands uniting in front, separated by a dark ventral stripe, and bordered externally by a darker ill-defined stripe; inferior portion of lateral surface white; dark bands on carapace broader than pale bands.

Measurements in millimetres.—Total length 9; carapace 5; first leg 14, fourth leg 17.

Loc. Port Elizabeth (*H. A. Spencer*).

Family **Oxyopidæ**.

Genus PEUCETIA, Thor.

Peucetia maculifera, sp. n.

♀.—*Colour.* Carapace greenish, with short radiating dark stripes; clypeus and mandibles without bands; an abbreviated and interrupted dark stripe on each side of the head above the basal mandibular spot; legs yellow, femora and coxæ minutely and rather thickly spotted at the bases of the spines and hairs; tibiæ and protarsi with larger and fewer spots at the base of the black spines, a faint blackish ring round distal end of patella and basal and distal end of tibia; sternum

green, minutely spotted at base of hairs; abdomen suffused with rosy pink above, yellower in front, greenish yellow below, paler in middle line.

Carapace as long as patella and tibia of third leg and three fourths of the protarsus of the first; clypeus almost vertical. *Abdomen* oval, not twice as long as broad.

Legs moderately long, first about five times, fourth nearly four times as long as carapace.

Vulva consisting of a pit crescentic in front and filled posteriorly by a pair of black oval sclerites, separated by a median crest and each marked behind by a deep pit.

Total length 13 millim.; carapace 5·3; first leg 26, fourth leg 20.

Loc. King Williamstown (*Stenning*).

Differs in colouring, form of vulva, &c. from the rest of the S. African species.

Family Heteropodidæ.

Genus SPARASSUS.

Sparassus Schönlandi, sp. n.

Colour of integument yellowish, clothed with whitish hairs; mandibles a little darker.

Carapace longer than wide, width of head as in *S. Batesi*, Poc.; eyes of posterior line slightly procurved; carapace as long as tibia of second leg.

Legs 2, 1, 4, 3; second exceeding first by its tarsus and one fifth of the protarsus; third leg scarcely reaching tip of tibia of second; patellæ unarmed, tibiæ with two pairs of inferior spines.

Vulva consisting of a large transversely oblong plate, the posterior border of which is semicircularly excised, the posterior angles of the excision produced inwards into a dark horny prominence.

Total length 12 millim.; length of carapace 6·5, of first leg 22, second 25, third 16, fourth 18·5.

Loc. Grahamstown (*Dr. Schönland*).

Genus PALYSTES, L. Koch.

Palystes lycosinus, sp. n.

= *Palystes megacephalus*, Pocock, Ann. & Mag. Nat. Hist. (6) xvii. p. 63, 1896 (? *P. megacephalus*, C. Koch).

♂.—Apparently resembling *P. megacephalus*, C. Koch, in colour and most structural features.

Tibia of *palp* armed at its distal end above with a single, slightly sinuous, basally stout, apically pointed spur directed forwards and outwards over the base of the tarsus.

♀.—Like male in colour.

Vulva bordered behind by a straight transverse crest, in front of which there is on each side a short thicker crest; the middle of the fore part of the abdomen bilobate.

Total length 21 millim.

Loc. Port Elizabeth (*H. A. Spencer*).

Palystes cultrifer, sp. n.

♂.—Resembling the preceding, but with two tibial spurs on the *palp*—a distal superior slender and upstanding, and a proximal external, stout, curved, blade-like with a sharp point.

Total length 17 millim.

Loc. Grahamstown (*Dr. Schönland*).

P. megacephalus, C. Koch, may be identical with either or neither of these species.

Palystes perornatus, sp. n.

Allied to *P. lunatus*, Poc., but with the sternum and coxæ a rich golden yellow; the femora of the legs palely olive-yellow below and mottled with silvery white spots.

Vulva with median horny process much shorter than in *P. lunatus*.

Total length 25 millim.

Loc. Queenstown, Cape Colony (*Capt. C. K. Bushe*).

Genus SELENOPS, Latr.

Selenops Broomi, sp. n.

♀.—Allied to *S. Krausii*, Poc., in curvature and relative size of eyes of ocular quadrangle, but differing in having five instead of six pairs of inferior spines on tibiae of first and second legs*, and in the form of the vulva, the lateral lobes of which are in contact in the middle line and circumscribe a more transversely cordate pale median sclerite.

Total length 11 millim.; carapace 5·5; first leg 19, fourth leg 21.

Loc. Little Namaqualand, Garies (*Dr. Broom*).

* In the type of *S. Krausii* the anterior leg on the right side has been reproduced and shows only five anterior spines beneath.

Selenops parvulus, sp. n.

♀.—Very small, dark-coloured, thickly mottled with black, white, and bronze-yellow.

Eyes of quadrangle not so strongly recurved as in *S. atomarius*; the posteriors larger than anteriors and with their lower rims just below the level of the upper rim of the latter, which are nearly two diameters apart and a little more than half their diameter from the posterior medians.

Tibiæ of anterior legs with four pairs of inferior spines, protarsi with three pairs.

Vulva consisting of a very large plate, representing the two lobes, impressed by a median sutural line, a small transverse pale area just in front of the plate.

Total length 5 millim.; carapace 2·5; first leg 7, fourth leg 8.

Loc. Port Elizabeth (*Dr. Broom*).

Family Thomisidæ.

Genus THOMISUS, Walck.

Thomisus Stenningi, sp. n.

♀.—Prevailing colour yellow; carapace with a sharply defined yellow stripe on each side, starting at the sides of the head and running upwards to a point on each side of the fovea; face white, orange-yellow round the anterior median eyes; mandibles white, with darker basal spot; a brown transverse stripe in the middle of the femur and tibia of first and second legs, also some brown near the tip of the protarsus and tarsus, the dark patches set off with white markings.

Carapace with horns much higher and longer than in *T. albus*; the summit of the head between these more strongly concave, with deeper notch adjacent to posterior median eyes; eyes of anterior line more strongly recurved. Protarsal spines 5 in front, 4 behind.

Vulva consisting of a swollen, hairy, indistinctly bilobed area, in front of which there is a shining plate marked with a pair of parallel narrow crests, which meet in front and posteriorly end in a kind of loop, darkened with pigment.

Total length 5·5 millim.

Loc. Pirie Bush, King Williamstown (*Stenning*).

? Genus CAMARICUS, Thor.

Camaricus marmoratus, sp. n.

Colour. Carapace deep red, with narrow black inferior

border on clypeus and large black patch on each side of head, involving anterior and posterior lateral and posterior median eyes; mandible reddish, sternum and mouth-parts pale; coxæ and trochanters of legs black, rest of segments yellow, lined with black; palpi with femur and trochanter black, the other segments yellow and lined with black; upperside of abdomen yellow, marked with six transverse black stripes, the anterior three of which are mesially interrupted; sides of abdomen with a broad inferior black band, ventral surface pale.

Carapace as broad as long, high, strongly convex, not narrowed in front. *Eyes* of posterior line very slightly recurved and slightly wider than those of anterior line, the medians nearly twice as far from each other as either is from the lateral; eyes of anterior line recurved; clypeus low, not much more than one fourth of the distance between the anterior median eyes.

Mandibles with inferior band of hair.

Legs weak, tibiæ of first and second with three pairs of slender spines below, protarsi of first and second with two pairs of spines below.

Abdomen subglobular, a little longer than wide; vulva marked with a deep suboblong or heart-shaped pit, which is broader in front than behind.

Total length 10 millim.

Loc. Grahamstown (*Schönland*).

XLII.—ASIATIC TORTRICIDÆ.

By the Rt. Hon. LORD WALSHINGHAM, M.A., LL.D., F.R.S.

[Continued from p. 243.]

BACTRA, Stph.

1006. *Bactra lanceolana*, Hb.

Aphelia lanceolana, Stgr. & Wk. Cat. Lp. Eur. 251. No. 1006 (1871)¹;
Stgr. Hor. Soc. Ent. Ross. XV. 252 (1879)².

Hab. EUROPE. AFRICA. AUSTRALIA. NEW ZEALAND.
S. AMERICA. UNITED STATES. ASIA.

ASIATIC TURKEY—Brussa, IV.-V.²; Rhodes Island²; Shar Devesy (*Native Coll.* 1893); Palestine (*Tristram*); Kerasdere, 30 V.²; Jenikeui-Hochebene, 23 V.² TRANSCAUCASIA—Lenkoran, 18 VI. 1874 (*Christoph*). PERSIA—Asterabad, 15 V. 1873 (*Christoph*). TURKESTAN—Krasnowodsk, 5 VI.

1872 (*Christoph*). COREA—Fusan, 9 VI. 1886 (*Leech*). INDIA—Berhampore, III. 1882 (*Minchin*); Hyderabad, IV. 1886 (*Swinhoe*); Karachi (*Swinhoe*, 1885). CEYLON—Nawalapitiya (*Pole*, 1890). SUMATRA—Padang Rengas, low country (*Doherty*, 1891). CELEBES—Macassar, 500 feet (*Doherty*, 1891).

1009 (1). *Bactra roseana*, sp. n.

Antennæ pale cinereous. *Palpi* slightly recurved, terminal joint short, not concealed; pale cinereous. *Head* pale cinereous. *Thorax* smooth, pale cinereous, tegulæ touched with greyish fuscous. *Fore wings* elongate, costa evenly rounded, apex somewhat angular, termen not oblique, tornus much rounded; pale greyish cinereous, speckled, streaked, and shaded with pale greyish fuscous, the dorsum shaded throughout with greyish fuscous; the apical part of the wing to the middle of the costa and to below the middle of the termen suffused with rosy carmine, through which run about nine short longitudinal blackish streaks, crossed obliquely near their base and again beyond their outer extremities by slender steel-grey lines coming from a series of costal geminations, alternately black and whitish ochreous; at the extreme apex one of these whitish ochreous streaks, longer than the others, descends to the termen, where it interrupts a narrow black line which extends along the extreme margin from the apex for two-thirds of its length in the direction of the tornus; cilia bright fawn-ochreous, tipped with greyish fuscous at the apex. *Exp. al.* 21 mm. *Hind wings* brownish fuscous; cilia whitish cinereous, a slender greyish fuscous line running through them near their base. *Abdomen* brownish fuscous, anal tuft subochreous. *Legs* [missing].

Type, ♂ (70258) Mus. Wlsm.

Hab. JAPAN — HONDO — Gifu, IV.-V. 1886 (*Pryer*).
Unique.

POLYCHROSIS, Rag.

1022. *Polychrosis porrectana*, Z.

Eudemis porrectana, Stgr. & Wk. Cat. Lp. Eur. 251. No. 1022 (1871).

Hab. EUROPE. ASIATIC TURKEY—HALEB—Shar Devesy (*Native Coll.* 1893).

NOTOCELIA, Hb.

1004. *Notocelia Uddmanniana*, L.

Aspis Uddmanniana, Stgr. & Wk. Cat. Lp. Eur. 250. No. 1004 (1871).

Hab. EUROPE. ASIATIC TURKEY—HALEB—Shar Devesy (*Native Coll.* 1893); PALESTINE (*Tristram*, 1883).

PELATEA, Gn.

1030 (1). *Pelatea bicolor*, sp. n.

Antennæ fuscous. *Palpi* moderate, porrect, median joint closely scaled, more thickly above than below, terminal joint short, exposed; fuscous, terminal joint tipped with ochreous. *Head* and *thorax* fuscous. *Fore wings* with a basal patch occupying one-fourth, its outer margin straight, blackish fuscous; a broad yellow ochreous band across the middle, its inner and outer edges both straight, whitish on its inner side and with a narrow whitish line along its outer margin, with three minute fuscous costal dots and two or three also on the dorsum; the apical third of the wing dark brownish fuscous, sprinkled with shining greyish fuscous, especially about its margins; cilia shining greyish fuscous, a slender pale line along their base. *Exp. al.* 12.5 mm. *Hind wings* greyish brown; cilia slightly paler. *Abdomen* greyish brown. *Legs* cinereous.

Type, ♂ (70167, Japan); ♀ (70168) Mus. Wlsm.

Hab. JAPAN (*Pryer*, 1886). ASSAM — Kohima (Naga Hills), 4700 feet, VI. 1889 (*Doherty*). Six specimens.

HYSTRICHOSCELUS, gen. nov.

(ὑστρίξ = a porcupine; σκέλος = a leg.)

Type, ♂ ♀, *Hystrichoscelus spathanum*, Wlsm.

Antennæ (♂) slightly ciliate. *Palpi* short, recurved, appressed to the face; median joint somewhat coarsely scaled beneath, terminal joint short, porrect, exposed. *Head* rough above. *Thorax* with a moderately erect tuft posteriorly. *Fore wings* of moderate width, costa slightly convex, ♂ with a weak costal fold; termen slightly oblique, scarcely impressed, tornus rounded. *Neuration*: 12 veins, all separate; 7 to termen; 3 somewhat recurved upwards. *Hind wings* broader than the fore wings; termen and dorsum evenly rounded. *Neuration*: 8 veins; 3 and 4 stalked; 5 moderately straight, not closely approximate to 4 at base; 6 and 7 separate, but closely approximate at base, sometimes almost coincident. *Abdomen* (♂) with a rather long anal tuft. *Legs*: ♂, hind tibiæ clothed with long hairs above, stretching to the middle of the tarsal joints, but not so densely packed as in *Phacasiophora*, Grt.: ♀, hind tibiæ slightly clothed above.

This genus is apparently allied to *Helictophanes*, Meyr., from which it differs in emitting vein 7 to the termen and also probably in the more extended clothing of the hind tibiæ.

1030 (2). *Hystrichoscelus spathanum*, sp. n.

Antennæ tawny grey. *Palpi* and *head* dark tawny. *Thorax* grey, mottled with tawny brown. *Fore wings* leaden grey, mixed with some whitish scales and transversely streaked and banded with umber-brown to two-thirds their length, the apical third white, slightly shaded with grey, and having numerous short black lines running longitudinally through it; the brown transverse streaking is somewhat plentiful on the basal third, at the outer edge of which a thicker band, much sinuated outwardly, forms the oblique margin of a basal patch in which the grey ground-colour of the wing is much mixed; scarcely beyond the middle is a broader band of brown, much widened beneath the costa, but again narrowed towards the dorsum, this is bounded on each side by leaden grey; beyond it there are five pairs of geminated oblique white streaklets along the costa, the space about their ends being tinged with chestnut-brown, through which one or two leaden grey lines are visible; a minute black dot lies within the chestnut-brown apex; the white outer third of the wing possesses a row of short black dashes towards its inner edge, and a curved row of similar dashes above it reaching to the middle of the termen, and some shining silvery grey scales, set in a sprinkling of grey and brown scaling, lie on the white space above the tornus; cilia white at the tornus, with a slender greyish line running through them above to the apex and a dark line along their base on the upper half of the termen. *Exp. al.* ♂ 15, ♀ 17–18 mm. *Hind wings*: ♂ whitish, shaded with greyish brown, especially towards the apex; cilia white: ♀ greyish brown; cilia pale cinereous, with a greyish brown shade running through them near the base; the flexal cilia contain a number of long spatulate dentate scales, these arise from the margin, not from the wing-surface, they are more strongly developed in the female than in the male. *Abdomen* brownish grey. *Legs*: ♂ whitish, the long hairs above the hind tibiæ snow-white, hind tarsi spotted with greyish fuscous: ♀ whitish cinereous; hind tibiæ slightly clothed above, hind tarsi barred with brownish grey.

Type, ♂ (70154); ♀ (70156) Mus. Wlsm.

Hab. JAPAN (*Pryer*, 1886). Four specimens.

EUCOSMA, Hb.

1041 (1). *Eucosma conformana*, Mn.

Grapholitha conformana, Mn. Verh. ZB. Ges. Wien, XXII. (1872) Abh. 36–7 (1872)¹; Stgr. Hor. Soc. Ent. Ross. XV. 259 (1879)².

Hab. EUROPE—*DALMATIA*—Ragusa¹, Spalato¹. *CROATIA*—Josefsthal¹. *HUNGARY*—Ofen¹. *ASIATIC TURKEY*—*KHUDAVENDIKIAR*—Brussa, VI.¹; *PALESTINE* (*Tristram*, 1883).

1049 (1). *Eucosma medullana*, Stgr.

Grapholitha medullana, Stgr. Hor. Soc. Ent. Ross. XV. 254-5 (1879)¹.

Hab. *ASIATIC TURKEY*—*KHUDAVENDIKIAR*—Brussa¹; *AIDIN*—Smyrna¹; *KARAMANIA*—Taurus¹; *HALEB*—Shar Devesy, 1 VII. 1890 (*Native Coll.*).

1057. *Eucosma hepaticana*, Tr.

Grapholitha (Pædisca) hepaticana, Stgr. & Wk. Cat. Lp. Eur. 253. No. 1057 (1871).

Hab. EUROPE. *ASIATIC TURKEY*—*HALEB*—Shar Devesy (*Native Coll.* 1893).

1061. *Eucosma graphana*, Tr.

Grapholitha (Pædisca) graphana, Stgr. & Wk. Cat. Lp. Eur. 253. No. 1061 (1871).

Hab. EUROPE. *ASIATIC TURKEY*—*HALEB*—Shar Devesy (*Native Coll.* 1893).

1069 (1). *Eucosma pica*, sp. n.

Antennæ greyish, faintly annulate, basal joint white. *Palpi* white, with a black spot externally at the base of the median joint. *Head* white, touched with black at the sides behind the antennæ. *Thorax* white, with a black band across in front and some black scales behind the middle. *Fore wings*: costa gently arched, ♂ with a narrow fold at the base, apex slightly rounded, termen impressed, slightly oblique; white, streaked and mottled with black on the costa and dorsum and on the fold to two-thirds the wing-length; a large black costal patch about the middle is carried obliquely downwards and outwards nearly to the fold, where it is bent upwards towards the apex and somewhat narrowed, joining an irregular black patch below the apex, which runs to the middle of the termen; beneath it before the tornus is a triangular black patch containing some white dots on the dorsum, and beyond its outer edge, which runs at right angles from the margin, is a pale steel-grey ocelloid patch mixed with white; on the costa beyond the median patch are three black spots, sending out black streaks to the subapical shade, slender

black lines lying between them on the white ground-colour, the apex is black; cilia white below the middle of the termen, grey above it, with a black line along their base reaching only to the middle of the margin. *Exp. al.* 17–20 mm. *Hind wings* slightly impressed below the apex; pale brown; cilia pale cinereous, with a dark shade running through them near their base. *Abdomen* pale brown. *Legs* whitish, shaded and spotted with grey and black.

Type, ♀ (60023); ♂ (70075) Mus. Wlsm.

Hab. JAPAN (*Pryer*, 1886)—HONDO—Yokohama (*Munley*, 1888). Six specimens.

1091. *Eucosma tripunctana*, Schiff.

Grapholitha (Pædisca) tripunctana, Stgr. & Wk. Cat. Lp. Eur. 255. No. 1091 (1871)¹; Stgr. Hor. Soc. Ent. Ross. XV. 257 (1879)².

Hab. EUROPE¹. ASIATIC TURKEY—KHUDEVENDIKIAR—Brussa, IV.–V.²; SIVAS—Amasia, VI.²; ANATOLIA²; HALEB—Shar Devesy, 24 VI. 1890 (*Native Coll.*).

1095. *Eucosma Pflugiana*, Hw.

Grapholitha (Pædisca) Pflugiana, Stgr. & Wk. Cat. Lp. Eur. 255. No. 1095 (1871)¹; Stgr. Hor. Soc. Ent. Ross. XV. 257 (1879)².

Hab. EUROPE. ASIATIC TURKEY—KHUDEVENDIKIAR—Brussa, V.²; ARMENIA¹. CHINA—Ta-chien-lu, V.–VI. (*Leech*, 1891).

1095 (1). *Eucosma Pryerana*, sp. n.

Antennæ greyish fuscous. *Palpi* short, scarcely projecting beyond the head; dark brownish cinereous. *Head* dark brownish cinereous. *Thorax* dark purplish fuscous. *Fore wings* blackish brown, thickly sprinkled with shining dark blue-grey streaks and blotches; a conspicuous white patch on the middle of the dorsum reaching to the fold, its apex sometimes overlapping the fold; three or four pairs of whitish geminated streaks on the outer half of the costa; four black spots on the ocelloid patch lie between bands of shining dark blue-grey; the apical portion of the wing is tinged with ferruginous, through which run blue-grey streaks from the costal geminations; cilia greyish, tinged with ferruginous at the apex. *Exp. al.* 22–25 mm. *Hind wings* dark brownish fuscous; cilia creamy whitish, touched with brownish at the apex, a dark brownish fuscous line along their base. *Abdomen* dark brownish fuscous. *Legs* greyish brown, hind tarsal joints spotted with whitish ochreous.

Type, ♀ (70069) Mus. Wlsm.

Hab. JAPAN—HONDO—Oiwake, VII. 1887 (*Pryer*). Six specimens.

This species is nearly allied to *Pflugiana*, Hw., but differs in the more pure whitish cilia of the hind wings and in the more clearly defined white dorsal patch. I have seen none of the mottled varieties that occur in the European species.

1095 (3). *Eucosma* (?) *macrorris*, sp. n.

Antennæ brownish cinereous. *Palpi* rather long, median joint with a long projecting tuft beneath, terminal joint concealed; brownish cinereous, shaded with fuscous. *Head* brownish cinereous. *Thorax* dark umber-brown. *Fore wings* broad, costa arched, termen slightly oblique, not impressed, tornus rounded; dark umber-brown mixed with ferruginous; a cream-white upright dorsal patch before the middle is divided by a single dark umber streak on its lower half; above and before it, at about one-third from the base, is a smaller creamy white costal spot, also divided through its middle by dark umber scales; three or four pairs of very short creamy white geminations occur on the outer half of the costa; near the base beneath the fold, and also about the region of the ocelloid patch, which contains some indistinct patches of leaden grey, the ferruginous scaling is more conspicuous than on the other parts of the wing, it extends also upwards along the termen; cilia creamy white on their upper half, touched with fuscous at the apex, leaden grey on their lower half, with a fuscous line along their base. *Exp. al.* 25 mm. *Hind wings* dark brown; cilia shining greyish, a brown line running through them near their base. *Abdomen* dark brown. *Legs* brownish, hind tarsal joints spotted with fuscous and whitish ochreous.

Type, ♀ (70067) Mus. Wlsm.

Hab. JAPAN (*Pryer*, 1886). Unique.

This species has much the appearance of *Eucosma expressana*, Chr. (= *contrasignata*, Chr., ♀), but differs in its longer palpi and more rounded costa. It is probably correctly referred to the genus *Eucosma*, but the male is at present unknown.

1095 (4). *Eucosma contrariana*, Chr.

Grapholitha contrariana, Chr. Bull. Soc. Imp. Nat. Mosc. LVI. 424-6. No. 126 (1882)¹; *sep.* 187-8 (1882)¹. *Grapholitha (Pedisca) contrariana*, Snell. Tijds. v. Ent. XXVI. 218-9, Pl. XIII. 3, 3 a (1883)².

Hab. E. SIBERIA—Irkutsk, 30 VI.—30 VII.²; Pompejefka¹; Wladiwostok, VII.¹; Amur, 21 VII.² CHINA—Chang Yang, 4000–6000 feet (*Pratt*, 1886).

1106 (1). *Eucosma inconspicua*, sp. n.

Antennæ greyish fuscous. *Palpi* with a rather strong projecting tuft of scales beneath the median joint, terminal joint small, exposed; greyish fuscous. *Head* greyish fuscous. *Thorax* dark brown. *Fore wings* moderately broad, costa slightly convex, ♂ with a narrow fold at the base reaching to beyond the basal third, termen slightly oblique; greyish fuscous, mixed with dark umber-brown and ferruginous, with leaden grey lines about the apical third, which is especially tinged with ferruginous; a very faintly indicated triangular greyish patch on the middle of the dorsum contains a dark streak at its middle; a curved steel-grey band, from a little beyond the middle of the costa, runs obliquely outwards in the form of two parallel streaks, tipped with whitish on the extreme costa and joining at their lower end the steel-grey band which precedes the ocelloid spot; beyond this are three pairs of whitish geminated costal streaks, throwing out steel-grey lines to the termen, and beneath these the outer edge of the ocelloid spot, which contains three black transverse streaks set in ferruginous, is also steel-grey, the termen and apex are also ferruginous; cilia dark bluish grey. *Exp. al.* 19–22 mm. *Hind wings* dark brown; cilia pale cinereous, with a darker shade running through them near their base. *Abdomen* dark brown. *Legs* greyish fuscous, hind tarsal joints spotted with whitish ochreous.

Type, ♂ (60122); ♀ (60125) Mus. Wlsm.

Hab. JAPAN (*Pryer*, 1886)—HONDO—Tsuruga, VII. 1886 (*Leech*). Eleven specimens.

1107. *Eucosma fænella*, L.

Grapholitha (Pædisca) fænella, Stgr. & Wk. Cat. Lp. Eur. 255. No. 1107 (1871)¹.

Hab. EUROPE¹. ARMENIA¹. COREA—Gensan, VI. 1886 (*Leech*), VII.–IX. 1887 (*Ito*). CHINA—Chang Yang, 4000–6000 feet (*Pratt*, 1886). JAPAN (*Pryer*, 1886)—KIUSIU (*Leech*, 1890)—Satsuma, V. 1886 (*Leech*). INDIA—PUNJAB—Dharmasala (*Hocking*).

The series is extremely variable.

1110 (1). *Eucosma fessana*, Mn.

Grapholitha fessana, Mn. Verh. ZB. Ges. Wien, XXIII. (1873) Abh. 573 (1873)¹; Stgr. Hor. Soc. Ent. Ross. XV. 257-8 (1879)².

Hab. ASIATIC TURKEY—*KARAMANIA*—Küle² (= Gülek¹); *SIVAS*—Jenikeui-Hochebene, 15 VI.²; Maidan 11, V.²; *ARMENIA*—Manglis²; *HALEB*—Shar Devesy, 25 VII. 1890 (*Native Coll.*).

Larva in stems of *Salvia candelabrum*².

A small specimen from Shar Devesy with rather darker hind wings cannot be described as distinct.

[To be continued.]

BIBLIOGRAPHICAL NOTICES.

A Treatise on Zoology. Edited by E. RAY LANKESTER, M.A., LL.D., F.R.S.—Part III. *The Echinoderma.* By F. A. BATHER, M.A., assisted by J. W. GREGORY, D.Sc., and E. S. GOODRICH, M.A. London: Adam & Charles Black, 1900.

THE present volume, on the Echinoderma, is the first published, but third in order of a Comprehensive Treatise on Zoology, which has been for some time past in preparation under the guidance of Prof. E. Ray Lankester.

Rather more than half of this volume has been written by Mr. F. A. Bather. Mr. E. S. Goodrich is responsible for the section on the Holothuroidea, and Dr. J. W. Gregory for that on the Stelleroidea and Echinoidea.

This is essentially a student's book. Its aim is to be a systematic rather than an anatomical work, hence facts that are of purely anatomical interest find no place here. This is well, for they have recently been dealt with in Prof. Lang's excellent compendium, and would only crowd out matter more germane to the purpose. Already this book has been much compressed and any further condensation would seriously threaten the usefulness of the whole.

This work is reared upon the foundation of phylogeny and ontogeny; and if it be objected that this is a somewhat insecure foundation, it must at least be admitted it is the ideal aim of every post-Darwinian taxonomist. It may be claimed for this book that it is unique, in that fossil and living forms are regarded as common material for the building thereof. The former are not regarded as merely decorative elements. So well has the piecing together of these fragments been done, that their true relationships to the living forms can be grasped with something more like certitude than ever

before. As a result, we have for the first time a real insight into the inter-relationships of this most difficult group.

The calycinal system is no longer the governing factor in our reckoning of the morphological level of the Echinoderma, as in the systems of Lovén, Carpenter, and Sladen. The plates taking part in the apical system of the Echinoidea and Stelleroidea cannot, Mr. Bather shows, now be regarded as merely homogenetic with those of the Crinoidea. The evidence of the fossils is fatal to this conclusion, inasmuch as the Eleutherozoa "if they arose from stalked forms at all, indubitably did so ages before the calycinal system had been evolved."

The most primitive Echinoderms which we know at present appear to be the Cystidea Amphoroidea. From this stock probably branched the Cystidea Rhombifera, Cystidea Diploporita, Blastoidea, and Crinoidea on the one hand, and the Edrioasteroidea and Eleutherozoa on the other, these last being derivable possibly from the Edrioasteroidea.

The account of the larval forms, which is absolutely indispensable, is lucidly, if briefly, sketched. Herein the complex coilings of the gut, the changes in the development of the cœlom, following the changes from a free-moving to a fixed habit, and the gradual evolution into the characteristic radial symmetry are made as clear as such a difficult matter can possibly be made. Most of the figures illustrating this section are new. That showing the change from the Pentactea to the Eleutherozoic Stelleroid type is very instructive.

Mr. Bather supports the view held by many that the simplicity of structure of the Synaptidæ is a secondary feature, and that therefore this form cannot be regarded as the simplest and most ancestral of the Echinoderms. The class he regards as a probable early offshoot from the Edrioasteroidea.

Mr. E. S. Goodrich's summary of the Holothuroidea is admirable and well illustrated. We venture to think he missed an opportunity in not directing attention to the fact that Ludwig's classification does not agree with his phylogenetic tree; and that whilst the latter may be taken as a more or less probable expression of the relationships of the forms included, one to another, the former is artificial, and savours rather too much of a "Key."

Dr. Gregory has certainly sustained the high standard which characterizes this work. He insists on the close relationship of the Stelleroidea and Ophiuroidea, wherein most will agree with him. It is incorrect, however, to state that *Ophioteresis* agrees with the Stelleroidea in having an ambulacral furrow. This is an important point, for Dr. Gregory uses it as an instance showing the unreliability of this character as a taxonomic factor for the division of the Ophiuroidea from the Stelleroidea. Again, the supposed pore-plates of *Bothriocidaris* are really tubercles. But these are to be regarded as slips which will creep into every work in spite of the most zealous precautions.

Prof. Lankester's choice of authors for this work has been in

every sense justified, and both Editor and Authors have placed zoological students under a great obligation by bringing within easy reach, and with marvellous completeness, all the essential facts concerning a group which has always ranked as one of the most difficult of comprehension. This book, we may safely say, as yet knows no rival.

It is beautifully and profusely illustrated and remarkably free from misprints. The only one which we have detected, so far, is on page 9, where constructed appears for constricted.

W. P. PYCRAFT.

A Monograph of Christmas Island. Physical Features and Geology by CHARLES W. ANDREWS, B.A.; with Descriptions of the Fauna and Flora by numerous Contributors. Printed for the Trustees of the British Museum. London, 1900.

THIS is a book of remarkable interest, and one of more than ordinary scientific value. It is an embodiment of the results of a ten-months' stay on Christmas Island by Mr. Andrews during 1897-98; and the Trustees of the British Museum, in publishing these results, have conferred a great and lasting benefit upon students of natural science.

Our thanks, however, are not alone due to the Trustees. "It seemed highly desirable," writes Sir John Murray in an Introductory Preface, "that this interesting island—which was evidently an up-raised coral atoll—should be carefully examined and described by a competent naturalist and geologist before being opened up by Europeans for agricultural and commercial purposes. Accordingly it was arranged with the Trustees of the British Museum that Mr. C. W. Andrews, B.Sc., F.G.S., of the Geological Department, should be granted leave to carry out this exploration. I undertook to pay all the expenses and to present a complete set of all specimens procured to the National Collection."

The physical features and geology have been written by Mr. Andrews. The zoology has been worked out by various specialists, most of whom are members of the Museum staff. Their work has been well done. Comparisons are odious, so we refrain from comment in this direction. Field-notes by Mr. Andrews are often appended to the descriptions of species, and some of these notes are of extreme interest. Perhaps one of the most vivid of these descriptions is that of the frigate-bird. "About the beginning of January," he writes, "the adult males begin to acquire the remarkable pouch of scarlet skin beneath their throat. This they can inflate till it is nearly as large as the rest of the body, and a dozen or more of these birds sitting in a tree with outstretched drooping wings and this great scarlet bladder under their heads are a most remarkable sight. When a hen bird approaches the tree the males utter a peculiar cry, a sort of 'wow-wow-wow-wow,' and clatter their beaks like castanets, at the same time shaking the wings. When they take to flight

the air is allowed to escape from the pouch, but occasionally they might be seen flying with it partly inflated."

There is a point concerning this pouch of very great interest. It is a secondary sexual character, developed during the breeding-season, but so far we have no information concerning its nature or the mechanism by which it is inflated and deflated. From an examination of spirit-specimens we believe that it will be found to be nothing more than a widening of the œsophagus, filled through the anterior nares, and held inflated by occlusion of the œsophagus by means of a sphincter at the back of the mouth.

One of the commonest mammals of the island is *Mus Maclearii*. "It occurred in swarms. During the day nothing is to be seen of it, but soon after sunset numbers may be seen running about in all directions, and the whole forest is filled with its peculiar querulous squeaking and the noise of frequent fights. . . . As may be imagined, they are a great nuisance, entering the tents or shelters, running over the sleepers, and upsetting everything in their search for food. They seem to eat anything, and destroy any boots or skins incautiously left within their reach."

"One of the chief objects of the expedition to Christmas Island was to find out whether its structure would throw any light upon the vexed question of the nature of the foundation of atolls."

This exceedingly difficult question is most ably and lucidly handled in the concluding part of this volume.

The occurrence in an oceanic island of thick beds of lower and middle Tertiary limestone is a point of extreme interest and importance, and the demonstration of this fact forms one of the many important results obtained by Mr. Andrews. "Perhaps the most remarkable of the rocks of Christmas Island are the thick deposits of nearly pure phosphate of lime which cap several of the higher hills. This substance is probably derived from ancient (? Pliocene) guano-beds formed on the low islets which existed before the first elevation of the island, and is the insoluble residue of beds of limestone altered by this guano."

Space forbids that we should extend this notice further; enough, it is hoped, has been said to show how admirably this work has been carried out and how fruitful have been its results.

We entirely agree with Sir John Murray, who, in his Introductory Note, says, "It will, I think, be admitted that in the present elaborate report we have the best account of a true oceanic island that has ever been published."

The illustrations, which are numerous, are, on the whole, very good. The text-figures, however, and one or two of the plates are about as badly reproduced as could well be. W. P. PYCRAFT.

THE ANNALS

AND

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[SEVENTH SERIES.]

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XLIII.—*Description of Sponges from Funafuti.*

By R. KIRKPATRICK, Assistant, Natural History Museum.

[Plates XIII.—XV.]

THE sponges described in this paper were obtained by the second Boring Expedition to Funafuti, and were entrusted to me by Prof. Judd for description. The specimens, which are mostly very small, incrust or are attached to fragments of corals and corallines dredged up from depths of from 30 to 145 fathoms. The fragments were obtained only with great difficulty, since they had to be detached from the bottom by means of chisels. The collection includes the representatives of twenty-one species, of which eleven are new.

In 1897 Mr. Whitelegge described (30, p. 323) from the same locality a small collection obtained from the surface of the reefs. Of the sixteen species recorded by him only one occurs in the present collection.

Altogether thirty-six species have been recorded from this locality. The special features of interest are the occurrence (1) of *Astrosclera Willeyana*, Lister, which represents a new family, or, possibly, order of calcareous sponges, (2) of a recent species of the Lithonine genus *Plectroninia*, hitherto found only in the Eocene, and (3) of a new genus of Clionidæ.

The following is a list of the species :—

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| <p>Subclass <i>CALCAREA</i>.</p> <p>1. <i>Astrosclera Willeyana</i>, Lister.
 2. <i>Plectroninia Hindei</i>, sp. n.
 3. <i>Clathrina depressa</i> (Dendy).</p> <p>Subclass <i>DEMOSPONGIDA</i>.</p> <p>Order <i>CARNOSA</i>.</p> <p>Suborder <i>OLIGOSILICINA</i>.</p> <p>4. <i>Chondrilla mixta</i>, Schulze.</p> <p>Suborder <i>MICROSCLEROPHORA</i>.</p> <p>5. <i>Corticium candelabrum</i>, O. Schmidt.
 6. <i>Placinolopha spinosa</i>, sp. n.
 7. <i>Placinastrellu clathrata</i>, sp. n.</p> <p>Order <i>TTRACTINELLIDA</i>.</p> <p>8. <i>Erylus monticularis</i>, sp. n.</p> <p>Order <i>MONAXONIDA</i>.</p> <p>Suborder <i>HADROMERINA</i>.</p> <p>Section <i>CLAVULIDA</i>.</p> <p>Fam. <i>Clionidæ</i>.</p> <p>9. <i>Cliona mucronata</i>, Sollas.
 10. — <i>Schmidti</i> (Ridley).
 11. <i>Dyscliona Davidi</i>, gen. et sp. n.</p> | <p>Fam. <i>Spirastrellidæ</i>.</p> <p>12. <i>Latrunculia clavigera</i>, sp. n.</p> <p>Suborder <i>HALICHONDRINA</i>.</p> <p>Fam. <i>Pæciloscleridæ</i>.</p> <p>13. <i>Agelas gracilis</i>, Whitelegge.
 14. <i>Tedania levis</i>, sp. n.</p> <p>Fam. <i>Haploscleridæ</i>.</p> <p>15. <i>Chondropsis ceratosus</i>, sp. n.
 16. <i>Pachychalina fibrosa</i>, Ridley & Dendy.</p> <p>Order <i>MONOCERATINA</i>.</p> <p>17. <i>Luffariella variabilis</i> (Poléjaeff).
 18. — <i>geometrica</i>, sp. n.
 19. <i>Psammopemma purpureum</i> (Carter).
 20. <i>Stelospongius cavernosus</i> (Pallas), var. <i>pyriformis</i>, Lendenfeld.
 21. <i>Polyfibrospongia Sweeti</i>, sp. n.</p> |
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Astrosclera Willeyana, Lister.

1900. *Astrosclera Willeyana*, Lister (16, p. 459, fig. A, 1-5).

The single large specimen of this species from Funafuti was sent to Mr. J. J. Lister, of Cambridge, who was at the time engaged in working out the structure of four small specimens of the same species from Lifu. Mr. Lister's description of the external features of the Funafuti specimen is as follows :—

“The specimen from Funafuti (fig. A, 1-5) has grown attached by a short stalk about 6 millim. wide at the base, which expands into a broad nearly circular disc, convex above, and resembling the pileus of a mushroom in shape. The diameter of the disc is about 20 millim., and the distance

from the broken end of the stalk to the centre of the upper surface of the disc is 16 mm.

"A smooth imperforate cortical layer covers the outer surface of the stalk and under surface of the disc. . . . The upper surface of the disc is in part perforate l by pores.

"There appears to have been an interruption of the growth of the specimen after the formation of the disc, and the later expansion has taken place not uniformly, but only from parts of its upper surface. At these parts rounded bosses of different sizes have been formed, and they, like the original disc, are perforated by pores on their convex upper surfaces and covered on the sides by an imperforate cortical layer. . . . the greater mass of the new growth appears to have been formed by the fusion of three originally distinct bosses.

"The upper surface, whether of the original disc or of the later formed bosses, is perforated by closely-set pores. These are sometimes isolated, but often they open into curving and branching grooves, recalling those of the coral *Meandrina*.

"At seven places on the surface of the later growth, and at one on the original growth, the lines of pores are seen to be disposed in a radiating manner about so many centres. The pores along these lines are large, being at least twice the diameter of those distributed elsewhere.

"The fully formed skeleton is built up of a solid mass of polyhedral elements (40 to 150 μ in diameter), whose surfaces are united closely together to the complete exclusion of the soft parts."

For a full account of the structure of the skeleton and soft parts of this sponge reference must be made to Mr. Lister's memoir (16). The skeletal structure of *Astrosclera* differs so entirely from that of other sponges that it will probably have to be placed in a third order of Calcarea, the other two being *Lithonina* and *Dialytina*; but Mr. Lister would defer the establishment of such a division until more material becomes available for investigation.

PLECTRONINIA, Hinde (12, p. 51).

Plectroninia Hindei, sp. n. (Pl. XIII. fig. 1, a-r.)

The specimen, which forms a minute oval crust on a coralline, is 4 \times 3 millim. in area and 1 millim. in thickness at the centre, but thinning away to the edges. The surface appears vitreous, with a faint yellow tinge, the interior being crystalline vitreous. The crust, which was easily flaked off from the coralline, showed a granular crystalline basal layer; on

vertical section a second granular "basal" layer, parallel with the first, occurs in the middle of the section.

Under magnification, the polygonal openings ($105\ \mu$ in diameter) of the excurrent canals are seen occupying the whole upper surface.

The thin edges of the specimen allow of no room for a dermal layer, but in one small recess there was a little nest of loose oxeas and styles, possibly the constituents of such a layer.

The *skeleton* is mainly built up of stout quadriradiates, usually smooth, with fused facial rays and with the sharp apical ray more or less free and pointing almost vertically to the surface; occasionally the surface of the rays is slightly spined or tuberculated.

The *basal* layers are composed of densely packed but separate small quadriradiates, varying considerably in shape and size, with rays frequently spined and terminating in flat expansions.

Spicules.—Skeletal network: length of beams formed by facial rays $70\text{--}100\ \mu$, and $40\ \mu$ in thickness; apical rays $85\text{--}200\ \mu$ in length by $15\text{--}45\ \mu$ in thickness.

The rays of the smaller basal quadriradiates vary from 18 to $35\ \mu$ in length.

Triradiates: (1) Sagittal, rays sharp-pointed, basal ray $120 \times 7\ \mu$, laterals $60 \times 7\ \mu$.

(2) Irregular, with slender pointed unequal rays, resting on the apices (tripod type).

(3) Tuning-forks: (a) with prongs curved away from the plane of the handle, with equal prongs each ending in trifid points.

(b) Prongs and handle in one plane, prongs of unequal length and spined; there are several variations in the shape of form (b).

Lance-shaped subtylotes and styles, finely spined with disk- or crook-shaped head, $200\text{--}500 \times 6\ \mu$, head $5\ \mu$, neck $3\ \mu$.

Finely spined oxeotes, $200\text{--}400 \times 7\ \mu$.

Plectroninia Hindei constitutes the second recent Lithonine sponge that has been discovered, the first being *Petrostroma Schulzei*, Löderlein, from Japan (10, p. 15, pls. ii.-vi.).

The new species is near to *Plectroninia Halli*, Hinde, from Eocene beds at Geelong and Flinders. So far as can be made out from crushed fragments and a broken surface of the minute specimen, the skeletal framework is fairly regularly reticulate, without presenting any radiating main beams, and the facial rays of the quadriradiates are always expanded, and not tapering. The chief specific differences from

P. Halli lie in the smaller size of the beams and meshes of the network and in the characters of the loose spicules. The type of the genus is turbinate in form, but it cannot be said what would be the ultimate shape of the probably young specimen of *P. Hindei*.

Locality. Beacon Island, Funafuti, 50 fath.

Clathrina depressa (Dendy).

1891. *Leucosolenia depressa*, Dendy (8, p. 65, pl. iii. figs. 4, 4 a, pl. viii. fig. 8, pl. xi. fig. 4).

The specimen forms a small whitish patch about 6 millim. in area on the surface of *Luffariella variabilis*. The dermal triradiates are slightly larger than in specimens from Port Phillip, being $240 \times 25 \mu$, as against $200 \times 28 \mu$ from the latter locality; the quadriradiates are few in number and with the apical ray almost aborted.

Locality. Funamara, Falefatu, 25-45 fath.

Distribution. Port Phillip, Victoria; Funafuti Atoll.

Chondrilla mixta, F. E. Schulze.

1877. *Chondrilla mixta*, F. E. Schulze (23, p. 116).

The one specimen forms a small bluish-black incrustation on an *Agaricia*. The surface of the sponge is finely granular to the naked eye. The spherasters are $25-30 \mu$ in diameter, with about 20 pyramidal prickles, and the oxyasters $24-28 \mu$ in diameter, with a centrum 7μ in diameter.

The spherasters just below the surface are united into little heaps, which give rise to the granular appearance of the surface; the oxyasters are only very rarely present in the ectosome.

Locality. Funafuti Islet.

Distribution. Java; Amirante Is.; Red Sea; Funafuti Atoll.

Corticium candelabrum, O. Schmidt.

1862. *Corticium candelabrum*, O. Schmidt (21, p. 42, pl. iii. fig. 25).

1881. *Corticium candelabrum*, F. E. Schulze (25, p. 410).

The specimen forms a small greenish-black disk, 3 millim. in area by 1 millim. in thickness, attached to a piece of coralline.

Locality. Fuafatu, 50-70 fath.

Distribution. Adriatic; Zebu; Funafuti Atoll.

Placinolopha spinosa, sp. n. (Pl. XIII. fig. 2, a-m.)

The specimen forms a whitish-brown crust about 10 millim. in area and 1-2 millim. thick, creeping over a nodule of coralline. Several oval oscules, 0.5×0.25 millim. in diameter, with membranous edges level with the surface, are present. The choanosome forms more or less vertical folds beneath the ectosome. The skeleton is composed of micro-calthrops of various sizes densely scattered in the ectosome and walls of the choanosomal folds, and of lophodiactines arranged tangentially in the ectosome and in the walls of the folds.

Spicules.—Microcalthrops in graduated sizes, from very slender forms with rays $24 \times 2 \mu$, smooth or slightly spined, with simple or bifid ends, up to stout forms with rays $42 \times 9 \mu$, much spined and di- or trichotomously branched at the ends. Lophodiactines $240 \times 12 \mu$, with simple or branched spines and once or twice branched at the ends.

The lophodiactines of *P. spinosa* resemble in form a spicule figured by Sollas (26, pl. xxxv. fig. 24), who found it associated with spicules of the Lithistid *Corallistes Thomasi* from the Ki Islands. Sollas, who was doubtful whether to regard the spicule as Tetractinellid or Monaxoid, assigned it to a new genus and species—*Orthorhachis problematica*. It seems very probable that Sollas's species comes under *Placinolopha*. The spicule figured by him is $450 \times 40 \mu$, nearly twice the size of the largest lophodiactine of *P. spinosa*.

Including that of Sollas, there are three species belonging to this genus:—

P. Bedoti, Topsent.—Philippines (28, p. 429).

P. spinosa, sp. n.—Funafuti.

P. problematica, Sollas.—Ki Islands.

Locality. E. end of F'uafatu, Funafuti Atoll, 50-70 fath.

Placinastrella clathrata, sp. n. (Pl. XIII. fig. 3, a-o.)

The specimen, which forms a small, rounded, soft nodule $8 \times 5 \times 5$ millim. in size and of dirty white colour in spirit, appears to have been cut off from a coral.

The surface is smooth, but when highly magnified shows an extremely fine pile formed by the points of a palisade of cortical diactines. An oscule in the form of an irregular fissure about 1 millim. in length, and level with the surface, occurs on the summit of the specimen. The pores occupy irregular cribriform areas with well-defined margins; the sieve-meshes are 70μ in diameter and the pores about 30μ (about two or three to a mesh). The pores lead by short

canaliculi into a system of subdermal spaces, which open into incurrent channels and spaces in the interstices of a close network of tubes, the lumen of the tubes constituting the excurrent canal system; this arrangement recalls that found in the Ascon genus *Clathrina*.

Skeleton.—The ectosome is supported by a palisade of slender diactines, but in the meshes of the pore-areas the diactines are tangential. The walls of the choanosomal tubes are supported by tangentially arranged diactines, triods, and microcalthrops of various sizes.

Spicules.—Diactines attaining $140 \times 5 \mu$, straight or slightly curved, with a slight kink or irregular thickening in the centre, and often abruptly bent near each end. Ectosomal diactines $36 \times 1.5 \mu$, with a slight kink in the centre.

Triods regular or irregular, with two rays (together $120 \times 4 \mu$) in a line and a shorter third ray (36μ) forming an angle.

Calthrops, larger forms with rays $36 \times 5 \mu$, smaller with rays $18 \times 3 \mu$.

The only other species of this genus *Placina* *Placina* *strella* *copiosa*, Schulze (24, p. 433, pl. xxi. figs. 17–21), is found at Naples. A cortical palisade of diactines is present in both; but the large definitely orientated calthrops occurring in *P. copiosa* are wanting in *P. clathrata*.

The tubular reticulum appears to be merely an elaboration of the system of simple folds found in *Placina simplex*, and the proper position for *Placina* *strella* is probably in the family Placinidæ, where Schulze placed it (24, p. 449), rather than in the Pachastrellidæ, to which the genus was assigned by Sollas (26, p. 103).

Locality. Funafuti Islet.

Erylus monticularis, sp. n. (Pl. XIV. fig. 3, a–h.)

The sponge forms an extremely thin pale brown lamella incrusting an *Agaricia*. Several minute conical oscules, .07 millim. in height and .175 millim. broad at the base, are scattered over the flat surface, the walls of the cones being supported by a sloping palisade of small oxea $80 \times 3 \mu$.

Skeleton.—Beneath the surface-layer of disciform sterrasters is a layer of scattered orthotriænes, with reduced rhabdomes directed vertically downwards.

Spicules.—Megascleres: oxea (few) slightly curved, $210 \times 10 \mu$.

Orthotriænes: rays of cladome each $186 \times 3 \mu$, slender, straight, sharp-pointed, rhabdome 6μ .

Microscleres: sterrasters oval, with diameters $150 \times 114 \mu$,

both surfaces granulose, with radiating striæ, edges finely serrated.

Microxea (medium) $80 \times 3 \mu$, slightly curved. Very slender microxea $40 \times 1 \mu$.

Small chiasters 10μ in diameter, with small centrum and about 12 slightly tylote rays.

Oxyasters $18-30 \mu$ in diameter, with about 6 rays.

The new species is near *E. placenta*, Thiele (27, p. 5, pl. i. fig. 1, pl. vi. figs. 1, *a-h*), but differs from it chiefly in the proportions of the oxea and orthotriænes. In Thiele's species the oxea attain a size of 800μ , and the microxea are centro-tylote. Further, in the new species there are no orthotriænes with long rhabdomes 500μ in length, but only aborted forms.

Locality. Funafuti Islet.

Cliona Schmidtii (Ridley).

1870. *Vioa Johnstoni*, var., O. Schmidt (22, p. 5, pl. vi. fig. 18).

1881. *Vioa Schmidtii*, Ridley (18, p. 130).

1884. *Vioa Schmidtii*, Ridley (19, p. 622).

1898. *Vioa Schmidtii*, Lendenfeld (14, p. 72, pl. iii. fig. 31, pl. vi. fig. 53, pl. vii. fig. 74, pl. x. figs. 135-139).

The specimens of this species ramify in fragments of *Echinopora* along with *Dyscliona Davidi*, and in a lamina of *Agaricia* along with *Cliona mucronata*, Sollas. Colour purple.

One of the two kinds of spinispirulas is $54 \times 1.5 \mu$, slender, with eight or more curves and with separate short blunt spines, the other kind being much stouter, $48 \times 6 \mu$, with about six bends and with sharp pyramidal spines.

The tylostyles are $360 \times 4 \mu$, straight or slightly curved, with oval or spherical heads about 7μ in diameter, but showing a certain amount of variation in shape and size.

Locality. Funamara, 25-45 fath., and Funafuti Islet.

Distribution. Amirante Is.; Funafuti Atoll; Adriatic.

DYSCLIONA, gen. nov.

Clionidæ with diactinal (usually strongylote) megascleres and spined diactinal microscleres.

Dyscliona Davidi, sp. n. (Pl. XIV. fig. 1, *a-g*.)

Boring sponges of orange-yellow colour. Oscular papillæ (and poral papillæ?) projecting slightly above the surface, cylindrical, patent, and about 1 millim. in diameter. Membranous poral areas (?) irregular in form and level with the

general surface. Lobes (mainly following the shape of the meshes of the madreporæ in the present specimens) usually elongated and quadrangular, attaining a size of 35×1.5 millim., but varying in shape and size; lobes connected with each other by short tubular channels varying in diameter; the interior of the lobes occupied by a labyrinth of thin-walled channels and spaces. Flagellated chambers oval, eurypylous, $30 \times 24 \mu$.

Skeleton formed of scattered strongyles occasionally forming an irregular reticulum, and mostly lying tangentially in the walls of the lobes.

Spicules.—Megascleres: strongyles varying from 126 to 246μ in length and from 3 to 5.5μ in thickness, curved at the centre, smooth, rarely slightly roughened at the ends.

Microscleres: microstrongyles (rather rare) $90 \times 3 \mu$, slightly curved, with truncate ends, and with spines arranged in a regular closely-whorled spiral.

Surface of the "galleries," and especially of the connecting channels, finely shagreened, but frequently smooth.

The specimens consist of three fragments of the coral *Echinopora* excavated by the sponge. Two of the pieces are dried, the sponge being of a dark brown colour; the third piece is in formol, the sponge here being orange-yellow when the coral is freshly fractured, but gradually becoming brown on exposure to light. The fragments are also excavated by the purple boring-sponge *Cliona Schmidtii*, Ridley. The new species is nearly related to the *Cliona purpurea* of Hancock (11, p. 343, pl. xii. fig. 6), the latter species now coming under the new genus.

Topsent (28, pp. 576-7) was of opinion that Hancock's species was not a genuine boring-sponge, but possibly a Desmacidine which had grown into excavations made by some other organism. In answer to my request for information about Hancock's collection, Mr. R. Howse, Curator of the Newcastle Museum, very kindly forwarded to me the type specimen of *Cliona purpurea*. In view of the close affinity of this species to *D. Davidi*, a brief description of the former is given here for comparison.

The type specimen consists of several small fragments of *Tridacna gigas*, with holes for the oscular and poral papillæ on the inner and outer surfaces. The broken edges show a labyrinth of small oval cavities with finely shagreened surface connected by tubes or foramina, and lined with a dull red fluffy membrane. The megascleres are amphi-subtylote and measure $246 \times 5.25 \mu$, the ends being 6μ in breadth, slightly spined, and sometimes with a terminal tuft of spines. The

microscleres are strongylote or substylote, slightly curved, finely and irregularly spined, and 90-144 μ in length by 3-5 μ in breadth.

After a careful examination of Hancock's specimen I consider *Dyscliona purpurea* to be a genuine boring-sponge.

To return to the Funafuti species: the *Echinopora* has been bored by *Cliona Schmidtii* and by the filamentous alga *Achlya*, and precautions were necessary to ensure that the *Dyscliona* was obtained free from admixture with the *Cliona*. Fragments of the coral with the cavities lined solely with the yellow tissues of *Dyscliona* were separated, none of the tylote and spinispirular spicules of *C. Schmidtii* being found. Hence I consider that these excavations were formed by the *Dyscliona*. Further, the existence of two closely allied species, *D. purpurea* and *D. Davidi*, ramifying deep down in the substance of shell and coral, tends to confirm the hypothesis that we have here genuine boring-sponges.

If this supposition be correct, the true position of these species would seem to be in the Clavulid family Clionidæ, despite the fact that only diactinal megascleres are present in them and that true spinispirulas do not occur. The undoubted Clionid sponges, *Cliona nodosa* and *C. labyrinthica*, have only diactinal megascleres; and, further, the spirally-spined microscleres of *Dyscliona Davidi* may be regarded as modified spinispirulas, the modification having proceeded still further in *D. purpurea*.

If *D. Davidi* and *D. purpurea* are not Clionids we have to assume that the faculty of boring belongs to Halichondrine as well as to certain Clavulid and Tetractinellid sponges.

To have placed these two species in the genus *Cliona* would have been to unduly disturb what Topsent has termed the "incomparable homogénéité" of that genus; accordingly they have been put into a new genus, *Dyscliona*. The new species is named after Prof. Edgeworth David, the leader of the Australian Boring Expedition.

Locality. Funamara and Funafuti Islet, 25-45 fath.

Latrunculia clavigera, sp. n. (Pl. XIV. fig. 2, a-e.)

Sponge forming a very thin greyish-white crust (on the stem of a *Gorgonia*).

Skeleton formed of a surface-layer of discasters, and, beneath this, of scattered tylotes arranged horizontally; scattered small nail-shaped tylotes with points upwards and heads on basal surface.

Spicules.—Megascleres: tylotes, average size 850 \times 9 μ ,

slightly curved; head faintly trilobed, $12\ \mu$ in breadth (one large tylote $1295 \times 15\ \mu$ was present on the microscopic slide).

Microscleres: discasters, $54\ \mu$ in length, straight or slightly curved, shaft spinose, tylote; disks concave above, convex below, with thick spinose rims; upper disk $19\ \mu$, lower $26\ \mu$ in diameter.

Small nail-shaped tylotes, $120 \times 6\ \mu$, straight, ending in a very sharp point, with double head $11\ \mu$ in breadth.

Carter gives a figure of a discaster (2, p. 358, pl. xxix. fig. 20) obtained by him from the debris of the root-tuft of *Euplectella cucumer* from the Comoro Islands, which closely resembles the discaster of the new species.

Locality. W. of Tutanga, Funafuti, 86 fath.

Tedania levis, sp. n. (Pl. XIV. fig. 4, a-e.)

Sponge forming a pale slate-coloured crust about 10 millim. in area and .5 millim. in thickness, on a nodule of coralline.

Surface smooth; no oscules or pores visible; consistence firm.

Skeleton.—Dermal: a felt-like network of tangentially arranged, contorted, spined strongyles. Choanosomal: a rather dense mass of contorted spined strongyles, occasionally with a tendency to unite into bundles; also scattered smooth styli (rather rare) and scattered smooth strongyles (rather rare). Trichodragmata and rhabdides abundant, the former being cylindrical and frayed at the ends.

Spicules.—Spined strongyles 250 to $300\ \mu$ in length and 3 to $12\ \mu$ in breadth, the dermal spicules being the more slender. Styles smooth, straight, or slightly curved, 245 to $1380\ \mu$ in length and 4 to $12\ \mu$ in breadth. Smooth strongyles straight, averaging about 1085 by $12\ \mu$.

Rhabdides 150 to $200\ \mu$ in length and about $1\ \mu$ in thickness; trichodragmata 150 to $200\ \mu$ in length and about 6 to $12\ \mu$ in thickness.

The new species, which is only placed in *Tedania* provisionally, should probably come under a new genus near *Tedania*, but differing from it in having spined diactinal megascleres in the choanosome. The contorted megascleres call to mind those of certain Axinellid sponges.

Locality. Fuafatu, 50-70 fms.

CHONDROPSIS, Carter (6, p. 122).

Chondropsis ceratosus, sp. n. (Pl. XV. fig. 3, a-c.)

Two specimens. Sponge incrusting. Colour reddish brown; texture soft and elastic.

Oscules 3 millim. in diameter, level with surface, with thin margins. Dermal membrane smooth, supported by a reticulum of primary and secondary fibres.

Skeleton formed of a square-meshed reticulum of horny fibres, which latter may be clear or filled with sand-grains. Width of meshes about 245μ ; width of fibres from 24 to 48μ .

Spicules.—Megascleres: oxea (rare and possibly foreign) slender, straight, sharp-pointed, $120 \times 2 \mu$.

Microscleres: sigmata abundant, 30 to 50μ in length.

Locality. W. of Tutanga, 30 fath.

The specimens, which are of irregular shape, are growing on fragments of *Seriatopora*, on branches of which they form a thin semitransparent coating, but attaining some thickness between the branches.

The new species differs considerably from other species of *Chondropsis* in its comparative freedom from sand and other foreign bodies; but I can find no other position for it than in the genus *Chondropsis*, Carter, as emended by Dendy (9, p. 250).

Pachychalina fibrosa, Ridley and Dendy.

1887. *Pachychalina fibrosa*, Ridley and Dendy (20, p. 21, pl. iv. figs. 3, 4).

1888. *Pachychalina fibrosa*, Lindgren (15, p. 293, pl. xix figs. 6 a-e).

The specimen is in the form of a small dried fragment 40 millim. in height, finger-shaped and expanded at the upper end. The colour is pale yellow and the spinules 2 to 3 millim. in height.

The spicules are strongyles $114 \times 3.5 \mu$, slightly curved.

Had it not been for Lindgren's description of transition forms in the spicules, which, in his specimens, include oxea, tornota, and strongyla, I would have hesitated before placing the specimen in the above species. Doubtless *Pachychalina spinosissima*, Dendy, and *Chalina spinifera*, Carter, are very nearly allied to the present species, but it is doubtful whether they are identical.

Locality. Funafuti Atoll.

Distribution. Off Bahia; Philippines; Funafuti Atoll; Cochin China; Java; Christmas I. (?); Mergui (?).

Luffariella variabilis (Poléjaeff).

1884. *Luffaria variabilis*, Poléjaeff (17, p. 69, pl. ix. figs. 1-6).

1889. *Luffaria variabilis*, Lendenfeld (13, p. 387, pl. xxxiv. fig. 5).

1899. *Luffariella variabilis*, Thiele (27, p. 25).

Several small, massive, and digitate specimens of this sponge occur from depths of 25–86 fathoms, either as dried washed-out skeletons or preserved in formalin; the branches of one of the digitate varieties anastomose. The dermal membrane is dark slate or black and the interior rich yellow.

Localities. Funamara, 25–45 fath.; Falefatu, 80 fath.; and Funafuti Islet.

Distribution. Api, New Hebrides, 60–70 fath.; Tahiti, reefs; Funafuti Atoll.

Luffariella geometrica, sp. n.
(Pl. XV. fig. 1, a–c.)

Sponge forming two subspherical masses attached to a branch of *Seriatopora*, the larger being 20 millim. in diameter. Colour reddish brown; consistence soft and elastic.

The dermal membrane sandy in parts, but in other parts transparent, the whole sponge being more or less transparent and allowing one or more concentric spheres (indicating periods of growth) to be visible in the interior. Oscules level with the surface and 6 millim. in diameter.

Surface conuli 210 μ , formed by projecting main fibres.

Skeleton forming a regular rectangular network composed of radiating primary main fibres, joined by secondary horizontal fibres in such a manner as to form triangular shafts; tertiary fibres also present, more or less irregularly distributed.

Dermal skeleton a regular reticulum in which usually six secondary fibres radiate out from each nodal vertical primary fibre, the joined bases of the resulting triangles forming more or less regular hexagons; the primary meshes filled in with a network of more slender fibres.

Fibres.—Primary main fibres 175–210 μ , secondary 110 μ , tertiary 16 μ .

Width of meshes about 700–1500 μ in width and 400–650 μ in height.

Flagellated chambers subspherical, 32 μ in diameter.

The present form constitutes the fifth described species of the genus. *L. geometrica* is more nearly allied to *L. calyx*, Lendenfeld, from the Indian Ocean, than to the other species, but differs from it in being devoid of gyriform protuberances on the surface.

The pith of the fibres occupies about one third of their diameter and is clearly differentiated by staining with borax carmine.

Locality. W. of Tutanga, 30 fath.

Psammopemma purpureum (Carter).1880. *Aplysina purpurea*, Carter (3, p. 36).1881. *Aplysina purpurea*, Carter (4, p. 103, pl. ix. figs. 1, 2).1885. *Pseudoceratina durissima*, Carter (5, p. 204).1885. *Holopsamma fuliginosa*, Carter (5, p. 213).1889. *Aplysina purpurea*, Dendy (7, p. 97).1889. *Psammopemma fuliginosum*, Lendenfeld (13, p. 636).

The sponge, which forms a dark purple incrustation on *Halimeda*, has a few cactiform protuberances on its surface and fragments of the coralline imbedded in its substance. The ground-substance contains fine fibrillæ $2\ \mu$ in thickness.

After examining the type specimens of *Pseudoceratina durissima*, Carter, and *H. fuliginosa*, I agree with Lendenfeld in considering these species as synonyms of *A. purpurea*; but I can see no reason for rejecting the oldest species name *purpureum*.

Locality. Tutanga, 50 fath.

Distribution. Port Phillip, Victoria; Funafuti Atoll; Gulf of Manaar.

Stelospongius cavernosus (Pallas), var. *pyriformis*,
Lendenfeld.1889. *Stelospongius cavernosus*, var. *pyriformis*, Lendenfeld (13, p. 509).

A small specimen, 70×40 millim. in area by 20 millim. in thickness, consisting only of the hard brown skeleton of flattened-pyriform shape.

The type specimen of the variety is in the British Museum (registered, year 1838. 4. 16. 10), the specimen having been purchased from a dealer, and it is important to note that the locality is unknown, and probably not "West Indies," as recorded by Lendenfeld. In fact, the type specimen may have come from the Pacific, since various specimens presented by Sir E. Home, who brought home collections from the Pacific, are registered on the same page. It is not unlikely that the dealer obtained his specimen from some fellow-voyager of Sir E. Home.

On the under surface of both specimens an oval patch of pale brown dermal membrane incrustated with foreign bodies still persists, and probably coincides with the area of attachment of the sponge.

Locality. Funafuti Atoll.

POLYFIBROSPONGIA, Bowerbank (1, p. 459).

1889. *Hircinia*, subgenus *Polyfibrospongia*, Lendenfeld (13, p. 587).1884. *Stelospongius*, Ridley (19, p. 383).

Stelospongiæ with a loose skeleton-net, the trabeculæ of which are formed of fascicles of parallel slender fibres frequently anastomosing.

Polyfibrospongia Sweeti, sp. n. (Pl. XV. fig. 2, a-c.)

Sponge forming an irregular incrusting mass, 4 centim. in length, 2.5 centim. in width, and 1 centim. in thickness, nearly encircling the stem of a *Gorgonia*; with long membranous yellow oscular tubes about 2 centim. in height, occasionally branched. Dermal membrane smooth, pergamentaceous, yellowish white.

Skeleton.—Ectosomal: composed of stout primary fibres 30 to 60 μ in thickness, partly cored with foreign bodies, the meshes being filled in by thinner clear fibres and crowded with foreign bodies; the oscular tubes consisting of a continuation of the dermal layer, but with the cored fibres forming a regular network with square meshes.

Choanosomal skeleton composed of an oval-meshed network of loose bundles of slightly branched anastomosing fibrils, the diameter of the bundles being 210 μ and of the fibrils 9 μ ; also of sparsely scattered slightly branched fibres 50 μ thick, and passing from the base to the surface, composed of foreign bodies cemented by spongin.

Filaments absent.

This remarkable species is nearly related to *Polyfibrospongia flabellifera*, Bowerbank, a thin flabellate species from New Guinea, but differs in shape and in having the oscular tubes. The type specimen of Bowerbank's species is in the Dresden Museum, but the Bowerbank collection contains two slides prepared from the type, and quite sufficient to show the close similarity in the skeletal structure of the two species.

Lendenfeld puts Bowerbank's species in a subgenus *Polyfibrospongia* under the genus *Hircinia*. After a careful search I have been unable to find filaments in either of the above two species, though these mysterious objects are abundant in a specimen from Port Jackson named by Lendenfeld *Hircinia* (*Polyfibrospongia*) *gigantea*.

To include *H. gigantea* in the same genus with *Polyfibrospongia Sweeti* and *flabellifera* would be tantamount to regarding the filaments as unessential elements from the systematic point of view. I have not at present a definite opinion on this difficult controversial question of the systematic value of the filaments, a question on which equally eminent spongologists take diametrically opposite views.

For the present I shall retain Bowerbank's genus with the two species *Sweeti* and *flabellifera*, placing it next to *Stelospongos*, and shall leave *H. gigantea* and *fasciculata* under *Hircinia*. The new species is named after Mr. G. Sweet, whose munificent donations rendered possible the success of the Australian Boring Expedition.

Locality. W. of Tutanga, 86 fath., Funafuti Atoll.

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EXPLANATION OF THE PLATES.

PLATE XIII.

- Fig. 1. Plectonimia Hindei*, sp. n.
a. Specimen, natural size.
b, c. Large fused quadriradiates, forming skeleton mesh, $\times 200$.
d, e. Smaller quadriradiates of basal layer, $\times 200$.
f, g, h. Triradiates, $\times 200$.
i-l. Tuning-fork spicules, $\times 400$.
m-o. Tyloles and subtyloles, $\times 400$.
p-r. Style and oxea, $\times 400$.
- Fig. 2. Placynolopha spinosa*, sp. n.
a. Natural size.
b-i. Microcalthrops in graduated sizes, $\times 200$.
k-m. Lophodiactines, $\times 200$.
- Fig. 3. Placinastrrella clathrata*, sp. n.
a. Surface, showing a pore area, $\times 6$.
b. Section, $\times 10$.
c. Small calthrops, $\times 200$.
d. Larger calthrops, $\times 200$.
e-g. Triods, $\times 200$.
h. Dermal diactine, $\times 200$.
i-o. Larger (choanosomal) diactines, $\times 200$.

PLATE XIV.

- Fig. 1, a.* Fragment of *Echinopora* bored by *Dyscliona Davidi*, sp. n.
b. Portion of the sponge separated by decalcification, showing the lobes, $\times 10$.
c. Strongyle, $\times 200$.
d. Spirally spined microstrongyle, $\times 200$.
e. The same, $\times 600$.
f, g. Spicules of *D. purpurea*, Hancock, copied from Hancock's figures.
- Fig. 2. Latrunculia clavigera.*
a. Specimen incrusting *Gorgonia*, natural size.
b. Tylole, $\times 125$.
c, d. Discasters, $\times 400$.
e. Small tylole, $\times 400$.
- Fig. 3. Erylus monticularis*, sp. n.
a. Surface, $\times 50$.
b. Sterraster, $\times 400$.
c. Large oxeum, $\times 200$.
d. Medium-sized oxeum, $\times 250$.
e. Smallest microoxea, $\times 250$.
f. Orthotriene, $\times 100$.
g. Chiaster, $\times 400$.
h. Oxyasters, $\times 400$.
- Fig. 4. Tedania levis*, sp. n.
a. Spined strongyle, $\times 200$.
b. Tylole, $\times 200$.
c. Smooth strongyle, $\times 200$.
d. Trichodragma, $\times 200$.
e. The same with raphides compact, $\times 200$.

PLATE XV.

- Fig. 1. *Luffariella geometrica*, sp. n.
 a. Natural size.
 b. Section, $\times 10$.
 c. Dermal skeleton, $\times 25$.
- Fig. 2. *Polyfibrospongia Sweeti*, sp. n.
 a. Natural size.
 b. Section, $\times 25$.
 c. Wall of oscular tube, $\times 15$.
 d. Bundle of fibres teased out, $\times 250$.
- Fig. 3. *Chondropsis ceratosus*, sp. n.
 a. Skeletal network, $\times 25$.
 b. Sigmata, $\times 125$.
 c. Oxeum, $\times 125$.

XLIV.—*The Scorpions of the Genus Heterometrus.*

By R. I. POCKOCK.

PROF. KRAEPELIN (Das Tierr., Scorp. p. 124, 1899) recognizes, under the name *Scorpio**, two species of the genus *Heterometrus*, namely *maurus* and *Boehmi*, a form referred on the authority of Birula to *testaceus* of C. Koch, from Syria, being regarded as doubtfully distinct. To the synonymy of *maurus* is added *palmatus* of Ehrenberg and *propinquus* of Simon, the latter being qualified with a mark of interrogation.

An examination of the material at my disposal has led me to conclusions by no means in accord with those contained in 'Tierreich.' *H. Boehmi* and *H. propinquus* are unknown to me; but including the latter I recognize the following four species as occurring in the area inhabited, according to Prof. Kraepelin, by the one form *maurus*:—

(1) *Heterometrus maurus* (Linn.).

Scorpio maurus, Linn. Syst. Nat. ed. 10, p. 624 (1758).

Buthus testaceus, C. Koch, Die Arachn. v. p. 3, fig. 259 (1839).

Scorpio maurus, Kraepelin, Das Tierr., Scorp. etc. p. 124 (1899) (in part.).

* The system, if any, of determining the type species of genera, which is adopted by Prof. Kraepelin, and presumably sanctioned by the Tierreich-Committee, is most puzzling. By elimination *maurus* is not the type species of *Scorpio*, since it was removed from that genus under the name *palmatus* by Hemprich and Ehrenberg and fixed on to *Heterometrus* by Thorell (Ann. & Mag. Nat. Hist. (4) xvii. p. 2, 1876). If it be regarded as the type of *Scorpio* on the strength of standing first under that heading in the 10th edition of the 'Systema,' it must for the same reason be regarded as the type of *Heterometrus*. In that case *Heterometrus* must be a synonym of *Scorpio*. Prof. Kraepelin, however, retains by elimination the name *Heterometrus* for the second species it originally contained, namely *spinifer*.

Loc. Marocco and Algeria. The British Museum has many examples from Tangier (*B. B. Woodward, &c.*), Cape Spartel (*T. Annandale*), Tunis, and Algiers.

(2) *Heterometrus palmatus*, Hempr. & Ehrenb.

Heterometrus palmatus, Hempr. & Ehrenb. Symb. Phys., Scorpiones, no. 1 (1829).

Heterometrus palmatus flavus and ? *rufus*, iid. *ibid.*

Scorpio maurus, Kraepelin, *op. cit.* (in part.).

Loc. Egypt: Cairo (*Dr. Anderson*).

Hemprich and Ehrenberg recognized two varieties of the Egyptian species—one from Alexandria, which was named *flavus*; the other from Sinai, named *rufus*. I have seen no examples from Sinai, but a single male specimen from Cairo (*Dr. Anderson*), which is doubtless referable to *H. palmatus flavus*, belongs to quite a distinct species from the Algerian *H. maurus*.

(3) *Heterometrus fuscus*, Hempr. & Ehrenb.

Heterometrus palmatus fuscus, Hempr. & Ehrenb. Symb. Phys., Scorp. no. 1 (1829); Simon, Ann. Soc. Ent. Fr. (5) ii. p. 258 (1872).

Heterometrus palmatus, var. *minor*, Simon, *ibid.*

Heterometrus testaceus, Birula, Horæ Soc. Ent. Ross. xxxiii. p. 138 (1898); Kraepelin, *op. cit.* (nec *testaceus*, C. Koch).

Loc. Syria: Jerusalem (*Herr Rolle*), Tiberias (*A. Smith Woodward*), &c.

Birula seems to have recognized the distinctness of the Syrian species, but erroneously used the name *testaceus* for it: *testaceus* was applied by C. Koch to a specimen from Algeria co-specific with *maurus* of Linn.

(4) *Heterometrus propinquus*, Simon.

Heterometrus propinquus, Simon, Ann. Soc. Ent. Fr. (5) ii. p. 259 (1872).

Loc. Syria: Damascus and Nablous.

This species is said to differ from the preceding (*H. fuscus*) in having the median eyes larger, the vesicle more globular, and 14 pectinal teeth.

Simon, unfortunately, did not determine the sex of his specimens; but since the type of *H. propinquus* is said to be smoother than specimens of *H. fuscus*, it is safe to assume that the former species is based upon the female sex.

To the above-mentioned I have to add the following new forms:—

(5) *Heterometrus arabicus*, sp. n.

Colour a nearly uniform yellowish brown, the legs and tail

entirely pale ochre, except for the normal brown spot at the extremity of the femur and patella in front. *Carapace* and *sterna* very weakly granular laterally. Median *eyes* larger than in *H. fuscus* and *maurus*. *Tail* narrow, second segment about as long as wide; intercarinal spaces almost smooth; keels normal, but the inferiors on the third and fourth segments scarcely denticulated, merely roughened with setal pores; vesicle larger, much wider than the fifth and as wide as the second caudal segment. *Hand* of chela ornamented above with a reticulated pattern of low ridges, passing into tubercles towards the base of the fingers and becoming obsolete on the inner edge of the hand; two very strong finger-keels on hand, the external the stronger. *Pectines* with 12 teeth; genital operculum a little wider than long. Spine-armature of fourth tarsus 10 or 9-7.

Length 10 millim.; carapace 8; tail 27; width of hand 6·7.

Loc. Arabia (*Mrs. Burton*).

Differs from *H. fuscus* in being much paler, much smoother, and in having the inferior keels on the third and fourth caudal segments not denticulated, the vesicle large, the hand very strongly everted, and the median eyes much larger.

In size of vesicle and of median eyes *H. arabicus* approaches *H. propinquus*, Simon (Ann. Soc. Ent. Fr. (5) ii. p. 259, 1872), from Damascus and Nablous; but since Simon noticed no difference in the carination of the inferior surface of the tail and of the hand between *H. propinquus* and *fuscus*, I cannot do otherwise than conclude that the two are alike in these particulars.

(6) *Heterometrus Townsendi*, sp. n.

♀.—Resembling the preceding in colour, granulation, &c., but with the hand almost entirely smooth above and much less strongly crested, the genital operculum as long as wide, the vesicle only slightly wider than the fifth and much narrower than the second caudal segment.

Total length 59 millim.; carapace 9·2; tail 28; width of hand 7·5.

Loc. Fort Reshire (near Bushire) and Bushire on the Persian Gulf (*F. W. Townsend*).

(7) *Heterometrus Boehmi*, Kraepelin.

Heterometrus Boehmi, Kraepelin, MT. Mus. Hamb. xiii. p. 137 (1896).
Scorpio Boehmi, id. Das Tierreich, Scorp. etc. p. 125 (1899).

Loc. Lake Tanganyika.

Evidently very distinct from the foregoing species by the

smoothness of the inferior keels on the last abdominal and first caudal segments, the spine-armature of the tarsi, &c.

The known species may be tabulated as follows :—

- a. Keels of last abdominal sternum and of underside of first caudal segment smooth (♀) *Boehmi*.
- b. Keels of last abdominal sternum and of underside of first caudal segment coarsely granular (♂ ♀).
 - a¹. Genital operculum divided; terga and sterna finely granular or shagreened (♂).
 - a². Hand in adult wider than length of carapace, distinctly crested above; immovable finger short, triangular; a crest on underside of brachium behind; tail thick, fifth segment less than twice as long as wide, third as wide as or wider than long *maurus*.
 - b². Hand narrower than length of carapace, not visibly crested above; immovable finger long; no crest on underside of brachium; tail narrow, third caudal segment longer than wide *palmatus*.
 - b¹. Genital operculum undivided; terga and sterna not shagreened (♀).
 - a³. Third and fourth caudal segments with inferior keels strong and granular.
 - a⁴. Median eyes small, vesicle not inflated.
 - a⁵. Genital operculum much wider than long, transversely elliptical; lower side of brachium with distinct smooth crest behind; hand more strongly granular and keeled, &c. *maurus*.
 - b⁵. Genital operculum heart-shaped, as long or nearly as long as wide; lower side of brachium evenly rounded behind; hand less coarsely granular and crested *fuscus*.
 - b⁴. Median eyes large; vesicle expanded *propinquus*.
 - b³. Inferior keels of third and fourth caudal segments smooth, only uneven with setal pores; median eyes large.
 - a⁶. Hand with a pair of strong smooth finger-keels, and ornamented above with a distinct network of smooth ridges *arabicus*.
 - b⁶. Hand almost smooth above, scarcely visibly sculptured; its crests obsolete *Townsendi*.

N.B.—Attention must be drawn to the omission from the ‘Tierreich’ of the following names which have been applied to various forms of the genus *Heterometrus*: *flavus*, *rufus*, *fuscus*, and *minor*. Apart from the possibility that these forms may in future take rank as distinct species, the recording of such names is necessary to prevent their application to new species by students who have no opportunity of consulting all the literature of the subject and look to a work of the aspirations of the ‘Tierreich’ to supply at least a complete list of the names that have been employed in each genus.

XLV.—*Rhynchotal Notes*.—VII. Heteroptera: *Fam.* Coreidæ.
By W. L. DISTANT.

THE following notes and descriptions refer to the subfamilies Merocorinæ, Mictinæ, Amorbinæ, Petascelinæ, and Daladerinæ. Vol. iv. of Walker's Catalogue refers to the Coreidæ, and the species and genera therein described are here reviewed so far as they belong to the subfamilies named above. A number of new species contained in the British Museum are described and also a few from my own collection.

MEROCORINÆ.

MENARDUS, gen. nov.

Head beneath armed with a prominent spine or tubercle. Scutellum about the length of the clavus, entire near base. Mesosternum with two small tubercles at base. Posterior femora armed beneath with two rows of strong spines or tubercles. Other characters as in *Flavius*, to which it is primarily allied by the prominent tubercles on the under surface of the head, and from which it may be at once separated by the much shorter scutellum.

Menardus notatus.

Meropachys notatus, Walk. Cat. Het. iv. p. 70. n. 6 (1871).

Hab. N. Brazil, Central America.

Genus PERANTHUS.

Peranthus tinctus.

Hirileus tinctus, Walk. Cat. Het. iv. p. 72. n. 5 (1871).

MICTINÆ.

Genus DEREPTERYX.

Derepteryx Hardwicki.

Cerbus (Derepteryx) Hardwickii, White, Ann. & Mag. Nat. Hist. (2) iii. p. 542 (1839).

Mictis amplexens, Walk. Cat. Het. iv. p. 25. n. 58 (1871).

Genus PRIONOLOMIA.

Prionolomia porrigens.

Trematocoris porrigens, Walk. Cat. Het. iv. p. 35. n. 11 (1871).

Prionolomia fulvicornis, Fabr., var. ?

The unique type is an unlocalized male specimen erroneously described by Walker as a female. Fourth joint of the antennæ subequal in length to first joint, not "shorter than the first."

Very closely allied to *P. fulvicornis*, Fabr.; posterior tibiæ more slender, posterior femora a little more granulated.

Prionolomia mandarina, sp. n.

Fuliginous-brown; body beneath, legs, and antennæ piceous (in some specimens the colour is fuliginous brown throughout); apical joint of antennæ ochraceous. Abdomen above red, connexivum and apex fuliginous.

Antennæ with the first and fourth joints subequal in length, second a little longer than the third; pronotal angles widely, broadly, and spatulately extended, their apices subtruncate and slightly directed upwards, their anterior margins strongly dentate, their posterior margins undulated; in some specimens the pronotal basal margin is somewhat deeply notched in front of scutellum, but this is not a constant character; connexivum distinctly extending in front of the posterior half of the corium.

♂. Anterior and intermediate tibiæ moderately outwardly dilated at a little beyond base; anterior and intermediate femora with a distinct spine beneath near apices; posterior femora incrassated, strongly tuberculated in a longitudinal series above and with a much more obsolete series beneath, and with two strong acute spines beneath, one near centre, the other a little before apex; apex angulated and finely dentate beneath; posterior tibiæ dilated on each side, inwardly broadly angulated at about centre, and outwardly convexly widened in the same position.

♀. Posterior femora moderately incrassated, tubercles above more obsolete than in male; posterior tibiæ convexly dilated on each side near base, not inwardly angulated as in male.

Long., ♂ ♀, 22-26 millim.; exp. pronot. angl. 11-12 millim.

Hab. China, Kiukiang (*Pratt*, Brit. Mus.).

Genus PHYLLOGONIA.

Phyllogonia limosa.

Sulpicia limosa, Walk. Cat. Het. iv. p. 39. n. 5 (1871).

Genus ELASMOPODA.

Elasmopoda affinis, sp. n.

♂. Dark pitchy brown; corium shortly ochraceously pilose; antennæ, eyes, rostrum, anterior and intermediate legs, and posterior tarsi ochraceous; anterior and intermediate coxæ and apices of femora piceous; body beneath reddish ochraceous, pro- and mesosternum somewhat paler, abdominal spines piceous; disk of apical segment and a marginal spot on apical and penultimate segments piceous, the marginal spots preceded by ochraceous shading.

Pronotum somewhat narrow, anterior lateral margins entire, not dentate, lateral angles produced in foliaceous subacute spines, their margins dentate.

Long. 21 millim.; exp. pronot. angl. 8 millim.

Hab. British East Africa, Samburu (*C. S. Betton*, Brit. Mus.).

Closely allied in structure, colour, and general appearance to *E. undata*, Dall., but differing by the narrower pronotum, with its non-dentate anterior lateral margins and its narrower and more acute lateral angles.

Genus HOLOPTERNA.

Holopterna Rothi.

Mictis Rothii, Dall. List Hem. i. p. 395. n. 28 (1852).

Cypia rubra, Lethierry, Ann. Mus. Civ. Genova, xvi. p. 286 (1881).

Cipia rubra, Leth. & Sev. Cat. Gén. Hém. t. ii. p. 8 (1894).

This species varies in the colour of the anterior and intermediate femora, which are either red or black; the corium is either unicolorous or with the apical half darker. Dallas's specimens of *H. Rothii* exhibit the variation shown in Lethierry's species.

Holopterna Elliotti, sp. n.

Castaneous; head, scutellum, inner claval margin, lateral areas of corium (excluding apex), membrane, rostrum, coxæ and trochanters, anterior and intermediate femora, base of posterior femora, posterior tibiæ, a broad central mesosternal patch, abdominal tubercles, and apex of abdomen piceous.

Antennæ with the third joint shortest, second and fourth joints subequal, first joint a little longest and thickest. Head very distinctly cleft at apex, eyes brownish. Pronotum finely rugulose, lateral margins distinctly pilose, lateral

angles subacutely produced, slightly directed upwards. Scutellum transversely rugulose. Corium thickly and somewhat coarsely punctate. Membrane opaque. First and second abdominal segments each with two robust conical tubercles.

Long., ♂ 22, ♀ 25 millim.

Hab. East Africa; Ruwenzori, 7000–8000 feet (*Scott Elliot*, Brit. Mus.).

EVAGRIUS, gen. nov.

Allied to *Holopterna*, Stål, but differing in the following particulars:—

♂. First joint of the antennæ longer than the fourth joint, but considerably shorter than the third and fourth joints together; third joint moderately dilated and grooved, a little shorter than fourth joint. Second, third, and fourth abdominal segments armed with a prominent tubercle on each side of disk.

The pronotal angles are very strongly, laminately, and arcuately produced, and between their area and the head the pronotum is suddenly and profoundly deflected.

Evagrius gladius, sp. n.

Pale castaneous, femora and antennæ darker in hue, the last with the apical joint pale stramineous; membrane piceous; abdominal tubercles black; meso- and metasternum with a broad oblique ochraceous fascia on each side. Antennæ with the bases and apices of the second and third joints very narrowly ochraceous, third joint moderately dilated and distinctly grooved, fourth joint the most slender and cylindrical. Pronotum with the depressed space between the area of the angles and head ochraceously pilose, with a narrow obscure central fascia extending therefrom to base; the angles extremely prominent, laminate, somewhat arcuately directed forwards and upwards, their apices slightly recurved and subacute, their margins moderately dentate, posterior femora with a prominent tooth and some smaller teeth near apex; posterior tibiæ moderately dilated, with an inner prominent spine near apex.

Long. 23 millim.; max. abd. lat. 6 millim.; exp. pronot. angl. 11 millim.

Hab. Brit. East Africa; Maziwa Mitatu and Maungu (*C. S. Betton*, Brit. Mus.).

Genus PTERNISTRIA.

Pternistria octolineata.

Melucha octolineata, Walk. Cat. Het. iv. p. 56. n. 10 (1871).

Genus MYGDONIA.

Mygdonia tuberculosa.

Mictis tuberculosa, Sign. Rev. et Mag. Zool. 1851, p. 448, pl. xv. fig. 6.
Melucha atra, Walk. Cat. Het. iv. p. 55. n. 7 (1871).

Genus OCHROCHIRA.

Ochrochira lunata, sp. n.

Fuliginous-brown; apical joint of the antennæ fulvous; abdomen above red, connexivum and apex fuliginous.

Antennæ with the first joint a little longer than the fourth, second a little longer than the third; pronotum with the lateral angles widely, broadly, and somewhat lunately produced, their margins dentate anteriorly, profoundly crenulate posteriorly, their apices subacute and slightly directed upwards. The body (excluding membrane) is finely ochraceously pilose.

♂. Anterior and intermediate femora with a distinct spine beneath near apex, the intermediate femora also with a series of short spines beneath; posterior femora incrassated and with two or three distinct tuberculous spines near apex beneath, and with a few spines on apical half of inner margin; posterior tibiæ moderately dilated, spinously produced at about two thirds from base, and thence narrowed and inwardly dentate to apex.

♀. As in male, but posterior femora much less incrassated and only spined at apex; posterior tibiæ simple, longitudinally sulcated.

Long., ♂ ♀, 25-26 millim.; exp. pronot. angl. 6-7 millim.

Hab. China; Kiukiang (*Pratt*, Brit. Mus.).

This species finds its nearest ally in *O. fuliginosa*, Uhler, from Japan, from which it is separated by the much more produced and lunate pronotal angles.

Genus MICTIS.

Mictis lateralis.

Mictis lateralis, Walk. Cat. Het. iv. p. 29. n. 69 (1871).

Allied to *M. alborittata*, Stål, from which it differs by the

absence of the pale longitudinal fasciæ beneath and by the lateral angles of the pronotum being directed outwardly as in Stål's species, but not recurved posteriorly at their apices.

Mictis longicornis.

Myctis longicornis, Westw. in Hope Cat. ii. p. 11 (1842).

Mictis javana, Walk. Cat. Het. iv. p. 30. n. 70 (1871).

Mictis filicornis.

Mictis filicornis, Walk. Cat. Het. iv. p. 27. n. 64 (1871).

Mictis amboinensis.

Mictis amboinensis, Walk. Cat. Het. iv. p. 28. n. 66 (1871).

Mictis profana.

Lygæus profanus, Fabr. Syst. Rhyng. p. 211. n. 33 (1803).

Mictis symbolica, Dall. List Hem. ii. p. 404. n. 52 (1852).

Mictis crux, Dall. loc. cit. p. 405. n. 53.

Mictis limbativentris.

Mictis limbativentris, Stål, Trans. Ent. Soc. Lond. 1863, p. 603.

This species was described by Stål from a female specimen only, and was afterwards placed by him (En. Hem. iii. p. 51, 1873) in "*Species Mictariorum incerti generis.*" The British Museum has since acquired two other specimens (one a male), of which the following are the principal structural characters:—

♂. Posterior tibiæ moderately dilated on each side, with a strong spine on inner surface at about one third from apex; second abdominal segment with a large raised conical tubercle on each side parallel with the posterior coxæ.

Long., ♂, 30 millim.

Hab. New Guinea, Dorey (*Wallace*, Brit. Mus.).

Mictis farinulenta.

Mictis farinulenta, Bredd. Mitt. nat. Mus. Hamb. xvi. p. 168 (1899), ♀.

♂. Abdomen beneath at junction of second and third segments broadly and tuberculously elevated; posterior tibiæ gradually dilated from base on inner side to a somewhat broad tooth about centre, from thence concavely narrowed to apex, and in structure somewhat resembling the femora of *M. tenebrosa*, Fabr.

Long., ♂, 21 millim.

The British Museum possesses both sexes from Lombok and a female specimen from Savu, Philippines, all collected by the late Mr. Everett.

Mictis oceanensis, sp. n.

Castaneous, obscurely and finely ochraceously pilose; apical joint of antennæ, apices of tibiæ, tarsi, and sternal segmental margins ochraceous; abdomen above ochraceous, lateral margins, a central longitudinal fascia, and the apex black; tarsal claws piceous.

Antennæ with the first and second joints subequal in length, third a little longer than fourth; pronotum with the lateral margins very strongly and coarsely serrated, the serration piceous, the lateral angles prominent and broadly subacute, its surface reticulately rugulose and finely but obscurely punctate; scutellum transversely rugose; corium obscurely and finely punctate; rostrum about reaching the intermediate coxæ, its apex black.

♂. Abdomen at junction of second and third abdominal segments broadly and tuberculously elevated; posterior femora moderately incrassated, very finely and obscurely tuberculate, with a lineate carina on outer edge and with two short blunt teeth at apex; posterior tibiæ sulcate, gradually dilated interiorly into a somewhat broad tooth about centre, thence concavely narrowed to apex.

♀. Abdomen unarmed; posterior tibiæ simple, sulcate, and slightly dilated near base.

Long., ♂ ♀, 25 millim.; exp. pronot. angl. 9 millim.

Hab. New Hebrides (*Dr. D. McNabb*, Brit. Mus.).

A species to be primarily recognized by the coarsely serrated pronotal margins and by the distinct colour of the upper surface of the abdomen.

Genus ANOPLOCNEMIS.

Anoplocnemis tristator.

Lygæus tristator, Fabr. Syst. Rhyng. p. 206. n. 13 (1803).

Mictis luteitarsis, Walk. Cat. Het. iv. p. 19. n. 34 (1871).

Anoplocnemis mæsta.

Mictis mæsta, Dall. List Hem. ii. p. 400. n. 41 (1852).

Posterior tibiæ in male angulated as in *A. pagana*, Dall.

Anoplocnemis Dallasiana, Leth. & Sev.

Mictis scutellaris, Dall. (nom. præocc.) List Hem. i. p. 390. n. 17 (1852).

The type of this species is no longer to be found; there are, however, a long series of specimens in the British Museum which undoubtedly belong to it, and which have been received from S. Africa, Angola, Zomba, and the Transvaal.

Anoplocnemis gracilicornis.

Mictis gracilicornis, Stål, Hem. Afr. ii. p. 42. n. 22 (1865).

Melucha aurulenta, Walk. Cat. Het. iv. p. 55. n. 8 (1871).

Anoplocnemis phasianus.

Lygæus phasianus, Fabr. Spec. ii. p. 361 (1781).

Mictis dubia, Dall. loc. cit. p. 389. n. 13: ♀.

Mictis castanea, Dall. List Hem. ii. p. 389. n. 14 (1852): ♀.

Mictis lata, Dall. loc. cit. p. 390. n. 15: ♀.

Mictis ferrifera, Walk. Cat. Het. iv. p. 24. n. 57 (1871).

Physomerus mictiformis, Walk. loc. cit. p. 61. n. 8: ♀.

Anoplocnemis signata, sp. n.

♂. Very dark castaneous, finely ochraceously pilose, especially on the pronotum; apical third of the scutellum ochraceous; antennæ with the first, second, and third joints castaneous, fourth joint ochraceous, with its apical half infuscated; body beneath and legs a little darker in hue, anterior and intermediate tibiæ and all the tarsi castaneous; sternum densely ochraceously pilose, more or less exhibiting distinct lateral ochraceous lines. Abdomen above reddish, with the margins and apex pitchy.

♀. Slightly paler in hue; abdomen more ochraceously pilose beneath.

Antennæ pilose, with the first and fourth joints subequal in length, second a little longer than the third; apex of the second segment of the abdomen in the male produced at centre in a flat oblong process extending about halfway across the third segment. Femora in male strongly incrassated, curved, and distinctly angulated beneath about one third from apex; tibiæ in both sexes compressed, moderately and evenly dilated.

Long., ♂ 16 millim., ♀ 17–18 millim.

Hab. East Africa, Ruwenzori, 6000–8000 feet (*Scott Elliot*, Brit. Mus.).

Apparently allied to *A. castaneicornis*, Stål, from which it differs by the colour of the upper surface of the abdomen, marking of the scutellum, smaller size, &c.

Anoplocnemis Whytei, sp. n.

Castaneous; corium dull stramineous, its lateral margins irregularly castaneous; posterior tarsi dull ochraceous; abdomen above black, its lateral margins and a central lineate spot on anterior margin of fourth and fifth segments ochraceous; connexivum and apex castaneous; membrane bronzy. Body and legs finely ochraceously pilose; antennæ with the basal joint a little darkest, first, second, and fourth joints subequal in length, third shortest; pronotum with the lateral angles subprominent and rounded; body beneath somewhat paler; sternum thickly ochraceously pilose, with an indistinct ochraceous fascia near the coxæ.

♂. Abdomen beneath broadly and tuberculously gibbous at the junction of the second and third abdominal segments; posterior tibiæ inwardly angulated at less than midway from base, and thence finely dentate to apex.

♀. Posterior tibiæ simple, but finely dentate along inner margin.

Long., ♂ 22 millim., ♀ 25 millim.

Hab. Nyasaland, Nyika Mts., 6000-7000 feet (*A. Whyte*, Brit. Mus.).

Genus MELUCHA.

Melucha Biolleyi, sp. n.

♀. Fulvous; first and second joints of antennæ, lateral margins and apices of lateral angles to pronotum, about basal half of lateral margins to corium, lateral margins and apex of scutellum, and a large basal spot to membrane black; body beneath more rufous than above, intermediate and posterior femora luteous, posterior femora with the apex and apical spines black, posterior tibiæ with about apical third luteous, basal rufous portion very narrowly edged with black; connexivum fuliginous; membrane cupreous.

Antennæ with the first joint longer than the second, their bases narrowly rufous; remaining joints mutilated; pronotum coarsely punctate and rugulose, its lateral margins finely crenulate, the lateral angles acutely and straightly produced, with their posterior margins crenulate; scutellum coarsely punctate, basal margin levigate; corium finely punctate; posterior femora armed with about five short teeth; posterior tibiæ outwardly dilated, convex, not toothed.

Long., ♀, 22 millim.; exp. pronot. angl. 9 millim.

Hab. Costa Rica; Turrialba, Atlantic slopes (*P. Biolley*, Coll. Dist.):

Genus MOZENA.

Mozena alata, sp. n.

In coloration and general appearance closely allied to *M. lunata*, Burm., but differing from that species by the more produced pronotal angles, which have their apices more elongately acute, less directed forward, and slightly recurved at their tips.

Long., ♂ ♀, 21-22 millim.; exp. pronot. angl. 12 millim.

Hab. Costa Rica; Tuis, Atlantic slopes (*P. Biolley*, Coll. Dist.).

Genus NEMATOPUS.

Nematopus fasciatus.

Nematopus fasciatus, Westw. in Hope Cat. ii. p. 14 (1842).

Nematopus decoratus, Walk. Cat. Het. iv. p. 78. n. 14 (1871).

Genus ACANTHOCERUS.

Acanthocerus clavipes.

Coreus clavipes, Fabr. Syst. Rhyng. p. 196 (1803).

Camptischium tenebrosus, Walk. Cat. Het. iv. p. 114. n. 4 (1871).

Camptischium verrucosum, Walk. *loc. cit.* p. 115. n. 6.

Camptischium subvarium, Walk. *loc. cit.* p. 116. n. 7.

Acanthocerus sublævis.

Camptischium sublæve, Walk. Cat. Het. iv. p. 115. n. 5 (1871).

Acanthocerus lobatus.

Crinocerus lobatus, Burm. Handb. ii. 1, p. 318. n. 2 (1835).

Acanthocerus lobatus, Uhler, Proc. Zool. Soc. Lond. 1894, p. 178.

Acanthocerus tuberculatus, Uhler (nec Herr.-Schäff.), *op. cit.* 1893, p. 705.

Prof. Uhler has returned specimens collected by Mr. H. H. Smith on the island of St. Vincent as belonging to *A. tuberculatus*, H.-S.; this identification was probably a slip of the pen, as they cannot be separated from other specimens from the island of Grenada and also identified by Mr. Uhler as *A. lobatus*, Burm. It is therefore necessary to erase the name of *A. tuberculatus*, Herr.-Sch., from the fauna of these islands, at least so far as the collections made by Mr. Smith enable us to form an opinion.

AMORBINÆ.

Genus AMORBUS.

Amorbus alternatus.

Amorbus alternatus, Dall. List Hem. i. p. 408. n. 1 (1852).

Amorbus planus, Walk. Cat. Het. iv. p. 42. n. 11 (1871).

PETASCELINÆ.

Genus PETILLIA.

Petillia calcar.

Mictis calcar, Dall. List Hem. ii. p. 397. n. 33 (1852).

Trematocoris subvittata, Walk. Cat. Het. iv. p. 34. n. 9 (1871).

Trematocoris vittata, Walk. loc. cit. p. 36. n. 12.

Melucha notatipes, Walk. loc. cit. p. 56. n. 9.

The *Melucha notatipes*, Walk., represents a rudimentary form of *P. calcar*.

Petillia biserrata.

Mictis biserrata, Walk. Cat. Het. iv. p. 29. n. 68 (1871).

DALADERINÆ.

Genus DALADER.

Dalader Horsfieldi, sp. n.

Pale brownish ochraceous; antennæ, femora, and membrane fuscous; basal and apical joints of antennæ, tibiæ, and tarsi brownish ochraceous, mottled with fuscous.

Antennæ moderately hirsute, first joint slightly longer than the second, third dilated and spatulate; head and pronotum with a faint central pale levigate line; pronotum with the anterior margins finely dentate, the lateral angles broadly and angularly produced, posterior margin concave before the base of the scutellum; abdomen above reddish ochraceous; the segmental margins ochraceous; connexivum brownish ochraceous, with subquadrate pale fuscous spots; femora somewhat thickly spined in longitudinal series beneath.

Long., ♂, 20 millim.; exp. pronot. angl. $8\frac{1}{2}$ millim.

Hab. Java (Horsfield Coll., Brit. Mus.).

This small species is allied to *D. rubiginosus*, Westw., from which it differs by the much more produced pronotal angles.

Genus *HORMAMBOGASTER*.*Hormambogaster*, Karsch, Ent. Nachr. 1892, p. 131 (May).*Ovengua*, Dist. Ent. Month. Mag. 1892, p. 285 (November).*Hormambogaster expansus*.*Hormambogaster expansus*, Karsch, Ent. Nachr. 1892, p. 131 (May).*Ovengua aperta*, Dist. Ent. Month. Mag. 1892, p. 285 (November).*Summarized Disposition of Walker's Genera and Species.***Merocorinæ, Mictinæ, Amorbinæ, Petascelinæ, and
Daladerinæ.***Genus treated as synonymic.**Mictoides*, Walk. Cat. Het. iv. p. 38 (1871), = Gen. *Curtius*, Stål.*Species considered valid and described under correct Genera.**Derepteryx truncata*, Walk. Cat. Het. iv. p. 11. n. 4 (1871). (The type is an immature form of the species.)*Mictis filicornis*, Walk. loc. cit. p. 27. n. 64.— *amboinensis*, Walk. loc. cit. p. 28. n. 66.— *lateralis*, Walk. loc. cit. p. 29. n. 69.*Archimerus indecorus*, Walk. loc. cit. p. 64. n. 17.*Phidippus asper*, Walk. loc. cit. p. 71. n. 1.*Nematopus ferrinus*, Walk. loc. cit. p. 77. n. 13.— *varius*, Walk. loc. cit. p. 78. n. 15.*Species considered valid, but requiring generic revision.**Mictis biplagiata*, Walk. Cat. Het. iv. p. 22. n. 51 (1871), belongs to gen. *Ochrochira*.— *insolita*, Walk. loc. cit. p. 27. n. 65, belongs to gen. *Liaspis*.— *biserrata*, Walk. loc. cit. p. 29. n. 68, belongs to gen. *Petillia*.*Trematocoris pardalipes*, Walk. loc. cit. p. 33. n. 3, belongs to gen. *Petillia*.— *notatipes*, Walk. loc. cit. p. 34. n. 5, belongs to gen. *Petillia*.— *bicoloripes*, Walk. loc. cit. p. 35. n. 10, belongs to gen. *Petillia*.— *porrigens*, Walk. loc. cit. n. 11, belongs to gen. *Prionolomia*.— *elegans*, Walk. loc. cit. p. 37. n. 14, belongs to gen. *Petillia*.— *patulicollis*, Walk. loc. cit. n. 15, belongs to gen. *Petillia*.*Sulpicia limosa*, Walk. loc. cit. p. 39. n. 5, belongs to gen. *Phyllogonia*.*Melucha octolineata*, Walk. loc. cit. p. 56. n. 10, belongs to gen. *Pternistria*.*Physomerus nigrorufus*, Walk. loc. cit. p. 60. n. 7, belongs to gen. *Ochrochira*.*Meropachys notatus*, Walk. loc. cit. p. 70. n. 6, belongs to gen. *Menardius*, gen. nov.*Hirileus tinctus*, Walk. loc. cit. p. 72. n. 5, belongs to gen. *Peranthus*.*Camptischium subleve*, Walk. loc. cit. p. 115. n. 5, belongs to gen. *Acanthocerus*, Pal. Beauv.

Species treated as synonymic.

- Mictis luteitarsis*, Walk. Cat. Het. iv. p. 19. n. 34 (1871), = *Anoplocnemis tristator*, Fabr.
 — *japonica*, Walk. loc. cit. p. 23. n. 53, = *Ochrochira fuliginosa*, Uhler.
 — *ferrifera*, Walk. loc. cit. p. 24. n. 57, = *Anoplocnemis phasianus*, Fabr.
 — *amplectens*, Walk. loc. cit. p. 25. n. 58, = *Dereptyx Hardwicki*, White.
 — *insularis*, Walk. loc. cit. p. 26. n. 63, = *Pternistria macromera*, Guér.
 — *javana*, Walk. loc. cit. p. 30. n. 70, = *Mictis longicornis*, Westw.
Trematocoris subvittata, Walk. loc. cit. p. 34. n. 9, = *Petillia calcar*, Dall.
 — *vittata*, Walk. loc. cit. p. 36. n. 12, = *Petillia calcar*, Dall.
Amorbus planus, Walk. loc. cit. p. 42. n. 11, = *Amorbus alternatus*, Dall.
Melucha atra, Walk. loc. cit. p. 55. n. 7, = *Mygdonia tuberculosa*, Sign.
 — *aurulenta*, Walk. loc. cit. n. 8, = *Anoplocnemis gracilicornis*, Stål.
 — *notatipes*, Walk. loc. cit. p. 56. n. 9, = *Petillia calcar*, Dall.
Physomerus mictiformis, Walk. loc. cit. p. 61. n. 8, = *Anoplocnemis phasianus*, Fabr.
Archimerus muticus, var., Walk. loc. cit. p. 63. n. 10, = *Capaneus tetricus*, Stål.
 — *acutiusculus*, Walk. loc. cit. p. 64. n. 16, = *Lycambes varicolor*, Stål.
 — *guttiventris*, Walk. loc. cit. p. 65. n. 18, = *Lycambes varicolor*, Stål.
 — *maculifer*, Walk. loc. cit. p. 65. n. 19, = *Archimerus scutellaris*, Stål.
Archimerus dolosus, Walk. loc. cit. p. 66. n. 20, = *Capaneus odiosus*, Stål.
Hirileus collaris, Walk. loc. cit. p. 73. n. 6, = *Lycambes varicolor*, Stål.
Nematopus decoratus, Walk. loc. cit. p. 78. n. 14, = *Nematopus fasciatus*, Westw.
Camptischium tenebrosum, Walk. loc. cit. p. 114. n. 4, = *Acanthocerus clavipes*, Fabr.
 — *verrucosum*, Walk. loc. cit. p. 115. n. 6, = *Acanthocerus clavipes*, Fabr.
 — *subvarium*, Walk. loc. cit. p. 116. n. 7, = *Acanthocerus clavipes*, Fabr.

SYNONYMICAL NOTES.

Fam. Pentatomidæ.

TESSARATOMINÆ.

Lyramorpha picta.

Lyramorpha picta, Dist. Ann. & Mag. Nat. Hist. (6) xi. p. 430 (1893).

Lyramorpha Vollenhovii, Horvath (part.), Term. Füz. xxiii. p. 351 (1900), tab. ix. fig. 7, tab. x. fig. 7.

Dr. Horvath has included my *L. picta* as a synonym of *L. Vollenhovii*, Stål, a species he has evidently not seen, and apparently misled by the spotted corium—"a speciebus reliquis hujus subgeneris corio maculato facillime distinguenda." The following characters, partly derived from Dr. Horvath's own description and figures, will serve to differentiate the species:—

L. Vollenhovi, Stål (Horv.).

♂. Posterior angles of sixth abdominal segment broadly and obtusely angulated.

Antennæ "fusco-ferrugineis, articulo primo subtus dilute roseo."

Long. 24-25 millim.

L. picta, Dist.

♂. Posterior angles of sixth abdominal segment acutely and more elongately produced; inner margin gradually narrowing to apex.

Antennæ brownish ochraceous; apex of the first joint, upper surface of the second, apex of the third, and the whole of the fourth and fifth joints (excluding their bases) fuscous.

Long. 21 millim.

Lyramorpha diluta.

Lyramorpha diluta, Stål, Trans. Ent. Soc. Lond. 1863, p. 598; Bredd. Ent. Nachr. xxvi. p. 35. n. 2, ♂, fig. 4 (1900); Horv. Term. Füz. xxiii. p. 348. n. 6, tab. ix. fig. 11, ♀ (1900), nec fig. 3, ♂.

Stål's type (a female specimen) is in the collection of the British Museum. Breddin has correctly figured the anal characters of the male, but Horvath's figure (tab. ix. fig. 3, ♂) does not apply.

Genus TAMOLIA.

(Horvath, Term. Füz. xxiii. p. 365 (1900).)

Tamolia Horvathi.

Tamolia ramifera, Horv. (nec Walk.) Term. Füz. xxiii. p. 365 (1900).

Walker's unique type of *Lyramorpha ramifera* (Cat. Het. iii. p. 476. n. 4, 1868) is in imperfect condition, possessing only the first, second, and third joints of the antennæ, and although somewhat divergent from *Lyramorpha* by the shape of the body, I considered it best under the circumstances to leave the species in that genus (*cf.* Ann. & Mag. Nat. Hist. ser. 7, vol. vi. p. 62). Dr. Horvath has, however, founded a genus (*Tamolia*) on a specimen, "uti videtur, nonnihil immaturum," which he takes to be Walker's species, but which is clearly proved to be not so by the character he describes—"spina ventrali antrorsum ante coxas anticas producta." In *L. ramifer* the ventral spine does not reach the anterior coxæ. Walker's species cannot therefore be considered the type of Horvath's genus.

Plisthenes dilatatus.

Tessaratomia dilatatum, Montr. Ann. Sci. Phys. (2) vii. 1, p. 100 (1855).

Plisthenes dilatatus, Dist. Trans. Ent. Soc. Lond. 1880, p. 151; Ann. &

Mag. Nat. Hist. (6) iii. p. 272 (1889); Horv. Term. Füz. xxiii. p. 363 (1900).

Plisthenes ventralis, Horv. Term. Füz. xxiii. p. 364 (1900).

Dr. Horvath, who has examined the type of Montrouzier's species, is able to give a distinct character as "articulo quarto antennarum articulo tertio distincte brevior." Following this up he has specifically described a very closely allied species as *P. ventralis* in which the third joint of the antennæ is compared with the fourth "subbrevior." As a synonym of this new species he adds *P. dilatatus*, Dist. (*cf. supra*). I cannot quite understand this course, as Dr. Horvath has not seen the specimen thus identified, nor did I in the structural differentiation between the species of Fabricius and Montrouzier allude to these characters, as most of my specimens have unfortunately reached me minus the apical antennal joint. I now, however, possess a specimen from the island of Bouro with complete antennæ which agrees with Horvath's character and in all other respects with the specimens I previously identified as *P. dilatatus*, Montr. Another character relied upon by Dr. Horvath, viz. the intensity of the fasciæ to the underside of the abdomen, cannot, with the material before me, be maintained, and is clearly a variable character.

Plisthenes ventralis, Horv., may be a distinct species, but certainly not if the specimens I identified as *P. dilatatus* are synonymic with it, as stated by Dr. Horvath.

XLVI.—Notes on some Insects from the Yang-tse-Kiang.

By W. F. KIRBY, F.L.S., F.E.S., &c.

DURING a journey on the Yang-tse-Kiang a small collection of insects was formed by Capt. A. W. S. Wingate, and presented by him to the Natural History Museum in the course of last year. The Diptera were represented by a single species of *Eristalis*, not in sufficiently good condition for determination; and the Homoptera were represented by some larvæ belonging to the family Flatidæ. The dragonflies and locusts were, however, of more interest, and of these a list is given below, including the description of a locust which appears to be new.

NEUROPTERA.

ODONATA.

Libellulidæ.

Neurothemis fulvia, Drury.

Sympetrum sanguineum, Müller.

Crocothemis soror, Rambur.

Deielia phaon, De Selys.

Orthetrum brunneum, Fonscolombe.

Æschnidæ.

Hemianax ephippigerus, Burmeister.

Agrionidæ.

Neurobasis chinensis, Linné.

ORTHOPTERA.

Locustidæ.

Aularches miliaris, Linné. Two rather small and brightly coloured specimens.

Cyrtacanthacris succincta, Linné.

Cyrtacanthacris Wingatei, sp. n. (*infra*).

Trilophidia annulata, Thunberg.

Cyrtacanthacris Wingatei, Kirby, sp. n.

Exp. al. 82 millim.; long. corp. 42 millim.

Male.—Front of head and pronotum dark red; vertex, cheeks, lower part of the face, and sides of the thorax much paler. The space between the facial carinæ and the thorax thickly rugose-punctate; back of the head smooth, with two rather indistinct rows of black spots running backwards from between the eyes, and diverging behind. Thorax irregularly mottled with black on the back and sides. Abdomen shining chestnut; interalary space paler. Legs brownish testaceous, four front femora spotted with black above. Hind femora with all the carinæ set with small black serrations, and with three black bands on the upper surface, the third narrower than the others, and followed by three pairs of black spots, the two hinder pairs more or less connected in the middle. Hind tibiæ red, with yellow spines tipped with black. Tegmina testaceous brown, darker towards the base, and mottled with black towards the base, and more sparingly with brown beyond. Wings smoky hyaline, darker towards the tips, yellowish brown along the costa nearly to the extremity, and broadly suffused with rosy at the base.

Allied to *C. succincta*, Linné.

One specimen.

I append a list of the butterflies drawn up by Dr. A. G. Butler.

List of the Butterflies collected by Capt. Wingate at Hunan.

By A. G. BUTLER, Ph.D.

Fam. **Nymphalidæ.**

Subfam. EUPLÆINÆ.

- Salatura plexippus*, Linnæus. One example.
 **Parantica aglea*, Cramer. One example.
Trepsichrois mulciber, Cramer. One example.

Subfam. NYMPHALINÆ.

- Precis almana*, Linn. Two examples.
 — *ænone*, Linn. Five examples.
 * — *orithyia*, Linn. One female.
 * — *laomedea*, Linn. One example.
 — *iphitu*, Cramer. One example.
Pyrameis cardui, Linn. Two examples.
 — *calliroë*, Hübn. One example.
Cethosia biblis, Drury. One example.
Neptis eurynome, Westwood. One example.

Subfam. SATYRINÆ.

- **Tansima verma*, Kollar. One example.
Lethe confusa, Aurivillius. One example.
 — *rohria*, Fabricius. One example.

Fam. **Lycænidæ.**

- Polyommatus bæticus*, Linn. One example.
Everes filicaudis, Pryer. Three examples.

Fam. **Papilionidæ.**

Subfam. PIERINÆ.

- Delias aglaja*, Linn. Two males, one female.
Terias anemone, Felder. One male.
Catopsilia pomona, Fabr. Two males, one female.
Ganoris melete, var. *dulcinea*, Butler. One male.

Subfam. PAPILIONINÆ.

- Papilio cloanthus*, Westwood. One example.
 — *asiaticus*, Ménétriés. One example.
 * — *xuthulus*, Bremer. One example.
 * — *Nevilli*, Wood-Mason. One example.
 — *chaon*, Westwood. One example.

Six examples (species marked above by an asterisk) have been retained for the Museum collection.

XLVII.—Descriptions of new Rodents from Western South America. By OLDFIELD THOMAS.

Ctenomys opimus, Wagn.

Ctenomys opimus, Wagn. Arch. f. Nat. 1848, p. 75.

There can be little doubt that the specimen on which this species was founded was one of the "large number" obtained by Mr. Bridges in Potosi and other parts of Bolivia, and referred by Waterhouse to *C. braziliensis* *.

The Museum contains several specimens from the same collector, and in addition a series of four from Tetiri, S. Peru, others from Sahama, N.W. Bolivia, and an isolated example from Jujuy; and these seem to represent three subspecies, of which the Sahama one, as being like some of Bridges's specimens, and the most like Wagner's description, may be taken as the typical subspecies. The other two are as follows:—

Ctenomys opimus nigriceps, subsp. n.

Similar in size to the typical form, or perhaps rather larger, and the tail rather longer.

Fur similarly soft and fine. General colour greyish fawn, more greyish and less sandy than in true *C. opimus*. Whole centre of face as far back as the nape prominently deep black; on the neck the black becomes much more grizzled with fawn, but is traceable as an ill-defined line down the back to the loins. On each side there is also a black band passing through the eye and across the ear, behind which it forms a distinct patch, separated from the central black of the crown by a projection forward of the body-colour. The sides of the muzzle and the chin are also black, behind which latter there is a contrasted transverse light mark corresponding in position with the rami of the mandible. Behind this again the centre of throat is prominently blackish. Upper surface of hands, feet, and whole of tail dark chocolate-brown; the comb-like fingers of the feet and the longer hairs at the end of the tail are, however, yellowish.

Skull as in the typical form.

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

Head and body 230 millim.; tail 100; hind foot (s. u.) 38, (c. u.) 43.

* N. H. Mamm. ii. p. 273.

Skull: greatest length in middle line 56; basilar length 47·8; zygomatic breadth 37; nasals $19 \times 8\cdot5$; interorbital breadth 12·5; least breadth across brain-case 21; greatest breadth on meatus 35; diastema 16; length of tooth-row (alveoli) 11·6.

Hab. Tetiri, about 40 miles W. of Puno, on the Puno-Moquegua road. Altitude 16,000 feet.

Type. Male. B.M. no. 97. 10. 3. 42. Collected 5th July, 1896, by J. Kalinowski. Four specimens examined.

Besides Mr. Kalinowski's four specimens, one of those collected by Mr. Bridges, though much faded, shows something of the same marking and may, perhaps, be referable to the same form. His other specimens agree better with Herr Garlepp's Sahaman examples of what may be considered as the typical *C. opimus*.

Ctenomys opimus luteolus, subsp. n.

Varying from true *C. opimus* in exactly the opposite direction to *C. o. nigriceps*, owing to the suppression of all the darker markings. General colour bright sandy buff all over, the centre of the face, if anything, rather lighter than the rest instead of being darker, the nasal region almost white. No darker markings round eyes, at back of ears, or on the chin. Under surface similar to upper, but rather brighter, almost ochraceous buff; no white markings anywhere. Hands, feet, and tail buffy, the last-named rather darker terminally.

Skull apparently as in the typical form.

Dimensions of the type (measured in skin, therefore only approximate):—

Head and body 220 millim.; tail 70; hind foot (s. u.) 36·5, (c. u.) 41.

Skull: greatest length in middle line 51; zygomatic breadth 32·7; nasals $19\cdot5 \times 8\cdot6$; interorbital breadth 12·7; least breadth across brain-case 19·5; diastema 15; length of tooth-series (alveoli) 11·2.

Hab. Cordilleras of Jujuy, Argentine Republic.

Type. Male. B.M. no. 99. 2. 22. 17. Presented by the La Plata Museum.

This tuco-tuco may be readily distinguished from its allies by its light-coloured muzzle, this part being brown or black in all the more northern specimens.

Ctenomys dorsalis, sp. n.

Size about as in *Ct. talarum*. Coloration very much as in the large *Ct. boliviensis*, Waterh. Fur soft and fine. General colour above shining buffy fawn, a marked black dorsal line running from the tip of the nose backward on to the rump; on the head this line is sharply defined and about half an inch broad, but broadens out and is less defined on the back. No dark lateral face-markings round eye or ear. Cheeks and chin like body, but the usual light collar behind them is well marked, running up on each side to the ear. Throat, chest, outer edges of belly, and a narrow line down its centre pale buffy, the hairs slaty basally; rest of belly white, the hairs white to their bases. Upper surface of hands and feet dirty whitish. Tail-hairs mixed black and white.

Incisors about the breadth of those of *Ct. talarum*, orange above and below.

Dimensions of the type (measured in skin, approximate):—

Head and body 156 millim.; tail 46; hind foot (s. u.) 27·2, (c. u.) 30·2.

Breadth of two upper incisors 4·3.

Hab. Northern Chaco of Paraguay.

Type. Female. Original number 255. Collected 7th May, 1900.

Native name "Sumkum." Presented by J. Graham Kerr, Esq.

The typical skin is unfortunately without a skull, but its striking coloration will readily distinguish this handsome little tuco-tuco from every species hitherto known except the enormously larger *Ct. boliviensis*.

Sciurus versicolor, sp. n.

Closely allied to *S. variabilis*, Geoff., but with the belly rich rufous.

Colour very variable, that of the specimen selected as the type as follows:—Head and posterior back dark grizzled olivaceous, the central area of the back darkened to black. Nape, shoulders, and outer side of arms rich rufous, grizzled along the centre line of the neck, deeper and purer on the arms. A small patch of yellowish at the posterior base of each ear. Outer side of hind limbs grizzled rufous. Whole under surface and the inner sides of arms and legs deep vivid orange-rufous. Tail grizzled blackish olivaceous for its basal fourth, then broadly washed with orange-yellow (more commonly bright rufous), its tip black.

In another specimen from the same locality the whole body is dull blackish rufous, nearly as rufous on the sides of the rump as on the shoulders.

Skull not appreciably different from that of *S. variabilis* from Santa Marta. Premolars $\frac{1}{2}$.

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

Head and body 230 millim.; tail 225; hind foot (s. u.) 58, (c. u.) 63; ear 27.

Skull: greatest length 57; basilar length 43·3; greatest breadth 33·5; nasals (diagonally) $18 \times 8\cdot8$; palate length 25; length of upper tooth-row 9·5.

Hab. (of type). Cachabi, Prov. Esmeraldas, N. Ecuador. Alt. 160 m.

Type. Male. B.M. no. 97. 11. 7. 32. Original number 25. Collected 3rd Jan., 1897, by Mr. W. R. Rosenberg.

The British Museum contains a large number of squirrels from the north-western corner of South America which have been referred to *S. variabilis*, Geoff.; but now that Mr. Bangs has shown that the true *S. variabilis* is constantly white-bellied (as is also the type of Gray's *S. Gerrardi*), it is evident that the red-bellied forms require a special name.

As is the case with *S. variabilis*, this species is a very variable one, and each of the several series of it in the Museum presents some striking variation among its members. The general tone varies in depth and degree of grizzling: the centre of the back varies from deep shining black to hardly darker than the sides, the ear-patches are occasionally suppressed, the middle part of the tail may be either yellow, orange, or red, the end of the tail may be either red or black (more frequently the latter), and even the distinctive red belly may be picked out with white markings in the axillæ, middle line, and groins. It is possible therefore that other variations will lead into *S. variabilis*, in which case it will have to be considered as a subspecies of that form.

Other localities from which the Museum has specimens of *S. versicolor* are—in Ecuador, Paramba (*Rosenberg, Miketta*); in Colombia—Valdivia, Lower Cauca (*Pratt*), Medellin (*Salmon*), San Pablo (*Hopke*), and Bogota (*Child*).

A rather similar coloration to that of *S. versicolor* is found in the true *S. griseogena*, Gray, of Venezuela; but that is a smaller form, as shown by its skull, and has a more uniformly grizzled back, less blackened behind and less reddened in front.

Mr. Nelson's *Sciurus caucensis* is not a member of this group, but is allied to—indeed, I do not see how it is different from—Gray's *S. medellinensis*, also from the Valley of

the Cauca. Perhaps this again will prove to be a synonym of *S. Pucherani*, Fitz. Neither species is referred to by Mr. Nelson.

XLVIII.—*A new Dassie from North Nyasaland.*

By OLDFIELD THOMAS.

Procavia mima, sp. n.

General appearance, colour, and length of hair almost exactly as in *P. (Dendrohyrax) arborea*, from which the number of the mammæ ($1-2=6$) widely separates it, and allies it to the more typical members of the genus. Fur very long, soft, and sleek, the hairs without the crinkling present in *arborea*. General colour above pale sandy fawn, heavily grizzled and lined with black, especially along the middle line; each hair dark brown for its basal 25–27 millim., then sandy for about 5 millim., and its terminal 5 millim. shining black. Crown and rump particularly black, owing to the very numerous shining black ends to the longer hairs. Upper lip and an inconspicuous spot over eye whitish. Ears rounded, well-haired, greyish white. Dorsal spot pale buffy white, the hairs this colour to their bases; peripheral hairs of spot not deeper buffy, as is often the case in *arborea*. Under surface white, with a faint buffy tinge, the bases of the hairs blackish. Upper surface of hands and feet grizzled black and pale buffy.

Dimensions of body apparently about the same as in *P. arborea*. Hind foot 57 millim.

Hab. Nyasa-Tanganyika Plateau, Northern Nyasaland.

Type. Female. Skin without skull. B.M. no. 99. 6. 28. 16. Presented in 1898 by Col. Manning, then Acting Commissioner, British Central Africa.

This Dassie is so strikingly like *P. arborea* that it has hitherto been regarded as belonging, or at least allied, to that species. But now that I find that it has $1-2=6$ mammæ, the formula of *Procavia* (s. s.) and *Heterohyrax*, as against the $0-1=2$ of *Dendrohyrax*, there can no longer be any doubt that it represents a distinct species. In colour and length of hair it is widely different from any known species with the same mammary formula.

XLIX.—*Description of a new Species of Ornithoptera.*

By H. GROSE-SMITH, B.A., F.E.S., F.Z.S., &c.

Ornithoptera titan, sp. n.

♂.—*Upperside.* Anterior wings black, with a broad yellowish-green band extending along the costa and partly invading the cell, narrowest at the base, but becoming wider in the middle and tapering towards the apex, which it does not reach; on the disk from the base and thence below the median nervure to the inner margin is a yellowish-green triangular area, the apex of which is a little above the lowest discoidal nervule; this green area, between the median nervules, does not extend to the median nervure, nor does it reach the outer margin, which is broadly black; there is no stigmatic brand as in the *O. priamus* group. Posterior wings golden yellow, with a black outer border, which is narrow along the costa and becomes wider at the apex; the outer edge of the yellow area is golden green, which colour extends inwardly along the veins; beyond the yellow area, which extends rather beyond the lowest median nervule, to the inner margin the wings are jet-black, the abdominal fold, which is bordered basally by golden scales, being very wide; on the disk towards the apex in the yellow area between the veins are three large oval golden-green patches, in the upper part of each of which is a black spot, which represent the spots on the underside.

Underside. Anterior wings golden green, the costal, outer, and inner margins broadly black, the veins black; on the disk between the veins is a row of four rather narrow black lunules. Posterior wings golden yellow, with a golden green submarginal and inner-marginal area, the latter very wide; three large oval black spots on the disk, the uppermost sub-apical, the two others on either side of the lowest subcostal nervule; outer margin narrowly black; abdominal fold pale buff, with long hairs of the same colour.

In shape the anterior wings are very broad, less produced at the apex than in the *O. priamus* group; posterior wings convex and rather truncate at the anal angle. Antennæ, thorax, and legs black; abdomen yellow, with small black spots on either side; orbits white.

Expanse of wings $7\frac{3}{4}$ inches.

Hab. New Guinea.

In my own collection.

This magnificent butterfly was sent to me in a collection

stated to be from New Guinea (collector unknown to me). The rest of the collection is in very bad condition. I conjecture, however, from the series of species contained in it that the insects may have been captured towards the southern end of British New Guinea. I hope to obtain further particulars later on.

The absence of the stigmatic brand on the anterior wings separates it from the group of *O. priamus*, and the shape and neuration of the wings from the *Schoënbergia* group. I have compared it with the drawing of the neuration of *Schoënbergia* (?) *goliath*, Honrath, as figured by Mr. Rippon, and find little, if any, difference; if the true locality of *S. goliath* is New Guinea (Mr. Rothschild gives its locality as Waigeu?, Dorey?), it is very probable that my butterfly is the male of that species.

A new genus should be created for this species.

L.—*Descriptions of Brazilian Coccidæ.*

By ADOLPH HEMPEL, S. Paulo, Brazil.

THE writer has published, in the 'Revista do Museu Paulista,' vol. iv., a paper on the Coccidæ of Brazil. One hundred and thirty-one species are included in that paper, which is printed in the Portuguese language; and under the circumstances it was thought advisable to publish the descriptions of the new species in the English language as well.

The measurements of the scales, body, antennæ, and long hairs are in millimetres; those of the joints of the antennæ and legs, and of short hairs, spines, and glands, are in micro-millimetres.

Coccidæ.

Subfamily *MONOPHLEBINÆ*.

Genus *ICERYA*, Signoret.

Icerya brasiliensis, Hempel.

Adult female elliptical, pink; antennæ and legs dark brown, entirely covered with white secretion; consisting of one long caudal tuft, one cephalic tuft, a lateral and a sub-lateral row of nine tufts on each side, and a central longitudinal mass. A tuft on each side of the caudal and cephalic tufts is longer than the other marginal tufts. Ovisac large,

white, sometimes showing a creamy tinge, distal end curved up. Beneath it is convex and slightly striated longitudinally. Dorsum and side longitudinally fluted, with 14 or 15 longitudinal furrows. In the largest individual examined the anal tuft was 20·5 millim. long. The caudal and cephalic tufts are usually fluted with four longitudinal ribs. The ovisac has one or two longitudinal slits on the medial dorsal line, through which the young escape. Forty-four eggs were found in one sac.

Antennæ usually 11-jointed: joint 5 is the shortest, and sometimes unites with joint 4, making the antennæ only 10-jointed; joints 2, 4, 6-10 are subequal in length; joint 11 equals or slightly exceeds joints 9 and 10 in length. Length of antennæ variable; the longest observed was 1·1 millim. long. Joints 1-10 each bear a whorl of about 6 hairs, while joint 11 has a terminal band of 15 or 16 hairs.

Legs ordinary; tarsus curved near the distal end; digitules absent. Digi:ules of claw fine, hair-like, short.

Rostrum large, situated just between the first pair of legs. Mentum with about 28 hairs. Rostral loop reaching beyond the insertion of the second pair of legs. Numerous hairs are scattered over both surfaces and around the margin; while the body is terminated by two terminal tufts of 5 long hairs. The entire dorsal surface is crowded with glands; these are round and appear to be composed of 6 to 9 parts placed in a circle, with a long glassy filament in the centre.

Length of insect and ovisac, excluding the tufts, 10·5 millim.

Larva (just hatched).—Elliptical, deep red with a pinkish tinge. On the dorsum there are four tufts of yellowish wax, forming a diamond-shaped patch, with the long diameter placed cephalo-caudad. Antennæ 6-jointed: joints 2-5 sub-cylindrical and subequal in length, ·066 millim. long; joint 1 convex on the inner side; joint 6 club-shaped, ·164 millim. long; joints 2-5 have each one long slender hair and several shorter ones; joint 6 with 6 very long hairs (longer than the antennæ), ·64 millim. long, and about 12 short ones.

The dorsum bears many slender hairs, placed in about ten irregular longitudinal rows. On the head there are four bristles between the eyes; the two middle ones are very long, reaching nearly to the tip of the antennæ. There are 6 anal bristles about 1·35 millim. long, equalling nearly twice the length of the body. There are also 6 shorter bristles on each side of the abdomen not one third the length of the anal bristles. The lateral margin of thorax and head also bears some short bristles. Dorsum with many round secretory

pores, placed more or less in transverse rows. Eyes 2, small, conical, dark brown, nearly black. Antennæ and legs also dark brown. Tibia of second and third pair of legs .20 millim. long, tarsus and claw a little shorter; claw long, slender, slightly curved, and notched at the end. Digitules of claw slender, buttoned, a trifle longer than claw. No tarsal digitules. Length .73 millim.

Female (third stage).—Body ovate; secretion or wax usually light yellow, arranged in two lateral rows each with about 10 tufts, two sublateral rows of 8 tufts each, one terminal tuft at each end, and one median longitudinal row of 5 tufts. Antennæ 9-jointed, joint 9 the longest. Legs shorter than in the larvæ. Rostral loop reaching to the insertion of the third pair of legs. Mentum with about a dozen short hairs. Both surfaces of the body are covered with hairs, those on the dorsum fewer and longer. The dorsal surface also contains a large quantity of round secretory pores, each situated above a group of five or six cells. These pores have the same construction as those in the adult, and are most abundant on the head and the margins of the body.

Hab. Sent from Iguape by Mr. E. Young, where it occurs in such numbers on *Codiaeum* sp.? as to kill the plant. Also found in Ypirauga and São Paulo on *Ficus* sp., rose, and other cultivated plants.

It has killed a number of shade-trees in São Paulo, and is apt to cause considerable damage to the parks. The individuals usually cluster on the undersides of the twigs and branches in great numbers. Also occurs in large numbers on *Liriodendron tulipifera*, L., *Laurus camphora*, L., and on a species of palm. Many Hymenopterous parasites have been bred from this species; but the parasites do little harm to the insect, as the eggs are not affected, and hatch, although the adult is full of parasites. A species of Coccinellid larva has also been observed feeding on the growing insects.

Icerya Schrottkyi, Hempel.

Adult female, massed together and all covered with a dense white secretion, so that it is hard to distinguish individual characters. Each insect, however, is covered with a dense mass of long white filaments of secretion, which seem to proceed from glands placed in two concentric rings on the dorsum; all the filaments pointing backwards, and some attaining a length of 30 millim. On the abdomen there are two small patches of white secretion. The ovisac is secreted under the abdomen, and consists of a dense mass of white

woolly secretion, very sticky, adhering to everything it touches. Denuded of wax orange-yellow in colour; legs and antennæ dark brown. Body ovate, wider posteriorly than anteriorly. The dorsum has two concentric rings of pits or glands extending around it, dividing it into three areas. The abdomen is transversely furrowed.

Length 7·50 millim.; width 5 millim.; height 3 millim.

Boiled in a solution of KOH it gives the solution a yellow muddy appearance. The derm is thin and transparent.

Antennæ variable, of 10 or 11 joints; 11, however, seems to be the typical number of joints, of which the last is the longest. Joints 1–10 each bear a whorl of 7–9 hairs; joint 11 has a brush of many hairs. Length about 1·10 millim.

Approximate formula: 11 2 1 3 (7 8 9) 10 6 (4 5).

Length of joints: (1) 110, (2) 123, (3) 97, (4) 66, (5) 66, (6) 75, (7) 93, (8) 93, (9) 93, (10) 84, (11) 173.

Legs long and hairy. Length of joints of first pair of legs: coxa 191, trochanter and femur 594, tibia 604, tarsus 252, claw 66. Tarsal digitules wanting. Digitules of claw short, hair-like. Eyes close to the base of the antennæ, small, conical, dark brown. Rostrum large, situated between the first pair of legs. Rostral loop extending to the second pair of legs. Mentum with about 20 hairs. The dorsal and ventral surface of the body is crowded with hairs and large round glands; the hairs on the ventral surface, however, are smaller than those on the dorsal surface.

Larva (just hatched).—Orange-red, elliptical, ·812 millim. long and ·400 millim. wide. A very little white secretion on the back. Antennæ about ·555 millim. long; of 6 joints, the terminal joint longest and club-shaped. Length of joints: (1) 57, (2) 70, (3) 79, (4) 79, (5) 79, (6) 191. All the joints bear hairs; joint 6 bears six very long hairs and many shorter ones; joint 5 bears also one very long hair. Eyes small, conical, dark brown. The six central caudal bristles are very long, attaining a length of 1·46 millim. Besides these there are six shorter bristles on each side, but these are scarcely one fifth as long as the others. The margin of the body and the derm also bears numerous hairs, none of them very long. Many round glands are also present in the derm. The legs are long and thin, with many hairs. Length of joints of first pair of legs: coxa 79, trochanter and femur 222, tibia 244, tarsus 164, claw 40. Digitules of claw long, slender, with slightly expanded ends. Tarsal digitules wanting. Claw slightly notched. Rostral loop short, extending a little beyond the third pair of legs.

Hab. Jundiahy, State of São Paulo, on the bark of an indigenous tree. Collected by Mr. C. Schrottky.

Several hundred small Hymenopterous parasites were bred from this species. As in *I. brasiliensis*, the parasites are present in the adult, and do not prevent the eggs from hatching, and consequently are but a slight check to this species.

Subfamily COCCINÆ.

Genus ERIOCOCCUS, Targ.

Eriococcus brasiliensis, Ckll.

Adult female reddish brown, oval in outline. Anal ring with 6 long hairs. Antennæ variable. In some specimens joint 3 is the longest, while in others joint 4 is the longest, being 44 long; joint 1 is 22 long. All joints except joint 3 bear one or more hairs.

Male sacs of same consistency and colour as those of the female, but a little smaller. The adult male is dark brown in colour. Antennæ variable, usually of 10 joints, but sometimes with only 9 or 9 joints: joints 2-9 are dilated at the distal ends; joint 2 is very thick, being twice the diameter of joint 3. Approximate formula: 10 2 (9 3) 8 7 (4 5 6) 1. All the joints bear many small hairs, while in addition to these joints 8 and 9 each bear one, and joint 10 bears five large thick hairs. Thorax large; abdomen wide, with several hairs on the margin of each segment. Genital spike short and acuminate. Wings ordinary, the pocket, for the insertion of the balancers, being large. Balancers or halteres long; the last joint long and slender, with a large hook at the distal end. Claws toothed as in the female.

Length .95 millim.; extent 1.87 millim.

Hab. Ypirauga. Usually crowded on the ends of the twigs of *Baccharis dracunculifolia*, DC.

The insect is active until just before gestation, when it constructs a closely felted sac, occupying three or four days for the work.

Eriococcus perplexus, Hempel.

Largest female sacs 11 millim. long, 3.5 millim. wide, and 1.75 millim. high; spindle-shaped, widest caudad of the middle. Snowy white, closely felted, pointed, and with a small opening at the posterior end. The dorsal surface is apt to be slightly flattened and shows traces of transverse furrows.

♀.—Orange-yellow, with a brown longitudinal median

stripe. After boiling in a solution of KOH it is 4·5 millim. long and 2·75 millim. wide. It colours the liquid light yellow. Antennæ variable, 7-jointed, about ·30 millim. long; joints 1, 3, and 4 nearly equal in length; formula: 1 (3 4) 2 7 (5 6), varying to 3 (1 4) 2 7 (6 5). The antennæ are large and are little reduced in size in the first four joints. All joints except joint 3 bear hairs. Legs short and stout; coxæ with two hairs and three or four short spines; trochanter with two terminal hairs and one spine; femur twice as long as wide; tibia and tarsus equal in length, about seven tenths as long as femur; claw long, curved; all the digitules slender, with expanded ends. Anal ring with six hairs. Mentum is situated in front of the insertion of the first pair of legs; rostral loop short, extending halfway to the middle pair of legs. The entire surface of the body is covered with straight and curved spines and minute round glands. The abdomen ends in a pair of small tubercles.

Larva (just hatched).—Orange, pyriform; the abdomen ends in a pair of tubercles, each terminated by a long bristle. Between the tubercles there are two long and four shorter hairs. The surface of the dorsum bears six longitudinal rows of large sharp spines and numerous small tubercles. Antennæ 6-jointed, joint 3 the longest. Legs small, claw long and slender and slightly curved; digitules slender. Anal ring with six hairs. There are two conspicuous hairs on the anterior margin between the antennæ. Eyes small, spherical, inconspicuous. Rostral loop long, reaching nearly to the anal ring.

Hab. Ypirauga, State of São Paulo, on the underside of leaves of a plant of the order Myrtaceæ; and State of Minas Geraes, where it occurs on the bark of *Eugenia jaboticaba*.

Eriococcus armatus, Hempel.

Female sacs oval, flattened, with a large elliptical aperture in the caudal end; composed of a thick closely felted material. White, with a creamy tinge. 3·25 millim. long and 2·25 millim. wide. Adult female oval in outline; reddish brown; abdomen transversely wrinkled. Boiled in a solution of KOH it colours the liquid a light red.

Antennæ placed very close together, of seven joints, joint 7 the longest, variable, about ·320 millim. long. Approximate formula: 7 (1 2) 4 6 3 5. All the joints bear hairs. Length of segments: (1) 44, (2) 44, (3) 36, (4) 40, (5) 31, (6) 38, (7) 89. Legs short; tibia and tarsus nearly equal to femur and trochanter. Tarsal digitules slender, with knobbed ends,

extending to the tip of claw. Digitules of claw larger, with expanded ends. Rostrum small, situated between the antennæ and first pair of legs. Mentum large, dimerous. Rostral loop long. Eyes small, oval. Anal ring with six hairs. Anal tubercles present, each terminating in a long seta, and bearing several hairs and four or five short thick spines. The last five or six segments of the abdomen bear, on the lateral margins and dorsum, several groups of these short, thick, spear-shaped spines, each group consisting of four or five spines. Scattered over both surfaces of the body are small round spinnerets, short spear-shaped hairs, and many short cylindrical glands. These glands are especially numerous on the lateral and caudal margins of the abdomen. Length 2.70 millim.

Larva.—Length .44 millim., oval. Antennæ of six joints, joint 6 the longest. Legs short, thick; digitules slender. Anal ring with six hairs. Anal tubercles not conspicuous, each ending in a seta, and bearing two short sharp spines. The dorsum bears about sixteen transverse rows of short hairs.

Hab. Ypirauga, on *Baccharis* sp. The individuals are clustered around the stem, close to the ground, on the roots, and also on the ends of the branches.

Genus DACTYLOPIUS, Costa.

Dactylopius grandis, Hempel.

Adult female oval in outline; dorsum convex, rounded, dark orange in colour. The dorsum is covered with a white powdery secretion, arranged in one submedian and one sub-lateral longitudinal row on each side. Around the lateral margin there is a fringe of short white tufts. There are also two long acuminate anal tufts. Sometimes the secretion has a yellowish tinge. The adult rests upon a cushion of white cottony matter that contains the young; this cotton readily adheres to anything it touches. The largest specimens are 7.50 millim. long, 5 millim. wide, and 3 millim. high.

Antennæ of eight joints, joint 8 being the longest; joint 1 thick, nearly twice the diameter of joint 2. Length of joints variable, joints 3, 6, 5, and 7 being subequal and joints 1 and 2 being subequal; sometimes 1, sometimes 2, is the longer. Approximate formula: 8 2 1 5 (3 6 7) 4. Average length of antenna .48 millim. All the joints bear hairs. Length of the joints: (1) 67, (2) 71, (3) 49, (4) 36, (5) 53, (6) 47, (7) 49, (8) 98. Eyes small, conical. Legs short, stout, with few hairs; coxa wider than long; tarsus and tibia about

equalling femur in length; claw small, with the digitules short and slender, with buttoned ends. Tarsal digitules slender, scarcely reaching to the tip of the claw. Rostral loop very short. Anal ring with six hairs. The two anal tubercles are inconspicuous, but each one bears several hairs and a number of small triangular glands and about 15 short, thick, sharp spines. On the dorsal surface of the body near the lateral margin there are about 32 groups of glands and spines, each group consisting of from 8 to 12 small triangular glands or spinnerets and from 5 to 8 short sharp spines. The lateral margin is also fringed by a number of short hairs. Dorsal surface of body bears many small triangular glands and short sharp spines, placed singly, apparently in transverse rows. The ventral surface of body bears glands and many small hairs.

Young (just hatched).—Elliptical, yellow; eyes small, conical, dark brown. Antennæ 6-jointed, joint 6 being the longest, equalling joints 3, 4, and 5. Rostral loop long, nearly extending to the anal ring. Legs long, claw slender, digitules of claw and tarsus long and fine, buttoned. Anal tubercles inconspicuous, each bearing a terminal seta. Around the margin of the body there are short sharp spines, while each of the last two abdominal segments bears two spines on each side. Length .45 millim.

Hab. Ypirauga. On leaves and twigs of a plant of the fam. Myrtaceæ.

Dactylopius setosus, Hempel.

Adult female elliptical, flat, orange-red in colour; legs and antennæ yellowish. Thorax and abdomen transversely wrinkled; the abdomen ends in two stout sharp filaments of white secretion, while both surfaces of the body are dusted with a white powder. On the dorsum there is one median row and on each side a sublateral and a marginal row of long glassy filaments, which stand out in all directions and give the insect a bristly appearance. Largest specimens 5 millim. long and 2.75 millim. wide.

Antennæ usually 8-jointed, although sometimes joints 3 and 4 are united into one; slender, joints 4-7 slightly expanded at the distal end. All of the joints bear hairs. Joint 8 the longest. Approximate formula: 8 3 (2 1) 5 4 (6 7). Antennæ varying in length from .60 millim. to .70 millim. Average length of antennal joints: (1) 89, (2) 89, (3) 102, (4) 64, (5) 84, (6) 62, (7) 62, (8) 133.

Legs long, slender, with many hairs. Coxa short and

wide. The joints of first pair of legs measure in μ :—femur 333 long; tibia 312; tarsus and claw 125. Digitules of tarsus slender, with small buttons at tip, reaching to tip of claw. Digitules of claw large, with widely expanded tip. Eyes small, conical. Rostral loop very short. Anal ring with 6 hairs. Anal tubercles present, each ending in a long seta, and bearing two short sharp spines and a number of small hairs, and minute triangular glands. Grouped around the anal orifice and arranged singly near the lateral margin of the dorsal surface are some characteristic cylindrical glands, each one 35μ long and 9μ wide. Three to five short hairs are arranged around the external openings of these glands. The dorsal surface also bears many minute triangular spinnerets, and in the cephalic region many hairs. The ventral surface also has hairs and glands scattered over it.

Hab. São Paulo. On the twigs of a species of *Ficus* planted as shade-trees in some of the streets of the city.

Dactylopius secretus, Hempel.

Female active; body ovate, transversely furrowed; very light yellow; the dorsum dusted with a fine white powdery secretion. The lateral margin bears a fringe of small tufts of white wax. A pair of these tufts, at the caudal extremity, are longer than the others, and between them there is another pair of fine hair-like tufts. The largest specimen was 2.25 millim. long and 1.25 millim. wide, but it was probably immature. It inhabits globular or cylindrical galls. These galls are formed by having part of the leaf thickened and folded upon itself, with its long axis parallel to the long axis of the leaf. The gall is on the underside of the leaf, with the opening on the upperside, and reaches a length of 12 millim.

Antennæ short, thick, of eight joints; each joint with several thick hairs; joint 8 the longest. Length about .42 millim. Approximate formula: 8 2 1 3 (5 7) (4 6). Length of the segments of an antenna: (1) 57, (2) 62, (3) 43, (4) 35, (5) 40, (6) 35, (7) 40, (8) 98. Legs short. Joints of first pair of legs: femur 191, tibia 182, tarsus and claw 102. Digitules of tarsus fine, slender, with ends slightly expanded, not extending beyond the tip of claw. Digitules of claw thick, end enlarged, extending beyond the tip. Rostral loop long, reaching about halfway between the second and third pair of legs. Eyes very small, oval. Anal ring with six large hairs. Anal tubercles not conspicuous, each ending in a large seta, and bearing two small sharp

spines, smaller hairs, and small triangular and larger round glands. The surfaces of the body bear hairs and scattered spines and numerous small and large glands.

Adult male light yellow; eyes black. Length, including style, .85 millim., extent of wings 2.25 millim. Antennæ 10-jointed; joint 10 the longest; joints 3-9 subequal.

Halteres short, expanded in the middle, bristle fine, with a large hook at the end. Legs long, slender, with numerous hairs. Tibia twice the length of tarsus. Claw very long and slender, one third length of tarsus. Digitules hair-like, short. Style very short, acuminate. The last segment of the body bears on each side of the style one long hair and several shorter ones. The other abdominal segments also bear several short hairs on the lateral margins.

Hab. Ypirauga. In galls on leaves of a plant of the family Solenaceæ.

But few of the galls contain insects, and it is probable that they are made by other insects and appropriated by this *Dactylopius*. This species is accompanied by an ant (*Cremastogaster?*).

[To be continued.]

LI.—*Descriptions of new Species of Japanese Land-
Shells.* By G. K. GUDE, F.Z.S.

AMONG a number of Helicoid land-shells received from Mr. Hirase the following appear to be undescribed:—

Arnouldia ceratodes, sp. n.

Shell imperforate, trochoid, smooth, shining, dark corneous; spire depressed, apex obtuse, suture impressed. Whorls $5\frac{1}{2}$, increasing slowly, the last not descending in front, at first keeled at the periphery, becoming rounded towards the mouth. Aperture oblique, lunate; peristome thin, straight, acute; margins distant, upper descending slightly, columellar margin slightly expanded above, the umbilical region sunk.

Diam. maj. 5.5, minor 4.75; alt. 4 millim.

Hab. Kashima, prov. Harima. Type in my collection.

The new species is allied to *A. stenogyra*, A. Ad., but it is darker and considerably larger and more deeply sunk around the umbilical region. Six specimens were received.

Arnouldia nanodes, sp. n.

Shell imperforate, depressed conoid; under the microscope seen to be very finely striated and decussated with close faint spiral lines, the latter a little more distinct and wider apart below; thin, dull above, a little shining below, pellucid, pale corneous. Spire depressed, apex obtuse, suture impressed. Whorls 4, increasing slowly, the last angulated at the periphery, tumid below near the mouth. Aperture oblique, securiform; peristome thin, straight, acute; margins approaching, the upper forming an obtuse angle with the outer margin at the periphery; columellar margin vertical, slightly expanded above.

Diam. 2·25, alt. 1·5 millim.

Hab. Kioto. Type in my collection.

The nearest ally of this form appears to be *A. obtusangula*, Reinh., but that species is perforated and is composed of 5½ whorls. Six specimens.

Crystallus sulcatus, sp. n.

Shell perforate, discoid, smooth above, very finely striated below; shining, pellucid, corneous. Spire depressed, suture channelled. Whorls 4, rounded, increasing slowly at first, the last widening rapidly, not descending in front, sunk round the umbilicus. Aperture nearly vertical, roundly lunate; peristome thin, straight, acute; margins distant, upper arcuate, columellar margin slightly dilated over the narrow umbilicus.

Diam. maj. 4, minor 3·75; alt. 2 millim.

Hab. Kioto. Type in my collection.

Two specimens only, one of which is imperfect. This species is allied to *C. microdiscus*, Reinh.

Crystallus velatus, sp. n.

Shell narrowly perforate, discoid; under the microscope seen to be faintly striated and decussated with excessively fine spiral lines; shining, pellucid, corneous. Spire depressed, suture impressed. Whorls 4, a little rounded, increasing slowly, the last not descending in front, sunk round the umbilicus. Aperture slightly oblique, narrowly lunate; peristome thin, straight, acute; margins distant, upper arcuate, columellar margin slightly expanded over the narrow umbilicus.

Diam. 3·5, alt. 1·5 millim.

Hab. Kioto. Type in my collection.

Allied to the preceding, but that shell is more elevated in the spire, the aperture is more widened laterally, the umbilicus is a little wider, and it is devoid of spiral sculpture.

Microcystis Hirasei, sp. n.

Shell perforate, depressed-conoid, very finely striated, decussated with microscopic spiral lines; thin, shining, pellucid, dark corneous, whitish below. Spire depressed, suture linear, faintly margined. Whorls $4\frac{1}{2}$, a little rounded above and below, increasing rapidly, the last twice as wide as the penultimate, not descending in front. Aperture a little oblique, lunate; peristome thin, acute; margins distant, upper depressed, columellar margin a little dilated over the narrow umbilicus.

Diam. maj. 9.75, minor 8; alt. 4.75 millim.

Hab. Kashima, prov. Harima. Type in my collection.

Three specimens received. This new species is intermediate between *M. rejecta*, Pfr., and *M. Doenitzei*, Reinh. Three other specimens (apparently immature) I also refer to this form; they measure barely 6 millim. in diameter.

Trishoplita cretacea, sp. n.

Shell deeply umbilicated, conoid, irregularly striated, indistinctly and minutely granulated; chalky white under a deciduous thin yellowish-white cuticle. Spire elevated, apex obtuse, suture impressed. Whorls $6\frac{1}{2}$, rounded, increasing slowly, the last descending very shortly in front, obsoletely angulated at the periphery, becoming rounded and a little widened at the mouth. Aperture oblique, elongate-rotundate; peristome scarcely thickened, expanded all round, the margins approaching, columellar margin broadly reflected over the deep but rather narrow umbilicus.

Diam. maj. 15.5-17.5, minor 13.5-15.5; alt. 13 millim.

Hab. Inga, prov. Hoki. Type in my collection.

The nearest ally is *T. mesogonia*, Pils., but that species is much smaller and possesses only $5\frac{1}{2}$ whorls. The twelve specimens received are all decorticated, but some have patches of the cuticle adhering.

Plectotropis conica, sp. n.

Shell deeply and perspectively umbilicated, conical, finely striated, the striæ decussated by very fine wrinkled spiral lines; from pale fuscous to reddish brown, paler around the umbilicus; the thin deciduous cuticle is raised transversely

into membranous lamellæ, which are rather long and not much interrupted at the peripheral region, but becoming shorter above near the suture and below near the umbilicus. At the periphery the cuticle is produced into conspicuous triangular membranous scales. Spire elevated conoidal, apex prominent, acute, suture impressed. Whorls $6\frac{1}{2}$ -7, increasing regularly, the earlier rounded, the later ones more or less flattened above, the last rather tumid below near the mouth, descending very shortly and slightly in front, acutely keeled. Aperture oblique, subcircular; peristome thickened and reflexed, pale rufous; margins approaching, the columnar a little reflected over the umbilicus, which is deep and perspectively widened, exhibiting the larger portion of the penultimate whorl.

Diam. maj. 18-19, minor 17-17.5; alt. 11-11.5 millim.

Hab. Izuhara, Tsu-shima. Type in my collection.

The only known species to be compared with this form is *P. trochula*, A. Ad.; but the latter is much smaller and more depressed, the umbilicus is narrower, the cuticular lamellæ are much more interrupted, the spiral sculpture is much finer, and the aperture less circular.

LII.—ASIATIC *TORTRICIDÆ*.

By the Rt. Hon. LORD WALSHINGHAM, M.A., LL.D., F.R.S.

[Continued from p. 341.]

HENDECANEURA, gen. nov.

(ἕνδεκα=eleven; νεῦρον=a nerve.)

Type (♂ ♀) *Hendecaneura impar*, Wlsm.

Antennæ simple, or scarcely pubescent beneath. *Palpi* slightly recurved, median joint roughly clothed above and beneath, terminal joint short, exposed; projecting to scarcely more than the length of the head beyond it. *Head* slightly tufted anteriorly. *Thorax* smooth. *Fore wings*, costa slightly arched, ♂ with a narrow costal fold at the base, termen slightly impressed below the rounded apex, tornus rounded, dorsum very slightly convex. *Neuration*, ♂ 11 veins (9 absent, coincident with 10 or 8): ♀ 12 veins all separate; 2 from middle third of cell; 3, 4, 5, and 6 more or less assembled towards the termen; 7 to termen. *Hind wings*

broader than the fore wings, somewhat triangular, apex slightly rounded, termen slightly indented above vein 5. *Neuration*, 8 veins; 3 and 4 stalked; 5 moderately straight, remote from 4; 6 and 7 nearly coincident along their base, diverging at about one-third their length. *Legs* smooth, hind tibiæ with a slight hair-pencil above.

The absence of one of the radial veins, presumably 9 by coincidence with either 10 or 8, and the possession of a costal fold enables this genus to be readily identified from the male.

(1). *Hendecaneura impar*, sp. n.

Antennæ ochreous. *Pulpi* ochreous, touched with fuscous externally at the end of the median joint. *Head* ochreous, touched with fuscous above the short, square, ochreous frontal tuft, face whitish. *Thorax* ochreous, mixed with greyish fuscous. *Fore wings* dark purplish fuscous, apex ferruginous; with an ochreous spot at the extreme base and a conspicuous shining white streak on the middle of the dorsum, much widened at its upper end beneath the fold; near the base is a reduplicated shining steel-blue patch on either side of the fold, not reaching to the margins, a similar patch beneath the costa a little before the middle, with two whitish ochreous streaks above it on the costa; beyond the middle the costa has seven oblique whitish ochreous streaks, the spaces between them being purplish fuscous; from the first pair of these streaks an outwardly oblique shining steel-blue line is angulated at the upper angle of the cell, and much widened towards the tornus, but turns outwards towards the termen before reaching it; the fourth of the costal streaks is also tipped with shining steel-blue, and the fifth sends out a shining steel-blue streak which nearly reaches the incision below the apex; below this is another slightly oblique steel-blue streak running nearly to the termen at one-third above the tornus, and enclosing between it and the wider steel-blue band behind it an ocelloid spot or space, crossed by six or seven transverse black lines, this and the whole apical space above it is rich ferruginous, and some ferruginous spots are scattered about the tornus and above the outer third of the fold; cilia steel-grey, with a dark line along their base. *Exp. al.* 15-18 mm. *Hind wings* dark brownish fuscous; cilia cream-white, shading to greyish fuscous at the flexus, with a brownish fuscous line running through them near

their base. *Abdomen* brownish fuscous. *Legs* whitish ochreous, hind tarsal joints spotted with brownish fuscous.

Type, ♂ (70237); ♀ (70236) Mus. Wlsm.

Hab. JAPAN (*Pryer*, 1886). Four specimens.

(2). *Hendecaneura* (?) *cervinum*, sp. n.

Antennæ, *palpi*, and *head* pale fawn-brown. *Thorax* blackish; *tegulæ* pale fawn-brown. *Fore wings* blackish; a short pale fawn-brown basal patch, with some blackish scales on the dorsum, is bounded outwardly by a transverse bright steel-blue band, which is slightly indented upon the fold; at one-third from the base is another bright steel-blue band with an excrescence on its outer side above the dorsum; at its upper extremity are two whitish costal dots; on the middle of the costa commences a series of oblique whitish costal streaks (seven or eight), from the first two a slightly interrupted oblique steel-blue band passes to the tornus, widened towards its lower extremity; the space beyond this band is brownish ochreous or olive-brown, transversely and slenderly striated with black and containing a bright steel-blue spot opposite the middle of the termen; two smaller spots above it, placed obliquely backwards, sometimes combine, forming a slender streak to the costal streak fifth from the apex; *cilia* shining steel-grey, tipped with fuscous near their apex and with a slender dark line near their base. *Exp. al.* 14 mm. *Hind wings* dark brownish fuscous; *cilia* pale greyish, with a dark line running through them near their base. *Abdomen* dark brownish fuscous. *Legs* greyish fuscous, hind tarsal joints spotted with pale ochreous.

Type, ♀ (70023) Mus. Wlsm.

Hab. JAPAN—YESSO (*Pryer*, 1882). Three specimens.

The male is at present unknown, but this species so greatly resembles *impar*, Wlsm., that there can be little doubt it is correctly referred to the genus *Hendecaneura*.

(3). *Hendecaneura apicipictum*, sp. n.

Antennæ pale cinereous. *Palpi* and *head* fawn-ochreous, tinged with cinereous. *Thorax* greyish fuscous. *Fore wings* dark reddish fuscous, mottled and streaked with bright shining steel-blue; on a not otherwise defined short basal patch are two or three bright steel-blue spots, a pair of whitish costal streaks above the upper one; before the middle

of the wing is an oblique elongate steel-blue spot beneath the costa, with two white costal streaks at its upper edge, opposite to which is a rounded steel-blue spot between the fold and the dorsum; this is followed by a smaller spot at the lower edge of the fold halfway to the tornus; from a little beyond the middle of the costa a slightly outward-curved bright steel-blue band runs to a little above the tornus, where it is diverted towards the termen; at its costal extremity are two oblique white costal streaks, these are followed by three pairs of similar costal streaks before the apex, the third from the apex sending out an oblique steel-blue line to the termen; some steel-blue spots follow the outline of the termen below it, and the space preceding these latter markings is streaked with olive-brown; cilia pale steel-grey, a slender whitish ochreous line along their base followed by a narrow fuscous line; the extreme apex of the wing around the last two costal streaks is tinged with olive-brown and the cilia at the extreme apex are whitish. *Exp. al.* 13-14 mm. *Hind wings* dark brownish fuscous; cilia white, tipped with greyish before the apex, a slender whitish ochreous line along their base, followed by a narrow brownish fuscous line. *Abdomen* brownish fuscous. *Legs* brownish grey; hind tarsal joints spotted with whitish ochreous.

Type, ♀ (70020); ♂ (70019) Mus. Wlsm.

Hab. JAPAN—YESSO (Pryer, 1882). Four specimens.

THIODIA, Hb.

1110 (2). *Thiodia infessana*, Wlsm.

Antennæ pale fawn-ochreous. *Palpi* projecting more than the length of the head beyond it; pale ochreous, the end of the tuft beneath the median joint fawn-brownish. *Head* and *thorax* pale ochreous, the latter with a brownish shade. *Fore wings* fawn-brown, mixed with minute brownish fuscous scales, profusely mottled and transversely strigulate with shining pale ochreous, and with two short black lines in the obscure ocelloid patch above the tornus; cilia pale ochreous, with brownish mottling. *Exp. al.*, ♂ 20, ♀ 22 mm. *Hind wings* brownish grey; cilia pale brownish cinereous, with a slender pale ochreous line along their base. *Abdomen* and *legs* brownish grey.

Type, ♂ (60827); ♀ (60828) Mus. Wlsm.

Hab. ASIATIC TURKEY—HALEB—Shar Devesy, 15 VI. 1890 (*Native Coll*); PALESTINE (*Tristram*, 1883). Six specimens.

This species much resembles *Eucosma fessana*, Mn., from which it differs in the absence of the costal fold, in its much larger size, and in the colour being rather rich fawn-brown instead of brown-grey, and in the numerous transverse strigulæ ochreous instead of white.

1112. *Thiodia citrana*, Hb.

Grapholitha (*Semasia*) *citrana*, Stgr. & Wk. Cat. Lp. Eur. 256. No. 1112 (1871)¹; Stgr. Hor. Soc. Ent. Ross. XIII. 258 (1879)².

Hab. EUROPE¹. ASIATIC TURKEY—*HALEB*—Shar De-vesy, 18 VI. 1890 (*Native Coll.*); *KHUDAVENDIKIAR*—Brussa, VI.²; *SIVAS*—Amasia².

1118. *Thiodia Metzneriana*, Tr.

Grapholitha (*Semasia*) *Metzneriana*, Stgr. & Wk. Cat. Lp. Eur. 256. No. 1118 (1871)¹.

Hab. EUROPE¹. N. PERSIA—Asterabad (*Lederer*), Zell. Coll. SIBERIA¹. AMUR—Pompejefka, 16 VII. 1876 (*Christoph*). COREA—Gensan, VI. 1886 (*Leech*). CHINA—Chang Yang, 4000–6000 feet (*Pratt*). JAPAN (*Pryer*, 1886; *Leech*, 1892)—*Yesso* (*Pryer*, 1882).

1121 (2). *Thiodia intacta*, sp. n.

Antennæ yellowish white, annulated with fuscous. *Palpi* porrect, brush-like, terminal joint concealed; whitish, shaded at the sides externally with brownish grey. *Head* yellowish white. *Thorax* pale brownish ochreous. *Fore wings* yellowish white, with a slight shade of pale brownish ochreous near the base, and with some very indistinct mottlings of the same colour about the dorsum; a small group of black scales lies at the upper edge of the ocelloid patch, which is shining white; cilia yellowish white. *Exp. al.* 19 mm. *Hind wings* brown; cilia white, with a pale brown shade along their base. *Abdomen* brownish, anal tuft white. *Legs* whitish, hind tarsal joints faintly shaded with brown.

Type, ♂ (70172) Mus. Wlsm.

Hab. JAPAN (*Pryer*, 1886). Unique.

1123 (1). *Thiodia rigidana*, Snell.

Grapholitha (*Semasia*) *rigidana*, Snell. Tijd. v. Ent. XXVI. 203–5, Pl. XII. 4, 4a (1883)¹.

Hab. E. SIBERIA—Askold Id.¹ COREA—Gensan, VI. 1886 (*Leech*). JAPAN—*Yesso* (*Pryer*, 1882); *KIUSIU* (*Leech*).

1123 (2). *Thiodia glebana*, Snell.

Grapholitha (Semasia) glebana, Snell. Tijds. v. Ent. XXVI. 206-8, Pl. XII. 6, 6 a (1883)¹.

Hab. E. SIBERIA—Pokrowsk, 29 V.¹; Baitonowa, 6-9 VI.¹; Tschernajewa, 11 VI.¹; Starikowo R., 23 VI. 1876 (*Christoph*).

1123 (3). *Thiodia sinensis*, sp. n.

Antennæ, *palpi*, and *head* dusky cinereous. *Thorax* brownish olivaceous. *Fore wings* olive-brown, paler towards the costa, along which is a series of short, slightly oblique, reduplicate whitish streaklets alternating with dark brown; these are of about equal length throughout beyond the middle, but shorter before it where they commence at about one-fourth from the base; a small white ocelloid patch containing two short black streaks lies opposite to the lower half of the termen, with a dark brown shade-patch above and below it; cilia dusky cinereous, with fuscous speckling. *Exp. al.* 18 mm. *Hind wings* dark greyish brown; cilia pale cinereous, with a shade-line near their base. *Abdomen* greyish brown. *Legs* cinereous, tarsi fuscous, annulate with whitish.

Type, ♂ (60151) Mus. Wlsm.

Hab. CHINA—CHE-KIANG—Ningpo, IV. 1886 (*Leech*).
Unique.

Allied to *aspidiscana*, Hb., *glebana*, Snell., and *corculana*, Z., but distinguished by the absence of any lengthening of the costal streaks before the apex.

1219 (2). *Thiodia niveicaput*, sp. n.

Antennæ simple in the male; yellowish white. *Palpi* very thickly clothed, with a long hairy brush beneath completely concealing the terminal joint; white. *Head* and *thorax* white, the latter shaded with brown posteriorly. *Fore wings* white, obliquely blotched and striated with brown along the dorsal half of the wing and with a series of oblique brown costal streaklets of varying lengths; these and the dorsal patches contain also some blackish scales; the first dorsal patch is at about one-third the wing-length, and reaches a little way across the fold, the second and larger dorsal patch is at two-thirds, the space between them more or less occupied by short waved streaks of the same colour; beyond the outer patch is a white ocelloid spot, margined at its inner and

outer edges with shining silvery white, and containing one or two transverse black streaks; above it the apical portion of the wing is shaded with brown and greyish, and there are some silvery lines between the costal striæ; cilia white, shaded with brown and greyish towards the apex. [In some varieties the brown patches are considerably shaded with greyish or greyish fuscous, and the costal streaks are also rather fuscous than brown.] *Exp. al.* 14-15 mm. *Hind wings* pale brownish grey; cilia shining white. *Abdomen* brownish grey. *Legs* whitish.

Type, ♂ (70097); ♀ (70098) Mus. Wlsm.

Hab. JAPAN (*Pryer*, 1886). Ten specimens.

EUCELIS, Hb.

1124 (3). *Eucelis* (?) *falcana*, sp. n.

Antennæ fawn-grey. *Palpi* triangular, much clothed above, porrect; fawn-grey. *Head* fawn-grey. *Thorax* fawn-brown. *Fore wings* with the costa slightly arched, the apex somewhat falcate; fawn-brown, very slightly darker along the basal half of the dorsum, and becoming somewhat suffused with fawn-grey toward the termen, before which a series of small fuscous spots is very indistinctly visible; along the costa also are some very indistinct, short, darker fawn-brown streaks; cilia chestnut-brown along their base, pale fawn brownish beyond it. *Exp. al.* 18 mm. *Hind wings* rather dark grey; cilia slightly paler, with a slender fawn-brown line running along their base. *Abdomen* brownish grey. *Legs* pale greyish cinereous.

Type, ♀ (70560) Mus. Wlsm.

Hab. JAPAN (*Pryer*, 1886). Two specimens.

A second female (70593) tends to show slender dark lines along the veins, especially beyond the cell. Probably correctly referred to *Eucelis*, Hb., but the male is at present unknown.

1124 (4). *Eucelis* *ochreocervina*, sp. n.

Antennæ cinereous fawn, faintly annulated. *Palpi* triangular, much extended, projecting twice the length of the head beyond it, terminal joint almost concealed; greyish fuscous. *Head* greyish fuscous. *Thorax* cinereous fawn. *Fore wings* elongate, rather narrow at the base, widened outwardly, costa gently arched, male without a fold; apex acute, termen

slightly impressed below the apex, tornus rounded; pale fawn-ochreous, shaded with greyish fuscous and fawn-brown, reticulated with whitish grey along the extreme costa, the intermediate spaces being greyish fuscous; the markings consist of an ill-defined basal patch, much wider below the fold than above it, mixed greyish fuscous and whitish grey; a subcostal shade beyond the middle of the same colour, the space below it tinged with fawn-brown, and containing at the outer end of the cell a greyish fuscous spot, preceded by some greyish white scales; near the termen are a few groups of black scales; cilia fawn-brown, a slightly darker line along their base, touched with greyish fuscous at the tornus. *Exp. al.* 20 mm. *Hind wings* pale greyish fuscous; cilia pale cinereous, a slightly darker shade near their base. *Abdomen* pale greyish fuscous, anal tuft fawn-ochreous. *Legs* greyish, posterior tarsal joints pale spotted.

Type, ♂ (60137, Goorais) Mus. Wlsm.

Hab. KASHMIR—Goorais Valley, 7000 feet, VIII. 1887 (*Leech*). JAPAN (*Pryer*, 1886). Five specimens.

In some of the Japanese specimens the costal shade is almost absent and the basal patch is reduced to a deep shade along the dorsum.

1125 (1). *Eucelis* (?) *divisa*, sp. n.

Antennæ ferruginous at the base, shading to brownish grey beyond. *Palpi* projecting the length of the head beyond it, median joint thickly clothed above, terminal joint short, depressed, scarcely exposed; pale ferruginous. *Head* pale ferruginous, somewhat roughly clothed above. *Thorax* dark ferruginous. *Fore wings* narrow at the base, widened outwardly, costa very slightly arched, termen slightly oblique, scarcely impressed, tornus rounded; dark ferruginous to two-thirds from the base, the outer edge of the dark portion slightly oblique, further from the base on the dorsum than on the costa; beyond it the apical portion of the wing is brownish fawn-colour, transversely striated with shining steel-grey, with a few lines of ferruginous scales, especially along the termen; on the costa the brownish fawn-colour contains four pairs of pale ochreous geminated streaks, separated and divided by dark ferruginous; a dark ferruginous spot lies within the extreme apex; cilia shining fawn-grey, with a dark line running through them near their base. *Exp. al.* 13 mm. *Hind wings* brownish fuscous; cilia pale cinereous, with a dark line running through them near their base. *Abdomen* [missing]. *Legs* whitish cinereous, shaded

externally with greyish fuscous, hind tarsal joints faintly spotted.

Type, ♀ (70095) Mus. Wlsm.

Hab. JAPAN (Pryer, 1886). Unique.

A small and very distinct species, of which, unfortunately, I have only a single female.

[To be continued.]

LIII.—*Description of a new Snake of the Genus Ablabes from Burma.* By G. A. BOULENGER, F.R.S.

Ablabes Hamptoni.

Snout short, convex, profile curved from the frontal region to the lip; eye three fourths the length of the snout; rostral once and a half as broad as deep, just visible from above; nasal divided; internasals a little longer than broad, a little shorter than the præfrontals; frontal once and two thirds as long as broad, longer than its distance from the end of the snout, shorter than the parietals; loreal small, longer than deep; a large præocular, with a second very small shield below it; 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 much longer than the posterior. Scales smooth, in 15 rows. Ventrals 194; anal undivided; subcaudals 76. Uniform greenish grey above (in spirit), white beneath and on the upper lip.

Total length 1050 millim.; tail 220.

This species, which is closely allied to *A. Doriae*, Blgr., differing in the broader rostral shield, was discovered by Mr. Herbert Hampton at Magok, on the Irawaddi, about 12 miles north of Mandalay. Together with the snake which I have the pleasure of naming, Mr. Hampton has presented to the British Museum examples of the following reptiles obtained by him at the same place, which are interesting from the point of view of the geographical distribution:—*Gymnodactylus khasiensis*, Jerdon; *Trirhinopholis nuchalis*, Blgr.; *Lycodon fasciatus*, And.; *Simotes violaceus*, var. *multifasciatus*, Jan; *Naja tripudians*, var. *cæca*, Gmel.

LIV.—*Descriptions of new Genera and Species of Hymenoptera.* By P. CAMERON.

A. *New Species of Vespidae from India and Japan.*

Polistes Rothneyi, sp. n.

Ferrugineus, nigro maculatus; facie, clypeo apiceque tarsorum flavis; alis hyalinis, nervis stigmatique flavis. ♂.
Long. 20 mm.

Hab. Barrackpore, Bengal (*Rothney*).

Antennæ rufous, the scape yellow beneath; the basal six joints black above; the third joint fully longer than the succeeding two united; the terminal joint black except at the base, compressed, rounded and slightly dilated at the apex. Head distinctly broader than the mesothorax; in front densely covered with silvery pubescence, granular; the lower part of the front, the face, and clypeus yellow; the occiput and a broad band across the vertex, extending to the eyes, black. Clypeus broadly roundly projecting in the middle, the sides waved. Mandibles rufous, tinged with yellow; the three teeth are black, the middle is slightly smaller. Thorax rufous, the lower parts of the pleuræ with a yellowish tinge; mesonotum black, the middle, especially at the base, with two broad irregular rufous marks. Scutellum and postscutellum rufous, the two separated by a black line. Metanotum black, the sides and two somewhat pyriform marks in the middle rufous; it is not very strongly or closely transversely striated. Mesopleuræ sparsely and indistinctly punctured; the base narrowly, the furrow, a broad irregular splash behind on the upper half, and with a small rufous mark in the middle, the apex more broadly than the base; the base, the lower side, the part along the furrow and the apex, except for a large mark in the middle, black—or, in other words, the mesopleuræ are black, with an upper and two lower rufous marks, the posterior being much the larger. Wings hyaline, slightly suffused with yellow along the eyes. Legs rufous, the four anterior yellowish in front, the four hinder coxæ, femora, and tibiæ lined with black above; the basal two thirds of the metatarsus black. The base of the first and second abdominal segments and the apices of the others, except the last, broadly black.

A distinct species. The form of the terminal joint of the antennæ is as in *P. schach*; that species differs from it in

having the eyes "very small, separated from the base of the mandibles by more than two thirds of their own length," they being here separated by one third only or by the length of the three mandibular teeth; in *schach* there are only two teeth, and it bears no black markings. Saussure ('Vespides,' i. p. 104) says that the mandibles of the male are "très fortes, longues et arquées, . . . leur base très épaisse, armée d'une forte dent dirigée en dedans," which is certainly not the case in our species, in which they are broad at the base, slightly obliquely narrowed towards the apex. The clypeus is quite flat, not convex; the sides at the top are broadly rounded; the centre is transverse; the occiput is sharply margined.

Polistes gallicus, Fabr.

This common European species may be added to the Indian fauna. I have seen an example from Gilgit. It belongs to the European form, not to the Eastern Asian var. *chinensis*, Fabr.

Polistes rufolineatus, sp. n.

Ferrugineus; vertice, meso-metathoraceque nigris, lineis 2 mesonoti, scutello postscutelloque rufis; pedibus rufis, coxis, trochanteribus, femorum anterioribus basi, femoribus tibiisque posticis nigris; tarsis flavis, basi nigra; alis fulvo-hyalinis.

Long., ♀ 23, ♂ 15 mm.

Hab. Khasia Hills. Coll. Rothney.

Head ferruginous; the ocellar region from shortly behind the posterior pair, from eye to eye, and extending along the upper part of the eye-incision, black; the front and vertex punctured, but not very strongly or closely; the antennal keel stout, roundly dilated behind and carinate in the middle. Clypeus broader than long, roundly convex, the top transverse, the angles oblique; the apex with the sides oblique; the punctures are sparse and moderately large. Mandibles rufous, sparsely punctured; the teeth black, the middle one smaller than the others. Antennæ rufous; the five basal joints of the flagellum black above. Thorax black; the prothorax, two lines on the centre of the mesonotum, a much shorter one opposite the tegulæ, a mark, narrowed below, under the tubercles, the scutellum and postscutellum, rufous. Mesonotum almost impunctate; the scutellum with shallow scattered punctures. Metanotum, except at the base, irregularly and rather widely transversely striated. Pleuræ bearing shallow punctures; the apical half of the metapleuræ obliquely

striated. Legs black; the greater part of the four anterior femora, the anterior tibiæ, the apical third of the middle, and the apex of the third rufous; the four posterior tarsi yellowish; the basal joints black, except at the apex. Wings fulvous, with a violaceous tinge; the stigma rufo-testaceous; the second cubital cellule at the top is as long as the space bounded by the first transverse cubital and the first recurrent nervures; the second and third transverse cubital nervures are parallel and roundly curved outwardly from shortly above the middle. Abdomen dark rufous. The base of the petiole and a narrow line on the base of the second segment black.

The male has the face, clypeus, and mandibles paler, of a more yellowish hue; the clypeus is longer than broad, almost impunctate; the apex is bluntly rounded, the lateral angles above are more rounded; the antennal tubercle is narrowly furrowed in the middle above; the mesopleuræ rufous, with three irregular marks above and in the middle behind, the latter being the larger and narrowed in the middle; the four anterior coxæ are only black at the apices, the posterior are irregularly marked with yellow behind; the black on the vertex is more extended and is united in the middle by a narrow line to the black on the occiput.

Polistes rugifrons, sp. n.

Ferrugineus; meso- metathoraceque nigris; pedibus rufis; coxis, trochanteribus, femoribus tibiisque posticis nigris; alis fulvo-fumatis. ♀.

Long. 25 mm.

Hab. Khasia Hills. Coll. Rothney.

Antennæ rufous, the third and following joints black above. Head rufous, the ocellar region and the occiput black; the inner orbits of a paler colour; the vertex, the eye-incision, and the centre of the front strongly and distinctly punctured; the space between the antennæ bluntly tuberculate. Eyes large, separated by, if anything, slightly more than the length of the last joint of the antennæ from the base of the mandibles. Clypeus roundly convex, strongly but not very closely punctured. The base of the mandibles with scattered punctures, their three apical teeth are of equal size. Thorax black, except the prothorax and the sides of the scutellum, which are ferruginous; the pronotum is lined with yellow on the top. Mesonotum closely and strongly rugosely punctured, the punctures running into reticulations in the middle behind. The scutellum and postscutellum are more rugosely punctured than the mesonotum. The median segment is transversely

but not closely striated, and has a wide, moderately deep furrow down the middle. Pro- and mesopleuræ closely rugosely punctured; the basal half of the metapleuræ is covered sparsely with shallow round punctures; the lower half has them much more widely separated. Legs rufous; all the coxæ and trochanters, the hinder femora, and the hinder tibiæ except at the apex are black. Wings dark fuscous-fulvous, iridescent; the stigma testaceous; the nervures blackish; the second cubital cellule is equal in length to the space bounded by the first transverse cubital and the second recurrent nervures. Abdomen dark ferruginous, the base of the segments darker, the apex of the first and second with a broad dull yellowish band.

Polistes khasianus, sp. n.

Ferrugineus, lineis pronoti abdominisque flavis; mesosterno femoribusque posticis subtus nigris; tarsis posticis flavis; alis fulvo fumatis, stigmatate fulvo. ♀.

Long. 14 mm.

Hab. Khasia Hills. Coll. Rothney.

Antennæ rufous, the flagellum darker above; the third joint is slightly but distinctly longer than the following two united. Head smooth, the front and vertex covered with a silky down, the clypeus sparsely with black hairs and with a few punctures; above it is distinctly incised, roundly in the middle; the apex is triangularly produced, the middle point rounded. Mandibles rufous, sparsely punctured in the middle; the three teeth are sharply pointed and of almost equal size. Thorax smooth, the mesopleuræ closely punctured, the punctures deep and distinct; metapleuræ obscurely striated, the base indistinctly crenulated. The mesosternum has the apex and the middle at the base black, as are also the edges of the divisions and the central furrow on the metanotum. Legs coloured like the thorax, the hinder femora lined with black on the outer half above; the apical four joints of the metatarsus yellow. Abdomen smooth and shining, silky: the petiole is black at the base, it and the other segments are narrowly lined at the apex with pale yellow.

A distinct species. Characteristic is the form of the clypeus, which is longer than usual compared to its breadth, it being much longer than broad, and is more largely developed below the eyes than usual.

Polistes nigratarsis, sp. n.

Ferrugineus; abdomine flavo-lineato, dimidio apicali nigro; metanoto

flavo bilineato; tarsis posticis nigris; alis hyalinis, apice fumato. ♂.

Long. 15 mm.

Hab. Barrackpore, Bengal (*Rothney*).

Antennæ rufous, darker towards the apex, the last joint one half longer than the penultimate. Head densely covered with pubescence, which is very dense and silvery on the clypeus, darker and longer on the top; the occiput is black, the outer orbits and the eye-incision narrowly lined with yellow. The clypeus is twice longer than broad, is slightly narrowed towards the top, where it is slightly and roundly incised; the antennal tubercle is not very convex, broad, slightly and gradually dilated towards the apex, which is rounded. The eyes are separated from the base of the mandibles by the length of the second antennal joint. The lower and upper teeth of the mandibles are large and sharply pointed, the middle one shorter and narrower. Thorax densely covered with a silky fulvous pubescence; the base of the mesonotum—the mark dilated in the middle behind—a transverse narrow line on the apex, the extreme base of the median segment, the central furrow (narrow at the top, broader below), and a mark (narrowed gradually behind on either side at the apex) black; a narrow line on the pronotum, a narrow line on the base of the scutellums, spots at their sides, and two large marks on the median segment (straight on the inner side, rounded on the outer, and narrowed gradually towards the apex) yellow. The pro- and mesothorax are granular, the sides more coarsely than the top; the median segment obscurely transversely striated; the metapleuræ obliquely striated above, below the furrow sparsely punctured. The hinder tarsi are entirely black, the middle black, white at the base, the anterior yellowish white; calcaria white. Wings hyaline, the stigma fulvous, the nervures darker; there is a fuscous cloud occupying the greater part of the radial cellule and the upper part of the apical cubital cellules; the apex of the costal cellule is brownish. Abdomen black, the two basal segments rufous; the sides broadly and apex of the basal segment and the apices of the second, third, and fourth segments yellow; the petiole below, except for a narrow line in the middle, and the apices of the second and third segments are yellow.

A distinct species allied to *P. maculipennis* and *P. stigma*; easily known from them by the much longer and narrower clypeus; it differs also in having a distinctly defined area above the clypeus, bounded by distinct furrows, and the apex of the clypeus is quite differently formed, it making a semi-circle, while in *stigma* its sides are straight and oblique.

Polistes ephippium, sp. n.

Niger; clypeo, orbitis oculorum, mandibulis, prothorace, scutello, postscutello, lineis duabus metanoti petioloque rufis; pedibus rufis, apice tarsorum nigris; alis fuscis, costa stigmatique rufotestaceis. ♀.

Long. 16-17 mm.

Hab. Khasia Hills. Coll. Rothney.

Antennæ rufous, the flagellum darker above. Head black, the outer orbits, the inner from the inside of the lower part of the incision, the space between the antennæ and the clypeus rufous. The front and vertex rugose, thickly covered with short fuscous hair. Clypeus with scattered punctures and with short fuscous hair; its edges narrowly black. Mandibles rufous; the teeth black. Prothorax rufous, except the basal slope. Mesothorax black; the scutellum, postscutellum, the sides near the tegulæ, the tubercles, and an oblique mark (narrowed gradually beneath) below them rufous. Pro- and mesonotum closely rugosely punctured, as are also the scutellum and postscutellum, thickly covered with fuscous pubescence. The striæ on the metanotum are not very close together; on each side is a large red mark, broad at the top, gradually narrowed towards the apex. Legs rufous; the greater part of the coxæ below, more or less of the trochanters, the base of the femora, and the apical three joints of the four hinder tarsi, black. Abdomen black, the petiole and the apical segment rufous.

A stout easily recognized species.

Polistes khasianus, sp. n.

Niger; clypeo, pronoto late, apice petioli segmentoque 4^o rufis; alis fuscis, stigmatе ochraceo. ♂.

Long. 12 mm.

Hab. Khasia Hills. Coll. Rothney.

Antennæ black, thickly covered with pale pubescence. Head black, the clypeus (except narrowly round the eyes) red; there is a narrow red band on the upper outer orbits. Vertex closely and distinctly punctured, as are also the eye-incisions and the front broadly in the middle; they are covered thickly with longish fuscous hair. Clypeus sparsely punctured and with a few blackish hairs. Thorax black, closely punctured and thickly covered with short pale hairs; the base of the prothorax to near the coxæ and the pleuræ broadly above brick-red; the red on the pleuræ broad and

rounded behind. Scutellum sparsely, postscutellum more thickly rugosely punctured, behind almost impunctate. The apex of the median segment has an oblique slope; on either side on the upper part are three curved distinctly separated keels. Pro- and mesopleuræ closely and distinctly punctured; the base of the metapleuræ smooth, except for a narrow row of striæ at the base; the apex and the lower part behind the oblique furrow with shallow round punctures and irregularly striated. Wings dark smoky, lighter behind and below towards the apex; the stigma ochraceous; the nervures black. Abdomen black, the apical third of the petiole and the fourth segment almost all round brick-red; the red band on the fourth segment is incised at the base on either side.

A distinct species. There is no known Indian species with which it can be confounded. The apex of the metanotum is not quite so closely striated as in most of the species.

Polistes Wattii, sp. n.

Flavus; tibiis posticis supra nigris; alis fulvo-hyalinis, nervis testaceis. ♀.

Long. 13 mm.

Hab. Bengal (*Dr. George Watt, F.L.S.*).

The third joint of the antennæ is nearly as long as the following three united, the apical slightly longer than the penultimate. Front and vertex finely granular, of a darker shade than the face. Clypeus broader than long, the middle at the top transverse, the sides oblique, the apex with the sides oblique, the middle rounded. Mandibles yellow; the teeth black, of nearly equal size, bluntly triangular. Pro- and mesothorax smooth; the scutellum has a narrow longitudinal furrow in the centre at the base. Median segment closely transversely striated, the furrow deep. Wings fulvo-hyaline, suffused with fuscous; the second cubital cellule at the top is slightly less than the distance bounded by the first transverse cubital and the first recurrent nervures. Legs coloured like the thorax, except that the hinder tibiæ are black behind, this being also the case with the base of the metatarsus. The base of the petiole, the greater part of the second segment, and to a less extent the base of the third, are infuscated, the darkened bands being dilated at the sides at the apex.

This species has no near ally, and is readily known by the unicolorous body. The clypeus is broader than usual; the antennal keel is broad, forming a large tubercle with a fovea

on the top; above it is a short narrow furrow; on the front, below the ocelli, is a narrow, not very distinct furrow.

Polistes japonicus, sp. n.

Long., ♂ ♀, 22 mm.

Hab. Japan (*George Lewis*).

This species so closely resembles the exceedingly variable *P. hebræus*, especially the dark varieties, that it easily might be passed over for it. The difference in the form of the clypeus, however, enables them to be readily separated. In *hebræus* ♀ the clypeus above has its sides straight and oblique; in *japonicus* the top forms a semicircle, the sides not being straight. The males are easily separated by the fact that in *hebræus* the bordering furrow of the clypeus touches the eyes, while in *japonicus* it is separated from them by a clear space; in the latter, too, the top is bordered by a distinct furrow, which is incised in the middle; in the common species this upper bordering furrow is absent or scarcely noticeable and it does not project downwards in the middle. In *japonicus* the curved transverse lines on the abdomen are united to a broad black band at the base of the segments, so that enclosed lateral marks are formed. Head testaceous; the occiput, the vertex from shortly behind the middle to the upper half of the eye-incision, the part between the antennæ, and the sides and top of the clypeus narrowly black. Clypeus sparsely punctured on the lower half, the apex with the sides oblique, the centre rounded. Front and vertex distinctly, but not very closely, punctured, the front with a narrow but distinct furrow. Mandibles testaceous, the three teeth of nearly equal size. Thorax black, the edge of the pronotum behind, the upper third of the sides, their base more narrowly, leaving in the centre a triangular black space, two large lines in the middle of the mesonotum, a curved spot near the tegulæ, the scutellum, postscutellum, two lines (narrowed gradually below) on the slope of the metanotum, a mark (narrowed below) near the tubercles on the mesopleuræ, and a more irregular one (narrowed gradually towards the middle) on the apex lower down, and a mark in the centre of the metapleuræ behind the furrow, yellow. Mesonotum obscurely punctured on the sides; the metanotum transversely striated, its central furrow much wider than in *hebræus*. Pleuræ obscurely punctured, the lower part of the mesopleuræ smooth at the base. Legs testaceous; the coxæ, trochanters, the base of the front femora, the basal half of the middle, the hinder (except at the apex), the four anterior tibiæ and tarsi, and the hinder tarsi (except at the

base) rufo-testaceous. Wings hyaline, with a smoky violaceous tinge; the costa and stigma rufo-testaceous. Abdomen testaceous, the basal two thirds of the petiole (except for two irregular curved marks), the base of the second segment broadly (with the middle dilated), a curved line running from its centre to the sides, where it becomes united to the base, thus forming a large enclosed space, and similar curved lines on the third, fourth, and fifth segments, but with the basal lines much narrower, black; the ventral segments are somewhat similarly marked, the basal two are almost entirely black.

The male is similarly coloured, but with more black on the vertex behind; the clypeus is clearly bounded by a deep furrow at the sides and above and distinctly separated from the eyes; the middle is turned down on the top; the sides of the epipygium are broadly and roundly raised, in the centre behind are two stout teeth, rounded behind.

Polistes erythrocerus, sp. n.

Niger; prothorace late, lineis 2 mesonoti, scutello, postscutello lineisque 2 metanoti flavis; abdomine late flavo balteato; alis fulvo-fumatis, stigmatе nervisque fulvis. ♀.

Long. 22 mm.

Hab. Kamakura, Japan (*George Lewis*).

Antennæ rufous, the scape lined with black above; the third joint is slightly longer than the fourth and fifth united, the last two equal in length. Head fulvous yellow; a broad band on the ocellar region, extending to the eyes and round the upper part of the eye-incision, a line above and below the base of the antennæ, the occiput, a line above it (united to the eyes by a small oblique line), black; the part between the antennæ is distinctly tuberculate, the centre of the upper part keeled. Front and vertex distinctly but not very closely punctured. Clypeus very sparsely punctured, longer than broad; the sides of the apex oblique, the top narrowed, its sides rounded, the middle roundly incised. Mandibles coloured like the head, except that the teeth are black. Thorax black; the prothorax (except for a triangular black mark near the middle behind), two lines in the middle of the mesonotum, two short ones opposite the tegulæ, the scutellum (except in the middle), its keels, the postscutellum, two large lines (narrowed below) on the metanotum, and a small irregular mark under the tubercles, yellow. Pro- and mesonotum closely and distinctly but not deeply punctured, the punctures running into reticulations; the middle impunctate

at the base. The scutellum is, if anything, more rugosely punctured than the mesonotum; the postscutellum is more sparsely punctured. Median segment transversely striated as usual. Propleuræ punctured, more closely above than in the middle. Mesopleuræ more closely and strongly punctured; metapleuræ much less strongly punctured, the middle almost smooth. Coxæ, trochanters, and femora black; the fore coxæ below, the fore femora above and below, and the hinder at both sides below yellow; the fore tibiæ rufous, tinged with yellow; the middle tibiæ rufous, lined with black at the base behind; the posterior entirely black behind; the tarsi rufous, the joints black at the apex. Wings fulvous, tinged with violaceous, the hinder more hyaline in tint. Abdomen black; the apex of the petiole narrowly and the apical half of the other segments testaceous.

One of the examples bears a large species of *Stylopidae*.

[To be continued.]

LV.—*On the Presence of Echis coloratus, Günther, in Africa.* By JOHN ANDERSON, M.D., LL.D., F.R.S.

THIS viper, along with four other species of reptiles, was found by Mr. D. MacAlister in the neighbourhood of the Emerald Mines on the coast of the Red Sea, in nearly the same latitude as Assuan, and was presented by him to the British Museum. I am indebted to the courtesy of Mr. G. A. Boulenger, F.R.S., for his permission to direct attention to the occurrence of this snake in the Eastern Desert of Egypt, as the species is not included in my work on the Reptiles and Batrachians of Egypt, this being the first occasion on which it has been met with on the African continent.

Mr. MacAlister informs me that the five species of reptiles collected by him in the afore-mentioned locality were obtained in a tract of country not more than 9 miles in breadth at any point, lying between the Wadis Rousbaid, Sakêt, and Nugrus, which open one into another and ultimately join the Wadi Gemâl. The first two of these Wadis are dry and stony, but they are covered more or less with "low scrub, *Gash* (*Bassilla*) and *Sayal* (*Mimosa*), and occasionally with small pumpkins." The Wadi Nugrus is sandy and with rather more scrub than in the two preceding Wadis, and the Wadi Gemâl partakes of the same character, but it is more open.

The snakes were caught in the Wadis Nugrus and Sakêt, and the lizards in the latter and in the Wadi Rousbaid. Mr. MacAlister says, "the Reptiles apparently live in the cracks in the gneiss."

Echis coloratus, Günther.

Mr. MacAlister captured two females, the measurements &c. of which are recorded in the following table along with those of the type specimen:—

	<i>Echis coloratus</i> , Gthr.		
	♀. Type. Midian, Arabia.	♀. Eastern Desert of Egypt.	♀. Eastern Desert of Egypt.
Snout to vent	660	485	378
Tail	80	67	54
Ventrals	208	188	194
Anal	1	1	1
Caudals	46	51	51
Scales	35	35	35

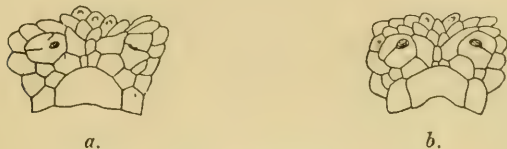
The type of *E. coloratus*, Günther, was found by the late Sir Richard Burton * at Jebel Sharr, behind El Mewaylah, in Midian, to the south of the entrance to the Gulf of Akabah, at an elevation of 4500 feet above the level of the sea.

The scales on the upper surface of the head, from the snout to between the eyes, anteriorly, are almost smooth in *E. coloratus*, whereas in *E. carinatus* they are strongly keeled; but on each scale can be detected a central eminence, the equivalent of the elongated and generally well-developed keel which occurs on the scales further back. There are 13 rows of scales across the head between the eyes, but no defined supraocular is present. The number of scales round the eyes varies, as on the right side there are 19, and on the left side only 16. There are four rows of scales between the upper labials and the eyes. Twelve to thirteen upper labials, the numbers varying on the opposite sides of the head. Rostral twice as high as broad. Nasal shield variable, not wholly divided on the right side, but completely so on the left, invariably separated from the rostral by two almost shield-like scales, the outermost lying on the first labial, with the innermost, the larger of the two, placed above it and separated from its fellow of the opposite side by two small scales.

* 'Gold Mines of Midian,' 1878.

Günther described the colour of the type as "greyish, with large pinkish spots on the upperside; they are rounded on the front part of the body, but more irregular and broken up on the posterior. Lower parts whitish, speckled and powdered with greyish."

Mr. MacAlister's two specimens present slight variations from the type, and these are brought out in the two accompanying figures of the front of the snout of (a) the type and (b) of one of the individuals from the Eastern Desert.



Echis coloratus.

In the type of *E. coloratus* the rostral is a dome-shaped shield, whereas in the Egyptian specimens it is more or less quadrangular. The form of this shield, however, is doubtless subject to much variation, depending on the number and disposition of the shields around it. In the Midian viper one infranasal intervenes between the nasal and the rostral, and behind it lie two other shields, one above the other, the uppermost in contact with the nasal and the one below it resting on the rostral and on the first labial. The internal infranasals are separated from each other in the mesial line by two small scales resting on the rostral. The supranasals are broadly excluded from the rostral by the foregoing two scales and by the first infranasal. In fig. *b* only one infranasal rests on the rostral, but behind it another infranasal exists between the nasal and front labial without being in any way in contact with the rostral. In this individual the equivalent of the second suprarostrals of the type seems to have fused with the rostral and with the front labial, and in so doing to have given greater transverse breadth to the former shield and greater height to the latter. These variations in no way connect the vipers presenting them with *E. carinatus*.

In the type of *E. coloratus* the supranasals are more or less irregular in form, widely separated from the rostral by the internal infranasals and by the median pair of scales which lie between the latter shields; but in fig. *b* (Eastern Desert viper) the right supranasal is prolonged down to the rostral on

the right side, whilst the supranasal of the opposite side is excluded from the rostral by a small scale. In the other viper from the Emerald Mines both supranasals touch the rostral, but in the two individuals from that locality the supranasals in each case are separated in the mesial line by a single scale.

The downward projection of the supranasals in these examples of *E. coloratus*, feeble though it be, is a variation in the direction of *E. carinatus*, in which these shields are markedly developed, broadly in contact with each other in the mesial line and in a varying degree with the rostral. In a specimen of *E. coloratus* from the Dead Sea the supranasals are large and directly in contact with the rostral, but in another from the same locality they are excluded by the infranasals. In both of these vipers the nasals are separated from the rostral by infranasals. The same variation occurs in vipers from the Hadramut, but, as in *E. carinatus*, the supranasals are in contact mesially. In a specimen in the British Museum said to be from Socotra the rostral is rounded like the type and the supranasals are excluded from contact with it by the infranasals, of which there are two, the second resting on the first upper labial.

The essential feature of *E. coloratus* is the broad separation of the nasal shields from the rostral and from the first upper labial, whereas in *E. carinatus* the nasals rest directly on the rostral and first upper labial. The accompanying figures (*c* and *d*) represent the front view of the snout of *E. carinatus* from Sind and from Jebba on the Upper Niger respectively; and if they are compared with the two modifications of *E. coloratus* (figs. *a* and *b*) the differences between the two species become apparent.

*c.**d.**Echis carinatus.*

As the scales around and between the eyes in the two species vary very nearly within the same limits as to numbers, they are practically by themselves of little use as guides to the distinction of the species; and the same may be said of the scales between the eyes and upper labials, as

examples of *E. coloratus* are met with having three rows of such scales, a number occurring occasionally in *E. carinatus*, in which, however, these scales are usually in two rows, whereas in *E. coloratus* they are either in three or four. The enlarged supraoculars generally present in the former species are usually absent in the latter, and when present they are not well developed.

In the specimens of *E. coloratus* here tabulated the ventrals range from 188 to 203, and the subcaudals from 46 to 51; whereas in *E. carinatus* these shields vary, over the vast area of its distribution, the ventrals from 132 to 194, and the subcaudals from 23 to 48. So few examples of *E. coloratus* are known, it is quite possible that the numbers of its ventrals and consequently of its trunk-vertebræ may rise much higher than the maximum number given above and also fall much below the minimum of 188. The type of *E. carinatus* had only 150 trunk-vertebræ, whereas now, after more than a century of research, individuals have been found with as few as 132 and others with as many as 194—that is to say, that there may be as great a variation as 62 vertebræ. This result is obtained by the consideration of many individuals from Asia and Africa brought together from between Madras and West Africa; but the vertebræ in question may vary as much as 39 among individuals from the same locality (Deccan, India), whereas in others from Sind and from West Africa the number of trunk-vertebræ may be practically the same, viz. 143 and 145. The existence of this enormous range of variation in the number of the vertebræ of the individuals of this genus, even although it takes place in structures which are mere repetitions the one of the other, is very remarkable, because associated with it there is of necessity a corresponding modification of the nervous and vascular systems. With such variations occurring in the form of an animal the possible modification of the epidermal structures would seem to be almost limitless. The *modus operandi* by which Nature effects these unstable variations of the skeleton and soft tissues associated with it is an enigma unsolved by any hypothesis as yet formulated.

The coloration of these vipers from the Eastern Desert is much the same as in the type, and as they have been quite recently killed, its general character is better made out. There are from 43 to 46 more or less transverse, narrow, pale greyish areas, becoming almost light grey spots in the younger specimen on the hinder part of the body. In both these pale areas are margined with dark finely speckled grey, the inter-

vening spaces being reddish buff. The sides of the body on the region of the serrated scales are marked with finely speckled dusky spots, more or less connected with the dorsal reticulations. There are also some dusky spots on the angles of the ventrals. The ventral surface is white, but with faint dusky spots here and there. This type of coloration corresponds in its broad outlines with that of *E. carinatus*. In two females of the latter species from Sind in the British Museum there are 36 and 40 spots respectively much more clearly and vividly defined than in *E. coloratus*, whilst on the tail the spots are practically absent. A specimen from Muskat in the British Museum has the same general type of coloration, but the dark and light markings are less defined, whilst in another young specimen from the same locality the light spots are absent and the dark markings are reduced to two very narrow parallel dorsal lines, largish brown spots occurring on the lateral serrated scales and a small brown spot on the angle of nearly every third ventral. In the specimen supposed to have come from Socotra the general colour above is dark slaty, with brown spots more or less obscurely present along the mesial line of the back, and irregularly shaped brown spots along the sides. No pale dorsal spots are present, but the ventral surface is obscurely spotted posteriorly. The specimens from the Dead Sea are pale yellowish, with the dark and pale markings not clearly defined and the ventrals immaculate.

In no viper with infranasals has the head ever been found to have its upper surface bearing the symmetrical dark brown markings present in a greater or less degree in vipers with their nasals resting directly on the rostral and on the front upper labial.

E. coloratus is as yet known only from Arabia, Southern Syria (Dead Sea), the Eastern Desert of Egypt, and from the island of Socotra.

Ptyodactylus Hasselquistii, Donndorff.

This is an example of the pallid typical form with the nostril but little, if at all, tubular. This is the most southern point it has yet been recorded from the Eastern Desert, but it is common as far south as Wadi Halfa.

Agama spinosa, Gray.

Two specimens, differing in no respect from the examples from Suakin. As already pointed out by me, the type of

this species, presented very many years ago to the British Museum by James Burton, the distinguished Egyptologist, came, in all likelihood, from the Eastern Desert about the latitude of Keneh.

Eremias guttulata, Licht.

Three specimens. This species is distributed all over Egypt, from Suez to Suakin.

Psammophis Schokari, Forskål.

This specimen, in its almost pale fawn-colour and the presence of two darker-coloured lines along the back and the obscure dotting of the ventrals, especially on the sides, and distinct head-markings, resembles the individuals of this species found at Durrur to the south. The number of its ventrals (190) largely exceeds the number found there and at Suakin, and in this respect it conforms to snakes of this species found at Assuan. It has 118 caudals.

BIBLIOGRAPHICAL NOTICES.

Bird Books.

In Bird-land, with Field-glass and Camera. By OLIVER G. PIKE. T. Fisher Unwin & Co. Pp. 1-280, with 83 photographs from Nature. 1900. Price 6s.

The Birds of Eastern North America. By CHARLES CORY. Printed for the Field Columbian Museum, Chicago, Ill. 1899. Parts I, II.

THE strides which photography has made among us of late years we regard with a jealous eye. Not satisfied with ousting the beautiful wood and steel engravings which adorned the pages of our older books, it has gone now so far as to displace literature itself, so that many of the "books" which are thrust upon a long-suffering and defrauded public to-day are practically little more than collections of bad pictures served up with a sprinkling of worse text—added for appearance' sake.

To every rule, however, there are exceptions; and there are occasions when we feel real gratitude towards the enthusiastic photographer.

Ornithologists are without doubt indebted to the Kearton brothers for the work which they have done and recorded in this field. The

present little book 'In Bird-land,' by Mr. Pike, may well rank beside the best in this direction. The birds and their ways are for the most part feelingly described, and the author shows himself to be not only an observer but also a lover of nature. We are at one with him in his condemnation of the gamekeeper. The fauna of these Islands has suffered great and irreparable losses at his ignorant hands. But if the keeper is to be subjected to the lash of our displeasure, how much more so shall his employer, who signs the death-warrants which he executes?

Many of the illustrations of this book are excellent. Some are bad. The frontispiece forces a grumble from us. It is really beautiful, and it seems a pity that, since such work is possible, some of the inferior or less interesting pictures were not suppressed, and the remainder reproduced in the same way as the frontispiece. What was lost in quantity would be repaid a hundredfold in quality.

There is some excuse for the use of photography in reproducing actual outdoor scenes, or objects of natural history taken at first hand, but to call in its aid to reproduce bad drawings is indeed a sin. The illustrations to the 'Birds of Eastern North America' is a case in point. The figures in this work are for the most part grotesque; they could scarcely be worse.

As a "key" the book is doubtless useful. The terms, however, employed in describing the topography of a bird are often faulty, sometimes very much so. We must protest against the use of the word "tertials" to indicate the long inner secondaries of the wing. On page 3 "tertials" are defined as "the few remaining remiges which grow from the humerus." The feathers called "tertials" in the plates are only long inner secondaries: it is very doubtful whether the parapteron and hypopteron can legitimately be regarded as remiges.

With a little pruning and revising this book could be made worthy of its author.

A Natural History of the British Lepidoptera. A Textbook for Students and Collectors. By J. W. TUTT, F.E.S. Vol. II. London: Swan Sonnenschein & Co., May 1900. Pp. viii, 584; plates vii.

THE first volume of Mr. Tutt's great work on British Lepidoptera appeared in January 1899, and already the second volume is lying before us. We are glad to find that the author has received so much encouragement that he is enabled to proceed with the book without delay and in the most elaborate manner. The second volume is thicker than the first by no less than 24 pages, and is similarly divided into two parts. The first part

is divided into five chapters, of which the first two deal with metamorphosis in Lepidoptera, and the others with the external morphology, internal structure, and phylogeny of the Lepidopterous pupa. The second part includes the Psychides (divided into Micropsychina and Macropsychina), a catalogue of the Palæarctic Psychides, the first portion of the Lachneides, and Index. The author has not only epitomized a large part of the extensive literature relating to the various subjects of which he treats, but has added a very large amount of entirely new and original matter, derived from the observations of himself and his correspondents.

No less than 334 pages of the second volume are devoted to the interesting, but extremely difficult, group of the Psychides, which is one of the most remarkable among the Lepidoptera. The females are almost always apterous, and in some species are almost destitute of legs and antennæ as well, being thus reduced to the condition of mere helpless egg-bags. The larvæ form cases for themselves on the plants on which they feed, somewhat resembling those formed by the larvæ of caddis-flies (*Trichoptera*), to which some entomologists have considered the Psychidæ to be allied. Here the pupa is formed, and the more helpless females never quit it, but deposit their eggs within it. Another peculiarity is that parthenogenesis is so common in some of the species, especially in the genus *Solenobia*, that you may go on breeding from the larva-like female for generation after generation without ever seeing a male, which greatly adds to the difficulty of satisfactorily separating and defining the species.

Mr. Tutt has thoroughly reviewed this difficult group. His Catalogue of the Palæarctic Psychides includes no less than 11 families, 20 subfamilies, 36 genera (of which 8 are new), and 143 species, besides varieties, &c. Among the Psychidæ, Mr. Tutt places several genera which many previous authors have included in the Tineides, such as *Diplodoma*, *Lypusa*, *Melasina*, *Solenobia*, *Talæporia*, &c. But if we exclude these, we find that the Psychides proper, which a few years ago used to form a single family, of three genera at most, and which were often included in one, has now expanded to four families, comprising twelve sections, and twenty-seven genera! This will appear to old-fashioned entomologists a terrible and unnecessary amount of subdivision, but in most similar cases the foresight of the innovator is, sooner or later, largely justified by the judgment of his successors.

The natural history of each species is also worked out as exhaustively as before; thus the account of *Pachythelia villosella*, Ochs., occupies more than eighteen closely printed pages.

The reprint of the original description of each genus and species, whether short or long, is a great assistance, especially as the original types of the genera are clearly indicated. Had this always been done, we should have been spared a tremendous amount of confusion, though few cases are quite so glaring as that of the genus

Æcophora, to which we may here allude, though it does not belong to the families that have yet been discussed by Mr. Tutt. Latreille established the genus *Æcophora* for *Æ. sulphurella*, Linné, which remained the type for twenty years, Curtis actually figuring it as such, and Stephens sinking his own genus *Dasycera* as a synonym. But Zeller gave the genus a wider extension, dividing it into three sections, for the last of which he adopted Stephens's discarded name of *Dasycera*. Then Stainton adopted *Æcophora* for Zeller's first section, separating *sulphurella* (the inalienable type of *Æcophora*) as *Dasycera*. Then Mr. Meyrick established two families, *Æcophoridae* and *Dasyceridae*, thus turning the very type of *Æcophora* out of the family *Æcophoridae* itself! This has since been rectified, but it is only an illustration of many similar cases which will occur to any entomologist who troubles himself about synonymy.

The remainder of the present volume is devoted to a portion of the Lachneides (or Lasiocampides), and the classifications of Hübner, Aurivillius, Dyar, and others are quoted in full. Only five species, however, are dealt with in the present volume: *Pæcilocampa populi*, *Trichiura crategi*, *Lachneis lanestris*, and *Malacosoma castrensis* and *M. neustria*. Mr. Tutt estimates that the remaining five genera and six species of the superfamily Lachneides will occupy 200 pages of the next volume. In his remarks on the phylogeny of the Lachneides, we are pleased to see that while freely expressing his own views, and criticizing those of his predecessors, he puts them forward tentatively, and quite avoids the dogmatic tone assumed by certain writers on what must necessarily long remain one of the most difficult and uncertain problems in entomology—all the more so, because, in Lepidoptera at least, we have nothing but the barest fragments of any Geological Record to help us to verify any of our conclusions; and without this we are necessarily only groping in the dark.

Five of the seven plates in the present volume are devoted to Psychides—phylogeny, neuration, spurs, antennæ; imagines and cases of *Whittleia reticella*; and the transformations of the American *Thyridopteryx ephemeriformis*. Plate 1 is devoted to the wings, wing-scales, &c. of Lepidoptera, and plate 7 to Dyar's phylogeny of the Lachneides.

We can fully sympathize with what Mr. Tutt says in his preface about the difficulty of getting more matter into each volume, but yet we should like to suggest that it would be very useful to include in the Contents a list of the British genera and species discussed in each volume. As the number of these is very limited, this would require very little space, and would probably not involve the sacrifice of more than a single page.

W. F. K.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

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LVI.—ASIATIC *TORTRICIDÆ*.

By the Rt. Hon. LORD WALSHINGHAM, M.A., LL.D., F.R.S.

[Concluded from p. 409.]

LASPEYRESIA, Hb.

1127 (1). *Laspeyresia iridescens*, sp. n.

Antennæ greyish fuscous. *Palpi* short, recurved, slightly erect, with appressed scales; very pale ochreous. *Head* small and prominent; greyish. *Thorax* brownish fuscous, sprinkled with whitish ochreous scales. *Fore wings* with the termen slightly indented below the apex; brownish fuscous, minutely and profusely speckled with whitish ochreous (with a strong greenish iridescence in a bright light if held at certain angles); on the outer half of the costa are some short whitish ochreous oblique streaks, the spaces between them being greyish fuscous (darker than the ground-colour); from these streaks run one or two very inconspicuous slaty grey lines, and the ocelloid patch, which contains three blackish spots, is bounded outwardly by a similar line; cilia brownish grey, with a slender dark line along their base; underside strongly iridescent, costal markings not visible. *Exp. al.* 17–19 mm. *Hind wings* dark brown, slightly paler towards the base;

cilia yellowish white, at the flexus greyish, with a dark line running throughout them near their base. *Abdomen* greyish fuscous. *Legs* greyish, hind tarsal joints pale spotted.

Type, ♀ (60138); ♂ (60141) Mus. Wlsm.

Hab. COREA—Gensan, VI. 1886 (*Leech*); Fusan, 9 VI. 1886 (*Leech*). JAPAN (*Pryer*, 1886)—KIVSIU—Satsuma, V. 1886 (*Leech*). Five specimens.

This species appears to the naked eye dull and unicolorous with the exception of the costal streaks; it differs from *nigricana*, F., in the absence of any visible markings on the underside, as well as in its larger size and shorter costal streaks.

1128 (1). *Laspeyresia quadrocellana*, sp. n.

Antennæ brownish fuscous. *Palpi* ochreous. *Head* and *thorax* brownish fuscous. *Fore wings* brownish fuscous, with a beautiful greenish and purplish iridescence, especially on the basal half; on the costa are five pairs of oblique pale ochreous geminated streaks, the first two pairs indistinct before the middle; a single streak lies between the third and fourth pairs, and these both terminate in outwardly oblique steel-blue lines, scarcely disconnected from two similar lines beneath them which form the margins of an upright ocelloid patch opposite to the middle of the termen, containing four black spots set in pale ochreous rings; two black spots occur between the ocellus and the termen; on the dorsum is an obscure pale ochreous patch, consisting of four parallel lines, all curved outward and attenuated to their termination at the lower margin of the outer third of the cell; cilia shining grey, with a dark line along their base, interrupted by a slight incision below the apex. *Exp. al.* 14 mm. *Hind wings* dark brown; cilia whitish cinereous, with a dark line along their base. *Abdomen* and *legs* greyish brown.

Type, ♂ (60797) Mus. Wlsm.

Hab. JAPAN—KIVSIU (*Leech*, 1890). Unique.

Allied to *nebritana*, Tr.

1128 (2). *Laspeyresia pavonana*, sp. n.

Antennæ greyish fuscous, paler on their underside. *Palpi* somewhat recurved, slightly erect; ochreous. *Head* more retracted than in *iridescens*, Wlsm.; greyish fuscous. *Thorax* greyish fuscous, with a slight greenish iridescence. *Fore wings*, ♂ without a costal fold, termen indented below the apex; greyish fuscous, strongly iridescent, with green and purplish reflections; from the middle of the dorsum four waved parallel subochreous lines extend obliquely outwards

towards the outer end of the cell, reaching halfway across the wing; on the costa is a series of oblique pale ochreous streaks, two before the middle, each geminated, short, and inconspicuous, six beyond the middle, of which the two nearest the apex are longer and less oblique than those which precede them; the spaces between these streaks are dark umber-brown; from the first and fourth streaks beyond the middle dark steel-blue lines extend outwards, the second reaching to the apex of the outer pair of ochreous streaks; beneath it is an olivaceous brown ocelloid patch containing some transverse black lines and margined by steel-grey streaks, the inner one of which reaches nearly to the tornus, where it is preceded by an umber-brown shade; beyond the ocelloid patch the termen is shaded with umber-brown, containing a series of about five black dots; a slender dark line runs along the extreme margin at the base of the brownish grey cilia; on the underside, which is also iridescent in certain lights, the ochreous costal streaks are plainly visible. *Exp. al.* 16 mm. *Hind wings* dark brown; cilia pale greyish, with a dark line along their base; underside iridescent. *Abdomen* greyish fuscous. *Legs* cinereous, inclining to ochreous.

Type, ♀ ♂ Mus. Wlsm.

Hab. JAPAN—HONDO—Shimonoseki, VII. 1886 (*Leech*).
Two specimens.

Very similar to *quadrocellana*, Wlsm., from which it may be distinguished by the black markings in the ocellus and preceding the termen. In *quadrocellana* the series of four ocelloid black dots set in pale ochreous rings slant outwards to the tornus, and only two black dots occur between the ocellus and the termen. In *pavonana* the upper three black streaks point inward, the two lower ones forming, with three or more black dots between the ocellus and termen, a sub-terminal series parallel with the margin of the wing.

1135 (1). *Laspeyresia adenocarp*i, Rag.

*Grapholitha adenocarp*i, Rag. Bull. Soc. Ent. Fr. 1875, lxxiii; Ann. Soc. Ent. Fr. (5 s.) VI. 406-8, Pl. VI. 4 (1876).

Hab. EUROPE. ASIATIC TURKEY—HALEB—Shar Devesy (*Native Coll.* 1893).

1136. *Laspeyresia cæcana*, Schlg.

Grapholitha (Semasia) cæcana, Stgr. & Wk. Cat. Lp. Eur. 256. No. 1136 (1871)¹; Stgr. Hor. Soc. Ent. Ross. XV. 258 (1879)².

Hab. EUROPE¹. ASIATIC TURKEY—KHUDEVENDIKLAR—Brussa, V.²; SIVAS—Amasia, IV.²; HALEB—Shar Devesy (*Native Coll.* 1890).

1148 (2). *Laspeyresia quadristriana*, sp. n.

Antennæ brownish grey. *Palpi* short, porrect, median joint brush-like beneath, terminal joint smooth exposed; whitish. *Head* brownish grey, face whitish. *Thorax* brownish grey. *Fore wings* with the termen indented below the apex; brownish grey at the base, shading to brownish beyond the middle; on the middle of the dorsum is a patch of four whitish ochreous lines running at right angles to the margin for one-third of their length, thence bent obliquely outwards and reaching nearly halfway across the wing; on the costa is a series of nine oblique whitish ochreous streaks, the outer one somewhat inverted, of these the third and fourth and the fifth and sixth combine in sending obliquely forward from each pair a short bright blue streak, and the last streak before the apex is also tipped with bright blue; the extreme apex is black, the ocelloid spot above the tornus is indicated only by a narrow upright shining cupreous patch; cilia shining rosy grey; underside shining iridescent green-grey, the pale costal streaks distinctly visible. *Exp. al.* 11.5 mm. *Hind wings* brownish; cilia pale cinereous; underside strongly iridescent. *Abdomen* greyish, whitish beneath. *Legs* whitish ochreous.

Type, ♂ (70112); ♀ (70113) Mus. Wlsm.

Hab. JAPAN (*Pryer*, 1886). W. CHINA—Foochow, IV. 1886 (*Leech*). Eight specimens.

1155 (2). *Laspeyresia gradana*, Chr.

Grapholitha gradana, Chr. Bull. Soc. Imp. Nat. Mosc. LVI. 419-20. No. 122 (1882)¹; *sep.* 182-3 (1882)¹.

Hab. AMUR, VII.¹—Starikowo R., 8 VII. 1876 (*Christoph*); Wladiwostok, 26-29 VII. 1877 (*Christoph*). JAPAN (*Pryer*, 1886).

1165. *Laspeyresia duplicana*, Zett.

Grapholitha (Semasia) duplicana, Stgr. & Wk. Cat. Lp. Eur. 258. No. 1165 (1871).

Hab. EUROPE. ASIATIC TURKEY—HALEB—Shar Devesy (*Native Coll.* 1893).

1167 (3). *Laspeyresia fimana*, Snell.

Grapholitha fimana, Snell. Tijds. v. Ent. XXVI. 225-6, Pl. XIII. 7, 7 a (1883)¹.

Hab. E. SIBERIA—Askold Id.¹; Wladiwostok, 25 V. 1877 (*Christoph*). JAPAN (*Pryer*, 1886).

1168. *Laspeyresia pallifrontana*, Z.

Grapholitha (Semasia) pallifrontana, Stgr. & Wk. Cat. Lp. Eur. 258. No. 1168 (1871)¹; Stgr. Hor. Soc. Ent. Ross. XV. 260 (1879)².

Hab. EUROPE¹. ASIATIC TURKEY—*KHUDAVENDIKIAR*—Brussa². *SIVAS*—Kerasdere², Maidan, 10–21 V². *HALEB*—Shar Devesy (*Native Coll.* 1893).

1168 (1). *Laspeyresia difficilana*, sp. n.

Grapholitha difficilana, Bang-Haas, Stgr. List, XLII. 25 (1888–9) MS.

Antennæ blackish. *Palpi* somewhat erect; white. *Head* blackish above; face white. *Fore wings* bronzy blackish brown, with a leaden grey tinge at the base; four pairs of short silvery white costal streaks, each pair terminating in shining steel-blue, all except the last pair pointing obliquely outward; on the middle of the dorsum a longer pair of evenly curved silvery white streaks, the first terminating in a small blue spot on the cell; arising from the tornus is a slightly inverted bright iridescent steel-blue band, not quite reaching the apex of the second pair of costal spots; cilia whitish grey, a dark fuscous line running along their base, but interrupted below the apex by a white dot; underside whitish, with the exception of the dark costal streaks on the outer half of the wing, termen shaded with fuscous. *Exp. al.* 11 mm. *Hind wings*: ♂ whitish at the base, apex and lower margin broadly cupreous brown; cilia snow-white, a dark line along their base, around the apex only; underside whitish, with one or two dark costal streaks near the apex, termen shaded with fuscous: ♀ somewhat more darkened than in the ♂. *Abdomen* blackish, banded with white beneath. *Legs*, hind pair silvery whitish, much shaded with greyish fuscous externally, terminal joint of the tarsi fuscous, spurs white.

Type, ♂ (61611); ♀ (7277) Mus. Wlsm.

Hab. ASIATIC TURKEY—*HALEB*—Shar Devesy (*Native Coll.* 1893); Zeitun (*Stgr.*). Five specimens.

This species is allied to *pallifrontana*, Z., and *interstinctana*, Clem.; from the first it may be at once distinguished by its more erect and whiter palpi and by the hind wings in both sexes having a pale space at the base; the latter distinction also separates it from *interstinctana*, but *interstinctana* need not be confused with *pallifrontana*, since that species is easily recognized by the much wider separation of the first and second pairs of costal streaks.

1168 (2). *Laspeyresia geministriata*, sp. n.

Antennæ greyish fuscous. *Palpi* recurved, slender, smoothly clothed, terminal joint about one third the length of the median; pale ochreous. *Head* greyish. *Thorax* brownish grey. *Fore wings* brownish grey, inclining to brownish fuscous beyond the basal third; a pair of upright pale ochreous streaks beyond the middle of the dorsum are widened in the middle and narrowed towards their apex, the first somewhat bent outwards, the second erect; on the costa are from five to seven very pale ochreous streaks, somewhat irregular and varying in size, but all rather wide and conspicuous (from the difference in the number of these streaks on the right and left wings they have evidently a tendency to run together); beneath and connected with these costal streaks are three short oblique rosy metallic dashes, and the ocelloid patch is indicated by a rosy cupreous upright patch, somewhat widened at its upper end; cilia shining rosy grey; underside strongly iridescent, the costal streaks being visible; there is also a pale spot on the termen below the apex which does not appear on the upperside. *Exp. al.* 12 mm. *Hind wings* brownish fuscous, slightly paler at the base; cilia greyish cinereous; underside iridescent. *Abdomen* greyish fuscous. *Legs* pale cinereous.

Type, ♀ (60142) Mus. Wlsm.

Hab. W. CHINA—Foochow, IV. 1886 (*Leech*).

1169. *Laspeyresia fissana*, Fröl.

Grapholitha (Semasia) fissana, Stgr. & Wk. Cat. Lp. Eur. 258. No. 1169 (1871).

Hab. EUROPE. ASIATIC TURKEY—*HALEB*—Shar Devesy (*Native Coll.* 1893).

1173. *Laspeyresia dorsana*, F.

Grapholitha (Semasia) dorsana, Stgr. & Wk. Cat. Lp. Eur. 258. No. 1173 (1871).

Hab. EUROPE. ASIATIC TURKEY—*HALEB*—Shar Devesy, 15 VI. 1890 (*Native Coll.*).

1173 (2). *Laspeyresia junctistrigana*, sp. n.

Antennæ dark greyish fuscous. *Palpi* and *head* smoky brown-grey. *Thorax* smoky blackish. *Fore wings* smoky brownish black, shading to dark tawny brownish about the apex; with five pairs of short silvery white costal streaks

terminating in sinuate lines of steel-grey, one of such lines serving for the third and fourth pair and apparently emanating from the outer streak of the third; an ocelloid patch, containing three or four short black streaks, is margined on both sides by shining metallic lilac; a snow-white dorsal streak, nearly erect, but slightly outcurved at its outer end above the fold, is of equal width throughout, a few dark scales in its middle at each extremity indicating reduplication; cilia dark brownish fuscous, with a slight cinereous admixture. *Exp. al.* 16 mm. *Hind wings* dark brown, whitish along the costa nearly to the apex; cilia dirty whitish, a dark shade-line running through their base. *Abdomen* dark fuscous. *Legs* whitish cinereous, shaded externally and on the hind tarsi with greyish fuscous.

Type, ♀ (61610) Mus. Wlsm.

Hab. ASIATIC TURKEY—*HALEB*—Shar Devesy (*Native Coll.* 1893).

CYDIA, Hb.

1181. *Cydia pomonella*, L.

Carpocapsa pomonella, Stgr. & Wk. Cat. Lp. Eur. 258. No. 1181 (1871).

Hab. EUROPE. AFRICA. ASIA. N. & S. AMERICA. AUSTRALIA. NEW ZEALAND. ASIATIC TURKEY—*HALEB*—Aintab, 10 V. 1892 (*Native Coll.*). KASHMIR—Dras Ladak, 7000 feet, 20 VI. 1887 (*Leech*).

1182. *Cydia grossana*, Hw.

Carpocapsa grossana, Stgr. & Wk. Cat. Lp. Eur. 258. No. 1182 (1871).

Hab. EUROPE. ASIATIC TURKEY—*HALEB*—Shar Devesy (*Native Coll.* 1893). JAPAN (*Pryer*, 1886).

PAMMENE, Hb.

1186 (1). *Pammene nannodes*, sp. n.

Antennæ pale cinereous. *Palpi*, *head*, and *thorax* whitish cinereous, dusted with fuscous. *Fore wings* whitish cinereous, with a minutely speckled or transversely strigulated appearance; the markings are greyish fuscous and consist of a series of small costal spots, more conspicuous beyond than before the middle; an oblique dorsal streak before the middle and an upright dorsal patch before the tornus, with a terminal

patch, the lower portion of which is enclosed by silvery streaks tending to converge downward; cilia whitish cinereous, with a dark fuscous line running through them near their base. *Exp. al.* barely 10 mm. *Hind wings* white, with a brown shade across the apical third and around the termen and dorsum; cilia white, with a brownish shade along their base. *Abdomen* greyish. *Legs* whitish.

Type, ♂ (60147) Mus. Wlsm.

Hab. SYRIA—Beyrout, III. 1886 (*Pratt*). PALESTINE (*Tristram*). Four specimens.

A small but distinct species having the appearance of a dwarfed *Laspeyresia succedana*, Schiff.

1192. *Pammene amygdalana*, Dp.

Phthoroblastis costipunctana, Hw. + *amygdalana*, Stgr. & Wk. Cat. Lp. Eur. 259. No. 1191 a (1871). *Grapholitha (Semasia) Lobarzewskii*, Stgr. & Wk. Cat. Lp. Eur. 259, 425. No. 1154 (1871). *Phthoroblastis Lobarzewskii*, Stgr. & Wk. Cat. Lp. Eur. 259. No. 1192 (1871).

Hab. EUROPE. ASIATIC TURKEY—HALEB—Shar Devesy, 10 VII. 1890 (*Native Coll.*).

1194. *Pammene Juliana*, Crt.

Phthoroblastis Juliana, Stgr. & Wk. Cat. Lp. Eur. 259. No. 1194 (1871).

Hab. EUROPE. ASIATIC TURKEY—HALEB—Shar Devesy (*Native Coll.* 1890).

1194 (2). *Pammene (?) griseana*, sp. n.

Antennæ, palpi, head, and *thorax* greyish fuscous. *Fore wings* grey, mottled with greyish fuscous; with an oblique whitish patch on the middle of the dorsum striated with greyish fuscous; a whitish ocelloid patch above the tornus, outwardly bounded with shining grey and containing some transverse black streaks; on the costa are five or six pairs of slender white geminations, the outer pair extending nearly to a slender small white spot on the termen below the apex; a narrow dark fuscous line runs along the termen; cilia greyish fuscous, a dark line along their base, and a small whitish patch on the slight indentation below the apex. *Exp. al.* 18 mm. *Hind wings* greyish brown; cilia pale whitish cinereous, with a greyish brown line along their base. *Abdomen* greyish brown. *Legs* pale brownish cinereous, hind tarsi banded with greyish fuscous.

Type, ♀ (70177) Mus. Wlsm.

Hab. JAPAN (*Pryer*, 1886). One specimen.

This species, almost certainly a *Pammene*, differs from *nimbana*, H.-S., in the more oblique and more mottled dorsal patch, and in the more distinct blackish lines crossing the ocelloid patch, which is less clearly margined on both sides with lustrous steel-grey lines than in *nimbana*; in other respects the markings of the wing are similar and the shape corresponds.

1207. *Pammene nitidana*, F.

Grapholitha (Semasia) nitidana, Stgr. & Wk. Cat. Lp. Eur. 257. No. 1160 (1871)¹. *Phthoroblastis flexana*, Stgr. & Wk. Cat. Lp. Eur. 260. No. 1207 (1871)². *Stigmonota nitidana*, Brt. Ent. Mo. Mag. XII. 7-8 (1875)³. *Phthoroblastis flexana*, Stgr. Hor. Soc. Ent. Ross. XV. 261 (1879)⁴. *Pammene nitidana*, Rag. Ann. Soc. Ent. Fr. LXIII. 217. No. 1160, 220. No. 1207 (1894)⁵; Meyr. HB. Br. Lp. 506 (1895)⁶.

Hab. EUROPE. ASIATIC TURKEY—*KHUDAVENDIKLAR*—Brussa⁴. JAPAN (*Pryer*, 1886).

Barrett⁵ and Meyrick⁶ adopted the synonymy *flexana*, Z. = *weirana*, Dgl., while Ragonot⁵ wrote *nitidana*, F. = *flexana*, Z.

Zeller, Stett. ent. Ztg. X. 281-2 (1849), described *flexana*, Z. in litt. (*rotundana*, Koll. in litt.), giving its habitat as Danzig; Sweden (*Bohemann*); Riesengebirge (*Standfuss*); and Pisa IV.-V. (*Mann*). The two latter specimens, labelled respectively "*Flexana*, Z. 1 Ex. v. Bohemann, 1847. 21" and "*rotundana*, Tosc. FR. 638," are the only types still in the Zeller Collection. These are both *nitidana*, F., and therefore confirm Ragonot's determination of *flexana*, Z.

TMETOCERA, Ld.

1210. *Tmetocera ocellana*, Schiff.

Tmetocera ocellana, Stgr. & Wk. Cat. Lp. Eur. 260. No. 1210 (1871)¹; Fern. Tr. Am. Ent. Soc. X. 48. No. 349 (1882)².

Hab. EUROPE¹. JAPAN (*Pryer*, 1886). UNITED STATES². CANADA.

1210 (2). *Tmetocera prognathana*, Snell.

Grapholitha (Tmetocera) prognathana, Snell. Tijd. v. Ent. XXVI. 227-8, Pl. XIII. 8, 8 a, 8 b (1883)¹.

Hab. AMUR, 19 VII. 1877 (*Hedemann*)—Chingan Mts., 20-22 VII. 1877¹; Pompejefka, 9 VII. 1876 (*Christoph*); Raddefka, 25 VII. 1876 (*Christoph*). JAPAN (*Pryer*, 1886).

GYPSONOMA, Meyr.

1212. *Gypsonoma dealbana*, Fröl.

Steganoptycha incarnana, Stgr. & Wk. Cat. Lp. Eur. 260. No. 1212 (1871)¹. *Steganoptycha alnetana*, Stgr. & Wk. Cat. Lp. Eur. 260. No. 1214 (1871)². *Steganoptycha reconditana*, Stgr. & Wk. Cat. Lp. Eur. 260. No. 1215 (1871)³. *Steganoptycha incarnana*, Fern. Tr. Am. Ent. Soc. X. 46. No. 337 (1882)⁴; Rag. Ann. Soc. Ent. Fr. LXIII. 221. Nos. 1214-15 (1894)⁵. *Gypsonoma dealbana*, Meyr. HB. Br. Lp. 481-2 (1895)⁶.

Hab. EUROPE¹⁻³. CHINA—Chang Yang, 4000-6000 feet (Pratt, 1886). UNITED STATES⁴.

Haworth, Lp. Br. 435 (1812), described *Tortrix incarnana*, thinking it probably the same as "*Tortrix incarnana*, Hüb. Schmet. Tort. 30. 191?" He had no intention to bestow a new name on his insect, but misquoted Hübner's name "*incarnatana*," Pl. XXX. 191. Haworth's name can only be regarded as a homonym erroneous in adoption (and quotation), and *dealbana*, Fröl., should be used for this species.

1224. *Enarmonia diniana*, Gn.

Sphaleroptera diniana, Stgr. & Wk. Cat. Lp. Eur. 241. No. 788 (1871)¹. *Steganoptycha pinicolana*, Stgr. & Wk. Cat. Lp. Eur. 261. No. 1224 (1871)²; Fern. Tr. Am. Ent. Soc. X. 47. No. 346 (1882)³. *Steganoptycha dmiana*, Rag. Ann. Soc. Ent. Fr. LXIII. 185. No. (†) 787, (†788) 221, No. 1224 (1894)⁴.

Hab. EUROPE². SIBERIA². JAPAN — HONDO — Oiwake (Pryer, 1885). UNITED STATES³.

1225 (2). *Enarmonia infausta*, sp. n.

Antennæ simple; brownish fuscous. *Palpi* brownish fuscous. *Head* and *thorax* dark brown, with minute pale brownish cinereous speckling. *Fore wings* dark brown, minutely speckled with pale brownish cinereous, and mottled with dark brownish fuscous, which is specially noticeable in a costal patch a little beyond the middle, in another before the apex, and in a third at the apex, the first of which is preceded and followed by two or more smaller ones; all these dark spots are narrowly separated on the costa by whitish ochreous; cilia brownish, tipped with whitish ochreous. *Exp. al.* 15 mm. *Hind wings* dark tawny brown; cilia greyish brown, tipped with whitish ochreous. *Abdomen* and *legs* dark brown.

Type, ♂ (60759) Mus. Wlsm.

Hab. JAPAN—Yesso—Hakodate, VI.-VII. 1887 (*Native Coll.*). Unique.

An obscure but distinct species.

1227 (1). *Enarmonia cristata*, sp. n.

Antennæ cinereous, faintly annulated. *Palpi* ferruginous. *Head* thickly crested above; bright ferruginous. *Thorax* fulvous, touched with silvery grey posteriorly. *Fore wings* narrow, elongate, termen oblique, not sinuate, costa gently arched; silvery grey, with a basal patch extending to one-third, fulvous, with a slight silvery-grey sheen; beyond the middle is a ferruginous patch narrowly touching the costa on its inner side and extending to the dorsum beneath, but reaching outwards above its middle and almost connected with two spots of the same colour, one within and one at the apex; costa mottled with ferruginous and fulvous scales beyond the middle, and a few ferruginous and fulvous scales are scattered about the termen; cilia silvery grey, speckled with pale grey. *Exp. al.* 13·5 mm. *Hind wings* pale brownish; cilia brownish grey. *Abdomen* [missing]. *Legs* greyish cinereous.

Type, ♂ (70174) Mus. Wlsm.

Hab. JAPAN (*Pryer*, 1886). Two specimens.

ANCYLIS, Hb.

1250 (1). *Ancylis partitana*, Chr.

Phoxopteryx partitana, Chr. Bull. Soc. Imp. Nat. Mosc. LVI. 430. No. 130 (1882)¹: sep. 193 (1882)¹.

Hab. AMUR¹—Raddefka, 17 V. 1876 (*Christoph*); Wladivostok, 30 V. 1877 (*Christoph*). JAPAN (*Pryer*, 1886)—YESSO—Hakodate, VI.-VII. 1877 (*Native Coll.*).

1250 (2). *Ancylis pulchra*, Btl.

Phoxopteryx pulchra, Btl. Ill. Typ. Lp. Het. B. M. III. 79-80, Pl. LX. 7 (1879)¹.

Hab. JAPAN (*Pryer*, 1886)—HONDO—Yokohama¹.

1256. *Ancylis biarcuana*, Stph.

Phoxopteryx biarcuana, Stgr. & Wk. Cat. Lp. Eur. 262. No. 1256 (1871)¹. *Phoxopteris biarcuana*, Fern. Tr. Am. Ent. Soc. X. 51. No. 373 (1882)².

Hab. EUROPE¹. AMUR—Raddefka, 17 V. 1876 (*Christoph*). JAPAN (*Pryer*, 1886). UNITED STATES—California².

1258 (1). *Ancylis latipennis*, sp. n.

Antennæ greyish fuscous. *Palpi* thickly and roughly clothed below, terminal joint short; greyish fuscous on their

outer sides, the end of the median joint and the terminal joint whitish cinereous. *Head* greyish fuscous above, face whitish cinereous. *Thorax* brownish grey. *Fore wings* rather wide, with the costa very slightly arched, the apex but slightly falcate; shining pale brownish grey, slightly striated and blotched with umber-brown and brownish fuscous; across the basal half of the wing are some very indistinct dark brownish striæ; a small brownish fuscous patch on the dorsum at one-third and some brownish fuscous dots along the costa; at about the middle of the costa is an oblique fasciaform umber-brown band, somewhat widened on reaching the discal cell and becoming less distinct and narrower towards the dorsum, which it attains before the tornus; at the end of the cell this band sends out obliquely upwards towards the apex a dark brownish fuscous pointed projection; on the outer half of the costa are five pairs of whitish geminated streaks, separated and divided by umber-brown lines; the apex is umber-brown, and a slender umber-brown line runs along the termen to below its middle; cilia greyish, shaded with brown and touched with brownish fuscous at the apex. *Exp. al.* 15.5 mm. *Hind wings* brown; cilia cinereous, shaded with brown. *Abdomen* brown, anal tuft slightly ochreous. *Legs* cinereous, shaded with brown.

Type, ♀ (70486) Mus. Wlsm.

Hab. JAPAN (*Pryer*, 1886). Unique.

In this species the wings are somewhat broader and shorter than is usual in this genus; it perhaps somewhat approaches *unguicella*, L., in the form of the markings, but the basal patch is confined to a small dorsal spot.

1264 (2). *Ancylis mandarinana*, sp. n.

Antennæ cinereous. *Palpi*, *head*, and *thorax* white. *Fore wings* white, shading to grey beyond the middle; a tawny chestnut-brown patch on the dorsum widens outward from the base, forming an obtuse angle above the fold and sloping thence with slightly convex outer margin to a little beyond the middle of the dorsum, its outer edge clearly defined by a narrow, rather shining, white line; beyond and above it is a large triangular costal patch of the same colour, extending from the middle of the costa to the apex, containing one long and four short outwardly oblique shining grey costal streaks, the long one forming an acute angle with a similar line bounding the outer side of the triangle and enclosing slender black lines; the upper part of the triangular patch fades to a greyish tinge before the anteapical costal streak; a whitish

line along the termen precedes the greyish cinereous cilia. *Exp. al.* 14 mm. *Hind wings* and cilia pale brownish cinereous. *Abdomen* brownish grey. *Legs* white, with blackish annulations on the hind tarsi.

Type, ♂ (60352) Mus. Wlsm.

Hab. E. CHINA—Ningpoo, IV. 1886 (*Leech*). AMUR—Anossovo, 15 VI. 1877 (*Hedemann*). JAPAN—Yesso (*Pryer*, 1882). Three specimens.

This is distinguished from *burgessana*, Z., by its paler hind wings, the paler dorsal patch, and by the pale space above the tornus, the costal triangle not extending to the tornus. It is nearly allied to *laciniana*, Z., and *lundana*, F.

RHOPOBOTA, Ld.

1268. *Rhopobota nævana*, Hb.

Rhopobota nævana, Stgr. & Wk. Cat. Lp. Eur. 263. No. 1268 (1871)¹.

Hab. EUROPE¹. JAPAN (*Pryer*, 1886). INDIA—Dharmasala (*Hocking*); Ootacamund, I. 1884 (*Minchin*).

CROCIDOSEMA, Z.

1269. *Crocidosema plebeiana*, Z.

Crocidosema plebeiana, Stgr. & Wk. Cat. Lp. Eur. 263. No. 1269 (1871)¹; Wlsm. Pr. Z. Soc. Lond. 1897, 127. No. 174 (1897)².

Hab. EUROPE¹. PALESTINE (*Tristram*). HAWAIIA (*Blackburn*). AUSTRALIA². WEST INDIES². BRAZIL². PERU². ARGENTINA².

1269 (1). *Crocidosema demutata*, sp. n.

Antennæ (♂) thickened, not ciliate; shining white, basal joint dull white. *Palpi* white, touched with greyish at the middle of the median joint externally. *Head* white. *Thorax* evenly mottled with white and grey. *Fore wings* (♂) with a costal fold from the base; basal patch whitish ochreous, costa and dorsum mottled with grey, and with some olive-brown on its lower half; beyond the basal patch is a strong grey shade, faintly reticulated with white and fuscous, and continued from the costa to a triangular patch, on the dorsum, consisting of a number of more or less connected white spots, varied with grey on the extreme margin; beyond this dorsal patch the outer part of the wing is stained with olive-green; there is a large circular patch of fuscous white below the commencement of the outer third of the costa, into which two pairs of geminated white streaks run from the margin above

it; these are preceded and followed on each side by a pair of similar costal streaks, the last pair before the apex sending out a leaden-grey line running within the termen nearly to the tornus, and thence reverting towards the white patch; the olive-green on the apical half of the wing is mottled with dark fuscous, especially around the lower margins of the white subcostal patch; cilia greyish fuscous, with pale parallel lines running through them along the margin and with two whitish interruptions above the middle. *Exp. al.* 18 mm. *Hind wings* pale brown; with a tuft of long, loose, hair-like scales arising from the median vein and from the space above and below it at its basal half (not upstanding as in *plebeiana*, Z., but combed backwards towards the limbus); cilia very pale cinereous, a dark line running through them near their base. *Abdomen* pale greyish brown. *Legs* pale greyish, hind tarsal joints slightly spotted.

Type, ♂ (70068) Mus. Wlsm.

Hab. JAPAN—YESSO (*Pryer*, 1882). Unique.

The fore wings are somewhat less elongate than in *plebeiana*, Z., but the form of the antennæ and the tuft on the hind wings, although not quite brush-like, as in that species, separate it from all other described genera.

LIPOPTYCHA, Ld.

1299. *Lipoptycha plumbana*, Sc.

Dichrorampha (*Lipoptycha*) *plumbana*, Stgr. & Wk. Cat. Lp. Eur. 264. No. 1299 (1871)¹. *Dichrorampha plumbana*, Fern. Tr. Am. Ent. Soc. X. 55. No. 503 (1882)².

Hab. EUROPE¹. UNITED STATES—CALIFORNIA². ASIATIC TURKEY—HALEB—Shar Devesy (*Native Coll.* 1893).

ADDENDA.

ARCHIPS, Hb.

692 ($\frac{1}{2}$). *Archips inornatus*, sp. n.

Antennæ brownish cinereous. *Palpi* not extending beyond the head; pale brownish ochreous. *Head* fawn-ochreous. *Thorax* reddish fawn-ochreous. *Fore wings* reddish fawn-ochreous, with a faint costal indication of a slightly darker band of the same colour diffused obliquely outward toward the tornus, and followed by another slight costal shade before

the apex; cilia pale ochreous; the costal fold is not closely appressed. *Exp. al.* 28 mm. *Hind wings* brownish grey; cilia paler grey. *Abdomen* and *legs* brownish grey.

Type, ♂ (60073) Mus. Wlsm.

Hab. COREA—Gensan, VI. 1886 (*Leech*). Unique.

This species appears to be allied to *Archips Lafauryanus*, Rag., but is of a richer ochreous colour and rather larger.

692 ($\frac{1}{3}$). *Archips luticostanus*, Chr.

n. syn. = *gigantana* (Bang-Haas MS.), Kennel.

Tortrix luticostana, Chr. Hor. Soc. Ent. Ross. XXII. 311 (1888)¹.

Tortrix (*Heterognomon*) *gigantana*, Kennel, Ent. Zts. Iris, XII. 6-7.

No. 4, Pl. I. 4 (1899)².

Hab. E. SIBERIA—Wladiwostok, VII.¹; Amur².

TORTRIX, L.

725 (2). *Tortrix trigonana*, sp. n.

Antennæ brownish grey. *Palpi*, *head*, and *thorax* buff-brown. *Fore wings* with the costa evenly arched, apex obtuse, termen oblique, slightly convex; buff-brown, with some greyish fuscous shading toward the termen and a series of obscure greyish fuscous spots along the costa and along the base of the brownish ochreous terminal and apical cilia; a triangular dark fuscous spot lies a little beyond the middle of the fold; above it is a small reduplicated spot of the same colour at the end of the cell, between this and the termen, to which they are parallel, a line of dark fuscous dots margined with ferruginous brown (in some specimens the markings fade almost to obliteration). *Exp. al.* 20 mm. *Hind wings* and cilia brownish, the latter fading to brownish cinereous outwardly, and with a slender pale line along their base. *Abdomen* and *legs* brownish grey.

Type, ♂ (70551) Mus. Wlsm.

Hab. JAPAN—HONDO—Gity (*Pryer*, 1886). Two specimens.

PHARMACIS, Hb.

854 (1). *Pharmacis magister*, sp. n.

Antennæ greyish. *Palpi* dark grey, tinged with ferruginous externally. *Head* and *thorax* brownish ochreous. *Fore wings* rich brownish ochreous, with ferruginous markings and shining leaden-grey cross-streaks and wavy lines; after a faint ferruginous shade, accompanied above and beyond by

leadен grey on the middle of the base, is a reduplicated patch on the middle of the dorsum, outlined before and behind with leadен grey, the inner line produced backward obliquely to the costa; before the tornus is a similar ferruginous dorsal patch, also outlined with leadен grey, the inner line furcate from above the fold and enclosing between its two branches which reach the costa a triangular ferruginous medio-costal patch, the outer line also produced upward to the costa, where it forms the inner margin of an anteapical ferruginous costal patch; the apical and terminal area is somewhat speckled with leadен grey, a reduplicated slender ferruginous marginal line running at the base of the shining coppery ochreous cilia (the first costal and the second dorsal patches are sometimes obliquely and narrowly confluent, but they send out no outward projection toward the apex, as in *aleella*, Schulze). *Exp. al.* 22 mm. *Hind wings* tawny brownish grey, with a shade-line near the base of the whitish cilia. *Abdomen* brownish grey. *Legs* whitish.

Type, ♂ (60856) Mus. Wlsm.

Hab. ASIATIC TURKEY—HALEB—Shar Devesy, 18 VI. 1890 (*Native Coll.*). Three specimens.

This species has the appearance of a very large form of *aleella*, Schulze, with which it agrees in neuration, but which is placed by Meyrick, wrongly as I think, in the genus *Phalonia*, Hb.

LOXOPERA, Stph.

†*Lozopera*, Stph. ‡*Loxopera*, Scudder.

862 (3). *Loxopera ferruginea*, sp. n.

Antennæ cinereous. *Palpi* [broken]. *Head* and *thorax* ochreous. *Fore wings* pale ochreous, profusely sprinkled with bright orange-ochreous, and with two oblique bright ferruginous transverse fasciæ, much diffused at their edges; the first runs from the middle of the costa to the basal half of the dorsum, somewhat dilated at its extremities, especially toward the costa, and attenuated on the fold; the second parallel with the first and attenuated at its middle beyond the end of the cell; there is a narrow ferruginous shade along the costa from the base to the first fascia; cilia pale ochreous. *Exp. al.* 21 mm. *Hind wings* rather dark grey; cilia paler. *Abdomen* dark grey. *Legs* pale cinereous.

Type, ♀ (61588) Mus. Wlsm.

Hab. ASIATIC TURKEY—HALEB—Shar Devesy (*Native Coll.* 1893). Unique.

This species has much the appearance of *sanguinana*, Tr., but the markings are more blurred and veins 7 and 8 of the fore wings are stalked.

PHALONIA, Hb.

866 (1). *Phalonia cestiva*, sp. n.

Antennæ white. *Palpi* white, the median joint shaded with brown externally, the terminal joint fuscous. *Head* and *thorax* white, the latter shaded with light brownish ochreous. *Fore wings* white, with light brownish ochreous markings; three equidistant costal spots with ferruginous dots between them, one before, one at, and one beyond the middle; an oblique medio-dorsal blotch pointing outward and reaching to the middle of the cell, below which it is margined on both sides with silvery grey and some fuscous scales; a fainter blotch before the tornus, less distinctly margined, and some pale ochreous spots on the terminal and apical area accompanied by silvery scaling; cilia whitish ochreous, dusted with fuscous. *Exp. al.* 18 mm. *Hind wings* brownish grey; cilia whitish, with a shade-line running through them. *Abdomen* brownish grey. *Legs* white, the tarsi dusted with fuscous.

Type, ♀ (60865); ♂ (60866) Mus. Wlsm.

Hab. ASIATIC TURKEY—HALEB—Shar Devesy (*Native Coll.* 1890). Three specimens.

872. *Phalonia Richteriana*, F. R.

Cochylis Richteriana, Stgr. & Wk. Cat. Lp. Eur. 245. No. 872 (1871).

Hab. EUROPE. JAPAN—YESSO (*Pryer*, 1882).

HYSTEROSIA, Stph.

= *IDIOPHYSIS*, Ld.

Stephens, who had originally placed *inopiana*, Hw., in the Phaloniad genus *Xanthosetia*, Stph., seems to have recognized its divergence from *hamana*, L., and its allies in proposing the genus *Hysterosia* for its reception. Wilkinson, finding a costal fold in the male, placed it in the genus *Halonota*, Stph. (*Olethreutinae*). In the same year (1859) Lederer characterized *Idiographis*, of which he made *inopiana* the type, placing it as a subgenus under *Tortrix*, Tr.; he was followed by von Heinemann and Staudinger & Wocke. Walsingham, in 1879, placed the genus *Idiographis* between *Retinia*, Gn., and *Conchylis*, Tr., recognizing the structural character "vein 2 of the fore wings arising from the outer third of the

cell," but relying on the costal fold for its separation from both. Fernald, who in 1882 instituted the subfamily *Conchylinæ*, started with *Idiographis* preceding *Conchyliis*.

The genus *Phtheochroa*, Stph. (type *rugosana*, Hb.), has been rightly recognized as belonging to this subfamily, but to this genus have been added two species which differ from it in the possession of a costal fold—*Duponcheliana*, Dp., and *amandana*, H.-S. I am unable to refer them to any other genus than *Hysterosia*. Meyrick (HB. Br. Lp. 554-5) placed the smaller species *maculosana*, Hw., by itself in the genus *Eupæcilia* as having a costal fold and thoracic tuft, vein 7 of the fore wings running to the apex. I find that in *maculosana* vein 7 distinctly runs to the termen, which justifies its inclusion in the genus *Hysterosia*, the type of which, *inopiana*, Hw., does possess a posterior thoracic tuft, although Meyrick unaccountably failed to observe it and described the thorax as smooth. In any case the name *Eupæcilia*, Stph., is inadmissible for *maculosana*, Hw., Westwood in 1840 having cited *angustana*, Hb., as its exponent, thereby rendering *Eupæcilia* a synonym of *Euxanthis*, Hb., Meyr.

909 (1). *Hysterosia syriaca*, sp. n.

Antennæ pale brownish, whiter towards the base. *Palpi* porrect, extending twice the length of the head beyond it; white. *Head and thorax* white, with a brownish tinge. *Fore wings* white, with a few silvery scales scattered around the edges of the darker markings; these are of two shades of brown and consist of a streak along the costa from the base, covering the narrow costal fold and joining the upper extremity of a broad transverse brown band, slightly indented at the middle on its inner side and adorned with four or five tufts of raised brown scales; three costal spots beyond the middle, the outer two merging in a transverse narrow brown band reaching to the tornus and scarcely separated from a dorsal blotch before the tornus ascending to the upper angle of the cell; two black spots mark the end of the cell and along the termen is a chestnut-brown shade, broken into a series of small marginal patches; cilia white, mottled with brownish grey, a darker shade running along their base. *Exp. al.* 22-28 mm. *Hind wings* greyish brown; cilia whitish, with a dark line near their base. *Abdomen* greyish brown, with white cross-bands. *Legs* dirty whitish, peppered with brown scales.

Type, ♂ (60832) Mus. Wlsm.

Hab. ASIATIC TURKEY—HALEB—Shar Devesy, 23-27 V. 1890 (*Native Coll.*). Five specimens.

This species is closely allied to *Hysterosia Duponcheliana*, Dp., but is separable through its larger size and the broader patch of white before the apex and much paler cilia.

909 (2). *Hysterosia decipiens*, sp. n.

Antennæ pale brownish grey. *Palpi* projecting more than twice the length of the head beyond it; white. *Head* and face white. *Thorax* brownish grey, with some black scales. *Fore wings*: ♀ stone-white, mottled with brownish grey, the outlines of the patches narrowly and irregularly marked with black scaling; a patch of black scales surrounding a ferruginous spot rests on the middle of the fold, extending upward to the anterior margin of the cell and downward nearly to the dorsum; the brownish grey mottling is specially noticed in a basal patch, a small costal patch about the middle, and in a patch above the tornus, followed by an outwardly curved transverse band before the apex, ending below the middle of the termen; cilia stone-white, mottled with brownish grey, and a few blackish scales: ♂ with a narrow darkened costal fold. *Exp. al.* 16 mm. *Hind wings* pale brownish grey; cilia pale cinereous. *Abdomen* brownish grey. *Legs* whitish.

Type, ♀ (61601); ♂ (60874) Mus. Wlsm.

Hab. ASIATIC TURKEY—HALEB—Shar Devesy (*Native Coll.* 1890, 1893). Four specimens.

910 (1). *Hysterosia coreana*, sp. n.

Antennæ white, with a brownish tinge. *Palpi* white, the median joint shaded with brown externally nearly to the apex. *Head* and face white. *Thorax* black. *Fore wings* white, with some silvery scales surrounding pale olivaceous grey mottling on the outer half and a black transverse fascia a little before the middle; a short black basal patch, not extending to the dorsum, sends forth a streak of black mottling along the costa, including the narrow costal fold, and reaching the black fascia; this contains some steel-blue scaling and is slightly bowed outward externally; it is followed by a small black triangular costal spot, with which it is almost connected; a slight costal shade before the apex is followed by a black terminal band including the apex and upper two-thirds of the termen and mixed with ferruginous scales; cilia whitish, with brown and black mottling on their outer half, a blackish line running through them near their base. *Exp. al.* 18 mm. *Hind wings* brownish grey; cilia whitish, with

a reduplicated shade-line running through them. *Abdomen* brownish grey, white posteriorly. *Legs* whitish, with some black bands.

Type, ♂ (60364) Mus. Wlsm.

Hab. COREA—Gensan, VI. 1886 (*Leech*). Unique.

In appearance this species is intermediate between *Hysterosia amandana*, H.-S., which has a white thorax and a costal fold, and *Phtheochroa pulvillana*, H.-S., which has a black thorax and no costal fold; except by its black thorax, it is also undistinguishable from the Japanese *albiscutellum*, Wlsm., of which unfortunately the male is not known, but this is a much larger species than *amandana*.

LVII.—*Descriptions of some Species of Coccidæ collected by Mr. James Lidgett in Victoria, Australia.* By E. ERNEST GREEN, F.E.S., Government Entomologist, Ceylon.

[Plate XI.]

MR. E. E. GREEN has sent to the British Museum some specimens of Coccidæ new to the collection, and with them the following descriptions and figures, which I have much pleasure in sending to the 'Annals' for publication.

CHAS. O. WATERHOUSE, V.P.E.S.

Mytilaspis indentata, sp. n. (Pl. XI. fig. 1.)

Female puparium brownish straw-colour, the sides and hinder part darker, with a very narrow whitish margin. First pellicle very pale yellow. Second pellicle almost colourless. Strongly convex above. Elongate, rather narrow, but widening slightly behind the exuvia; usually much curved or contorted, as in *M. intermedia*, Mask. (Trans. N. Z. Inst. 1890, p. 7). Ventral scale moderately developed. Length about 2 millim.

Male puparium not observed.

Adult female of usual elongate form, broadest across the basal abdominal segments. Antenna consisting of the usual small tubercle and curved bristle. Mouth-parts large and conspicuous. Parastigmatic glands absent or represented only by a single pore at the anterior spiracles. Abdominal segments with groups of oval pores and short cylindrical ducts on the lateral margins. Pygidium (Pl. XI. fig. 1) deltoid,

the margin deeply indented at the junctions of the suppressed segments, these indentations made more conspicuous by a thick chitinous rim. Median lobes minute and inconspicuous. First lateral lobes undivided, large and broad but not very prominent, the free margin evenly curved, the sides straight. Other lobes obsolete. Margin on each side strongly chitinous and serrated. There are no squames and only two small spines are noticeable on each side immediately laterad of the large second lobes. No circumgenital glands. Anal at about same level as genital aperture, near centre of pygidium. Dorsal pores few, but strongly marked by thickened chitinous rims.

Total length of insect averaging 1.50 millim.

Hab. On an unidentified plant collected at Werribee Gorge, Bacchus Marsh, Victoria, Australia. (Lidgett Coll. no. 47.)

A very distinct species, easily recognizable by the minute median lobes followed by the large simple lateral lobes, and by the absence of circumgenital glands. The only other Australian species of *Mytilaspis* with this character are *M. convexa*, Mask., and *M. drymidis*, Mask. In *convexa* the puparium is greyish white and the second pellicle is so much raised that its posterior edge forms a conspicuous ridge over the secreted portion. The pygidium is also said to have broad median lobes, though (from an examination of the figure) it seems possible that these may really represent the lateral lobes as in *indentata*. *M. drymidis* is easily distinguished by the remarkable fringed tubular processes on the margin.

Ctenochiton (?) *araucarie*, sp. n. (Pl. XI. figs. 2, 2 a.)

Adult female oblong-oval; strongly convex above; naked, or with a very imperfect coating of irregular waxy plates which appear to be brittle and easily detachable. Colour of dried examples dark chestnut-brown; the dorsal surface strongly rugose, usually with a well-defined median longitudinal ridge. Antenna (fig. 2) with eight joints, third longest, 6, 7, and 8 very short, subequal. The terminal joint bears several stout spines. Antennal formula—3, 4, (2, 5), 1, (6, 7, 8). Legs stout; tarsus equal to about two thirds length of tibia. Foot with four digitules, the unguis broadly spatulate, the tarsals stoutish knobbed hairs. Anal scales usually widely divergent; base shorter than outer edge, which is rounded and bears a few truncate spines. Anal ring with six stout hairs; the invaginated tube which surrounds them strongly rugose. Margin closely set with

moderately long stout spines, their extremities truncate. Stigmatic cleft shallow, with three or four stout pointed stigmatic spines, one or more of which are longer and curved (fig. 2 a). Derm with small and rather obscure circular and oval pores, more conspicuous towards the margin. Numerous small circular pores (circumgenital glands) surrounding the genital aperture, and a group of similar pores (parastigmatic glands) below the stigmatic cleft.

Length 5 millim.; breadth 3-3½ millim.

On the twigs bearing the adult females are some very imperfect empty and crushed tests, which may represent either the second stage of the female or the male puparia. They are composed of granules or small irregular plates of transparent waxy matter.

Hab. On *Araucaria* sp., Victoria, Australia. (Lidgett Coll. no. 50.)

I have considerable difficulty in determining the proper genus in which to place this species. The structural characters of the insect itself suggest *Eriochiton*; but the female forms no felted or cottony covering—in fact, the adult female, as submitted to me, is practically naked, bearing only scattered fragmentary patches of glassy wax. The complete marginal series of stout spines distinguishes it from *Lecanium*.

Although I can find no vestige of a marginal fringe of flattened waxy plates, I have provisionally attached this insect to Maskell's genus *Otenochiton*, to which in other respects it conforms fairly well. In *Oten. depressus*, Mask., the fringe is said to be "inconspicuous or sometimes absent" in the adult female.

BIRCHIPPIA, gen. nov.

Test of adult female completely enclosing the insect, with a small aperture at posterior extremity.

Male puparium with a well-defined circular valve at hinder end, through which the adult insect makes its escape.

Adult female shrivelling to anterior extremity after gestation, the hinder part of the test being filled with the eggs. Legs absent. Antennæ more or less rudimentary. Mentum monomerous. Stigmatic spines present. Posterior extremity cleft. Anal aperture surrounded by chitinous plates, which do not meet to form a valve as in typical Lecaniinæ. Anal ring with ten hairs.

Adult male unknown.

Larva with 6-jointed antennæ; the terminal joint long. Legs normal. Anal plates as in adult; anal ring with six

hairs. Posterior extremity of body with a pair of long caudal setæ, not springing from the anal plates.

Having only a single species with which to deal, it is difficult and inadvisable to define the generic characters very minutely.

I have still further difficulty in determining the proper systematic position of the new genus. It has some characters (stigmatic spines, anal cleft, &c.) which associate it with the Lecaniinæ, others which suggest Dactylopiinæ, but not such as would warrant its inclusion in the intermediate family Hemicoccinæ, where the larvæ are Dactylopiinid and the adults Lecaniinid. I think that the Lecanoid characters have here the predominance, the principal differences being the non-valvular anal plates and the marginal position of the caudal setæ.

The name of the genus is taken from that of the locality in which the specimens were collected.

Birchippia anomala, sp. n. (Pl. XI. figs. 3-3 d.)

Test of adult female corneous, semitransparent, fulvous, more or less obscured by a fragmentary coating of brownish waxy matter. The dark body of the dead insect can be distinguished through the test at the anterior extremity. Broadly oval to oblong-oval according to position. Strongly convex above, smooth. A small circular opening at the posterior extremity.

Length 3-4 millim. ; breadth 2 millim.

Male puparium whitish, opaque. Rather broadly oval, with a circular valve-like opening at posterior extremity. Moderately convex above, more so above the abdominal area. Surface marked by numerous transverse depressed lines and usually four longitudinal furrows ; the area between the two median furrows standing up as a rounded ridge. The general character of the puparium is strongly suggestive of that of a male Lecaniodiaspid.

Length 1.25 millim. ; breadth 0.75 millim.

Adult female (fig. 3) shrivelling to anterior part of test, subcircular (after maceration). Posterior extremity cleft. Mentum monomerous. Antenna (fig. 3 a) atrophied, varying in development in different individuals. In some examples a distinct basal and a compound terminal joint only can be distinguished. In others at least three distinct joints are present, the median as long as the other two combined. The terminal joint has two or more imperfect divisions and bears six or seven stout bristles at its extremity. On the margin,

opposite the stigmatic areas, are some stout dilated blunt spines, flattened towards the ends (fig. 3 *b*), two (rarely three) at anterior point, one (rarely two) at the other point, placed on dorsal surface. On the ventral surface is an extended group of ceriferous pores, directed towards the opening of the spiracle. Derm with a large number of bituberculate spinnerets scattered over the surface and forming a more or less continuous series on the margin. They are connected with some remarkable tubular ducts, each terminating in a lateral finger-like process. The connexion between the external spinneret and the tubular duct is very indistinct; but it can be made out by careful illumination (see figs. 3 *b* and 3 *c*). Anal aperture at base of cleft, surrounded dorsally by four more or less confluent triangular chitinous plates (fig. 3 *c*), the lower pair largest, with two stout spines near the apex of each; these plates do not meet to form a valve, as in typical Lecaniinæ. Anal ring with ten stout flattened hairs projecting into the cleft. Margin of body with a scattered series of short spines, which increase in size near the anal cleft.

Diameter 1.50–1.75 millim.

Newly hatched larva oval. Antenna 6-jointed, sixth longest; extremity abruptly narrowed and truncate, bearing a longish fine hair. Anterior stigmatic area with two, posterior with one stout spine. Anal aperture (fig. 3 *d*) surrounded by chitinous plates as in adult. A long stout seta on each side of the cleft, not attached to the chitinous plates, but springing from a minute tubercle on the margin of the body.

Hab. "On a small Leguminous shrub, collected at Birchip, Victoria." (Lidgett Coll. no. 49.)

The scales are thickly clustered on the twigs of the plant.

Peradeniya, Ceylon,
24th May, 1900.

EXPLANATION OF PLATE XI.

- Fig. 1.* *Mytilaspis indentata*. Pygidium.
Fig. 2. *Ctenochiton araucariæ*. Antenna of female.
Fig. 2 a. Ditto. Stigmatic area of adult female.
Fig. 3. *Birchippia anomala*. Adult female, ventral view.
Fig. 3 a. Ditto. Antenna of adult female.
Fig. 3 b. Ditto. Anterior stigmatic area of adult female.
Fig. 3 c. Ditto. Extremity of abdomen, dorsal aspect.
Fig. 3 d. Ditto. Posterior extremity of young larva.

LVIII.—*Descriptions of new Species of Japanese Land-Shells.* By G. K. GUDE, F.Z.S.

A FURTHER consignment of Helicoid land-shells received from Mr. Hirase contains seven undescribed species.

Kaliella elata, sp. n.

Shell subperforate, elongate-conoid, thin, fragile, subpellucid, corneous, under the microscope seen to be covered with about ten spiral liræ above the periphery, below minutely spirally striated, shining. Spire elevated, apex obtuse, suture slightly impressed. Whorls 6, compressed, increasing slowly; the last not descending in front, angulated at the periphery, a little convex below, narrowly impressed around the axis. Aperture a little oblique, subquadrate; peristome thin, straight, acute; margins distant, the columellar margin vertical, slightly reflected over the narrow perforation.

Four specimens.

Diam. 1.5, alt. 2 millim.

Hab. Kashima, prov. Harima. Type in my collection.

Kaliella crenulata, sp. n.

Shell imperforate, conoid, thin, fragile, subpellucid, pale corneous, minutely ribbed above, shining and minutely striated below. Spire conoid, apex obtuse, suture linear. Whorls 6, flattened, increasing slowly, the last not descending; periphery with a crenulate keel, convex below, narrowly impressed round the axis. Aperture subvertical, subquadrate; peristome thin, straight, acute; margins distant, columellar margin subvertical, slightly reflected above.

One specimen.

Diam. 2.75, alt. 3 millim.

Hab. Kashima, prov. Harima. Type in my collection.

Differs from its nearest ally *K. acutangula*, A. Ad., by the flatter whorls, less convex base, and crenulated keel. It is also nearly double the size, although having but half a whorl in excess of its congener. Five specimens from Kioto, previously referred to *K. acutangula*, prove to pertain to this new species.

Kaliella pagoduloides, sp. n.

Shell imperforate, ovoid-conoid, thin, subpellucid, ochreous-corneous; under the microscope seen to be finely ribbed

above, spirally wrinkled below. Spire convex-conoid, apex obtuse, suture impressed. Whorls $5\frac{3}{4}$, rather tumid, increasing slowly, the last not descending in front, convex below, narrowly impressed round the axis. Aperture vertical, truncate-lunate; peristome thin, straight; margins distant, columellar margin vertical, slightly reflected above.

Two specimens.

Diam. 2, alt. 1.75 millim.

Hab. Kashima, prov. Harima. Type in my collection.

Allied to *K. stenogyra*, but it has fewer whorls than that species and is rounded at the periphery. In shape it much resembles a very minute *Ganesella pagodula*, Ehrm.

Pyramidula (s. s.) *pretiosa*, sp. n.

Shell umbilicate, discoid, corneous under an olivaceous cuticle, distantly costulate. Spire depressed, apex obtuse, suture rather deep. Whorls $3\frac{1}{2}$, a little rounded, increasing rather rapidly; the last scarcely descending in front, angulated at the periphery. Aperture roundly ovate; peristome thin, straight, acute; margins approaching, columellar margin a little reflected over the narrow deep umbilicus.

Ten specimens.

Diam. $1\frac{1}{2}$, alt. 1 millim.

Hab. Fukura, Awaji Island. Type in my collection.

Allied to *P. amblygonia*, Reinh., but much smaller.

Trishoplita *Dacostæ*, sp. n.

Shell deeply umbilicated, conoid, finely striated, obsoletely decussated with microscopic spiral lines, perceptible only in the depressions between the striae, corneous, pellucid, rather solid, shining below, duller above. Spire depressed, apex obtuse, suture deeply impressed. Whorls 5- $5\frac{1}{4}$, rounded above, a little flattened below, increasing rather rapidly; the last shortly deflected in front, rounded at the periphery, widened towards the mouth and sloping into the umbilicus behind the peristome. Aperture oblique, subrotundate; peristome scarcely thickened, slightly expanded all round, the margins approaching, columellar margin a little reflected over the deep but moderately wide umbilicus, which exhibits the anterior half of the penultimate whorl.

Two specimens.

Diam. maj. 10.5-11.5, minor 9-9.5; alt. 7-8 millim.

Hab. Kagashima, prov. Satsuma. Type in my collection.

Allied to *T. conospira*, Mts., but more solid and with wider

umbilicus. The spiral sculpture is scarcely perceptible under a strong lens. A specimen in the collection of Mr. S. J. Da Costa, and labelled by the late Dr. Hungerford "*Satsuma*, sp., Ikao, Nippon," I also refer to this new species. It is a little more shining and smaller than the type, measuring:—Diam. maj. 9·5, minor 8; alt. 6 millim.

Ganesella tosana, sp. n.

Shell narrowly umbilicated, depressed-conoid, finely striated, decussated with fine spiral lines, thin, pellucid, a little shining below, silky above, with a broad milky-white band under the suture, the umbilical region more or less clouded with milky white. Spire depressed, apex prominent, suture impressed. Whorls $5\frac{1}{2}$ –6, rounded, increasing rather rapidly, the last widened towards the mouth, descending shortly in front, obsoletely angulated at the periphery; aperture oblique, ovate-rotundate; peristome thin, acute, margins convergent, the lower expanded, the columellar margin reflected over the narrow deep umbilicus.

Three specimens.

Diam. maj. 14, minor 12; alt. 9 millim.

" " 13, " 11·5; alt. 9·5 millim.

Hab. Ushirogawa, Tosa Island. Type in my collection.

The present species is allied to *G. Hilgendorfi*, Kob., but it is thinner, more depressed, and with narrower umbilicus.

Eulota (Euhadra) grata, sp. n.

Shell sinistral, deeply umbilicated, conical; embryonal whorls smooth, the others finely regularly ribbed, the interstices minutely spirally striated; thin, glossy, subpellucid, the earlier whorls pale corneous, the later ones straw-yellow. Spire elevated, apex obtuse, suture margined. Whorls $6\frac{1}{2}$, rounded, increasing somewhat rapidly, the last shortly deflected in front, angulated at the periphery, becoming rounded and widened at the mouth, a little flattened below. Aperture oblique, broadly lunate; peristome rather thin, white; margins approaching, upper straight, acute, outer and lower broadly expanded and reflected, columellar reflected over the narrow deep umbilicus.

Two specimens.

Diam. maj. 27, minor 24; alt. 21·5 millim.

Hab. Nishigo, prov. Uzen. Type in my collection.

Var. *zonata*, nov.

Ornamented with a wide, ill-defined, and more or less interrupted ochreous-brown zone, reaching from near the suture to below the periphery.

Hab. Same as the type.

This handsome new species belongs to the group of *E. qucesita*, Desh. It is, however, much smaller, much more elevated in the spire, thinner in texture, more shining, and has a narrower umbilicus. The dark zone of the variety is evidently the result of the diffused colouring-matter of three bands—one peripheral, one supra- and one infraperipheral—which are faintly visible on holding the shell to the light.

LIX.—Notes on the Neuropterous Family Nemopteridæ.

By W. F. KIRBY, F.L.S., F.E.S.

THIRTY-THREE species of this small but very interesting family are enumerated in the present paper, of which the Natural History Museum possesses fourteen, which I have distinguished by an asterisk (*). They are remarkable for the great length of the hind wings, which take the form of long slender tails.

I have given the synonymy with tolerable completeness, as the references are very scattered, and many of them occur in old books not always easy of access.

It is somewhat remarkable that, as in the Ascalaphidæ, the brightly coloured species are nearly all Mediterranean, while those with hyaline fore wings mostly occur elsewhere.

Genus I. NEMOPTERA.

Nemoptera, Latr. Hist. Nat. Crust. Ins. iii. p. 296 (1802), xiii. p. 20 (1805); Olivier, Enc. Méth. viii. p. 173 (1811); Klug, Abhandl. Akad. Berlin, 1836, p. 92; Walker, List Neur. Ins. ii. p. 470 (1858); Hagen, Stett. ent. Zeit. xxvii. pp. 374, 451 (1866); Proc. Bost. Soc. Nat. Hist. xxiii. p. 250 (1886).

Nemopteryx, Leach, Zool. Misc. ii. p. 74 (1815).

Physapus, Leach, Edinb. Encycl. ix. p. 137 (1815).

Nematoptera, Burm. Handb. Ent. ii. p. 984 (1840); Westwood, P. Z. S. 1841, p. 9; Ann. & Mag. Nat. Hist. viii. p. 376 (1842).

The types of this genus are *Nemoptera coa*, L., as figured by Coquebert and Latreille. The latter figure has been referred to *N. bipennis*, but seems to possess the distinctive characters of *N. coa*.

*1. *Nemoptera sinuata*.

Nemoptera sinuata, Oliv. Enc. Méth. viii. p. 178. n. 2 (1811); Ramb. Ins. Névr. p. 335 (1842); Hagen, Proc. Boston Soc. Nat. Hist. xxiii. p. 250 (1886).

|| *Panorpa coa*, Borkhausen, Scriba, Beitr. Ins. ii. p. 155, pl. xi. fig. 1 (1791).

Nemoptera coa, pt., Latr. Hist. Nat. Crust. Ins. xiii. p. 20 (1802); pt., Klug, Abh. Akad. Berl. 1836, p. 92. n. 1.

|| *Nematoptera coa*, pt., Burm. Handb. Ent. ii. p. 987. n. 9 (1840).

Nematoptera petiveri, Westw. P. Z. S. 1841, p. 9. n. 1; Ann. & Mag. Nat. Hist. viii. p. 376. n. 1 (1842).

Hab. Turkey, Asia Minor, Syria.

This species differs from the others in the wings being much less mottled.

*2. *Nemoptera bipennis*.

Panorpa bipennis, Illiger, Ahrens, Faun. Eur. fasc. i. fig. 16 (1812).

Nematoptera bipennis, Westwood, Proc. Zool. Soc. Lond. 1841, p. 10. n. 3; Ann. & Mag. Nat. Hist. viii. p. 377. n. 3 (1842).

Nemoptera bipennis, Hagen, Proc. Bost. Soc. Nat. Hist. xxiii. p. 253. n. 4 (1888).

Nemopteryx lusitanica, Leach, Zool. Misc. ii. p. 74, pl. lxxxv. fig. 1 (1815).

Nemoptera lusitanica, Klug, Abh. Akad. Berl. 1836, p. 93. n. 3; Rambur, Faune Andal. ii. pl. ix. fig. 1 (1842); M'Lachl. Proc. Ent. Soc. Lond. 1886, p. lviii.

|| *Nematoptera lusitanica*, Burmeister, Handb. Ent. ii. p. 907. n. 8 (1840).

Hab. Spain, Portugal.

I have not seen Ahrens's figure.

*3. *Nemoptera ægyptiaca*.

—, Savigny, Descr. Ins. Neur. pl. ii. fig. 15.

Nemoptera ægyptiaca, Rambur, Ins. Névr. p. 334 (1842); Hagen, Proc. Bost. Soc. Nat. Hist. xxiii. p. 252 (1886).

Nemoptera hebraica, Westwood, Thes. Ent. Oxon. p. 178, pl. xxiii. fig. 5 (1874).

Hab. Egypt, Syria, Palestine.

*4. *Nemoptera coa*.

Ephemerella coa, Hasselquist, Iter Palæst. p. 423. n. 110 (1757).

Panorpa coa, Linné, Syst. Nat. (ed. x.) i. p. 552. n. 3 (1758); Coquebert, Icones, p. 15, pl. iii. fig. 3 (1799).

Nemoptera coa, Oliv. Enc. Méth. viii. p. 178. n. 1 (1799); Walker, List Neur. Ins. B. M. ii. p. 470. n. 1 (1858); Ramb. Ins. Névr. p. 333, pl. iii. fig. 3 (1842); Hagen, Proc. Bost. Soc. Nat. Hist. xxiii. p. 253. n. 3 (1880).

Nematoptera coa, pt., Burm. Abhandl. Akad. Berl. 1836, p. 92. n. 1.

Nematoptera Petiveri, pt., Westwood, Proc. Zool. Soc. Lond. 1841, p. 9. n. 1; Ann. & Mag. Nat. Hist. viii. p. 376. n. 1.

Nematoptera Coqueberti, Westwood, *ll. cc.* p. 9. n. 2. p. 376. n. 2.

Hab. S. Europe, N. Africa.

Genus II. HALTER.

Halter, Ramb. Ins. Névr. p. 335 (1842).

The time has hardly yet arrived for subdividing this genus, to which we may provisionally refer all the transparent-winged species with long beaks. The species are divisible into several very distinct groups, most of which will probably hereafter rank as genera.

Section 1.

Hind wings linear, with a long dark band before the extremity.

*5. *Halter africana*.

Nemopteryx africana, Leach, Zool. Misc. ii. p. 74, pl. lxxxv. fig. 1 (1815).

Nemoptera africana, Gray, Griffith's Anim. Kingd. xv. p. 324, pl. cv. fig. 4; Westwood, Proc. Ent. Soc. Lond. i. p. lxxv (1836); Walker, List Neur. Ins. ii. p. 475. n. 14 (1853); Hagen, Proc. Bost. Soc. Nat. Hist. xxiii. p. 262. n. 10 (1888).

Nemoptera africana, Westwood, Proc. Zool. Soc. Lond. 1841, p. 12. n. 9; Ann. & Mag. Nat. Hist. viii. p. 379. n. 9 (1842).

Nemoptera bacillaris, Klug, Abhandl. Akad. Berl. 1836, p. 95, fig. 2.

Nemoptera bacillaris, Westwood, *ll. cc.* p. 12. n. 10, p. 379. n. 10.

Nemoptera halterata, pt., Klug, *l. c.* p. 94. n. 8 (1836).

Nemoptera latipennis, Burm. Handb. Ent. ii. p. 986. n. 5 (1840).

Nemoptera latipennis, Westwood, *ll. cc.* p. 12. n. 11, p. 379. n. 11.

Hab. S. Africa.

The type is in the British Museum.

6. *Halter remifera*.

Nemoptera remifera, Westwood, Thes. Ent. Oxon. p. 179, pl. xxxiii. fig. 9 (1874); Hagen, Proc. Boston Soc. Nat. Hist. xxiii. p. 265. n. 11 (1888).

Hab. Cape.

7. *Halter costalis*.

Nemoptera costalis, Westwood, Proc. Ent. Soc. Lond. i. p. lxxv (1836); Thes. Ent. Oxon. p. 179, pl. xxxiii. fig. 6 (1874).

Nemoptera costalis, Westw. Proc. Zool. Soc. Lond. 1841, p. 12. n. 13; Ann. & Mag. Nat. Hist. viii. p. 379. n. 13 (1842).

♂. *Nemoptera angulata*, Westwood, Proc. Ent. Soc. Lond. i. p. lxxv (1836); Duncan, Jardine's Nat. Libr., Intr. Ent. p. 293, pl. xxvii. fig. 3 (1840); Hagen, Proc. Bost. Soc. Nat. Hist. xxiii. p. 259. n. 9 (1888).

Nemoptera angulata, Westwood, Proc. Zool. Soc. Lond. 1841, p. 12. n. 12; Ann. & Mag. Nat. Hist. viii. p. 379. n. 12 (1842).

Nemoptera angula, Walk. List Neur. Ins. ii. p. 475. n. 16 (1853).

Hab. Cape.

As the name *costalis* stands before *angulata* in the Proc. Ent. Soc., the former must stand for the species if the two names are correctly placed together as sexes, as appears probable.

8. *Halter biremis*.

Nemoptera biremis, Kolbe, SB. Ges. naturf. Fr. Berlin, 1900, p. 16.

Hab. Cape.

Section 2.

Hind wings more or less expanded towards the extremity (once, twice, or thrice), and with a broad dark band towards the base of the expanded part of the wings.

9. *Halter allostigma*.

Nemoptera allostigma, Westwood, Thes. Ent. Oxon. p. 179, pl. xxxiii. fig. 7 (1874).

Hab. Zululand.

*10. *Halter halterata*.

Panorpa halterata, Forskål, Descr. Anim. p. 97 (1775); Icones, pl. xxv. fig. E (1776).

Nemoptera halterata, De Selys, Ann. Soc. Ent. Belg. x. pp. 254, 255, pl. ii. figs. 5, 6 (1887); Hagen, Proc. Boston Soc. Nat. Hist. xxiii. p. 257. n. 8 (1887).

Nemoptera pallida, Olivier, Enc. Méth. viii. p. 179. n. 5 (1811); Rambur, Ins. Névr. p. 335, pl. viii. fig. 4 (1842).

Nematoptera pallida, Westwood, Proc. Zool. Soc. Lond. 1841, p. 11. n. 8; Ann. & Mag. Nat. Hist. viii. p. 378. n. 8.

Nematoptera Forskali, Westwood, *ll. cc.* p. 11. n. 6, p. 378. n. 6.

Hab. Arabia, Baghdad.

This is the type of the genus, *N. pallida*, Olivier, being the first of four species referred by Rambur to *Halter*, and, moreover, being figured. The specimen in the British Museum is from Mount Sinai. Several other species have been wrongly called *N. halterata* by various authors, whose references I have not always quoted.

*11. *Halter tipularia*.

Nemoptera tipularia, Westwood, Thes. Ent. Oxon. p. 179, pl. xxxiii. fig. 10 (1874).

Hab. Damaraland.

*12. *Halter Bettoni*, sp. n.*Dimensions*.—

	♂.	♀.
Long. corp.	21 mm.	15 mm.
Exp. al. ant.	48 „	46 „
Long. al. post. . . (circa)	50 „	54 „

Body reddish brown, beak (except at the tip) and sides and under surface of thorax testaceous; abdomen slender, slightly hairy towards the extremity. Fore wings hyaline, with brown nervures, the costal nervure and the second median nervure spotted with paler in the spaces between the transverse nervures. Subcostal nervure slightly reddish. Towards the extremity of the wing is a dark pterostigma, filling up the narrow oblong space between two approximate nervures, but not extending quite to the costa. Hind wings very long and slender, white, with a yellowish central line, from which numerous small blackish T-shaped markings diverge asymmetrically on each side. The extremity is broadly triflabelate, with a reddish-brown band extending over the first expansion, except at the base, and the basal portion of the second; the terminal part of the wing snow-white.

Hab. Maragoja Fundi, Tara Desert, British East Africa; a pair collected by Mr. C. S. Betton on March 3, 1897.

A very distinct species, somewhat allied to the West-African *H. imperatrix*, Westwood.

The costal nervures vary in number from 33 to 37 before the pterostigma on the fore wings, and are not uniform on the two sides, showing that this is a variable character.

*13. *Halter imperatrix*.

Nemoptera imperatrix, Westwood, Trans. Ent. Soc. Lond. (3) v. p. 507 (1867); Thes. Ent. Oxon. p. 178, pl. xxxiii. fig. 8 (1874).

Hab. W. Africa.

14. *Halter remipennis*.

Nemoptera remipennis, Kolbe, SB. Ges. naturf. Fr. Berlin, 1900, p. 13.

Hab. Nyassa, Usambara.

15. *Halter togonica*.

Nemoptera togonica, Kolbe, SB. Ges. naturf. Fr. Berlin, 1900, p. 15.

Hab. Togo, Upper Guinea.

Section 3.

Hind wings long, more or less expanded two or three times towards the tips, and with two blackish bands on the expanded portion.

The British Museum possesses no species belonging to this section, to which I refer *H. gracilis* with a little doubt.

16. *Halter gracilis*.

Nemoptera gracilis, Hagen, Proc. Boston Soc. Nat. Hist. xxiii. p. 255 (1886).

Hab. Cape.

17. *Halter barbara*.

Nemoptera barbara, Klug, Abhandl. Akad. Berl. 1836, p. 94. n. 5; Selys, Ann. Soc. Ent. Belg. x. p. 254, pl. ii. figs. 3, 4 (1887); Hagen, Proc. Boston Soc. Nat. Hist. xxiii. p. 255. n. 6 (1886).

Nemoptera barbara, Westw. Proc. Zool. Soc. Lond. 1841, p. 11. n. 7; Ann. & Mag. Nat. Hist. viii. p. 578. n. 7.

|| *Panorpa halterata*, Fabricius, Ent. Syst., Suppl. p. 208. n. 8 (1798).

Nemoptera algerica, Rambur, Ins. Névr. p. 336 (1842); Luc. Expl. Alg. iii. p. 139, pl. iii. fig. 3 (1849).

Hab. Algeria.

18. *Halter Ledereri*.

Nemoptera Ledereri, Selys, Ann. Soc. Ent. Belg. x. p. 254, pl. ii. figs. 1, 2 (1887); Hagen, Proc. Boston Soc. Nat. Hist. xxiii. p. 254. n. 5 (1886).

Hab. Asia Minor.

Section 4.

Hind wings less than twice as long as the fore wings, with two large black dilatations and a short white terminal process.

19. *Halter dilatata*.

Nemoptera dilatata, Klug, Abhandl. Akad. Berl. 1836, p. 94. n. 6, fig. 1.

Nemoptera dilatata, Westw. Proc. Zool. Soc. Lond. 1841, p. 11. n. 5; Ann. & Mag. Nat. Hist. viii. p. 378. n. 5 (1842).

Hab. S. Africa.

Section 5.

Hind wings less than twice as long as the fore wings, with a wide dark dilatation towards the extremity, which is formed by a broad lobe, rounded at the extremity, white at the base and dark beyond.

*20. *Halter extensa*.

Nemoptera extensa, Oliv. Enc. Méth. viii. p. 178. n. 4 (1811); Guér. Ann. & Mag. N. Hist. Ser. 7. Vol. vi. 31

Icon. R. Anim., Ins. p. 384, pl. lxi. fig. 1 (1829-1844); Klug, Abhandl. Akad. Berl. 1836, p. 93. n. 4; Ramb. Ins. Névr. p. 336 (1842).
Nemoptera citensa, Westwood, Proc. Zool. Soc. Lond. 1841, p. 11. n. 4; Ann. & Mag. Nat. Hist. viii. p. 397. n. 4 (1842).

Hab. Baghdad.

Genus III. CHASMOPTERA, gen. nov.

Antennæ very thick; beak prominent; hind wings only one and a half times as long as the fore wings; fore wings hyaline, except a slightly marked pterostigma; hind wings wholly dark except at the extremity and on the median line in the middle of the principal lobe, which expands very broadly on each side, occupying the third quarter of the wing; at the base it expands gradually, and at the extremity it is truncated, the angles, however, being rounded off; from the central line a number of bifid nervures diverge on each side. This is followed by a second smaller lobe on each side, and a broad terminal projection, white on the apical half.

*21. *Chasmoptera Huttii*.

Nemoptera Huttii, Westwood, Proc. Ent. Soc. Lond. v. p. 27, pl. viii. fig. 1 (1847); Hagen, Proc. Boston Soc. Nat. Hist. xxiii. p. 265. n. 12 (1888).

Hab. Australia (Perth, Swan River).

Genus IV. SAVIGNIELLA, n. n.

|| *Brachystoma*, Rambur (nec Meigen), Ins. Névr. p. 337 (1842).

Mouth not produced into a beak; hind wings long, linear, scarcely enlarged towards the extremity.

22. *SavignIELLA costata*.

—, Savigny, Descr. Egypte, Neur. pl. ii. fig. 14 (details).

|| *Nemoptera halterata*, Oliv. (nec Forsk.) Encycl. Méth. viii. p. 178 (1811).

Nemoptera costata, Klug, Abhandl. Akad. Berl. 1836, p. 94. n. 7.

Nemoptera Olivieri, Rambur, Ins. Névr. p. 337 (1842).

Nemoptera Olivieri, Westwood, Proc. Zool. Soc. Lond. 1841, p. 13. n. 14; Ann. & Mag. Nat. Hist. viii. p. 379. n. 14 (1842).

Hab. Alexandria.

Hagen considers Savigny's fig. 13, usually referred to this species, to represent *Halter Ledereri*, Selys.

Genus V. STENORRHACHUS.

Stenorrhachus, M^cLachlan, Proc. Ent. Soc. Lond. 1886, p. lviii.

|| *Stenotænia*, M^cLachlan (nec Gervais), Trans. Ent. Soc. Lond. 1885, p. 376.

23. *Stenorrhachus Walkeri*.

Stenotænia Walkeri, M^cLachl. Trans. Ent. Soc. Lond. 1885, p. 377.

Hab. Chili.

The only described American representative of this family.

Genus VI. CROCE.

Croce, M^cLachlan, Trans. Ent. Soc. Lond. 1885, p. 378.

*24. *Croce filipennis*.

Nemoptera filipennis, Westwood, Proc. Zool. Soc. Lond. 1841, p. 13. n. 19; Ann. & Mag. Nat. Hist. viii. p. 380. n. 19 (1842).

Nemoptera filipennis, Hagen, Proc. Boston Soc. Nat. Hist. xxiii. p. 267. n. 13 (1888).

Hab. N. India.

The Natural History Museum possesses three specimens of what may possibly be a second Indian species, the hind wings being apparently much narrower than in the typical form; but this may perhaps be due merely to the pubescence being more closely appressed to the shaft of the wing.

*25. *Croce aristata*.

Nemoptera aristata, Klug, Abhandl. Akad. Berl. 1836, p. 96. n. 13.

Nemoptera aristata, Westwood, Proc. Zool. Soc. Lond. 1841, p. 13. n. 17; Ann. & Mag. Nat. Hist. viii. p. 380. n. 17 (1842).

Hab. Ambukohl (*Klug*); Thebes (B. M., presented by A. Carter, Esq.).

26. *Croce (?) alba*.

Nemoptera alba, Oliv. Enc. Méth. viii. p. 179. n. 6 (1811); Klug, Abhandl. Akad. Berl. 1836, p. 96. n. 12; Rambur, Ins. Névr. p. 336. n. 6 (1842).

Nemoptera alba, Westw. Proc. Zool. Soc. Lond. 1841, p. 13. n. 18; Ann. & Mag. Nat. Hist. viii. p. 380. n. 18.

Hab. Baghdad.

Found in abundance in houses in the evening towards the end of May by Olivier, and described by him; but no further information about the species has been given by any author, and it was apparently unknown in nature even to Rambur.

27. *Croce pusilla*.

Nemoptera pusilla, Taschenberg, Zeitschr. f. Naturw. lvi. p. 183 (1884).

Nemoptera pusilla, Hagen, Proc. Boston Soc. Nat. Hist. xxiii. p. 268. n. 14 (1888).

Hab. Socotra.

*28. *Croce setacea*.

Nemoptera setacea, Klug, Abhandl. Akad. Berl. 1836, p. 95. n. 10, fig. 3.

Nemoptera setacea, Westwood, Proc. Zool. Soc. Lond. 1841, p. 13. n. 15; Ann. & Mag. Nat. Hist. viii. p. 379. n. 18 (1842).

Hab. S. Africa.

29. *Croce capillaris*.

Nemoptera capillaris, Klug, Abhandl. Akad. Berl. 1836, p. 96, fig. 4.

Nemoptera capillaris, Westwood, Proc. Zool. Soc. Lond. 1841, p. 13. n. 16; Ann. & Mag. Nat. Hist. viii. p. 379. n. 16 (1842).

Hab. Arabia Felix.

30. *Croce ephemera*.

Nemoptera (Croce) ephemera, Gerstaecker, Mitth. Ver. Vorpomm. xxv. p. 152 (1893).

Hab. Mesopotamia.

31. *Croce Baudii*.

Nemoptera (Croce) Baudii, Griffini, Boll. Mus. Torino, x. no. 214, p. 2 (1895).

Hab. Cyprus.

32. *Croce Chobauti*.

Croce Chobauti, McLachlan, Bull. Soc. Ent. France, 1898, p. 169.

Hab. Algeria.

33. *Croce damaræ*.

Croce damaræ, McLachlan, Bull. Soc. Ent. France, 1898, p. 170.

Hab. Damaraland.

LX.—On *Equus Penricei*, a Representative of the Mountain Zebra (*Equus zebra*, L.) discovered by Mr. W. Penrice in Angola. By OLDFIELD THOMAS.

DURING his last expedition to Angola Mr. W. Penrice discovered an animal which he rightly recognized as a representative of the Mountain Zebra, hitherto only known * from South Africa, and now, alas, nearly exterminated there.

Of this most interesting animal he brought home a flat skin, which on examination proves to possess the deeper and more essential characters of *E. zebra*, such as the forward slope of the median dorsal hairs, the presence of a "gridiron-pattern" on the rump, &c., but to differ from it so much in other details that it clearly cannot be assigned to the typical form of that species. The only question is as to whether it should be considered a species or subspecies; but since it is now isolated geographically, and its general appearance is so strikingly different from that of *E. zebra*, it would seem necessary to call it a species until at least any evidence is brought forward that intermediate specimens occur. To no other species than *E. zebra* is it at all allied, although the equal striping of the body, the short close fur, and the buffy tone of the light stripes give it a superficial resemblance to *E. Grevyi*, which it may be said to rival in the extreme handsomeness of its markings.

Equus Penricei, sp. n.

Spinal hair-slope, character of rump-stripes, gridiron-pattern of loins, and complete striping of limbs as in *E. zebra*. Size apparently rather larger than in that animal, but exact measurements are not at present available. Fur short, close, and glossy, the hairs of the back only about 5 millim. in length, and therefore very different from the comparatively long and shaggy hairs of *E. zebra*. Light ground-colour not white, as in *E. zebra*, but buffy or creamy dun, as in *E. Grevyi*, lightening, however, nearly to white on the belly. Dark bands glossy brownish black. Striping throughout modified from that of *E. zebra* by the broadening of the light and the narrowing of the dark bands, the light bands being everywhere (with the exception of those on the sides of the neck) as broad as or broader than the dark ones, the latter being far the

* In Prof. Bocage's "List of the Mammals of Angola" (J. Sci. Lib. (2) v. p. 23, 1890) "*Equus zebra*" is included, on the strength of observers who had seen zebras in Southern Angola. Although *E. Burchelli* is more common there, Bocage's name may in part refer to Penrice's zebra.

broader on all parts of the allied species. This difference is most noticeable along the back, where, instead of dark stripes about $1\frac{1}{2}$ inch wide alternating with white ones of half an inch, both light and dark are equally about 1 inch wide. Similarly on the face all the fine light stripes are broader than the dark ones, which latter are, as usual, reddish instead of black. On the ears again the white is increased at the expense of the black. The transverse dorsal markings on the whole are rather more uniform and less irregular than in *E. zebra*, and they are throughout (except in two cases) divided from each other by a well-defined narrow median black line which runs from the withers right through on to the tail. The gridiron-pattern of the loins is essentially similar to that of *E. zebra*, but owing to the alteration in the proportions of the colours would rather be called black markings on a buff ground instead of white ones on a black ground. Upper light rump-stripe nearly twice the breadth of that of *E. zebra*.

Length of the tanned skin, from tip of nose to base of tail, 8 feet 4 inches.

Hab. Mossamedes, Southern Angola. Type from Providencia, near the River Moninho, about 70 kilometres N.E. of Mossamedes. Altitude 300 m.

Type. Male. B.M. no. O. 9. 12. 1. Shot in May 1900 by Mr. G. W. Penrice.

Mr. Penrice informs me that the country where this zebra is found consists of sand-flats dotted all over with stone kopjes in a state of disintegration, the flats in many cases being thickly strewn with boulders. He had heard of zebras being occasionally found on the top of the Chella range, 2100 metres, but was unable to say to which species they belonged.

He had first met the magnificent animal with which I have associated his name on the Coroca River, 50 kilometres east of Port Alexander, and at an elevation of only 180 m., and was also told that a zebra of this species had been shot some two years ago within a few miles of the sea.

LXI.—*New Peruvian Species of Conepatus, Phyllotis, and Akodon.* By OLDFIELD THOMAS.

Conepatus arequipæ, sp. n.

Closely allied to the Ecuadorean *C. quitensis*, with which it agrees in the great breadth of the white stripes anteriorly. Size rather less than in that animal. Fur of body long and

thick, as befits the high altitude; that of the nape reversed forwards from the withers to the crown. White stripes ending on the loins, not continued on to the root of the tail, as they are in *C. quitensis* and *chinga*. Tail long, thick, very bushy, its basal half black, its terminal half mixed black and white, the hairs of the two colours about equally numerous.

Skull broad and stout, shorter and broader than that of *C. quitensis*, larger than that of *C. rex* and *chinga*. Upper molar comparatively small.

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

Head and body 370 millim.; tail 200; hind foot (s. u.) 70, (c. u.) 80; ear 28.

Skull: basal length 70; greatest breadth 48; length of nasals (in middle line) 13; interorbital breadth 25; greatest diameter of $m.^1$ 9.5.

Another skull, that of an aged male, measures:—

Greatest length 87; basal length 73; zygomatic breadth 56; intertemporal breadth 20; mastoid breadth 47; palate length 36.5.

Hab. Sumbay, Province of Arequipa, S. Peru. Alt. 4000 m.

Type. Male (young adult). B.M. no. 0. 10. 1. 2. Original number 1032. Collected 6th June, 1900, by Mr. Perry O. Simons.

This skunk is an intermediate link between *C. quitensis* and *C. rex*. It differs from the former by its smaller size, by the more definite reversal of the nape-hairs, and by the white stripes ending on the loins and not passing backwards to the root of the tail. From *C. rex*, on the other hand, it differs by its rather larger size and by the white stripes being throughout separated from each other by the median black line.

Phyllotis sublimis, sp. n.

A vole-like species of medium size, with short tail and very long fur.

Size medium; proportions rather Microtine, intermediate between those of the medium-tailed *Ph. boliviensis* and the remarkable short-tailed *Ph. Garleppi*. Fur long, extremely soft and fine; hairs of back about 14 millim. in length. General colour dull pale greyish fawn, greyer anteriorly, more distinctly fawn on the sides and posteriorly on the rump. Centre of back browner. Head like back, no darker markings round eyes. Ears of medium length, not long as

in the more typical *Phyllotes*, their anterior halves externally brown, rather darker than the general head-colour; hairs on their inner surface yellowish, an ill-defined patch of yellowish fawn at their bases. Under surface white, not very sharply defined, the bases of the hairs slate. Upper surface of hands and feet silvery white. Tail only about half the length of the head and body, uniformly finely haired, not pencilled; a narrow line along the top ill-defined fawn, the remainder white.

Skull more normal in general shape than the widely expanded skull of *Ph. boliviensis* or the very peculiar one of *Ph. Garleppi*. Nasals narrow, evenly tapering backwards, considerably surpassing the premaxillary processes posteriorly. Interorbital region flat, its edges square but not ridged. Interparietal narrow, strap-like, its anterior edge concave forwards. Anterior zygoma-root slanted backwards. Palatal foramina long; choanæ narrow; bullæ small, much smaller than in *Ph. boliviensis*. Molars normal. Incisors narrow, though not so much so as in *Ph. Garleppi*; pale yellow above and below.

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

Head and body 105 millim.; tail 54; hind foot (s. u.) 21·5, (c. u.) 23; ear 23.

Skull: greatest length 25·3; basilar length 20·2; greatest breadth 14·5; nasals 10 × 3·6; interorbital breadth 3·7; breadth of brain-case 12·5; palate length 12·1; diastema 6·9; palatal foramina 6; length of upper molar series 4·7.

Hab. Rinconado Malo pass, above Caylloma, on the Sumbay road, Peru. Altitude 5500 metres (nearly 18,000 feet).

Type. Female. B.M. no. 0. 10. 1. 60. Original number 1104. Collected 18th June, 1900, by Mr. P. O. Simons. Nine specimens examined, all dug out of one burrow.

This most interesting little mouse lives at the highest altitude from which mammalian life has been recorded in the New World, and in the Old is only surpassed in this respect by a few of the Himalayan species. Zoologically it is also of interest, owing to its forming a link between the peculiar short-tailed *Phyllotis Garleppi** and the other members of the genus, so that it tends to resolve the doubt with which I assigned that species to *Phyllotis*.

Akodon amœnus, sp. n.

A medium-sized species with close fur and sharp-edged supraorbital region.

* Ann. & Mag. Nat. Hist. (7) i. p. 279 (1898).

Probably most nearly allied to, and of about the same size as, *A. punctulatus*, Thos.* Fur rather short, close and almost crisp, the ordinary hairs about 8 millim. in length, though these are mixed on the back with much longer fine hairs 12–13 millim. long. General colour above dull yellowish, rather, but not conspicuously, darker in the middle of the back. Muzzle, cheeks, rings round eyes, and base of ears clearer and deeper buffy yellow. Longer hairs of back brown, tipped with white. Under surface dull whitish, fairly well defined, the bases of the hairs plumbeous except on the chin, where they are white to the roots. Ears rather short, well-haired, of about the same colour as the head. Upper surface of arms and legs, as far down as the metapodials, orange-yellow; fingers and toes white; fifth hind toe (without claw) barely reaching to the base of the fourth. Tail about as long as the body without the head, well-haired, its upper surface dull orange, its lower white.

Skull very different from that of the more typical Akodons, narrow, strongly bowed, its upper outline very convex and its interorbital region sharply square-edged, though not ridged. Nasals short and rather broad. Interparietal very small. Palatal foramina long. Molars of normal Akodont structure.

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

Head and body 100 millim.; tail 75; hind foot (s. u.) 19·5, (c. u.) 21·5; ear 16.

Skull (much damaged): extreme length 26·5; nasals 8·5 × 3·7; interorbital breadth 4·9; breadth of brain-case 11·4; length of upper molar series 4·2.

Hab. Calalla, Rio Colca, near Sumbay, Peru. Altitude 3500 metres.

Type. Male. B.M. no. 0. 10. 1. 77. Original number 1109. Collected 19th June, 1900, by P. O. Simons.

This is an isolated species, apparently only allied to *A. punctulatus*, from which it is distinguishable by its very different colour.

Besides these three species, Mr. Simons's Caylloma and Arequipa collection contains examples of the remarkable *Chinchillula sahamae*, of *Akodon pulcherrimus*, *Phyllotis boliviensis*, and *Reithrodon pictus*.

* Ann. & Mag. Nat. Hist. (6) xiv. p. 361 (1894).

LXII.—*A new Free-tailed Bat from Central America.*

By GERRIT S. MILLER, Jr.

A SPECIES of free-tailed bat represented by two skins from Chiriqui, submitted to me for determination by Mr. Oldfield Thomas, is strikingly distinct from any hitherto known. In size and external appearance it suggests a small "*Nyctinomus*" of the *gracilis-europis* group; but its skull and teeth show it to be a *Promops* related, notwithstanding its small size, to *P. glaucinus*.

Promops nanus, sp. n.

Type (in British Museum *).—Adult male (skin and skull), no. 56 collection of H. J. Watson, taken at Bogava, Chiriqui, Panama (alt. 250 m.), October 7, 1898. "Caught under the roof of a house."

Character.—Essentially a miniature of *Promops glaucinus*; forearm about 39 millim. instead of 56 millim., greatest length of skull 16.5 millim. instead of 22 millim.

Muzzle and lips.—So far as can be determined from the dried specimens, after relaxation of the parts, the lips are slightly less wrinkled than in *P. glaucinus*, and the pointed horny projections on the ridge above and between nostrils are even smaller and less distinct.

Ears.—The ears are of the same form as in *P. glaucinus*; laid forward they extend about 2 millim. beyond tip of muzzle; their inner borders arise together on forehead, about 5 millim. behind tip of muzzle. In outline the conch is irregularly squarish, the anterior and superior borders about equal in length, the posterior much shorter, the corners bluntly rounded. Antitragus about two thirds as high as wide, its anterior and posterior borders converging regularly toward the bluntly rounded tip, the width of which is a little less than half that of base. Keel well developed, its edge very noticeably thickened. Tragus minute, scarcely more than 1 millim. in length, its highest point at extremity of posterior margin.

Feet and membranes.—The feet and membranes present no characters of importance. Wing attached at distal extremity of tibiæ.

Fur and colour.—The fur is not peculiar either in quality or distribution. On middle of back it is about 5.5 millim. in length. General colour above dark bistre, very faintly washed

* [Now registered as no. 0. 7. 11. 99.—O. T.]

with ecru-drab. The drab is only visible in certain lights. Underparts broccoli-brown, strongly washed with ecru-drab. Throughout the body the hairs are whitish smoke-grey at base.

Skull.—Notwithstanding its size, less than that of *Nyctinomus europs* or *N. brasiliensis*, the skull of *Promops nanus* closely resembles that of *P. glaucinus*. The brain-case is relatively larger and less angular, and the basisphenoid pits are actually larger. Bony palate entire anteriorly.

Teeth.—The teeth throughout are similar to those of *Promops glaucinus*, except that the upper incisors do not quite come in contact with the canines and the posterior molar, both above and below, is relatively larger and better developed. The third upper molar contains a small but distinct metacone, a cusp that is lacking in the corresponding tooth of *Promops glaucinus*. Similarly, the third lower molar is provided with an entaconid of considerably greater relative size than that of the corresponding tooth in the larger species. Hypocone of first and second upper molars as in *Promops glaucinus*.

Measurements.—External measurements of type: head and body 41 mm.*; tail 34*; tail (free) 15; tibiæ 11; foot 7·8 (6·6); forearm 38; thumb 5·5; second digit 38; third digit 75; fourth digit 58; fifth digit 37. The other specimen (a female) is slightly larger; forearm 39·5.

Cranial measurements of type: greatest length 16·4 mm.; basal length 15; basilar length 13; median palatal length 6; zygomatic breadth 9·8; least interorbital breadth 3·6; mastoid breadth 9; greatest breadth of brain-case above roots of zygomata 8; lachrymal breadth 5; mandible 11·6; maxillary tooth-row (exclusive of incisor) 6·4; mandibular tooth-row (exclusive of incisors) 6·8.

LXIII.—*Natural History Notes from the Royal Indian Marine Survey Ship 'Investigator,' Commander T. H. Heming, R.N., commanding.*—Series III., No. 4. *Some Results of the Dredging Season 1899-1900.* By A. F. MCARDLE, B.A., M.B., Capt. I.M.S., Surgeon-Naturalist to the Survey.

DURING the season 1899-1900 the R.I.M.S. 'Investigator' was for the greater part of the time without the services of a Surgeon-Naturalist. At the beginning of April 1900 I joined

* Collector's measurement.

the ship at Colombo, and remained in her till the 4th May, when she went into dock at Bombay. Altogether there were twelve trawls made in over 100 fathoms, yielding a fair number of Crustacea, Fishes, Mollusca, &c. Of these the Fishes and Crustacea have been identified, while the Worms and Mollusks remain still to be described by the specialists to whose hands they have been entrusted.

Of the most interesting finds made during the year may be mentioned:—

1. A very large specimen (an adult male), 12 inches long, of *Bathynomus giganteus*, A. M.-Edw., dredged off the north-west of Ceylon in 594 fathoms.

2. A specimen of that strange crab *Trichopeltarium ovale*, from a depth of 445 fathoms.

3. Five specimens of the Atlantic fish *Hoplostethus atlanticum*.

4. A trawl of twenty-eight specimens of *Glyphocrangon investigatoris*.

5. Two fine specimens of *Pennatula* from 487 fathoms, in the branches of each of which was found a small polychæte worm of one and the same species.

6. Two specimens of *Pleurotoma symbiotes*, from 771 and 464 fathoms. As on the two previous occasions on which this interesting mollusk was dredged, the same species of *Epizoanthus* was found encrusted on the living shell.

7. A large collection (forty-five specimens) of *Turbo indicus*, from 595 fathoms. The living shells were generally covered on the spire by *Scalpellum* and sponges.

8. Two fine specimens of a species of *Conus* were found at the very unusual depth of 487 fathoms.

Most of the Crustacea obtained had been previously known, but the following three species are new:—

BRACHYURA.

OXYRHYNCHA.

Fam. Maiidæ.

Subfam. INACHINÆ.

CYRTOMAIA, Miers.

Cyrtomaia Goodridgei, sp. n.

Description of an adult male.—Carapace bluntly triangular, broader than long, vertically depressed anteriorly, broadly rounded over the branchial regions, and with the gastric an l

cardiac regions greatly elevated. It is finely granular and has numerous spines arranged as follows:—In the gastric region one very long spine on either side, with a very short one in the median line between them, a fourth gastric spine intermediate in size being situate in the median line posterior to the other three. In the cardiac region are two strong spines on well-marked tubercles close to and on either side of the median line. There is a well-marked hepatic spine. In the branchial region there is a very long and strong spine directed forwards, and laterally there are numerous small spines, mostly arranged in two horizontal lines running through the branchial and pterygostomial regions. There is a prominent postocular, but no preocular nor supraocular spines. A very small intestinal spine. The rostrum appears, when looked at from in front or from above, to be trifid, owing to the presence of a strong interantennular spine, which is as long as either of the proper rostral spines. The latter are two in number, triangular, and run forward horizontally and almost parallel to one another. They are bent downwards at the tips. The abdomen consists of seven distinct segments; the first six carinate and spinous, the spine on the sixth segment being the longest, the seventh segment granular and rounded at its distal extremity. The sternum is spiny, both anteriorly, where the spines are situated more or less transversely, and laterally, where they are placed in two rows, one at the bases of the chelipeds and ambulatory legs, and the other row midway between them and the margin of the abdomen. The eyes are short, robust, with a small spinule at their distal extremities. The basal joint of the antennæ has two spinules on its outer border, one of which—that nearer the base—points downward, the other pointing forward. Arising between these two, but from the inferior surface of the basal joint, there is a third spinule, pointing downwards. The second and third joints are flattened from above down, have each two small spinules on their outer margins, and the third joint reaches to the tip of the rostral spines. The flagellum is long, slender, and setose. The third maxillipeds have the ischium and merus strongly spinous, and the antero-external angle of the latter is produced to a spiny tubercle. The exognath is as long as the ischium and merus together, and is somewhat narrowed anteriorly. The chelipeds are long and slender, over two and a half times as long as the carapace (77 : 28), the merus slightly shorter than the palm and fingers combined (32 : 35), fingers irregularly toothed and not fitting closely. The first pair of ambulatory legs are between twice and one and a half times as long as the chelipeds [122 : 77],

the second pair about two thirds as long as the first. The first two pairs are strongly spinose, the spines being arranged in longitudinal rows. The last two pairs are shorter and much more slender, and have no spines, with the exception of one at the distal extremity of the merus. Dactyli nearly straight and hirsute.

Colour in spirit dull ivory-white.

Adult ♂.

	millim.
Length of carapace to base of rostrum	28
Greatest breadth	32
Length of rostrum	5½
" gastric spine	13
" branchial spine	8
" chelipeds	77
" first ambulatory legs	122

A perfect adult male, dredged at Sta. 267 in about 500 fathoms, in lat. 7° 02' 30" N., long. 79° 36', off the west coast of Ceylon.

Of the species heretofore described it is most like *C. Smithii*, but differs in the shape and character of the rostrum, in having no supraorbital spine, in possessing a large branchial spine, and in the description of the basal joint of the antennæ.

From *C. Murrayi* it can be easily distinguished by its rostrum, by the absence of spines on its third and fourth ambulatory legs, by having no præorbital spine, and by its shorter and more robust eyes.

From *C. Suhmi* it differs in its shorter and more robust eyes, in its general appearance, the regions of the carapace being much better defined, in the general arrangement of the spines, and by the rostrum.

A figure will be given in an early issue of the "Illustrations of the Zoology of the R.I.M.S. 'Investigator.'"

OXYSTOMA.

Fam. DORIPPIDÆ.

Subfam. DORIPPINÆ.

ETHUSA, Roux.

Ethusa hirsuta, sp. n.

Carapace subquadrilateral, flat, with its length equal to its extreme breadth. It is expanded, but not greatly so, over the branchial regions, and the lateral convergent borders are

almost straight. The whole of the carapace and the sternum are covered with hairs, which are particularly long and strong over the anterior and lateral borders. The cardiac region is not depressed, and the branchio-cardiac lines, which are well marked, do not meet in front. The front of the carapace is four-toothed, the teeth equal in length, but the median being more widely separated from one another than they are from the lateral. The widest and deepest space is that between the lateral teeth and the external orbital spine, which is long, slender, acutely triangular, and extended forwards beyond the tips of the rostral spines, and is directed slightly outwards. The eyes are small, well pigmented, situated on moderately sized, freely movable eyestalks, which extend well beyond the angles of the orbital sinuses.

There is no distinct epistome. Antennules folded obliquely.

The bases of the antennæ moderately developed. Flagellum short. The outer maxillipeds have the ischium produced at its antero-internal angle; the merus articulates with the next joint at its antero-external angle and has its antero-internal angle rounded. The exognath is long, slender, and narrowed anteriorly.

The chelipeds are equal, more than three fourths the length of the first pair of ambulatory legs. Palm and fingers taken together are twice the length of the carpus. Fingers not as long as the palm. The chelæ fit well and there is no space at the base.

The first pair of ambulatory legs are longer than the chelipeds ($24:19\frac{1}{2}$) and the second than the first, but the disproportion is much less than in some allied forms. The last two pair of legs are small, covered with hair, and have small recurved dactyli. The abdomen in the female is 7-jointed, in the male 5-jointed, owing to the coalescence of the third, fourth, and fifth segments.

Colour (in spirit) yellowish white.

♂.

	millim.
Length of carapace	15
Breadth of carapace	15
Length of chelipeds	$19\frac{1}{2}$
" first ambulatory legs	24
" second ambulatory legs	$28\frac{1}{2}$

A female and a young male dredged at Stations 267 and 268 in between 500 and 600 fathoms, lat. $7^{\circ} 02' 30''$ N. and $7^{\circ} 36' 00''$ N., and long. $79^{\circ} 36' 00''$ E. and $78^{\circ} 05' 00''$ E. respectively.

The species is nearest *E. indica* of Alcock and *E. lata* of M. Rathbun (*E. pubescens*, Faxon). It differs from the former in having a flatter carapace with less swollen branchial regions, a cardiac region not depressed, in being covered with hair, in having longer eyestalks, and in having the external orbital spines directed forwards instead of obliquely outwards. From *E. lata* by its general hairy covering, by the longer eyestalks which extend beyond the angle of the orbit, the external orbital spine projecting beyond the rostral spines, and the chelipeds being much longer in proportion to the ambulatory legs.

In the "Key to the Indian Species of *Ethusa*," as published by Major Alcock in the J. A. S. B. vol. lxxv. part ii. no. 2 (1896), the species will be placed with *E. andamanica* in part 2 of the first division, being divided from it by the distinction that the external orbital spines are long, acute, and project beyond the level of the frontal spines, and the body being hairy.

The species will be figured in the "Illustrations to the Zoology of the R.I.M.S. 'Investigator.'"

MACRURA.

Fam. Thalassinidæ.

CALOCARIS, Berl.

Calocaris Alcocki, sp. n.

Description of an adult female.—Carapace laterally compressed and smooth. Rostrum long, narrow, and curved upwards, deeply grooved on its upper surface, the margins of the groove being produced backwards as well-defined ridges over the anterior part of the carapace, and giving rise on either side to a small spine directed upwards and forwards. The rostrum itself has two small spinules on its left margin, one on its right. All the regions of the carapace are smooth and devoid of hair. A slight median carina runs the whole length of the carapace. The abdomen is longer than the carapace, smooth, non-carinated.

Eyestalks short, eyes rudimentary; no traces of pigment or cornea.

The second antennæ have their first or basal joint unarmed, the second joint has two fixed spines. A short internal spine and an external, which is longer, but which does not reach the next joint. From the second joint there also arises an articulatory spine or scaphocerite, which projects but for a

very short distance over the third joint. The third joint is slender and very long, longer than the other three segments taken together; both it and the fourth joint, which is short, are unarmed.

Flagellum long. Epistome well developed.

The chelipeds are long and slightly asymmetrical; coxa unarmed; the ischium has one small spine above at its proximal end, two small spines below at its distal. Merus very long, flattened laterally, and curved on itself; at the upper border of its distal end is a prominent spine. Carpus unarmed. The palm has a large spine distally on its upper border. The chelæ are narrow and long (but not so long as the palm); on the right side the margins are sharp, finely dentate, with curved crossed tips. On the left side the chelæ are imperfect.

Second pair of legs slender, with small perfect chelæ; remaining legs slender, with short curved dactyli.

With the exception of a few hairs on the last and penultimate joints all the legs are naked.

The female genital openings are easily seen, and there is a tubercle in the position of the male openings.

Eggs large, blue in life.

The outer plate of the large swimmeret has a diagonal suture running obliquely from its outer to its posterior border. There is a spinule at the outer end of this, but none along the course of the suture. No spinules on the inner plate. The telson is longer than broad, with a rounded end.

Colour in life reddish, in spirit yellowish white.

Adult ♂.

	millim.
Length of rostrum	5
" carapace to base of rostrum.....	16½
" abdomen with telson	32
" chelipeds:	
Ischium	4
Merus	16
Carpus	7
Palm.....	11
Fingers.....	10

One adult female dredged off the north-east of Ceylon in Sta. 266, in 542 fathoms, lat. 8° 36' 15" N., by long. 81° 20' 30" E.

I have placed this new species in the genus *Calocaris* of Bell, in spite of its having a styloid scaphocerite on the peduncle of its second antennæ, a point which Faxon has

thought of sufficient importance to found a new genus (*Catastacus*) on. Moreover, Bell, in his description of the genus *Calocaris*, says that the second antennæ have "a large triangular scale reaching to the end of the first joint," and gives a figure of it at the head of his description of the only species. The length of this scaphocerite seems to be only a matter of degree; it is very short in the species which has just been described, it is longer in *Calastacus investigatoris*, And., and *Calastacus felix*, and longest of all in *Calastacus stilirostris*, Faxon.

C. Alcocki is easily distinguishable from *C. Macandreae* by the general naked appearance of the body and legs and by the marked differences in the rostrum and chelipeds.

From *Calastacus stilirostris* by the short external spine and scaphocerite on the second antennæ, the rostrum being grooved, the gastric area being smooth, and by differences in the chelipeds and the telson.

From *C. investigatoris* and *C. felix* by the carapace having no hairs and not being granular, in having shorter spines on the second antennæ, no denticle at the end of the carina, and the abdominal terga smooth, and by differences in the rostrum, telson, and chelipeds.

The species will be illustrated in an early issue of the "Illustrations of the Zoology of the R.I.M.S. 'Investigator.'"

LXIV.—*Diagnoses of new Fishes discovered by Mr. J. E. S. Moore in Lake Tanganyika.* By G. A. BOULENGER, F.R.S.

I. Cyprinidæ, Siluridæ.

Capoeta tanganicæ.

D. 12. A. 8. L. lat. 68-70. L. tr. $\frac{13-14}{14-15}$.

Depth of body $3\frac{3}{4}$ to 4 times in total length, length of head 5. Diameter of eye $3\frac{1}{2}$ in length of head, 2 in interorbital width; a very small barbel. Third ray of dorsal very strong, ossified. Caudal peduncle twice as long as deep. Olive above, each scale darker at the base, silvery white beneath.

Total length 320 millim.

North end of Lake Tanganyika.

*Barbus platyrhinus.*D. 11. A. 8. L. lat. 40. L. tr. $\frac{5\frac{1}{2}-6\frac{1}{2}}{5\frac{1}{2}}$.

Depth of body $3\frac{1}{4}$ times in total length, length of head 4. Snout broad and rounded, twice as long as eye, which is $5\frac{1}{2}$ times in length of head, $2\frac{1}{2}$ in interorbital width; barbels two pairs, subequal, as long as eye. No bony dorsal ray. Ventral below middle of dorsal. Caudal peduncle $1\frac{2}{3}$ as long as deep. $3\frac{1}{2}$ scales between lateral line and root of ventral. Olive-brown above, golden yellow beneath.

Total length 390 millim.

South of Usambura.

*Barbus altianalis.*D. 12. A. 8. L. lat. 35. L. tr. $\frac{6\frac{1}{2}}{5\frac{1}{2}}$.

Depth of body equal to or slightly greater than length of head, 4 to $4\frac{1}{4}$ times in total length. Snout moderately broad and rounded, $1\frac{1}{2}$ to $1\frac{2}{3}$ as long as eye, which is 5 to $5\frac{1}{2}$ times in length of head, 2 in interorbital width; barbels two pairs, subequal, as long as or a little longer than eye. Third dorsal ray very strong, bony, not serrated. Longest anal ray $\frac{5}{6}$ length of head, nearly reaching caudal when folded. First ventral ray corresponding to origin of dorsal. Caudal peduncle twice as long as deep. 3 scales between lateral line and root of ventral. Olive-brown, very dark above.

Total length 350 millim.

Lake Kivu and Rusisi River, N.E. of Tanganyika.

*Barbus serrifer.*D. 10. A. 8. L. lat. 28-30. L. tr. $\frac{4\frac{1}{2}-5\frac{1}{2}}{5\frac{1}{2}}$.

Depth of body 3 to $3\frac{1}{2}$ times in total length, length of head 4 to $4\frac{1}{3}$. Snout rounded, as long as or a little longer than eye, which is 4 to $4\frac{1}{3}$ in length of head and $1\frac{1}{3}$ to $1\frac{1}{2}$ in interorbital width; barbels two pairs, posterior longer, twice as long as eye. Third dorsal ray very strong, bony, strongly serrated. Last ventral ray below first of dorsal. Caudal peduncle $1\frac{1}{2}$ to $1\frac{2}{3}$ as long as deep. 3 scales between lateral line and root of ventral. Olive-brown above, silvery white below; a greyish stripe above lateral line; a small blackish spot at base of caudal.

Total length 120 millim.

North end of Lake Tanganyika.

*Barilius Moorii.*D. 12. A. 16-17. L. lat. 56-60. L. tr. $\frac{10-11}{7}$.

Depth of body equal to length of head, 4 times in total length. Mouth extending to below anterior third or centre of eye. Anal originating below middle of dorsal. 3 scales between lateral line and root of ventral. Silvery, brownish on the back; about 10 dark vertical bars on the body; dorsal blackish at the end.

Total length 115 millim.

North end of Lake Tanganyika.

*Barilius tanganicæ.*D. 13. A. 20. L. lat. 82. L. tr. $\frac{13}{7}$.

Depth of body equal to length of head, $4\frac{1}{4}$ times in total length. Mouth extending to below posterior border of eye. Anal originating below posterior third of dorsal. 4 scales between lateral line and root of ventral. Silvery, olive on the back; 16 or 17 dark vertical bars on the body.

Total length 260 millim.

North end of Lake Tanganyika.

Chrysichthys brachynema.

D. I 6. A. 12-13.

Head little longer than broad, smooth above; snout twice as broad as long; diameter of eye 5 to 6 times in length of head; maxillary barbel $\frac{1}{2}$ or $\frac{2}{3}$ length of head, outer mandibular $\frac{1}{3}$ or $\frac{1}{2}$; nasal barbel not or but scarcely longer than diameter of eye; teeth on the palate forming a broad crescentic or horseshoe-shaped band on the vomer and pterygoids. Dorsal spine $\frac{1}{3}$ or $\frac{2}{3}$ length of head. Adipose fin measuring $\frac{1}{3}$ or $\frac{1}{2}$ its distance from the rayed dorsal. Pectoral spine very strongly serrated. Caudal deeply notched, with obtusely pointed lobes. Olive above, white beneath.

Total length 400 millim.

Several specimens from Kalambo and Usambura.

Synodontis granulosus.

D. I 7. A. 11.

Head granular above; eyes supero-lateral; maxillary barbel simple, as long as or a little longer than the head;

mandibular barbels with short simple branches; anterior mandibular teeth very short, 40 to 42. Adipose dorsal 4 times as long as deep, $2\frac{1}{2}$ to $3\frac{1}{2}$ times as long as its distance from the rayed dorsal. Humeral process narrow, keeled, sharply pointed. Body covered with granular papillæ. Olive above, yellowish beneath; dorsal, anal, and paired fins black in front, orange behind; caudal black, edged with orange.

Total length 230 millim.

North end of Lake Tanganyika.

LXV.—Note on Diatoms from Chincha Guano.

By C. MERESCHKOWSKY.

[Plate XVI.]

I HAVE, through the kindness of Mr. E. Thum, of Leipzig, been provided with a very interesting slide containing a great number of Diatoms from Chincha guano (in Peru). Having carefully studied the various forms which it contains and determined the species so far as possible with the aid of the few books at my disposal, I give in the present note a list of forty-one forms accompanied by a few remarks concerning several of them and by the description of some new species and varieties.

The majority of Diatoms of which the Chincha guano material is composed belong to the group Anaraphidieæ or Cryptoraphidieæ. Different kinds of *Biddulphia*, small species of *Coscinodiscus* and *Chatoceros*, represented by a great number of species, form the greatest bulk of this material. There are only a few representatives of the group Raphidieæ and still fewer belonging to the group Pseudoraphidieæ, or Bacilloideæ, as I propose to call this group*.

1. *Diploneis vacillans*, var. *delicatula*, Cl. Very rare.
2. *Navicula Henedyi*, var. *subrostrata*, nov. var. (Pl. XVI. fig. 14.) Very rare.

Size small, length 0.044 mm., breadth 0.025 mm.: valve elliptic, with slightly rostrate apices; lateral areas moderately

* In a note which will soon be published I have separated the Nitzschioideæ and Surirelloideæ from the rest of the Pseudoraphidian Diatoms, and given to the latter the name Bacilloideæ, while the former have been united in a new group called Carinatæ.

large, smooth, with almost parallel internal margins; marginal striæ 11 in 0·01 mm., axial striæ 13–14 in 0·01 mm. Puncta indistinct.

Among the numerous varieties of this species enumerated by Cleve* there is not a single one which is described as having valves with rostrate ends. I think therefore that the above-described form belongs to a new variety. From its small size it might be referred to the *varietas minuta*, Cl. (size, according to Cleve, 0·027–0·05 mm.), or the *varietas tahitensis*, Cl. (size 0·04–0·045 mm.); but as Cleve does not give in his 'Synopsis of the Naviculoid Diatoms' a sufficient description of these two varieties and I do not possess his work 'On New and Rare Diatoms,' where they are figured, it is impossible for me to ascertain whether it is so or not. It seems, however, not very probable that this form belongs to the first variety on account of the striæ, which are here 11 in 0·01 mm., while in the *varietas minuta* they are 8–10 in 0·01 mm. The same reason makes it even more improbable that the above-described variety belongs to the *varietas tahitensis*, which has 13–14 marginal striæ. From Tahiti I know another variety of *Navicula Henedyi*, the valves of which have also subrostrated apices; but this latter (Pl. XVI. fig. 15) differs from the *varietas subrostrata* in the lateral areas, which are of a somewhat different shape, their interior margins being divergent; the ends of the valve are also more or less elevated. I will give the description of the variety from Tahiti in a future note on Polynesian Diatoms; I give here the figure of the latter in order to make the comparison of both forms easier.

3. *Trachyneis aspera*, Ehr. Rather rare.

4. *Pleurosigma nicobaricum*, Grun. Rare.

Cleve, in his 'Synopsis of the Naviculoid Diatoms' †, attributes to this species a length of 0·14 mm. I have seen a specimen attaining 0·267 mm. in length, with a breadth of 0·036 mm., not differing in other respects from the description which Cleve gives of this species.

5. *Cocconeis costata*, var. *pacifica*, Grun. Very rare.

6. *Cocconeis scutellum*, Ehr. Rather rare.

* Cleve, 'Synopsis of the Naviculoid Diatoms,' part ii. p. 58.

† *L. c.* part i. p. 36.

7. *Grammatophora angulosa*, Ehr. Very rare.

There exist at least two different forms similar in their general aspect, but differing in the striæ, which are usually confounded. In one of them the striæ are distinctly seen under a moderately high magnifying-power (12-14 striæ in 0.01 mm.), while in the other they are invisible under such conditions (about 20 striæ in 0.01 mm.). The Chinchá form belongs to the latter, which I consider to be the genuine *G. angulosa*, the other belonging to a quite different species.

8. *Grammatophora maxima*, Grun. Rare.

This species has been found hitherto, so far as I know, only in a fossil state in Californian deposits (Redondo, Santa Monica, San Pedro, Monterey, &c.). I have seen several beautiful specimens in the Chinchá guano, and it is also sometimes to be found in a living state in California.

9. *Sceptroneis caduceus*, Ehr. Rare, and always in a broken condition.

Attains a large size, over 0.1 mm.

10. *Chætoceros bicoronata*, sp. n. Very rare.

Of this species I have seen only a single endocyst, which in its general outlines, as well as in the disposition of the awns, resembles greatly the endocysts of *C. seiracanthus*, Gran, recently described by H. Gran*. It differs essentially from the latter in having a corona of spines not only on one of the margins of the median part of the endocyst, but on both; the spines are also much stronger than represented in the figures of Gran. Unfortunately I neglected to make a drawing of this species at the time I found it, and afterwards I did not meet with it again.

11. *Chætoceros borealis*, Bail. Rare.12. *Chætoceros chinchæ*, sp. n. (Pl. XVI. figs. 3-7.) Not very rare.

Of this species I know only the endocysts, which have a very peculiar appearance. Their form is elongated elliptical, with rounded ends; the margins are provided with short, more or less irregular spines, which become shorter towards

* H. Gran, in 'Norske Nordhavs-Expedition,' plate iii. figs. 40, 41.

the ends of the valve ; they do not form any regular row, as in other species, but are disposed at rather variable intervals one from another, and their apices are usually not very acute, often bent in a hook, sometimes bifid (fig. 6). The surface of the valve shows very peculiar, coarse, irregularly contorted lines or markings, resembling somewhat Arabic inscriptions or shorthand writing signs ; these markings are sometimes distributed all over the surface of the valve, and in this case the diatom has a striking resemblance to *Liradiscus ovalis*, Grev., the more so as the general outlines of both are nearly the same * ; but usually the lines or markings are not so numerous, sometimes even more scantily represented than in the figure 4, and sometimes there are only a few of them, as shown in the figure 5. As will be seen from fig. 7, these lines or markings are irregular membranaceous ribs elevated over the surface of the valve.

Length : 0.024 0.0245 0.0265 0.027 0.031 0.042 0.042 0.049
 Breadth : 0.013 0.014 × 0.0145 × 0.014 × 0.015

13. *Chætoceros diadema* (Ehr.), Gran. Common.

A very characteristic species, of which I have seen not only the endocysts, but the frustules also. Filaments of this species with endocysts enclosed in their cellules have been recently observed and figured by H. Gran †.

14. *Chætoceros didymus*, Ehr. Very common.

15. *Chætoceros incurvus*, Bail. Rather rare ; known only by its endocysts. (Pl. XVI. figs. 1, 2.)

This very peculiar species is easily recognized by the disposition of the four awns with which the endocysts are provided. The figures given by Brightwell are correct as to their general outlines, but this author has failed to represent the granulation of the surface of the valves ; the granules are small and irregularly scattered over the whole surface of the body of the endocysts (figs. 1, 2). In the above-cited work of H. Gran we find the description of a new species of *Chætoceros*—the *Chætoceros cinctus*, Gran, which has endocysts very similar to those of *C. incurvus*, Bail. ‡, differing

* It would not be surprising if *Liradiscus* should prove to be the endocyst of some unknown species of *Chætoceros*.

† H. Gran, in 'Norske Nordhavs-Expedition,' plate ii. fig. 18.

‡ H. Gran, *l. c.* plate ii. figs. 23-27.

only in the greater relative length of the awns and the size, which seems to be larger; the surface of the endocysts is also granulated. It might represent only a variety of *C. incurvus*.

I give here some measurements of the latter:—

General length :	0·023	0·028	0·029	0·027	×
Length of the valve :	$\frac{0·014}{\times}$	0·019	0·019	0·0195	$\frac{0·021}{\times}$
Breadth of the valve :		0·010	0·010	0·009	0·0115

16. *Chætoceros Lorenzianus*, Grun. Very common.

17. *Chætoceros peruvianus*, Brightw. Rare.

There are a few more species of this genus, which, however, I was unable to determine.

18. *Rhizosolenia styliformis*, Brightw. Very common.

19. *Skeletonema costatum* (Grev.), Cl. Very common.

20. *Skeletonema costatum*, var. *spiralis*, var. nov. (Pl. XVI. fig. 8.) Not rare.

Differs from the type only in the oblique disposition of the spines, which unite the frustules together; the degree of inclination of the spines is variable, and there are always some frustules in the same filament whose spines are straight, as in the type species.

Although *Skeletonema costatum* is known to me from very different localities all over the world, I have never before seen such a spiral disposition of the spines; it seems therefore advisable to regard the present form as a separate variety.

21. *Eucampia zodiacus*, Ehr. Rather rare.

22. *Biddulphia* (*Triceratium*) *alternans*, Bailey. Very common.

23. *Biddulphia* (*Triceratium*) *alternans*, var. *variabilis*, Brightw. Rare.

These two forms are generally regarded as belonging to two distinct species—the second being characterized by the irregular form of the valve, its concave margins and the acute apices of the three ends; the first having a regular form, straight margins, and broadly rounded apices. The examination of both of these species from Chincha guano, in which

the first (*B. (T.) alternans*) is very frequent, has shown me without any doubt that they cannot be considered two different species, being connected one with the other by all possible intermediate forms. Usually the *B. (T.) alternans* has regularly triangular valves, with the three apices of equal length; but there occur forms in which, while one or two apices are broadly rounded, as in the type species, the other one (or sometimes two) is acute and has the peculiar irregular appearance which characterizes the *varietas variabilis*.

In figs. 9, 10, I have represented some of these intermediate forms. As to the structure of the valve, it is identical in both, and their size is also the same.

B. (T.) alternans being the more common form, I regard it as the type species and the other as its variety.

24. *Cyclotella striata* (Kütz.), Grun. Rare.

Diameter from 0·0185 to 0·031 mm.

25. *Auliscus sculptus*, var. *cœlata*, Bail. Rare.

The only specimen observed agreed pretty well with the figure of Bailey.

26. *Actinoptychus undulatus*, Ehr. Not very rare.

Often with a small process placed on the submarginal median portion of each alternate compartment, sometimes of all compartments.

27. *Actinoptychus areolatus*, Brightw. Rather rare.

Seems to be only a variety of the preceding species.

28. *Actinoptychus splendens* (Schadb.), Ralfs. Rare.

29. *Asteromphalus flabellatus* (Bréb.), Grev. Not very rare; a widely distributed species.

30. *Asteromphalus heptactis* (Bréb.), Ralfs (Pritchard, Inf. pl. viii. fig. 21; *Spatangidium Ralfsianum*, Norm. Micr. Journ. vii. (1859), pl. vii. figs. 7, 8; *Asteromphalus Ralfsianus*, A. Schmidt, Atlas, pl. xxxviii. figs. 5-8)*. Rather rare.

* The above-cited synonyms are given after Cleve, "Report on the Phyto-Plankton collected on the Expedition of H.M.S. 'Research,' 1896," Fifteenth Annual Report of the Fishery Board for Scotland, part iii. p. 297.

31. *Asteromphalus malleus* (or *malleiformis*), Wall., var. *pacifica*, var. nov. (Pl. XVI. figs. 11, 12.) Not very rare.

Valve almost circular or slightly ovoid, with the upper part (containing the median ray) a little narrowed. The median ray is placed more or less asymmetrically, forming an acute angle with the longitudinal axis; its central part is conical; 8 rows of puncta in 0.01 mm., the puncta bordering the rays being a little larger than the others.

Length: 0.043 0.046 0.051 0.057
 Breadth: 0.041 0.0455 0.050 0.057

This diatom greatly resembles the type species from the Indian Ocean which has been described by Wallich, differing from it in the central part of the median ray. In the type species this central part is quadrangular, with a deep constriction in the middle, dividing it into two parts of equal size and shape; in the var. *pacifica* this part has never such an appearance, being of a more or less conical form. In order to show more clearly this difference I have reproduced in the fig. 13 the type species as given by Wallich.

Although this difference is very constant, occurring in all specimens which I have observed, and there is another difference consisting in the asymmetry of the median ray, still it seems to me that these characteristics are too trifling to be of any specific value. I think it therefore more reasonable to consider the Pacific form simply a variety of the Indian species.

32. *Asteromphalus variabilis*, Grev. Very rare.

Resembles exactly figure 7 of Greville, but has distinct puncta, which are, I suppose, omitted in Greville's figures.

33. *Coscinodiscus radiatus*, Ehr. Rare.

34. *Coscinodiscus radiatus*, var. *asteromphala*, Ehr. Very rare.

The large central alveoles surrounding a small hyaline circular spore are provided with elongated puncta along their periphery.

35. *Coscinodiscus excentricus*, Ehr. Very common.

36. *Coscinodiscus gigas*, Ehr. Rather common.

37. *Coscinodiscus perforatus*, var. *cellulosa*, A. S. Rare.

38. *Coscinodiscus polyacanthus*, Grun. Not rare.

Resembles *C. subtilis*, but has numerous marginal spines.

39. *Coscinodiscus subconcausus*, Grun. Not very rare.

40. *Coscinodiscus subtilis* (Ehr.?), Grun. Rare.

Without marginal spines.

41. *Spermatogonia antiqua*, Leud. & Fortmorel. (Pl. XVI. figs. 16-21.) Not rare.

This curious form, as to the nature of which there still exist some doubts, was originally found in Java; but it seems to be a widely distributed species. Besides the Chincha guano, I have observed it in New Guinea (Tami Islands) and very often among diatoms from the Adriatic Sea (Triest), and Cleve has recently found it in the Plankton of the Atlantic Ocean*.

The inflation at the lower end is not triangular, as described by Leudiger and Fortmorel, but has exactly the form of the head of a human spermatozoon. The frustule is usually not straight, but more or less sigmoidally bent. The upper part is enlarged and terminates in a point; one margin of the enlarged portion is more straight, the other is always convex, sometimes angular (fig. 17). The striæ are not capitate, as described by the authors, this appearance being due to the fact of their crossing the double outlines of the frustule. It might be that the striæ are superficial ribs, which give to the margins a somewhat indented appearance of the same kind as in *Thalassiothrix*, although in a much lesser degree. The number of striæ is 8 in 0.01 mm.; they gradually disappear near the lower end. Figure 21 represents a small and straight individual with an obscure longitudinal line which might possibly be a kind of keel.

Length:	0.096	0.118	0.126	0.152	0.161	×
Breadth:	0.003	0.0024	0.0035	0.004	0.004	0.005

The Chincha guano contains also a form known as *Actiniscus sirius*, Ehr., which, however, is not a diatom, but

* Cleve, 'A Treatise on the Phytoplankton of the Atlantic and its Tributaries' (Upsala, 1897), p. 25.

rather belongs to the so-called Silico-Flagellatæ. I have found this same form in California and in the Mediterranean.

EXPLANATION OF PLATE XVI.

- Figs. 1, 2. Chætoceros incurvus*, Bail. Endocysts.
Figs. 3-7. Chætoceros chincha, Mer. Endocysts. (Fig. 6 in a somewhat oblique position; fig. 7 in profile.)
Fig. 8. Skeletonema costatum, var. *spiralis*, Mer.
Figs. 9, 10. Intermediate forms between Biddulphia (Triceratium) alternans, Bail., and *varietas variabilis*, Brightw. The puncta are not represented.
Figs. 11, 12. Asteromphalus malleus (malleiformis), var. *pacifica*, Mer.
 $\frac{900}{1}$
Fig. 13. Asteromphalus malleus (malleiformis), Wallich, reproducing the figure of Wallich. $\frac{400}{1}$.
Fig. 14. Navicula Hennedyi, var. *subrostrata*, Mer.
Fig. 15. Another variety of N. Hennedyi from Tahiti.
Figs. 16-21. Spermatogonia antiqua, Leud. & Fortm.

LXVI.—*Some new African Theraphosoid Spiders in the British Museum.* By R. I. POCKOCK.

Family Theraphosidæ.

Subfamily EUMENOPHORINÆ, Poc.

Genus HYSTEROCRATES, Sim.

A few weeks ago the Trustees of the British Museum acquired by purchase seven large Theraphosoid spiders which were captured on the island of St. Thomas in the Gulf of Guinea, and were offered to the British Museum under the name *Selenocosmia Greeffi* of Karsch. Who may be responsible for the identification I know not, but examination showed the specimens to be referable to three perfectly distinct species, neither of which is identical with the species described by Karsch, if any reliance is to be placed on the description of the latter.

The species may be described as follows:—

Hysteroocrates didymus, sp. n.

? *Phoneyusa Greeffi* (Karsch), Simon, Hist. Nat. Araignées, i. p. 153 (1892).

♀.—*Colour.* Integument deep blackish brown, hairy clothing a rich ruddy olive-brown, with paler tips to the

segments of the legs; legs without distinct pale lines; carapace, abdomen, and femora more sooty than the remaining segments of the legs.

Carapace normal in form, shorter than patella and tibia of fourth or of first leg, and than protarsus and tarsus of fourth, and than patella, tibia, and tarsus of palp; its width subequal to or a little less than distance between ocular tubercle and posterior emargination, equal to or slightly exceeding femur of fourth leg, less than femur and patella of third leg; no perceptible transverse groove in front of fovea.

Mandibles tubercular in front.

Legs 4, 1, 2, 3 in length, fourth exceeding the first by the length of its tarsus; fourth leg not in any sense thickened, the height of the femur not quite a third of its length (7:23.5); patella and tibia narrower than femur, patella a little thicker and higher than tibia; tibia cylindrical, about three times as long as high or wide (18:5.5); length of upperside of patella more than twice its height or width.

Palp with tarsus tumid at base, being proximally higher and wider than tibia (woodcut, fig. *b*, p. 493).

Measurements in millimetres.—Total length 58; carapace 28, its width 25; length of first leg 73, of second 62, of third 60, of fourth 84; patella and tibia of first 29, of fourth 30; protarsus and tarsus of fourth 31, of first 22.

Loc. Island of St. Thomas in the Gulf of Guinea (*Mocquerys coll.*).

This species is probably the same as that determined by Simon as *Phoneyusa Greeffi*, Karsch, which, according to Simon, has the tarsus of the palp tumid above at the base. Karsch's description contains nothing to justify this statement, no special modification of this segment being mentioned. Since, moreover, the length of the legs in *P. Greeffi* is, according to the description, different from that of the legs in the form here described, I am compelled to regard the two as specifically distinct.

Hysterochrates scepticus, sp. n.

♀.—In appearance and structure closely resembling the preceding, but with the tarsus of the palp normal and the legs shorter as compared with the carapace, the latter being longer than the patella and tibia of first or fourth legs.

Most nearly allied to *H. hercules**, Poc., from Jebba, up

* In the description of this species the carapace stands as 34 millim. long. Including the posterior epimeral piece (which, consistently, should be included), the length is 35.5.

the Niger (P. Z. S. 1899, p. 844), and like that species in presenting a shallow transverse groove in front of the fovea, but certainly differing in the much greater inequality in length between the first and fourth legs. In *H. hercules* the first leg falls short of the fourth by nearly half the length of the tarsus of the fourth, whereas in *H. scepticus* it falls short by more than the length of the tarsus; the fourth leg in *H. hercules* is exceptionally short, its patella and tibia being less than those of the first.

Measurements in millimetres.—Total length 63; length of carapace 32, its width 27; first leg 74·5, second 63, third 60, fourth 86; patella and tibia of first leg 30, of fourth 31; tarsus and protarsus of fourth 31; femur of fourth 24·5, its height 7; tibia 17·5, its width 5.

Loc. Island of St. Thomas in the Gulf of Guinea (*Mocquerys coll.*).

Hysterochrates apostolicus, sp. n.

♀.—Resembling *H. scepticus* in having the tarsus of the palp normal, but distinguishable by the much greater length and strength of the fourth leg.

Fourth leg strong, rather thicker than the first, the femur three times as long as high (22 : 7), the tibia a little less than three times as long as wide (16 : 5·5); height of tibia equal to that of patella; the patella and tibia or protarsus and tarsus are very noticeably longer than the carapace, the whole limb surpassing the first leg in length by its tarsus and one third of its protarsus.

Carapace about equal to patella and tibia of first leg and to patella, tibia, and tarsus of palp; no transverse groove in front of the fovea.

Measurements in millimetres.—Total length 51; carapace 25·5, its width 22; length of first leg 62·5, of second 53, of third 52, of fourth 79; patella and tibia of first 25, of fourth 28; protarsus and tarsus of fourth 28·5.

Loc. Island of St. Thomas in the Gulf of Guinea (*Mocquerys coll.*).

Of the species that occur on the mainland, *H. apostolicus* approaches *H. gigas*, Poc. (P. Z. S. 1897, p. 762, and 1899, p. 845), from the Cameroons, and *H. laticeps*, Poc. (*op. cit.*), from Old Calabar. From the former it may be recognized by its broader carapace and by having the carapace shorter instead of longer than the patella and tibia or protarsus and tarsus of the fourth leg; from the latter by having the patella and tibia of the fourth greater than of the first leg instead of

equal, and by the fourth leg exceeding the first by more than its tarsus in length instead of by less than its tarsus.

The only species of this group previously recorded from St. Thomas is that described by Karsch as *Selenocosmia Greeffi*, the generic position of which is still a little doubtful. In his original description (SB. Ges. Naturwiss. Marburg, 1884, p. 60) Karsch writes, when describing the legs, "Die Metatarsen der beiden Hinterpaare an der Spitze unterhalb mit . . . Scopula"; whereas subsequently (Berl. ent. Zeit. 1886, p. 83) he says "Scopula an Metatarsus iv. fast hart bis zur Basis des Gliedes reichend." These statements clearly involve either an error of identification, the author confounding two distinct genera as one species, or of observation. Simon has assumed the latter to be the case, and, following him, I have on the strength of the assumption referred *S. Greeffi* to the genus *Hysterochrates*. If, however, as is possible, the specimens that Karsch first described as *S. Greeffi* have the scopula on the fourth protarsus confined to the apex of the segment the species will fall no doubt into *Phoneyusa*.

Assuming that it falls into *Hysterochrates*, the known species from the island of St. Thomas may be tabulated as follows:—

- | | |
|---|----------------------|
| a. Legs short; first leg just exceeding twice the length of the carapace (62:30); fourth leg only twice and one sixth the length of the carapace (according to Karsch). | <i>Greeffi</i> . |
| b. Legs longer; first leg* not less than twice and one third the length of the carapace; fourth leg not less than twice and two thirds the length of the carapace. | |
| a ¹ . Tarsus of palp swollen at base, wider and higher than tibia..... | <i>didymus</i> . |
| b ¹ . Tarsus of palp normally cylindrical, not wider than tibia. | |
| a ² . Fourth leg not thickened; carapace a little longer than its patella and tibia or protarsus and tarsus.. | <i>scepticus</i> . |
| b ² . Fourth leg a little thickened; carapace considerably shorter than its patella and tibia and protarsus and tarsus | <i>apostolicus</i> . |

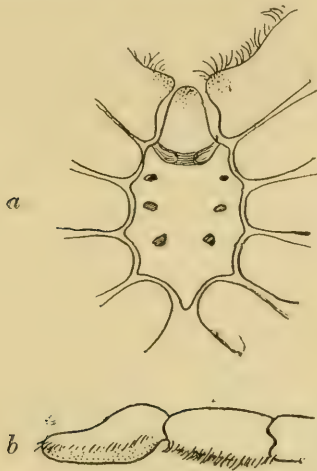
CITHARISCHIUS, gen. nov.

Resembling *Phoneyusa*, Karsch (with which, pending a re-examination of the types, I provisionally include *Harpaxotheria*, Sim., and *Pelinobius*, Karsch), in the restriction of the

* The legs are here measured from the base of the femur. Karsch's measurements may contain a greater number of segments, but cannot contain a smaller. I have assumed that they contain the same. If they contain a greater number of segments, the shortness of the legs in *Greeffi* is even greater than here represented.

scopula of the fourth protarsus to the apical third of the segment, but distinguishable from all the known genera of the subfamily by the size and peculiar shape of the labium, which is as long as half the length of the sternum, has the form of a truncated cone, being so much narrowed anteriorly that its apical width is only half the basal width, the apex itself being rounded and not transversely truncated (woodcut, fig. *a*). Moreover the third and fourth legs are much stouter than the first and second.

Type *Citharischius Crawshayi*, sp. n.



a.—*Citharischius Crawshayi*, gen. et sp. n. Labium and sternum.
b.—*Hysterochrates didymus*, sp. n. Extremity of palpus, ♀.

Citharischius Crawshayi, sp. n.

♀.—*Colour*. Integument reddish brown, hairy clothing rusty red, shining with silky lustre, and brighter in tint on the distal segments of the legs than on the femora, carapace, and abdomen.

Carapace much longer than wide, the width less than the distance between the ocular tubercle and the posterior median emargination; length equal to that of patella, tibia, and half the protarsus of first leg, exceeding patella, tibia, and tarsus of palp, just exceeding patella and tibia of fourth leg, but barely equal to protarsus and tarsus of fourth.

Legs 4, 1, 2, 3 in length: third and fourth much more robust than first and second, first a little more than twice as long as the carapace; second and third subequal, less than

twice as long as the carapace, fourth more than twice and a half as long; first leg falling short of fourth by the tarsus and one fourth of the protarsus of the latter; no spines on legs except at apices of protarsi beneath; femur of fourth considerably less than three times as long as high (23:9); tibia about as wide as high, less than three times as long as high ($16\frac{1}{2}$:6); patella rather more than twice as long as high (15:6 $\frac{1}{2}$); the inner side of the patella, tibia, protarsus, and tarsus pseudoscapulate—that is to say, the hairs are short, erect, close-set, and equal in length like those of a mole's skin; on the protarsus this peculiar modification of the hairy clothing extends well on to the upper and under-side of the segment.

Measurements in millimetres.—Total length 52; length of carapace 33, its width 25.5; length of palpus 47, of first leg 69, of second leg 64, of third leg 63, of fourth leg 85; patella and tibia of first 27, of fourth 31.5.

Loc. Kinani, British East Africa.

A single female specimen, collected and presented, together with a male of *Phoneyusa Bettoni*, Pocock, by Mr. Richard Crawshay.

The distinctive features of the undoubted genera of Eumeno-phorinæ, a subfamily of Theraphosidæ characterized by the presence of a remarkable stridulating-organ between the basal segments of the palpus and first leg (an organ described in P. Z. S. 1897, p. 772, and figured in the 'Zoologist,' 1898, pp. 14–21), may be tabulated as below:—

- | | |
|--|------------------------|
| a. Scopula on fourth protarsus extending almost to base of segment. | |
| a ¹ . Fovea of carapace large and wide | <i>Loxomphalia.</i> |
| b ¹ . Fovea of carapace small, crescentic | <i>Hysterochrates.</i> |
| b. Scopula on fourth protarsus confined to distal third of segment. | |
| a ² . Tarsal scopula of fourth leg divided by a broad band of setæ | <i>Eumenophorus.</i> |
| b ² . Tarsal scopula of fourth leg undivided. | |
| a ³ . Labium very long, conical, half the length of the sternum; fourth leg much thicker than first | <i>Citharischius.</i> |
| b ³ . Labium less than half the length of sternum; fourth leg not thicker than first. | |
| a ⁴ . Anterior tibia of male with spine-tipped spur | <i>Monocentropus.</i> |
| b ⁴ . Anterior tibia of male unarmed. | |
| a ⁵ . Fovea large, straight | <i>Anoploscelus.</i> |
| b ⁵ . Fovea small, crescentically procurved . . | <i>Phoneyusa.</i> |

LXVII.—*Descriptions of new Genera and Species of Hymenoptera.* By P. CAMERON.

[Continued from p. 419.]

The Males of Icaria.

Bingham, in his 'Hymenoptera of India,' does not describe the male sex of any species of *Icaria*. Saussure, in his 'Étude sur la Fam. d. Vespides,' only describes the male of one species, from which it would appear that the males must be rarer than the females or workers.

The male of *I. ferruginea* is of the same size as the female, and agrees with it in general coloration. The underside of the scape, the eye-incision, the face, clypeus, and mandibles are pale yellow; the clypeus is strongly punctured, except at the apex; the clypeus is broader than long, is slightly convex, and is roundly and broadly incised in the middle, the sides being oblique; the fifth and following joints of the antennæ are roundly incised, the incision becoming deeper towards the apex; the apical joint is deeply incised, almost hook-shaped, somewhat as in *Eumenes*.

The male of *variegata* has the middle of the front, the eye-incision, the clypeus, and mandibles lemon-yellow; the clypeus is smooth, the incision on its top is somewhat horseshoe-shaped, deep and black; the lateral keel does not reach to it; the flagellum becomes gradually thicker to the penultimate joint, the joints are not incised, the last is about three times longer than the preceding and is broadly curved on the lower side; on its inner side beneath it is broadly hollowed, the hollow bordered by a keel, which is obliquely curved. The pro- and mesopleuræ are for the greater part yellow, streaked with rufous; the mesosternum is also yellow; the mesonotum blackish; the scutellum, postscutellum, and metanotum are also yellow; the yellow band on the apex is one fourth of the length of the segment and has a black band at its base; the other segments are for the greater part yellowish; the petiole is shorter than the second segment by about one fourth, and it is distinctly longer than it is in the ♀. In length it is 12 millim.

I am not certain, but this may be the male of *artifex*, with which, in some points, it agrees better than it does with the female of *variegata*. The petiole appears to be intermediate between the two, being larger than in *variegata*, but not so long compared with the second segment as in *artifex*. The last joint of the antennæ is longer compared with the preceding than it is in *ferruginea* and is differently formed; the joints preceding it, too, are simple, not incised, as in *ferruginea*.

Icaria quadrimaculata, sp. n.

Brunnea, flavo-maculata; petiolo segmentoque 2^o flavo-bimaculatis; alis hyalinis, nervis stigmatæque nigris. ♂.
Long. 10 mm.

Hab. Bengal, probably Barrackpore (*Rothney*).

Antennæ blackish, the scape yellow below; the flagellum below and at the apex above brownish; the last joint is shortly but distinctly longer than the preceding. Head brownish; the eye-incision, the face, clypeus, and outer orbits narrowly yellow; the vertex and front are thickly covered with silvery pubescence; the frontal keel is stout and extends to the top of the clypeus, which is roundly incised in the middle; the sides are oblique. Mandibles yellow, like the clypeus, with the teeth black. Thorax brownish; a narrow line on the pronotum, the base of the propleuræ narrowly, a conical mark below the tegulæ in front, a smaller more oval one below it behind the furrow, a large irregular mark on the mesopleuræ on the lower side behind, a mark below the hind wings, the base of the scutellum (more broadly laterally), the postscutellum, and two marks on the metanotum, lemon-yellow. Legs fuscous, the anterior lighter in tint; the tarsi black; the apex of the hinder tibiæ and of the hinder femora yellowish. Wings hyaline; the radial cellule infuscated. Abdomen brownish black: two spots on the node of the petiole near the middle, two in the centre of the second segment, and lines on the sides of the others, two large marks on the second segment beneath, broad lines, narrowed in the middle, on the base of the third to sixth, and the last broadly, lemon-yellow. The petiole is long and slender and not nodose at the apex, it becoming only gradually and slightly wider towards the apex from the middle.

This species is not, I am sure, the unknown male of *I. fuscipennis*; it appears to be too small; the markings on the thorax and abdomen are smaller and of a distinct lemon-yellow colour, not pallid; the head and abdomen are darker, more distinctly black in colour.

Icaria ornaticeps, sp. n.

Nigra, late flavo-maculata, fronte mesonotoque flavo-lineatis; pedibus posticis nigris, coxis apiceque femorum flavis; alis hyalinis, apice fumatis, nervis stigmatæque nigris. ♀.
Long. 8 mm.

Hab. Khasia Hills. Coll. *Rothney*.

Antennæ black; the scape yellow; the flagellum rufous beneath, densely covered with pale pubescence. Head black, the outer orbits entirely below, more narrowly above, the inner orbits from shortly above the top of the eye-incision (broadly below the incision, more narrowly above), a large irregular mark on the middle of the front extending from the ocelli to the base of the antennæ, the clypeus (except round the edges), and an irregular line in the centre above, a curved line on the sides behind the ocelli, and the mandibles, lemon-yellow. The mandibular teeth are black at the apex. Thorax black; the prothorax at the base, on the sides broadly (especially on the upper half, where it extends to the middle of the pleuræ), two lines on the centre of the mesonotum at the base, the sides of the scutellum widely, the base of the postscutellum widely, the median segment (except in the middle), a large irregular mark on the base of the mesopleuræ under the wings, an irregular mark on the lower side at the apex, its base prolonged backwards below, and an elongated mark above the hinder coxæ, lemon-yellow. The thorax is thickly covered with a pale pile and is impunctate; the short furrow on the metapleuræ black. Legs black; the fore coxæ, the four posterior (except broadly at the base below), a line on the fore femora in the middle in front, the apex broadly below, the apical half of the middle, the apex of the posterior, with a streak in the centre, the fore tibiæ behind, and a mark on the middle pair, lemon-yellow. Wings hyaline, the costa, stigma, and nervures black; the radial cellule with a broad black cloud in front. Abdomen black; a pear-shaped mark on the side of the petiole, two large irregular marks on the base of the second segment, its base below broadly, its apex all round narrowly, the sides of the third broadly, lemon-yellow. The petiole is about two thirds the length of the second segment and becomes gradually wider towards the middle; the apical half is of uniform width; the second segment cup-shaped, widely rounded at the base; the second cubital cellule is much narrowed above; both the recurrent nervures are received behind the middle of the cellule.

Easily known by the yellow marks on the head and mesonotum.

Icaria rufocollaris, sp. n.

Nigra; capite, prothorace, scutello, dimidio apicali petioli apiceque segmenti secundi rufis; apice clypei, basi postscutelli medioque metanoti flavis; alis fuscis, nervis nigris, stigmatibus testaceo. ♀. Long. 13 mm.

Hab. Khasia Hills. Coll. Rothney.

Antennæ black, the scape and the greater part of the second and third joints rufous; the flagellum of a duller rufous colour beneath. Head rufous; the vertex, occiput, the edges of the clypeus, and a large mark in its centre black; the apex of the clypeus pallid yellow. Mandibles dull rufous, their base pallid yellow, the teeth black. Front and vertex distinctly and closely punctured; the clypeus with some scattered punctures, its apical tooth sharp, distinct; below each antenna is a short, deep, oblique furrow. Thorax black; the pronotum, a large oblique mark on the mesopleuræ, and the greater part of the scutellum rufous; the base of the postscutellum and the middle of the median segment pale lemon-yellow. Pro- and mesonotum with the scutellum closely punctured and thickly covered with pale pubescence; the postscutellum punctured at the base only; the median segment finely transversely striated. Pro- and mesopleuræ closely punctured, the punctures almost forming reticulations; the lower part of the metapleuræ obscurely punctured. Legs black, the four anterior coxæ yellow below; the femora and tibiæ rufous, black above; the tarsi black. Wings fuscous, the front and apex smoky; the nervures and costa black; the stigma testaceous; the second cubital cellule is much narrowed at the top; the first recurrent nervure is received near the base of the apical third of the cellule. Abdomen black; the apical dilated half of the petiole, the sides of the second segment narrowly at the junction between the dorsal and ventral parts, and a narrow line before the apex, rufous; the apex itself is yellow.

The male has the face and clypeus pallid yellow, this being also the case with the lower part of the eye-incision; the front and vertex are entirely black; there are two large yellow marks on the sternum between the four front legs; the neck of the second segment and a streak along the sides at the base are yellow; otherwise as in ♀.

Comes near *I. speciosa* and *ungulata*; easily known from them by the rufous prothorax. Instead of there being a detached spot on the base of the second segment there is a short yellow line laterally at the extreme base.

Icaria nigroplagiata, sp. n.

Ferruginea; metathorace nigro, medio flavo; abdominis segmento 2° basi biflavo-maculato, apice flavo; alis fere hyalinis, apice fumato, stigmatibus flavo, nervis nigris. ♀.

Long. 11 mm.

Hab. Khasia Hills. Coll. Rothney.

Antennæ dark rufous; the flagellum blackish above. Head thickly covered with short pale pubescence; the front and vertex closely covered with round, not very deep punctures; the ocellar region black. Clypeus yellow, its edges and a broad band down the middle black, the black edged with rufous, sparsely punctured and thickly covered with silvery pubescence, its top broadly roundly incised in the middle; the lower half of the outer orbits is black. Thorax rufous; the postscutellum and a large mark in the middle of the metanotum (incised at the top and bottom) lemon-yellow. Pro- and mesothorax with the scutellum closely and distinctly punctured; postscutellum smooth. Median segment obscurely striated; the yellow mark on it does not extend far below the middle. The punctuation on the metapleuræ is obscure. Legs dark rufous, the coxæ, trochanters, femora, and hinder tibiæ darker coloured; the fore coxæ largely, the middle slightly, marked with pale yellow; they are thickly covered with white hair. Wings hyaline; the radial cellule and the upper part of the apical cubital cellules smoky; the top of the second cubital cellule is as long as the space bounded by the second recurrent and the second transverse cubital nervures. The narrowed basal half of the petiole is black; the node is longish; the petiole distinctly longer than the second segment; the second and following three segments are closely punctured and thickly covered with pale hair; the two yellow marks on the base of the second are irregular in shape; the apical band is narrow.

This species is closely related to *I. artifex*; it may be known from it by the metathorax being entirely black, except for the yellow mark on the middle of the metanotum, by the scutellum not being furrowed down the middle, by the yellow mark on the metanotum being smaller, it not extending much beyond the middle, the pleuræ entirely without yellow, and the head is more broadly developed behind the eyes, especially above.

Icaria carinata, sp. n.

Ferruginea; abdomine nigro, flavo-maculato, basi ferruginea; alis fusco-hyalinis, stigmatate nervisque nigris. ♂.

Long. 15 mm.

Hab. Khasia Hills. Coll. Rothney.

Comes into Bingham's Section A a (*l. c.* p. 286), in which it will form a new division, distinguished by having the second and following segments of the abdomen black. Antennæ ferruginous, the flagellum darker above. Head ferruginous

darker above; the face thickly covered with silvery pubescence; the antennal tubercles longish, extending equally below and above the antennæ, and sharply keeled down the middle; the front and vertex closely punctured, closely transversely above the antennæ; the sides narrowly and the apex of the clypeus broadly pale yellow; the apex of the clypeus broadly rounded, not projecting in the middle. Mandibles pale yellow, thickly covered with silvery pubescence; the teeth black; the palpi pale yellow. Thorax dark ferruginous; a narrow line on the base of the postscutellum and two large marks (longer than broad and oblique at the base and apex) on the apex of the median segment lemon-yellow. The scutellum is darker coloured than the mesonotum and is widely furrowed down the centre on the apical half; the postscutellum is finely longitudinally striated in the centre. The median segment is narrowly furrowed at the base, the rest with the furrow much wider; the segment is thickly covered with short fuscous hair and is obscurely transversely striated; the furrow is blackish on the apical two thirds. The propleuræ below, the mesopleuræ above, and the base and apex of the metapleuræ more or less blackish. Legs dark rufous; the four hinder femora infuscated above; the tibiæ black, except in front, the tarsi for the greater part black. Wings hyaline, with a fuscous tinge; the radial cellule and the apex of the costal cellule smoky. Petiole dark rufous, blackish at the base and apex; the rest black; there is a broad yellow band on either side of the second segment at the base; two smaller ones on the base of the third; a mark on the sides of the fifth near the middle; the last segment is broadly obscure yellow on the base. The apex of the petiole is yellowish and sharply bordered laterally; the basal three fourths of the second and third segments, the basal half of the fourth, the base of the fifth narrowly, and a longer semicircular mark on the base of the sixth, yellow.

A very distinct species, intermediate between Bingham's sections "A. Reddish or ferruginous brown, with yellow markings," and "B. Black, with red or yellow markings."

Icaria Wroughtoni, sp. n.

Long. 15 mm.

Hab. Poona (*Wroughton*).

Comes into Bingham's section "A. Reddish or ferruginous brown, with yellow markings," and "a. Second abdominal segment with no transverse yellow band on its apical margin," which now stands:—

Abdomen with no yellow markings; the scutellum not furrowed	<i>guttatipennis.</i>
Abdomen with large yellow markings; the scutellum deeply and widely furrowed behind	<i>Wroughtoni.</i>

Antennæ rufous, darker towards the apex. Head rufous; the antennal tubercles and the apex and sides of the clypeus broadly lemon-yellow; the antennal tubercle punctured, narrowly keeled in the middle; the clypeus with scattered shallow punctures, its sides oblique, ending in the middle in a black blunt tooth; the apex of the clypeus with scattered punctures; the face bears a white pile; the clypeus is sparsely covered with long fuscous hair, black along the apex. Mandibles yellow; the teeth black. Thorax rufous; the pleuræ more or less and the sides of the median segment yellow. Scutellum broadly furrowed down the middle. Median segment broadly furrowed down the middle, the top, sides, and furrow blackish, the centre yellowish, the furrow finely transversely striated. Propleuræ broadly lemon-yellow round the edges, except behind; the lower part sharply keeled at the base, the lower part behind the coxæ raised, hollowed above the raised part; there is a bifurcated furrow on the mesopleuræ, from the centre of which a furrow runs obliquely to the fore coxæ. On the metapleuræ below the wings is a curved furrow; behind this is an obliquely striated space; the base of the pleuræ more coarsely striated, the striated part becoming wider on the lower part. Metapleuræ finely obliquely striated. Legs rufo-testaceous, the coxæ yellowish. Wings hyaline; the radial cellule and the upper part of the costal smoky; the costa and stigma rufo-testaceous; the nervures slightly paler, especially towards the apex. Petiole rufous above, the sides yellowish; the other segments ferruginous, the second to the fifth with two large transverse yellow marks; the second ventral segment is for the greater part yellow; the others broadly yellow at the base.

Icaria fuscipennis, sp. n.

Long. 13-14 mm. ♀.

Hab. Khasia Hills. Coll. Rothney.

Comes into Bingham's section A and is closely related to *I. carinata*, with which it agrees in having the abdomen black and the wings fuscous-hyaline, but may be known by the shorter petiole, by the pleuræ and sternum being marked with yellow, by the mesonotum having two yellow lines, by the four hinder legs being largely marked with black and

yellow, and by the second abdominal segment being marked with yellow at the base. In the presence of the two yellow marks on the base of the second abdominal segment it agrees with *artifex* and *variegata*, from which it is otherwise very distinct.

Antennæ dark rufous, darker above; the scape yellow below. Head dark rufous; the clypeus, the inner orbits to the top of the eye-incision, the upper half of the antennal tubercle, the outer orbits (narrow above, broader below) from near the top to the base of the mandibles, the palpi, the mandibles (except at the apex), a transverse line on the pronotum above, one on its sides, the postscutellum, two large marks on the metanotum, an oblique squarish mark under the tegulæ, a larger oblique one (narrowed at the base) on the lower side on the apex of the mesopleuræ, a mark on the top of the metapleuræ, triangularly dilated below, on the sides of the mesosternum is a large mark turned outwardly at the base and largely dilated at the apex, on the apex is a larger oblique mark, at the tubercles a smaller one, and on the lower half of the metapleuræ is a large mark, incised in the middle above, and the base of the propleuræ, all clear yellow. Scutellum narrowly furrowed in the middle from the base to the apex; the median segment widely but not deeply furrowed down the middle. Wings fuscous-hyaline; the apex of the costal cellule and the radial cellule smoky, especially above. The four front legs yellowish, the trochanters, the femora in front (except at the apex), the basal half of the tibiæ, and the basal joint of the tarsi fuscous; the middle coxæ broadly on the inner side below, the basal half of the femora, the basal two thirds of the tibiæ and the tarsi black; the hinder legs similarly coloured, but with the black more extended. Petiole dark rufous; the sides (except at the apex) and a mark on the sides of the dilated part, two large marks on the sides of the second segment at the base, two large marks on the base of the third, two smaller ones on the base of the third and two large marks on the last segment, the sides of the petiole beneath, a large mark (narrowed at the base) on the base of the second, a large transverse line (dilated at the sides) on the base of the third, and a narrower one on the base of the fourth segment, lemon-yellow. The sides of the clypeus are oblique, its middle ending in a short blunt tooth; the antennal tubercle is large; the edge of the pronotum is sharply keeled above; the thorax above thickly covered with short white pubescence.

Icaria tinctipennis, sp. n.

Ferruginea; abdomine, coxis femoribusque posticis nigris; alis fusco-hyalinis, nervis stigmatæque nigris. ♀.
Long. 21 mm.

Hab. Khasia Hills. Coll. Rothney.

Antennæ rufous; the basal joints of the flagellum darker above. Front and vertex shagreened, thickly covered with fulvous pubescence; the part between the antennæ projecting, keeled in the middle. Clypeus shining, sparsely punctured, thickly covered with fuscous hair; the apex in the middle forming a distinct tooth. Mandibles pilose, sparsely and distinctly punctured; the teeth deep black. Thorax rufous; the edges of the mesonotum, a line down the centre, the apex of the mesopleuræ, the part along the sutures, the breast, the base of the metapleuræ, the central furrow of the metanotum and its sides black. The entire thorax is thickly covered with short pubescence, which has a fulvous tint on the mesonotum; the pleuræ are shagreened; the metanotum obscurely transversely striated. The nervures are paler, more testaceous in tint than the costa and stigma; the second cubital cellule above is distinctly wider than the space bounded by the two recurrent nervures; the space bounded by the second and by the third transverse cubital nervures is slightly but distinctly wider than the space enclosed by them. Legs coloured like the thorax; the coxæ, the hinder trochanters, and the hinder femora blackish; the four hinder tarsi are infuscated. Petiole longer than the second segment, the node becoming slightly and gradually narrowed towards the apex; the third segment is one third longer than the fourth, which is equal in length to the fifth.

The differences between this species and *I. fulvinerva* may be best shown in synoptical form:—

Petiole rufous; wings yellowish; the fourth abdominal segment distinctly longer than the fifth	<i>fulvinerva</i> .
Petiole black; wings not yellowish; the fourth abdominal segment equal in length to the fifth.	<i>tinctipennis</i> .

The petiole is stouter and more distinctly dilated towards the apex, the scutellum is not furrowed down the middle, and the propleuræ not striated as in *fulvipennis*. It is one of the largest of the Indian species.

Icaria fulvinerva, sp. n.

Ferruginea; abdomine nigro, petiolo ferrugineo; tarsis posterioribus nigris; alis flavo-hyalinis, nervis stigmatæque rufis. ♀.
Long. 17-18 mm.

Hab. Khasia Hills. Coll. Rothney.

Antennæ ferruginous; darker above, the scape brownish. Front and vertex alutaceous; the incision and the inner orbits black; the front with a narrow furrow in the middle; the part between the antennæ projecting, its sides oblique, the centre keeled. Clypeus shining, of a brighter colour than the front, sparsely punctured, its apex thickly fringed with fulvous hair. Mandibles dark ferruginous, sparsely punctured, the teeth black. Thorax thickly covered with a silky pile. Mesonotum and scutellum shagreened, the latter with a shallow furrow down the middle. The striæ on the metanotum not prominent and absent from the furrow, which is shallow and black on the apical half. The lower half of the propleuræ striated; the furrow on the mesopleuræ black, deep, its basal fork not continued to the base and not much longer than the apical. Legs coloured like the body; the four hinder tarsi black above and for the greater part below; the calcaria pale. Wings hyaline, with a distinct yellowish tint, especially in front; the second cubital cellule is fully more than half the length of the third above and slightly less than the space bounded by the first transverse cubital and the first recurrent nervures; the latter is received shortly in front of the middle. Petiole rufous, longish, its node not much dilated; it is nearly as long as the second and third segments united; all the segment very smooth and covered with a silky pile.

A distinct species, easily known by the red head, thorax, and petiole, black abdomen, and fulvous wings.

Odynerus hindostanus, sp. n.

Long. 9 mm. ♀.

Hab. Barrackpore (*Rothney*).

Agrees closely with *O. sibilans*; differs from it in the yellow mark on the front being separated from the yellow lateral marks, in the clypeus being broader compared to its length, it being broader than long, its sides are not so straight and its apex in the middle is more distinctly incised, and the second ventral segment bears two large yellow marks.

Antennæ black, the scape yellow, the flagellum rufous beneath. Head black; the clypeus, a somewhat crown-

shaped mark on the front, the eye-incision, and the posterior orbits yellow. Vertex closely, the front somewhat more widely punctured. Clypeus wider than long, its sides roundly curved; the apex with a shallow incision. Mandibles yellow, the apex broadly rufous. Thorax black; a broad mark on the sides of the pronotum (the two almost touching), the tegulæ, a large mark under the tegulæ, the scutellums, and the sides of the median segment broadly, yellow. Pro- and mesothorax closely and strongly punctured, the upper basal slope of the pronotum, the base and apex of the mesopleuræ, the base of the metapleuræ, and the middle of the metanotum smooth; the punctuation on the median segment is slight, its centre is broadly and slightly hollowed and is keeled down the middle. Legs yellow; the anterior coxæ entirely, the four posterior behind, the anterior femora at the base behind and the posterior entirely (except at the apex), black; the four posterior tibiæ are marked with black behind. Wings fuscous-hyaline, the apex violaceous; the second cubital cellule much narrowed above, scarcely one fifth the length of the third. Abdomen black; the apical half of the petiole broadly at the nodes and the apex entirely, a large irregular mark (wider than long) on the sides of the second segment, its apex broadly, widest in the middle, the apex of the third to fifth, and the sixth broadly in the middle, yellow. On the second segment beneath are two yellow marks; its apex and that of the third broadly yellow.

The male is similarly coloured; there is less black on the legs; the yellow mark on the front is prolonged between the antennæ as a short streak; the flagellum is black, except at the apex; the yellow on the scutellum is narrowed and incised in the middle.

Odynerus Antoni, sp. n.

Niger, dense albo-pilosus; basi clypei, linea pronoti lineaque abdominis segmentis 1^o et 2^o rufis; alis fusco-violaceis. ♂.

Long. 7 mm.

Hab. Barrackpore (*Rothney*).

Antennæ entirely black, except the apical claw, which is brownish; it is thick and reaches to the base of the eleventh joint. On the head, the base of the clypeus broadly, a mark between the antennæ, and a small mark behind the eyes are brick-red; the front and vertex are closely and strongly punctured and covered with long white hair; the keel between the antennæ is stout. Clypeus roundly convex, sparsely punctured, thickly covered with white, somewhat depressed pubescence; its apex depressed and slightly roundly incised

in the middle. Pro- and mesothorax strongly rugosely punctured, covered thickly with white hair; the pronotum is transverse at the base, its sides triangularly projecting; on the posterior half of the mesonotum are two shallow furrows. Apex of postscutellum rounded. The apex of the median segment has an oblique slope and is transversely aciculated; it is bounded above and at the sides with a stout keel, which is bent down towards the centre above; from this a narrow keel runs down the middle. Pro- and mesopleuræ strongly punctured; the punctures large and distinct; there is a somewhat triangular red mark at the tubercles. Metapleuræ finely and closely longitudinally aciculate; the upper half irregularly longitudinally striated. Legs black; the anterior tibiæ entirely in front and the middle pair at the base testaceous. Wings fuscous-violaceous, the posterior pair paler; the second cubital cellule above not quite one half the length of the third. Abdomen black; the first and second segments lined with black on the apex; the petiole has an oblique slope on the base and is sharply keeled above; it is somewhat strongly but not closely punctured; the other segments are obsoletely punctured; the base of the second is crenulated.

Allied to *O. sikhimensis*.

Note.—At p. 415 *antea*, for *Polistes khasianus* read *P. lepcha*.

[To be continued.]

BIBLIOGRAPHICAL NOTICES.

Catalogue of Eastern and Australian Lepidoptera Heterocera in the Collection of the Oxford University Museum.—Part II. *Noctuidæ*, *Geometridæ*, and *Pyrilidina*. By Colonel C. SWINHOE, M.A., F.L.S., F.Z.S., F.E.S. *Pterophoridae* and *Tineina* by the Right Hon. Lord WALSINGHAM, M.A., LL.D., F.R.S., &c., High Steward of the University of Cambridge, and JOHN HARTLEY DURRANT, F.E.S., Memb. Soc. Ent. France. With eight Plates. (Oxford, Clarendon Press, 1900.) Pp. vii, 630.

THE importance of public collections of insects depends partly on the number of species accurately named, and partly on the possession of types, by which the descriptions of the original describers of a species can be checked or verified. The original specimens on which species are founded should always find their way eventually into public collections; for private collections are not always easy of access, and their contents are almost sure, sooner or later, to be lost or dispersed. Great Britain is peculiarly rich in public collections, and may boast of a considerable number of the types of Linné, preserved by the Linnean Society; though Queen Ulrica's collection, from which Linné likewise described many species,

remains at Stockholm. Fabricius, the pupil of Linné, and his worthy successor in entomology, was much in England, and described the insects in the collections of Sir Joseph Banks, Dr. Hunter, and others; and though some of these types are missing, a large proportion are still preserved in the British Museum (Natural History) and also in Glasgow.

Oxford University Museum contains no types of the last century; but the nucleus of its entomological collection consists of the united collections of Hope and Westwood, to which large additions have been made from other sources, especially from the collection of Wilson Saunders, which was specially rich in the types of moths described by Francis Walker from the collections formed by Dr. A. R. Wallace in the Malay Archipelago. As Walker's descriptions are frequently short and unsatisfactory, it was a matter of considerable scientific importance to verify them as far as possible from the original types; and hence the present work was undertaken by Col. Swinhoe, and the first volume, containing Sphinges and Bombyces, and illustrated by eight plates, was published in 1892. The second volume, just issued, and twice the thickness of the first, completes the subject. It is a full synonymic catalogue of the Eastern and Australian moths in the Oxford Museum, and special attention has been paid to the elucidation of Walker's types, a considerable number of which are figured, as well as many new species which are now described and figured by Col. Swinhoe and his coadjutors for the first time.

Books like the present are of great use to all entomologists who are working at exotic moths, and we cordially recommend Col. Swinhoe's work to their special attention.

Sexual Dimorphism in the Animal Kingdom. By J. T. CUNNINGHAM, M.A. London: Adam and Charles Black, 1900.

Colour in Nature. By MARION I. NEWBIGIN. London: John Murray, 1898.

IN the production of the first-mentioned book, the nucleus of which appeared in the pages of the now unhappily extinct 'Natural Science,' Mr. Cunningham has, without doubt, spared neither time nor pains. As a result, he has brought together a considerable number of facts of real and lasting value. Whether, however, his interpretation of these facts will find favour with students of this subject is another matter: we shall be surprised if he succeeds in making a single convert.

Mr. Cunningham is Lamarckian in principles. His object has been, he tells us, not to "attempt to prove that acquired characters are inherited," but "merely to point out how remarkably the multitudinous facts all agree with the hypothesis that secondary sexual characters are due to the inheritance of acquired characters." This very cautious statement of his case looks somewhat as though Mr. Cunningham were a little afraid of the ghost which he has conjured up.

The beard of man, and especially of the Caucasian races, it is suggested, owes its conspicuous development to the stimulation of

the growth of the hair by tugging of the teeth or hands in the combats of mature males. But, as Mr. Cunningham remarks, "It is unlikely that men should fight in the way suggested after they had reached even the stage of evolution known to us in the lowest existing savages, for they seem always to fight with weapons." Thus, from the dawn of man's evolution the stimulation which Mr. Cunningham invokes has ceased to act, at least with any degree of periodicity; therefore by the tenets of his faith these secondary sexual characters should have disappeared, from disuse. After all, as Mr. Cunningham remarks, "what is wanted is evidence concerning the influence of mechanical irritation of the hair-follicles in the growth of the hair."

The common fowl, we are reminded, in fighting erects the long neck-hackles, "which accounts for their elongation." The blows of the beak upon the head received during these contests had similarly been made to account for the comb and wattle. The crest of the peacock has been produced, we are solemnly informed, like the comb of the common cock, by strokes of the beak, which, being less violent, have plucked at the feathers instead of injuring the skin, and so causing an outgrowth from it.

Are we to account in the same way for the two remarkable feathers which depend, one on either side of the head, in the King of Saxony's Bird of Paradise? or the wonderful balls of down which invest the legs of the humming-birds of the genus *Spathura*?

The brilliantly coloured bare skin of the cassowary is the result of the irritation, we are asked to believe, "produced by the blows of the beaks of the birds when fighting . . . the habit of fighting with the beak also explains the presence of the bony crest on the skull."

As a matter of fact the cassowary fights not with the beak, but with the legs, which by powerful down-strokes can inflict serious injuries. No one who knows anything of the structure of the helmet of the cassowary would suggest that its existence was due to blows of the beak.

We venture to think that the above instances are indicative that Mr. Cunningham has failed to seriously injure the case for sexual selection, which, as yet, it must be admitted, holds the field, even though it may fail to satisfy us as an explanation of all the problems which it is called upon to solve.

As a whole we may say of this book that it contains many new things and many good things; but the new things are not good and the good things are not new. Nevertheless it will doubtless be widely read and will find a place on the bookshelves even of those who differ from Mr. Cunningham on this very important subject. It is well printed, well illustrated, and nicely got up.

In the little work on 'Colour in Nature' we have an undoubtedly important contribution which will enable us to test the value of much that has hitherto been of a purely speculative nature. The book has probably by this time become tolerably well known. To those who have not yet made its acquaintance we would recommend it as an extremely interesting and helpful work.

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LXVIII.—*A suggested Origin of the Segmented Worms, and the Problem of Metamerism.* By H. M. BERNARD, M.A. Cantab.

DURING the last five years in which I have been working at the stony corals, the Cœlenterata, as an animal group, have been more or less continuously in the foreground of my imagination. I do not pretend to have seriously worked at any other than the Madreporaria; yet the fact just stated will, I trust, be accepted as some excuse for the following article. In it I propose to show how the Cœlenterates may have given rise to the segmented Worms. The idea forced itself upon me by its simplicity, and, although not altogether new, it has never, so far as I am aware, been stated as here proposed. I may add that I am still further impelled to trespass beyond the region of my own serious studies by perceiving that, if there is any truth in the suggestion, it offers a possible solution to that vexed problem "What was the origin of the mesoderm?"

In the geological record metamerism first appears in the Trilobites, which are constructed of a number of segments jointed together. With the exception of a head-piece and, in most cases, a tail-piece, which differ from one another and

from the other joints, all the segments in the typical Trilobite are alike in form; they diminish in size, however, progressively from front to back. Further, with regard to the head-piece, it is not difficult to see that this has been built up of a certain number of fused and thus modified segments. The same is true of the tail-piece, as we gather not only from its markings but also from the fact that some of the very oldest Trilobites are found without any such specialized fusion of segments. Characteristic of the Trilobite segment is the pair of immense pleural folds, which can only be regarded as secondary specializations. We conclude, then, that the Trilobites must have been descended from some form made up of simpler segments, *i. e.* of segments without pleuræ, and that these segments, with the exception of the first, containing the mouth, and the last, containing the anus, were in all respects similar in form, but *diminished progressively from the oral to the anal end.*

We look elsewhere, then, for more primitive segmentation than that which we find in these ancient fossils. We have not far to look, for there exists a group in which it attains its greatest development, the primitive segments being apparently but little altered by secondary specializations. I refer to the segmented Worms. In typical forms we have here a long string of segments, the first and the last alone being peculiar; all the rest, no matter how many, are structurally exact repetitions of one another. Not only are the appendages and markings of the segments faithfully repeated from segment to segment, but if cut open the internal machinery of each segment, excluding the reproductive, is found simply to repeat the internal machinery of that which precedes it; muscles, nerves, blood-vessels, excretory organs, are all more or less exactly repeated.

That metamerism reaches its highest development in the Worms there can then be no doubt; hence it is to animals below the Worms in structural complexity that we must look for its origin. Where segmentation or vestiges of it are found in animals above the Worms—for instance, we have traces of it in ourselves—we are justified, in the absence of clear evidence to the contrary, in assuming that it has been derived from Annelidan ancestors. It is to my mind almost outside the bounds of probability that such a remarkable repetition of parts could have been developed twice on quite independent lines.

Now the problem is, How did such an animal come into being? Several interesting suggestions have been made,

but zoologists have not been able to agree as to the process which best satisfies the conditions. But, on the other hand, zoologists are all, I think, agreed that the form which comes with the greatest probability next below the typical segmented Worm is the Cœlenterate; for as yet no satisfactory position has been found for the other groups of vermiform animals, and though we usually place them near one another, we travel outwards from the typical Annelid towards these groups with uncertain steps. We only reach solid ground again when we come to the Cœlenterates. Morphologists have, indeed, long recognized that the Cœlenterate body marks a well-defined stage in the evolution of the Metazoa. The mechanism is simple, yet very perfect, for the two primary functions of animal life, the vegetative and the reproductive. Its success may be gathered from the extraordinary wealth of the Cœlenterates still peopling the waters of our planet both in numbers and in forms. But we are justified in assuming that this success has attended them from their first appearance in early geological periods, bearing in mind that, as we go back to simpler conditions of environment—simpler in the fact that many animal forms preying and to be preyed upon were not then evolved,—the variations in form would be less and less numerous, until we reach a time when the simplest of all conceivable types of Cœlenterate was the only representative of the race.

It is to the Cœlenterates therefore that we naturally look first for the ancestors of the segmented Worms, and more than one attempt has been made to sketch the form-changes which would be necessary. So far as I remember, the earliest and, to my mind, the best suggestion refers the segmented Worms to the serial budding which is known to occur among the Cœlenterates, *e. g.* in the “strobila.” This is, however, so far only a suggestion; I know of no attempt to work it out in detail; one apparently insuperable difficulty blocks the way, *viz.* the presence, in the Annelids, of the cœlomic cavities, which are unknown in the Cœlenterates. Prof. Sedgwick* proposes to deduce the cœlomic cavities of the Annelids from the mesenterial chambers (“gastric pouches”) of a Cœlenterate-like ancestor. This would not explain the addition of new segments, progressively diminishing in size, at the posterior end. The method of the increase in the number of the mesenteries which takes place in the higher Cœlenterates is quite different. It seems to me that the reference of

* Quart. Journ. Micr. Sci. xxiv. (1884).

segmentation to serial budding is singularly apt. No group of animals before or since, excluding perhaps the Protozoa, have shown such marvellous developments of this method of reproduction. The number of successful colony-formations among the Cœlenterates, both stationary and free-swimming, is perfectly bewildering. We have, then, in this power of increase by budding a wealth of possibilities upon which we can safely draw without putting any strain whatever upon our sense of what is probable. I go even further, and think it possible to show that free-swimming strings of buds must at one time have existed as a necessary interaction between an organism like the Cœlenterate, capable of budding anywhere, and its environment.

I prefer, then, to go lower down among the Cœlenterates than Prof. Sedgwick, lower down either phylogenetically or ontogenetically, for the origin of the Annelids—*i. e.* to forms either primitive or larval, and before the mesenteries (which, I think, developed as muscular bands drawing and holding in the primitive mouth in order to form an œsophageal infolding*) appeared.

The chief assumption which we have to make, then, is that some free-swimming ciliated Cœlenterate of the very simplest type, instead of becoming early attached, continued to be free-swimming long enough to put out buds. There is nothing improbable in this. Drifted away by currents, thousands must have missed finding anything to attach themselves to. In times before the seas swarmed with carnivorous fish or Crustacea—both, I believe, descendants of the Worms whose origin we are discussing—there would be abundance of opportunity for some of these unattached forms to lead a free-swimming life with safety, feeding on still simpler forms, animal and vegetable.

* This method of deducing the Scyphozoa with ectodermal gullet from the Hydrozoa without ectodermal gullet is to my mind preferable to the belief, entertained by Sedgwick and others, that the mesenteries were developed primarily as folds for the increase of the digestive surface. The differentiation of the muscles round the primitive mouth into radiating bundles could hardly fail to result in the formation of internally projecting folds, the body being but a flexible sac frequently distended by fluid. The more strongly these ridges developed the more permanent would be the tucking of the primitive oral aperture into the body, the ectoderm around it becoming the lining of an œsophageal tube. The advantages to the organism not only of this more perfect mouth, with its stronger sphincter and radial muscles, but also of the increase in the digestive surface afforded by the mesenterial folds, would lead to its further development.

We merely assume, then, that a certain number of forms remained free-swimming long enough to feed and to grow and to put out buds. Now, without going so far as to say that there is only one place where such a free-swimming form *could* bud and yet continue to pursue its active life, viz. at its hinder end, it is certainly clear that the most likely place for a bud to appear would be at the posterior end. Not only would any other place make forward locomotion impossible, but at the hinder end the conditions seem to be more favourable than anywhere else. The external pressure would here, in the wake of the animal, be less than anywhere else in the body—indeed, during rapid forward swimming there would be something like suction at this spot. Now if this is true for the first bud, it is surely more true for the second, and it seems clear that we get all the conditions for rapid serial budding: for the addition of the first bud, by increasing the number of available cilia, would propel the animal faster through the water; this greater speed would enable more food to be swallowed, part of which would find its way into the bud, while at the same time it would still further diminish the external pressure of the water at the extreme hinder end, and we have still more favourable conditions for the formation of a second bud behind that already formed, and so on. If there is any probability in this argument at all, it would seem that the more buds there were the faster would buds be produced, until some limit, presently to be discovered, was reached.

But apart from this argument, and merely bearing in mind the wealth of colony formation developed among the Cœlenterates, is there not full justification for believing that round the shores of the ancient seas, soon after the primitive forms appeared, there would be free-swimming individuals trailing behind them longer or shorter strings of buds diminishing in size progressively backwards? Of these, some, we may fairly assume, would sooner or later again give up more or less completely the laborious free-swimming life and become creeping forms. It is in this direction that I should be inclined to look for the ancestors of some of the other members of the ancient class "Vermes" *.

* The Turbellarian *Microstomum lineare*, Ehr., still swims about trailing short strings of buds after it. I was once fortunate enough to get a glimpse of it living, under a high power, and saw very clearly what appeared to be typical nematocysts scattered here and there in its skin. The derivation of the Plathelminthes from primitive Cœlenterates, which gave up a free-swimming for a creeping manner of life, has much to be

But confining our attention solely to the forms which we assume persisted in their more active free-swimming habits, a vista of possibilities opens out with regard to them which seems to lead straight to the typical Annelid.

It appears at first sight as if there would be no limit to the possible addition of fresh buds, so that, excluding accidents, each original (or parent) animal would soon trail after it a string of buds of indefinite length. Mechanical difficulties, however, would most certainly sooner or later arise. The most important difficulty would, it seems to me, be the following:—The first-formed buds would have considerable difficulty in getting rid of the indigestible remains of their food. The parent animal, or first segment, was probably able to get rid of fæcal remains through the mouth; but this would be very difficult for the buds, and, indeed, progressively difficult the further back they were. The aperture leading from sac to sac we may justly presume to have been, at least primitively, very small, and it may perhaps have remained so in the immediate ancestors of the segmented Worms. Before long, therefore, particles of fæcal matter would be mixed with the food which found its way back into the last-formed bud, until in time the fæcal matter from the progressively increasing number of digesting buds would make the arrival of food-particles from the mouth impossible. Some nutriment might for a while be extracted from this fæcal matter, but the posterior segments would eventually be so poorly nourished that further budding would cease. This difficulty was hardly likely to last long. Apertures can occur almost anywhere in the Cœlenterate wall, as we know from the apertures in the walls of the Sea-anemones for the discharge of acontia. Hence a posterior opening might early be developed in order to free the terminal buds from their useless and deleterious burden*. The muscular fibres of the walls would provide the

said for it. The tentacles of *Temnocephala* may be secondary adaptations to its sessile manner of life; but the fact discovered by Professor Haswell (Quart. Journ. Micr. Sci. xxviii., 1888), that the young of the Australian forms invariably have six, while the adult has only five tentacles, is significant rather of the opposite view. My esteemed friend and teacher Prof. Arnold Lang (Text-book of Comp. Anat. pt. i.) also suggests an origin from free-swimming Cœlenterates which have secondarily adopted a creeping manner of life, but along an entirely different line, viz. through the Ctenophora, certain specialized forms of which furnishing almost ideal intermediates.

* Cf. Prof. Sedgwick's account (*l. c.*) of the possible origin of nephridial apertures out of the constricted gastric pouches, which, according to his theory, gave rise to the cœlomic chambers.

sphincters. Such an anal aperture, acquired of necessity by the lengthening chain of digesting buds, would be earlier and earlier developed by that force in living matter called heredity, which causes it to repeat itself so long as the habits of life demand.

This specialized aperture, however, would now be in the exact position from which budding had formerly taken place. Although division of highly organized cells is known in the Protozoa, it is certainly commoner in cells not differentiated for special functions. Hence we may suppose that the cells which were specialized as epithelial, muscle-, or nerve-cells to line and regulate the new opening would not divide, at least actively, but the less differentiated zone of cells immediately round these would, and by so doing push the specialized anus out in front of them, so that it would always be at the posterior end of the chain.

At first this anal aperture would have been very simple and small, but as it became more highly specialized the budding zone would retreat from the extreme tip until there appeared a regular "anal segment," the budding zone being always between it and the last-formed bud. This is, in fact, still the law in all animals that develop metamerically—the new segments are added between the anal "segment" and the one in front of it.

The mechanical difficulty due to the accumulation of fæces being thus simply got over, the possibility of further advance is instantly furnished; more food would now be passed along, and the posterior segments being better nourished, the budding process at the end could be renewed. The number of buds would, however, still be limited, as, even though fæcal matter could now be got rid of, yet as the length increased it is obvious that more fæcal matter than food would reach the posterior end of the body, which would thus be badly nourished and cease to grow. This limit could only again be surmounted by the development of a vascular system.

So far, then, we have arrived at long free-swimming strings of Coelenterate buds with a mouth at one end and an anus at the other, and with a tendency to produce fresh buds up to a limit between an anal prominence or segment and the last-formed bud. This brings us so near to the typical Annelids that it is worth seeing whether the structural differences which still separate them are insurmountable. Here I might parenthetically remark that it is just such active free-swimming organisms as those we have sketched which attain to higher levels of organization. They, least of all, would

stand still in the midst of the developing life of the sea. We have a right to expect that, if in the age of the Cœlenterates any such forms existed, profound structural modifications for the perfecting of their activities would take place in them.

The difficulty, and the only great difficulty, which lies in the way of the deduction of the typical Annelid from the hypothetical organism described above, lies in the fact, already mentioned, that the former have paired cœlomic cavities. The rise of these in the animal kingdom is still one of the great riddles of zoology. Professor Sedgwick's suggested solution, which has been deservedly widely accepted, would, I think, have satisfied me entirely had division of existing segments been the rule for their multiplication. As it is, their known method of production has always seemed to me to point so unmistakably to serial budding, that nothing which has been said on the subject has been able to deter me from watching for clues in that direction. On the other hand, his argument based upon the blastopore is very complete, and, so far as I can see, can only be attacked as coming too much within the field of purely developmental adaptations. I repeat, then, that this paper will have some value if it suggest a simple and natural line of development for these cavities—that is, a line of development without resort to any hypothetical “change of function,” which is one of the convenient stocks-in-trade of the puzzled morphologist;—if it show that in the further development of strings of Cœlenterate buds as free-swimming organisms some such mesodermal structures would inevitably arise, fulfilling essentially the same function from their earliest rudiments to their latest specialization.

We are safe in assuming that the body-cavities arose, as all new structures arise in the animal kingdom, in response to some physiological need. In the present instance we do not require to look far for that need. In the struggle for existence between such chains of Cœlenterates it is not likely that the muscles in the walls would be long kept out from assisting in locomotion. A waving of the body is a far more efficient method of propulsion than the rowing of cilia. Hence we should expect the wall-muscles in each bud to be gradually specialized into systems in order to bring about definite serpentine movements of the whole string, and, increasing in size and strength, gradually to take on the whole function of propulsion. But muscles require not only to be fed and oxygenated, but also to be relieved of the waste products of their activities. The more they are used the more elaborate must be the nutritive and excretory apparatus to enable them

to maintain their efficiency. Further, this growth and ever increasing concentration of the muscular systems of the individual buds would necessarily be accompanied by an ever increasing development of their nervous systems. These also would require to be well nourished and cleansed. The feeding and the carrying away of the waste products of this developing neuro-muscular sheath could hardly be carried on in the original Cœlenterate wall. Structural modifications, increasing in specialization as the systems they subserved became more and more perfect, were bound to take place; these, I think, we may safely outline. In the simpler stages scattered cells with fluid spaces would appear in the mesenchymal layer; their increase would result in the development of a parenchymatous tissue, with still larger fluid spaces, for a compact tissue would be a hindrance to contractility. These spaces would gradually separate the ectoderm from the endoderm—*i. e.*, on the one hand, the ectodermal layer and locomotory muscles from the digesting endoderm, the only source of nourishment; and, on the other hand, the digesting endoderm from the ectoderm, the only breathing surface. Further advance along these lines would necessitate definite streams, and ultimately a vascular system, collecting nutriment from the digesting layer and oxygen from the ectodermal. In this way, then, the endoderm and the ectoderm would be gradually divorced from each other by an increasing development of intervening tissue. The former (endoderm) would be ultimately confined to a central hollow strand, the alimentary canal, suspended and held in place by membranous tissue and wrapped round by muscles and cells split off from the early mesenchymatous or parenchymatous layer already described. In passing we may note that though the deep columnar epithelium characteristic of the alimentary canal of the Annelids could doubtless be developed at any time, still it is just possible that it may be an expression of the shrinkage of the surface due to the detachment of the endoderm from the outer wall and to its becoming the inner lining of a narrowing axial tube. The suggestion arises naturally from the remarkable difference seen between the endoderm of an expanded and that of a contracted polyp.

Here, then, we have a very simple and natural origin for the mesoderm in the Metazoa, the activities of our string of buds supplying us with an adequate reason for its development. The case is, I think, a strong one, for the muscles in each bud necessary to enable it to take its share in giving to the whole string a serpentine movement would have to be

far stronger than any which the bud itself would require had it existed as a single animal. Similarly the nervous system necessary to coordinate the movements of these muscles within each bud and with those of the buds before and behind it would have to be very much more highly developed than would have been necessary in single animals the size of the buds or segments. We need not be surprised, then, at the enormous development of the mesodermal chambers. It is significant here to note that the Turbellarians, which I am inclined to regard as the nearest existing kindred of our early strings of buds, having, with a few exceptions, lost the power of forming buds, have their muscles and nerves simply embedded in a parenchymatous tissue not unlike that which we imagine to have been a stage in the development of the mesodermal cavities of the Annelids. Neither muscles nor nerves in these single animals required the same high specialization as was required by the individuals forming the separate links in a long chain which had to move as one, comparatively speaking, immense composite organism. We thus have, in the specially pronounced development of the neuro-muscular sheath of each segment of our string of buds—a far more developed sheath, I repeat, than any single animal could possibly require,—an efficient cause to account for so highly specialized a nutritive and excretory apparatus as the mesoderm of the Annelids, with its cavities, vascular system, and nephridial funnels.

On turning to the embryological records of the mesoderm we find them confused, and, for want of a clue, frequently contradictory. We have the coelomic cavities arising in masses of parenchymatous tissue, or forming early out of very few cells, or, again, as definite invaginations. All these fall into their places in the light of the origin above assigned to the mesoderm. They are fragments and abbreviations of the true phylogenetic history. The invaginations may be either for the purpose of rapidly supplying cells or else as shortened methods of forming the coelomic cavities. They obviously serve both purposes.

We have here an excellent illustration of the difficulty of discovering phylogeny from embryology. The parenchymatous mesoderm suggests little or nothing, whereas mesodermal invaginations seem so clearly to indicate some once useful structures which, by "change of function," might have supplied the mesoderm, that they immediately acquire a greater importance than really belongs to them. One primitive function to which they have been attributed—besides

that suggested by Professor Sedgwick, that they were at one time due to foldings of the digestive layer—is the reproductive. But I cannot help remarking that the view here put forward, which regards the mesoderm as arising by gradual structural modifications in response to the simplest and most frequently recurring of life's activities, viz. to locomotion in pursuit of food—that is, to locomotion which lasts from the beginning to the end of life,—supplies us with a better motive for its production than do the needs of the reproductive function, which are periodic and confined to the adult. Further, I need hardly again emphasize the fact that the suggested origin put forward in this paper avoids all appeals to “change of function”; from its earliest rudiments to the highest specialization the mesoderm, if developed along the lines here sketched, had essentially the same function.

With the perfection of the powerful neuro-muscular sheath and the necessary mesodermal apparatus for its nutrition and excretion we have brought our strings of Cœlenterate buds near enough to the typical Annelid to show that, whether this was the true origin of the Annelids or not, it could easily have been so. It is admittedly only an outline sketch. A much closer comparative study of kindred animals and of their homologous structures would be necessary in order to fill in details. One somewhat prominent point may, however, be noted.

For the purpose of bringing about the strong lateral contractions of each segment necessary to give the whole complex its serpentine motion, the longitudinal muscles would tend to stretch from end to end of each segment. Their points of insertion would consequently be more and more concentrated at the ends of the buds, leaving the middle regions free. As already noted, the ectoderm was the only available respiratory surface. What more natural than that this middle region should become specialized for respiration, the greatly developed neuro-muscular system demanding for its efficiency ever-increasing supplies of oxygen. The necessary mechanism for obtaining this extra supply was well within reach and the structures developed would be from the first functional. I refer to the lateral skin-folds which would arise in the middle regions above mentioned every time the longitudinal muscles contracted. From this point of view the parapodia, whatever specialization and differentiation they may since have undergone, were originally nothing more than gill-folds, and they arose concomitantly with the rise and concentration of the powerful longitudinal muscles as these latter required more and more oxygen for their work.

We can thus trace our rows of Cœlenterate buds along a line of development, each step in which, so far as I can see, would be a necessary result of their locomotory activities, not as so many separate buds, but acting together as a single complex organism. This line has led us, without strain or difficulty, to the typical Annelid with its cœlomic cavities and its parapodia.

On page 2 I stated that I considered the metameric segmentation so remarkable a phenomenon that wherever traces of it can be discovered we are justified in assuming descent from Annelidan ancestors. The segmentation found so widely spread in the vegetable kingdom is a parallel phenomenon, being due to periodical buddings. In the Vertebrata we have organisms which show very distinct traces of segmentation, but complicated by the fact that their most characteristic structure, the notochord, shows no traces of having been primitively segmented. The jointing which later appears in the vertebral column has apparently been impressed upon it as a mechanical necessity by the segmented organism in which it developed. For an attempt to show how the vertebrate organization with its primitively unsegmented notochord can be deduced along what appears to be a similarly straightforward line of mechanical adaptations from an annulate ancestor, see "A new Reading in the Annulate Ancestry of the Vertebrata," *Natural Science*, vol. xiii. 1898, p. 17.

[NOTE.—This paper was written eighteen months ago, and was finally corrected for press before the appearance of Prof. Lankester's critical *résumé* of the subject in the recent instalment of his 'Text-book of Zoology.']

LXIX.—*On some little-known African Silurid Fishes of the Subfamily Doradinæ.* By G. A. BOULENGER, F.R.S.

AMONG the least-known freshwater fishes of Africa there is a group of small or very small Silurids, more or less closely allied to *Synodontis* and falling under Günther's division "*Stenobranchiæ*," which have been described in a more or less satisfactory manner by various authors under the generic names of *Mochocus*, *Rhinoglanis*, *Chiloglanis*, *Doumea*, *Atopochilus*, and *Peltura*. Having lately had the privilege of examining the few specimens of these fishes preserved in the

Paris, Hamburg, and Genoa Museums, and having received examples of new or rare species from the Nile and Congo, I have attempted to meet a long-felt requirement by drawing up original comparative descriptions of all the genera and species.

Chiloglanis <i>Ptrs.</i>	Mochocus, <i>Joannis.</i>
<i>Deckenii, Ptrs.</i>	<i>niloticus, Joannis.</i>
<i>niloticus, Blgr.</i>	Doumea, <i>Sauv.</i>
Euchilichthys, <i>Blgr.</i>	<i>typica, Sauv.</i>
<i>Guentheri, Schilth.</i>	Phractura, <i>Blgr.</i>
<i>Dybowskii, Vaill.</i>	<i>Bovei, Perugia.</i>
Atopochilus, <i>Sauv.</i>	<i>scaphirhynchura, Vaill.</i>
<i>Savorgnani, Sauv.</i>	Andersonia, <i>Blgr.</i>
	<i>leptura, Blgr.</i>

1. CHILOGLANIS.

Chiloglanis, Peters, Mon. Berl. Ak. 1868, p. 599.

Body moderately elongate, feebly depressed. Anterior dorsal entirely in advance of ventrals, formed of 1 spine and 5 branched rays; an adipose fin opposed to the anal; pectoral with a spine; ventral with 7 rays. A cephalo-nuchal bony shield. Mouth inferior, surrounded by a very large, circular, papillose lip; conical teeth on the præmaxillaries and on the vomer*; movable, slender, curved teeth in the mandible; a maxillary and two mandibular barbels on each side; nostrils rather remote from each other, both with a valve, the anterior tubular; eyes small, without free border. Gill-clefts short, confined to the sides. Air-bladder small, partially enclosed on each side between the enlarged processes of the anterior vertebræ.

1. *Chiloglanis Deckenii.*

Chiloglanis Deckenii, Peters, Mon. Berl. Ak. 1868, p. 599, pl. ii.; Pfeffer, Fische O. Afr. p. 38, fig. (1896).

Synodontis eurystomus, Pfeffer, Jahrb. Hamb. Wiss. Anst. vi. 1889, p. 14, and x. 1893, p. 31, pl. i. fig. 5.

Body slightly depressed, its depth $5\frac{1}{2}$ to $6\frac{1}{3}$ times in total length. Head strongly depressed, a little longer than broad, its length 3 to $3\frac{1}{2}$ times in total length. Eye directed upwards, in the second half of the head, its diameter about 5 times in length of head and $1\frac{1}{2}$ in interorbital width, which equals the distance between the eye and the nostril; two widely separated oval groups of præmaxillary teeth, forming 3 or 4 transverse series; a series of 6 to 8 short mandibular

* "Præmaxillary teeth" of Peters.

teeth; maxillary barbel about $\frac{1}{3}$ length of head, a little longer than the lower labials. Dorsal I 5; spine not distinctly serrated, about $\frac{2}{3}$ length of head. Adipose fin $\frac{1}{3}$ to $\frac{1}{2}$ its distance from the rayed dorsal. Anal III 6. Pectoral spine a little longer than the dorsal. Ventral extending to beyond origin of anal. Caudal forked. Caudal peduncle nearly twice as long as deep. Olive-brown, with irregular darker cross-bands; a dark bar at the base of the caudal and another across each lobe of the fin.

Total length 70 millim.

German East Africa (Korogwe, on the Rufu River).

Type in Berlin Museum.

Thanks to the kindness of Prof. Pfeffer, one of the specimens obtained by Stuhlmann at Korogwe is now in the British Museum.

2. *Chiloglanis niloticus*, sp. n.

Distinguished from *C. Deckenii* in the following characters:—

Depth of body 4 to $4\frac{1}{2}$ times in total length. Diameter of eye 6 times in length of head; interorbital width much greater than the distance between the eye and the nostril. Dorsal I 6, the spine about $\frac{2}{3}$ length of head. Pectoral spine $\frac{2}{3}$ length of head. Anal III 8. Pale greyish olive above, yellowish beneath; four broad blackish cross-bands on the body; a horizontal blackish bar on each lobe of the caudal.

Total length 45 millim.

Several specimens were obtained in May last by Mr. W. L. S. Loat whilst on the island of Arko, Soudan.

2. EUCHILICHTHYS, gen. nov.

Body moderately elongate, not or but feebly compressed. Anterior dorsal entirely in advance of ventrals, formed of 1 spine and 6 branched rays; an adipose fin opposed to the anal; pectoral with a spine; ventral with 7 rays. A cephalonuchal bony shield. Mouth large, inferior, surrounded by a much-developed, circular, papillose lip; a broad band of pointed, curved, movable teeth in the præmaxillaries, this band entirely in advance of the narrower band of mandibular teeth, the base of which is long and slender, the crown truncate or notched and bent up hook-like; conical teeth on the vomer; a barbel on each side, and a pair of very short ones on each side of the lower section of the circular lip; nostrils

rather close together, the posterior with a valve; eyes with free border. Gill-clefts short, confined to the sides. Air-bladder small, partially enclosed on each side between the enlarged processes of the anterior vertebræ.

Distinguished from *Chiloglanis* by the angularly bent, truncate or bicuspid mandibular teeth, which form a broad band; from *Atopochilus* by the pointed præmaxillary teeth so different from those on the mandible.

Two species.

1. *Euchilichthys Guentheri*.

Atopochilus Guentheri, Schilthuis, Tijdschr. Nederl. Dierk. Ver. (2) iii. 1891, p. 86, pl. vi. fig. 2.

Depth of body $\frac{2}{3}$ its greatest width, 7 times in total length. Head large, much depressed, covered with soft skin, a little longer than broad, its length $3\frac{1}{2}$ times in total length; snout broadly rounded, nearly twice as long as postocular part of head; nostrils nearer end of snout than eye, the diameter of which is 5 times in interocular width; buccal cleft straight, nearly half length of head; lateral barbel $\frac{1}{4}$ length of head, posterior barbels about half diameter of eye. D. I 6, originating immediately behind pectorals; spine strong, covered with skin, measuring $\frac{1}{4}$ length of head. Adipose fin very short. A. 10 (3 rays rudimentary). Pectoral spine $\frac{1}{2}$ length of head, its inner border with strong retrorse spines. Ventrals not reaching anal. Caudal forked. Caudal peduncle $1\frac{1}{2}$ as long as deep. Skin villose. Dark brown, with small round black spots on the anterior parts.

Total length 190 millim.

The single known specimen, from the Stanley Pool, Congo, is now in the British Museum.

2. *Euchilichthys Dybowskii*.

Chiloglanis Dybowskii, Vaillant, Bull. Soc. Philom. 1892, no. 16, p. 2.

Body a little deeper than broad, its depth $4\frac{1}{2}$ times in total length. Head large, moderately depressed, covered with a very thin skin, not quite $1\frac{1}{2}$ as long as broad, its length $2\frac{2}{3}$ times in total length; snout rounded, nearly twice as long as postocular part of head; nostrils nearer end of snout than eye, the diameter of which is 5 to $5\frac{1}{2}$ times in length of head, twice in interocular width; buccal cleft straight, $\frac{2}{5}$ length of head; lateral barbel nearly $\frac{1}{4}$ length of head, posterior shorter still. D. I 6; spine strong and smooth, $\frac{2}{5}$ length of head.

Adipose fin much longer than deep, nearly as long as its distance from the first dorsal. A. 10 (3 rays rudimentary). Pectoral spine $\frac{3}{5}$ length of head, its inner border with 4 or 5 strong retrorse spines. Ventrals extending a little beyond origin of anal. Caudal deeply emarginate. Caudal peduncle as long as deep. Skin villose on the sides of the body. Pale brown; a blackish band across the dorsal, another across the pectorals; ventrals and anal blackish.

Total length 39 millim.

The two type specimens, from the Ubanghi, French Congo, are preserved in the Paris Museum.

3. ATOPOCHILUS.

Atopochilus, Sauvage, Bull. Soc. Philom. (7) iii. 1878, p. 96, and N. Arch. Mus. (2) iii. 1880, p. 42.

Body moderately elongate, feebly depressed. Anterior dorsal entirely in advance of ventrals, formed of 1 spine and 6 branched rays; an adipose fin opposed to the anal, which is short; pectoral with a strong spine; ventral with 7 rays. A cephalo-nuchal bony shield. Mouth large, inferior, surrounded by a much developed, circular, papillose lip; teeth fine, slender, movable, truncate, bent at an obtuse angle and forming a very broad band in the præmaxillaries, this band entirely in advance of the narrower band of mandibular teeth, which are similar to the præmaxillaries, but closer together; conical teeth on the vomer; a barbel on each side, and another pair on the posterior border of the lip; nostrils close together, the posterior with a valve; eyes with free border. Gill-clefts short, confined to the sides.

A single species.

1. *Atopochilus Savorgnani*.

Atopochilus Savorgnani, Sauvage, *ll. cc.* pl. iii. fig. 3.

Depth of body a little less than its greatest width, $5\frac{2}{3}$ times in total length. Head depressed, $1\frac{1}{2}$ as long as deep, a little longer than broad, its length $3\frac{2}{5}$ times in total length; upper surface of head a little rugose; snout broadly rounded, its length $2\frac{1}{2}$ postocular part of head; nostrils nearer end of snout than eye, the diameter of which is $4\frac{1}{2}$ times in length of head, $1\frac{2}{3}$ in interorbital width; buccal cleft straight, $\frac{3}{5}$ length of head; band of mandibular teeth not half as broad as that of præmaxillaries; lateral barbel $\frac{1}{4}$ length of head, more than twice as long as posterior barbel. Occipito-nuchal shield as long as broad, ending in two points. A striated, acutely

pointed humeral process. D. I 6; spine striated, $\frac{2}{3}$ length of head. Adipose fin 3 times as long as deep, $\frac{2}{3}$ its distance from rayed dorsal. A. 11 (2 rays rudimentary). Pectoral with a strong striated spine bearing 12 retrorse teeth on its inner border, its length $\frac{3}{4}$ that of head. Ventral nearly reaching origin of anal. Caudal peduncle $1\frac{1}{2}$ as long as deep*.

Total length 90 millim.

The single specimen, preserved in the Paris Museum, is from the falls of Doumé, Upper Ogowe.

4. MOCHOCUS.

Mochokus, Joannis, Mag. Zool. 1835, Poiss.; Günth. Cat. Fish. v. p. 217 (1864).

Rhinoglanis, Günth. t. c. p. 216.

Body moderately elongate, slightly compressed. Anterior dorsal ending over the ventrals, formed of a strong spine and 7 or 8 branched rays; a second dorsal, formed of soft rays, above the short anal; pectoral with a strong spine; ventral with 7 rays. A cephalo-nuchal bony shield. Mouth sub-inferior, without labial folds; small conical teeth in both jaws; a maxillary and two mandibular barbels on each side; nostrils rather remote from each other, both with a valve, the posterior very large; eyes moderate, without free border. Gill-clefts short, confined to the sides. Air-bladder large, free.

1. *Mochocus niloticus*.

Mochokus niloticus, Joannis, l. c. pl. viii.

Rhinoglanis typus, Günth. l. c. p. 216, fig., and in Petherick's Trav. ii. p. 237 (1869).

Rhinoglanis Vanmutellii, Vinciguerra, Ann. Mus. Genova, (2) xix. 1898, p. 254.

Depth of body $5\frac{1}{3}$ to $5\frac{2}{3}$ times in total length, length of head 4 to $4\frac{1}{3}$. Head depressed, as long as broad, rugose above; a large frontal fontanelle; eye directed upwards, 3 to $3\frac{1}{2}$ times in length of head, not much narrower than inter-orbital width; barbels long and slender, the maxillary reaching end of pectoral spine or beyond. Anterior dorsal I 7-8; spine nearly as long as head, with ascending serræ on anterior border; second dorsal 10-15, about as long as its distance from the first. Anal 9-10. Pectoral spine a little longer

* The caudal fin is injured in the type specimen; it was probably notched or forked, not truncate, as figured by Sauvage.

than dorsal, serrated like it on outer border, with very strong retrorse teeth on inner border. A long, sharp, humeral process. Ventral not reaching anal. Caudal forked. Caudal peduncle nearly twice as long as deep. Pale greyish olive above, speckled and marbled with blackish; two more or less distinct, irregular, dark bands across the back, one under each of the dorsal fins; belly white; dorsals and caudal with blackish dots.

Total length 55 millim.

The type specimen is not to be found in the Paris Museum.

The figures given by Joannis are very incorrect, as may be inferred from the discrepancies between them. A comparison of specimens obtained by Mr. Loat at Assuan with the type of *Rhinoglanis typus*, from Gondokoro, and those of *R. Van-nutellii*, from Lake Rudolf, has convinced me that these supposed species cannot be maintained as distinct from *Mochocus niloticus*.

5. DOUMEA.

Doumea, Sauvage, Bull. Soc. Philom. (7) iii. 1878, p. 96, and N. Arch. du Mus. (2) iii. 1880, p. 41.

Body elongate, depressed, with extremely slender caudal peduncle. Two short dorsal fins, the anterior entirely in advance of the ventrals and formed of one simple, flexible, and 6 branched rays, the second opposed to the anal and formed of fine soft rays partly concealed in adipose tissue; pectoral and ventral fins large, horizontally expanded, without spine, but with thickened, simple outer ray; 12 rays to the pectoral, 6 to the ventral. No cephalo-nuchal shield. Mouth small, inferior, surrounded with large papillose lips; no mandibular teeth; small conical præmaxillary teeth*; a maxillary and two mandibular barbels on each side; nostrils rather remote from each other, both with a valve; eyes small, without free border. Gill-clefts narrowly interrupted at the isthmus.

A single species.

Sauvage referred this genus to the "*Pimelodineæ*" of Günther. Vaillant (Bull. Mus. Paris, 1897, p. 82), on the contrary, referred it to the vicinity of *Synodontis*, a view in which I entirely concur.

* The "vomerine" teeth of Sauvage.

1. *Doumea typica*.

Doumea typica, Sauv. *ll. cc.* pl. iii. fig. 1.

Depth of body slightly less than its width, 8 times in total length. Head strongly depressed, with slightly rugose skull covered with a thin skin, $1\frac{1}{2}$ as long as broad, $5\frac{1}{3}$ times in total length; snout pointed, projecting a little beyond the mouth, $1\frac{3}{4}$ as long as postorbital part of head; internarial space equally distant from end of snout and eye; latter directed upwards, its diameter $6\frac{1}{2}$ times in length of head, $1\frac{1}{2}$ in interorbital width; maxillary barbel $\frac{1}{3}$ length of head, mandibular barbels shorter still. Occipital process narrow, 3 times as long as broad, not reaching interneural shield. Dorsal I 6, first ray a little longer than the head. Anal I 7. Pectorals reaching the ventrals, which extend far beyond origin of anal. Caudal with crescentic notch. Caudal peduncle a little depressed, $\frac{1}{3}$ total length. Uniform brownish in spirit.

Total length 90 millim.

The unique specimen in the Paris Museum is from the falls of Doumé, Upper Ogowe.

6. PHRACTURA, n. n.

Peltura (non M.-Edwards), Perugia, Ann. Mus. Genova, (2) x. 1892, p. 972.

Body elongate, depressed, with extremely slender caudal peduncle; a series of imbricate scutes along each side of the back and belly from the dorsal and ventral fins to the caudal peduncle, which is entirely surrounded by bony scutes. Two short dorsal fins, the anterior entirely in advance of the ventrals and formed of one simple, flexible, and 6 or 7 branched rays, the second opposed to the anal and formed of fine soft rays; pectoral and ventral fins large, horizontally expanded, without spine, but with thickened, simple outer ray; 10 rays to the pectoral, 6 to the ventral. No cephalonuchal shield. Mouth small, inferior, surrounded with large papillose lips; no mandibular teeth; small conical præmaxillary teeth; a maxillary and two mandibular barbels on each side; nostrils rather remote from each other, both with a valve; eyes small, without free border. Gill-clefts narrowly interrupted at the isthmus.

Two species.

1. *Phractura Bovei*.

Peltura Bovei, Perugia, l. c. fig.

Depth of body 9 times in total length, length of head 6 times. Head $1\frac{1}{3}$ as long as broad; skull a little rugose, covered with thin skin; snout a little longer than the postocular region of the head, pointed, projecting beyond the mouth; the space between the nostrils equally distant from the end of the snout and the eye, which is directed upwards; the diameter of the eye 10 times in the length of the head and $2\frac{1}{2}$ in the interocular width; maxillary barbels $\frac{2}{3}$ length of head, nearly reaching the gill-cleft, mandibular barbels much shorter. Occipital process 3 times as long as broad, not reaching interneural shield. Dorsal I 7; first ray longest, $\frac{1}{4}$ longer than the head; second dorsal very small. Anal I 7. Pectoral a little longer than the head, as long as the ventral; latter nearly reaching the anal. Caudal with crescentic notch. Caudal peduncle depressed, $\frac{1}{3}$ total length. 23 dorsal and 19 ventral scutes, the last 5 on the caudal peduncle. Uniform yellowish in spirit.

Total length 110 millim.

Lower Congo. Type in Genoa Civic Museum.

2. *Phractura scaphirhynchura*.

Doumea scaphirhynchura, Vaillant, Rev. Scientif. xxiii. ii. 1886, p. 18.
Peltura scaphirhynchura, Pellegrin, Bull. Mus. Paris, 1900, p. 6.

Differs in the following points from the preceding species:—Length of head 5 times in total length, $1\frac{1}{2}$ its width; snout twice as long as postocular part of head; diameter of eye 7 times in length of head, $1\frac{1}{2}$ in interocular width; maxillary barbel $\frac{1}{4}$ length of head, $\frac{1}{3}$ the distance separating its root from the gill-cleft. Occipital process $2\frac{1}{2}$ as long as broad, reaching interneural shield. Dorsal I 6, first ray as long as head. Pectoral not longer than head. 22 dorsal and 18 ventral scutes.

Total length 120 millim.

Diélé, on Alima R., French Congo. Type in Paris Museum.

7. *ANDERSONIA*, gen. nov.

Body elongate, depressed, with extremely slender caudal peduncle; a series of imbricate scales along each side of the back and belly from the dorsal and ventral fins to the caudal peduncle, which is entirely surrounded by bony scutes. Two short dorsal fins, the anterior above the ventrals and formed

of one simple ossified ray or spine and 6 branched rays, the second opposed to the anal and formed of fine soft rays preceded by a short spine; pectoral and ventral fins moderately large, the former with a spine; 8 rays to the pectoral, 6 to the ventral. No cephalo-nuchal shield. Mouth small, inferior, toothless; lips not much developed; a maxillary and a mandibular barbel on each side; nostrils remote from each other, both with a valve; eyes small, without free border. Gill-clefts narrowly interrupted at the isthmus.

Nearest allied to *Phractura*, from which it is well distinguished by the position of the anterior dorsal, the presence of a spine in front of each of the dorsals, the presence of a single mandibular barbel, and the total absence of teeth.

Named in memory of the late Dr. John Anderson, to whose exertions during the latter years of his life Science is indebted for much progress in the zoology of the Nile region, and to whose initiative we owe the organization of a survey of the Nile Fishes which is now being carried on by the Egyptian Government.

1. *Andersonia leptura*, sp. n.

Depth of body 9 times in total length, length of head 5 times. Head $1\frac{1}{2}$ as long as broad; skull rugose; snout as long as the postocular part of the head, thrice as long as the diameter of the eye, which is half the interorbital width; barbels slender, as long as the snout. Occipital process keeled, $2\frac{1}{2}$ as long as broad, widely separated from the inter-neural shield; a shorter process on each side of the occipital process. Anterior dorsal I 6; first ray longest, nearly as long as the head. Anal I 9. Pectoral $\frac{2}{3}$ length of head, as long as the ventral, widely separated from the anal. Caudal with crescentic notch. Caudal peduncle depressed, $\frac{1}{3}$ total length. 25 dorsal and 23 ventral scutes, the last 9 on the caudal peduncle. Greyish above, marbled with blackish, white beneath.

Total length 50 millim.

A single specimen was found by Mr. Loat in a pond near Koshek, Soudan, in March 1900.

LXX.—*Descriptions of new Genera and Species of Hymenoptera.* By P. CAMERON.

[Concluded from p. 506.]

Rhynchium khasianum, sp. n.

Nigrum; clypeo, scapo antennarum subtus, pronoto late pedibusque ferrugineis; tarsis posterioribus nigris; alis violaceis. ♀.
Long. 17–18 mm.

Hab. Khasia Hills. Coll. Rothney.

Antennæ black, the scape rufous, spotted with black on the top. Head black, rugosely punctured; the clypeus rufous. On the vertex behind the ocelli are two large, deep, smooth foveæ, the space between them being smooth. Antennal keel smooth and shining, dilated at the top, and with a small yellow mark on either side of the top. Clypeus rufous, longitudinally punctured; its apex wide, not much narrower than the base; the extreme apex depressed and with a broad slight curve. Mandibles rufous, black on the upperside. Palpi black, sparsely covered with stiff hairs. The base of the pronotum is smooth and shining; the upper half of the sides rufous, as are also the tubercles, a spot on either side of the metanotum, a line on the mesonotum near the tegulæ, and the tegulæ. Mesonotum closely and strongly punctured; the extreme base smooth and distinctly separated from the pronotum. There is a bordered furrow on the basal half of the scutellum in the middle. Median segment rugosely punctured, the middle smooth, alutaceous; the basal half furrowed in the middle, the apical keeled; the top and middle of the mesopleuræ closely rugosely punctured; there is a wide deep furrow on the top of the smooth basal part, with a keel down its middle. Metapleuræ deeply rugosely reticulated. Legs ferruginous, the tarsi blackish; the fore tarsi rufous at the base; the fore coxæ for the greater part black. The basal slope of the petiole smooth; the rest of it and the second segment closely punctured; the third segment is less strongly punctured, smoother at the base; the fourth and fifth punctured, smooth at the apex.

Belongs to Bingham's group "A. Basal segment of abdomen slightly constricted, the apex distinctly narrower than the base of the second segment." What appears to be a variety has the rufous band on the pronotum obliterated, and there is a yellow mark on either side of the clypeus at the top.

Rhynchium clypeatum, sp. n.

Nigrum, dense argenteo-pilosum, basi medioque clypei albo; alis violaceis. ♂.

Long. 14 mm.

Hab. Barrackpore, Bengal (*Rothney*).

Antennæ black, the flagellum slightly brownish beneath; the claw brownish, stout. Head strongly and closely punctured, thickly (especially on the face and outer lower orbits) covered with silvery pubescence. Clypeus large, its greatest width as long as its length, its base broadly rounded, its apex roundly incised, the sides forming triangular teeth; its upper third, and the lower half broadly in the centre, yellow, the apical yellow mark being separated from the basal yellow part; the edges of the black separation are irregular; the inner orbits opposite the antennæ are yellow. Thorax rugosely punctured, covered with a silvery pile; the lower part of the propleuræ bear four stout clearly separated keels. The base of the mesopleuræ is smooth; in the middle is a longitudinal furrow; above this the punctures are somewhat more widely separated; the lower part of the apex is smooth. The upper part of the metapleuræ above the hollow is longitudinally striated; the lower part is smooth and impunctate; the upper part of the apex is strongly but not closely punctured; the lower part is smooth. The sides of the median segment are broadly rounded above and have no teeth. Wings violaceous, the anterior pair deeper in tint than the posterior; the second cubital cellule is much narrowed at the top, about one sixth of the length of the third and about half the length of the space bounded by the first transverse cubital and the recurrent nervures. Abdomen thickly covered with silvery pubescence, sparsely punctured; the ventral surface with the punctures stronger and closer.

Comes nearest to *R. argentatum*, Fabr. (sec. Saussure, Stett. ent. Zeit. xxiii. p. 187, = *metallicum*, Sauss. Etudes, i. 114), but is larger, has the clypeus broader compared to its length, more rounded on the top, and yellow in the middle at the apex; the thorax is less strongly punctured; the sides of the median segment bulge out more and the apex is more excavated therefore in the middle; the third cubital cellule is of nearly equal width at the top and bottom, while in *R. argentatum* it is distinctly wider at the top than at the bottom, and the hind wings are not so clearly hyaline compared with the anterior.

R. argentatum, Bingham ('Fauna of India,' Hym. i.

p. 358), is a different species from the *argentatum* of Saussure's Revision of the East Indian Odynerides (Stett. ent. Zeit. xxiii. pp. 129 and 207). It is probably a form of *R. bengalense*, Sauss., which = *R. argentatum*, Saussure, Etudes, i. p. 115, non Fabr., sec. Sauss. Stett. ent. Zeit. l. c. p. 191. Col. Bingham does not appear to have been acquainted with the above-mentioned Revision. *R. carbonarium*, Sauss., from Tranquebar, mentioned by Bingham shortly in a footnote (l. c. p. 358), is described in full by Saussure (Stett. ent. Zeit. l. c. p. 183). It is a *Pararhynchium*.

Rhynchium basimacula, Cam.

This is a good and distinct species, and not a variety of *R. flavomarginatum*, as stated by Bingham ('Fauna of India,' Hym. i. p. 359). It is easily known from *flavomarginatum* by the head and thorax not being "coarsely and very closely" punctured, the clypeus in particular having only some small scattered punctures; it is much broader at the apex, almost transverse, the sides not projecting into teeth; the abdomen is impunctate, very smooth, and shining. The form of the clypeus is different from what it is in most of the species, it being not roundly convex, but flat, except at the sides, which have an oblique slope. The entire insect is thickly pruinose, which gives it a whitish appearance. The only species with such a broad and flat clypeus is *R. lugubrinum*, which, however, differs from it in having the head, thorax, and base of abdomen closely rugosely punctured.

Rhynchium lugubrinum, sp. n.

Nigrum; abdominis segmentis basalibus duobus flavo-lineatis; alis fulvo-violaceis; tegulis rufis. ♀.

Long. 14-15 mm.

Hab. Khasia Hills. Coll. Rothney.

Antennæ and head entirely black. Front and vertex rugosely punctured, thickly covered with longish fuscous hair. Antennal keel stout. Clypeus slightly obliquely narrowed at the apex; the sides slightly obliquely depressed, closely rugosely punctured, the apex with a rounded incision, closely punctured and thickly covered with silvery pubescence; the extreme apex depressed and punctured. Pro- and mesothorax closely and almost uniformly punctured; the mesopleuræ above with the punctures running into reticulations; the basal half of the metapleuræ smooth, the apical reticulated; the upper part of the median segment reticulated,

the lower in the middle smooth except for some transverse striæ, the centre carinate. The whole thorax is thickly covered with pale pubescence. The second cubital cellule is much narrowed at the top, being there in length less than the distance bounded by the second transverse cubital and the second recurrent nervure. Legs entirely black, thickly covered with pale pubescence. Tegulæ rufous. Abdomen black, the basal two segments banded with yellow, the bands interrupted in the middle; the basal two segments closely punctured, the third and fourth more closely, the apical alutaceous.

The apex of the clypeus is broader than usual and does not project into teeth; it is flat, with the sides oblique; the insect is more densely pilose than usual; the apex of the median segment is slightly and roundly concave; the upper part at the sides broad, not forming teeth; the central keel is stout; the second cubital cellule is much narrowed at the top, being there only one half the length of the space bounded by the second transverse cubital and the second recurrent nervure; the second abdominal segment is not much narrowed at the base.

This species comes nearest to *R. flavomarginatum*, with which it agrees in coloration; it may be known from it by the body being more densely pilose, and is readily separated from it by the clypeus not being deeply grooved in the middle.

Rhynchium rugolatum, sp. n.

Long. 12-14 mm.

Hab. Barrackpore (*Rothney*), Poona (*Wroughton*), Khasia Hills.

This species closely resembles *R. brunneum*. The differences between the two are best expressed in synoptical form:—

- ♀.—Mesonotum shining, sparsely and slightly punctured; the scutellum impunctate; the sides of the median segment with sharp teeth *brunneum*.
- Mesonotum and scutellum closely rugosely punctured; the sides of the median segment without teeth *rugolatum*.
- ♂.—The top of the clypeus transverse; the oblique lower part shorter than the upper part; the middle femora not narrowed and twisted at the base *rugolatum*.
- The top of the clypeus rounded, its narrowed lower part longer than the upper; the middle femora narrowed and twisted at the base *brunneum*.

The head rufous; the ocellar region broadly (the mark slightly narrowed and rounded behind), the part between the

antennæ, a broad, short, oblique line over each, and the occiput, black. Front and vertex coarsely closely punctured, thickly covered with short white hair. Clypeus pyriform, broadly rounded above, sparsely and somewhat strongly punctured; the apex in the middle depressed and with a shallow incision; the sides forming oblique stout teeth. Thorax rufous, coarsely and closely punctured except at the base and apex; the lower part of the pronotum, the edges of the mesonotum (narrowly at the base and sides, broader at the apex), the base broadly in the middle, the apex of the scutellum, the sides of the post-scutellum, the middle of the metanotum broadly, its sides, the base of the pronotum narrowly, the base and apex of the mesopleuræ, a large irregular mark, a line along the furrow, the base and lower half of the metapleuræ, and the breast black. The scutellum is more closely punctured than the mesonotum; the postscutellum has behind and above the oblique apical slope a stout somewhat irregular ridge; the apex of the segment has an oblique slope; it is smooth and shining, the centre hollowed, the sides oblique; in the middle is a keel bordered by fine striæ. Pro- and mesopleuræ coarsely and closely punctured, except at the base; metapleuræ smooth, sparsely punctured; there are no teeth on the sides; the apex roundly dilated. Legs rufous; the four anterior coxæ behind, the hinder almost entirely, the fore femora narrowly at the base behind, the middle narrowly at the base in front and broadly behind, and the posterior except at the apex black. Wings yellowish, fuscous along the edge; the apex with a violaceous cloud; the costa and stigma rufous, the nervures black; the hinder wings hyaline. Abdomen rufous; the basal slope of the petiole, an irregular line on the base of the second segment, and the bases of the third and fourth segments black; the basal ventral segments are more or less marked with black.

In the male the black on the vertex is broader and extends to the eyes; the part below it is yellowish, tinged with rufous; the oblique marks above the antennæ are as in the female, but there is no black between the antennæ; the clypeus is as wide as its longest length, is smooth, except for some punctures; the oblique lower part is slightly shorter than the upper; the incision is shallower and wider than in the female, and the part above it is not depressed; the markings as in the female.

In general coloration it more resembles *carnaticum*, with which it also agrees in the form of the male middle femora; but in the form of the clypeus &c. it differs, as it does also from *brunneum*.

Montezuma bisulcata, sp. n.

Nigra, sparse albo-maculata; alis fusco-violaceis; scapo antennarum basique mandibularum albo-maculatis. ♀.

Long. 14–15 mm.

Hab. Khasia Hills. Coll. Rothney.

Scape of antennæ sparsely and minutely punctured, yellowish beneath. Front and vertex rugosely punctured, the vertex more sparsely than the front; the part between the antennæ broadly carinate; foveate above, a yellow mark on either side of the fovea. Clypeus closely rugose, the apex with scattered punctures; depressed and roundly and distinctly incised at the point. Mandibles with a small yellow mark in the middle near the base, its lower side obliquely widened at base and apex, the apical part being the longer. Thorax black, except for an interrupted line on the pronotum and a mark on either side of the apex of the median segment. Pro- and mesonotum closely rugosely punctured; the scutellum, if anything, more closely, almost rugosely, punctured, and with a shining line, gradually widened towards the apex in the middle; the postscutellum has the punctures, if anything, more widely separated than on the scutellum; its centre is smooth and has an elongated shallow depression in the middle. Pro- and mesopleuræ coarsely rugosely punctured, the punctures on the latter running into reticulations; the apex is alutaceous, impunctate. Metapleuræ alutaceous, the apex obscurely obliquely striated; on the base are five foveæ, separated by stout keels, and having at the top a much larger more elongated depression. Wings fuscous-violaceous, the apical half of the posterior more hyaline. Legs black, a line on the basal two thirds of the anterior tibiæ in front and a line on the base of the posterior behind yellow; the front femora are similarly marked on the apical two thirds in front. Abdomen black; a line, interrupted in the middle, on the apex of the petiole, and three lines on the apex of the second segment, yellow. Petiole above closely rugosely punctured; a shallow indistinct furrow on the apex in the middle above; the base sparsely covered with long white hair; the lower side is regularly and stoutly transversely striated. The second segment is closely but not very deeply punctured; the third segment is slightly depressed and punctured on the apex.

The insect is covered with a pale pile. On the median segment the central furrow is large and deep and is divided into two parts by a transverse partition—a shorter basal,

rounded and narrowed at the base and apex, and a longer, wider apical one, with a stout keel in the middle. The tegulæ are brownish on the outer side.

Allied to *M. burmanica*, Bingham.

Labus armatus, sp. n.

Niger; clypeo, scapo antennarum subtus, basi mandibularum, linea pronoti, maculisque 2 scutelli flavis; alis fusco-hyalinis, stigmatibus nervisque nigris.

Long. 9 mm. ♂.

Hab. Khasia Hills. Coll. Rothney.

Antennæ covered with a pale down; black, the scape yellow below; the terminal hook rufous. Head black; the clypeus (except narrowly round the edges) and the base of the mandibles to near the second tooth lemon-yellow. Front and vertex closely and somewhat strongly and uniformly punctured all over; covered with silvery pubescence; the lower part of the front and the eye-incision covered with silvery pubescence. Clypeus sparsely punctured; the apex obliquely narrowed from the eyes to the middle, where there are two minute black teeth. On the mandibles are one large apical tooth, followed by two blunter, more rounded ones, of half the length of the apical; the third has a much shorter tooth or tubercle near its base. Palpi black. Thorax black; a broad line on the pronotum with its teeth, two marks on the base of the scutellum, rounded and slightly narrowed on the apex, from the outer side to the inner, yellow. Pro- and mesonotum closely, uniformly, and rather strongly punctured. Scutellum more sparsely punctured than the mesonotum. The tooth on the postscutellum large, sharply pointed towards the apex. Median segment sparsely punctured; the central furrow becoming gradually wider towards the apex. Propleuræ strongly punctured above, below smooth, aciculated; mesopleuræ similarly punctured, except at the base beneath; metapleuræ more sparsely punctured than the meso-, especially towards the base. Legs black, the four anterior tibiæ in front and the basal joint of the four front tarsi yellow. Abdomen black; the apex of the petiole above and of the second segment all round yellow; the petiole has the basal half coarsely punctured; the punctures are large and longer than broad; below, the punctures extend nearer to the apex. The whole insect is covered with a pale pile. Wings fuscous-hyaline; the stigma and nervures black; the apex of the radius is bluntly rounded, it is distinctly curved upwards at the second cubital cellule; the tegulæ are yellow, broadly black in the middle.

This does not appear to me to be *L. Humbertianus*, a Ceylon species recorded by Bingham from Burma and Tenasserim. The metanotal furrow is certainly not "supra bispinosa," but the apical teeth are distinct enough and luteous in colour. The scutellum in our species can hardly be said to be divided in the middle by a furrow, except, perhaps, between the yellow marks, which have the appearance of being slightly raised.

Bingham ('Fauna of India,' Hym. i. p. 348), it may be as well to point out, omits from his generic and specific descriptions one of the most characteristic features of this genus, namely, that the postscutellum is armed with a stout erect spine. It is possible that the Burmese examples described by Bingham as *Humbertianus* may be different from Saussure's species, which was from Ceylon.

B. *Descriptions of Two new Genera and Species of Braconidæ from Britain and Two Species of Pompilus from India.*

HARKERIA, gen. nov.

Radial nervure abbreviated, not reaching to the apex of the stigma, the radial cellule therefore confluent with the cubital; the cubital nervure almost entirely obliterated, only indicated by a stump beyond the first transverse cubital, which is rather faint, but not bullated. The first cubital cellule is confluent with the first discoidal, through the obliteration of the cubitus at the base; the transverse median discoidal nervure is not interstitial with the marginal discoidal, being received shortly beyond it; the second discoidal cellule is completely enclosed, it and the costal and the median cellules are the only complete cellules. Stigma linear, elongate, narrow; the pterostigma is distinct. In the hind wings there is only one nervure, which is probably the subcostal, which ends in what may be a stigma. Antennæ filiform, 19-jointed. Occiput margined. Mandibles ending in a longish sharp tooth. Eyes prominent. Parapsidal furrows distinct at the base. Scutellum large, roundly convex. Median segment large; it has a gradual rounded slope to the apex, which has a large distinctly defined area, rounded at the top on either side, and between them in the middle a narrower one, which is not very distinctly defined on the top. Abdomen with a distinct petiole, which is about four times longer than broad; its apex is triangular and ends in a short projecting ovipositor.

This genus belongs to the *Euphorides*. It comes nearest perhaps to *Microtonus*, with which it agrees in the paucity of

the alar nervures ; but it may be easily known from it and from all the other genera in having the radial cellule completely open at the apex, the radius being very short.

Harkeria rufa, sp. n.

Rufa ; vertice mesonotoque nigris ; antennis longiore quam corpore, flagello nigro ; alis hyalinis, stigmatate pallido, nervis pallide fuscis. ♀.

Long. fere 4 mm.

Antennæ blackish, the scape and the base of the third joint rufo-testaceous. Head, pro- and mesothorax smooth and shining ; the face and clypeus of a much paler colour than the vertex ; the ocellar region deep black ; on either side of the front ocellus is a fuscous splash which extends to and behind the eyes. The mesonotum, except in front at the sides, black ; the scutellum and postscutellum are of a darker rufous colour ; the median segment is obscurely shagreened at the base. The petiole closely shagreened ; the rest of the abdomen is smooth and shining.

Taken near Gloucester in June many years ago, probably on the banks of the Severn, when in the company of the late Prof. Allen Harker.

LAMADATHA, gen. nov.

Wings abbreviated and narrowed ; the stigma and metacarpus greatly thickened, broad, projecting beyond the costa ; the stigma not separated from the metacarpus ; the radius irregular, thickened, about half the thickness of the stigma ; it is united to the stigma shortly behind the middle by a short branch, near which there is on it a small cellule, which is longer than broad ; the transverse præbrachial and the præbrachial nervures are normal ; in the hind wings the costa is thick ; the subcostal area is distinctly defined ; both wings are ciliated with long hairs. Antennæ filiform, longer than the body, 24-jointed. Head large, broader than long, broadly projecting behind the eyes ; the occiput not margined, rounded inwardly. Middle lobe of the mesonotum distinctly separated ; the scutellum roundly raised ; the postscutellum convex, distinctly separated from it. Metathorax rugosely punctured, it has a rounded slope from the base to the apex. Petiole distinct, thick, longer than broad, rugose, the other segments flat, smooth, and shining, its apex bluntly rounded. Eyes bare, distant from the mandibles.

The face is rugose, the clypeus roundly convex, smooth,

shining, and is clearly separated from the face by a suture; the suture on the mesosternum is wide, deep, and transversely striated; the prosternum is long and furrowed down the centre. The mandibles are small; the apical tooth is long, curved, sickle-shaped; in the middle is a small triangular tooth: above them, on either side of the clypeus, is a large deep depression.

Belongs by the form of the mouth and mandibles to the *Exodontes*, and probably to the *Dacnusi*dæ, from the fact of there being apparently only two cubital cellules, counting the small cellule at the base of the radius as the second cubital. The thickened radius also allies it to *Dacnusa*. The form of the mandibles is different from what we find either in the *Dacnusi*dæ or the *Alysioidæ*, they being much more slender and sharper, particularly at the apex. The abdominal petiole is also more slender and distinctly separated.

Lamadatha testaceipes, sp. n.

Nigra; basi antennarum pedibusque testaceis; alis hyalinis.
Long. 2 mm. ♂.

Antennæ longer than the body, filiform; the basal half clear, the apical dark testaceous. Head smooth and shining, sparsely covered with longish hair; the eyes strongly faceted. Pro- and mesonotum smooth and shining, sparsely covered with longish black hairs: in the middle of the hinder half of the mesonotum is a broad, punctured, longitudinal furrow; the sides of the raised basal lobe are punctured; in its centre is a narrow, smooth, longitudinal furrow. Scutellum and postscutellum smooth; the depression at the base of the former is smooth. The lower part of the propleuræ is closely rugosely punctured; the part of the mesopleuræ above the furrow is smooth and shining; the metapleuræ and the metanotum closely rugosely punctured. Wings hyaline, the basal nervures testaceous; the apical nervures, the stigma, and metacarpus blackish, the nervures in the hinder wings testaceous. Legs testaceous, longish. Abdomen smooth and shining; the petiole closely rugosely punctured; behind the middle, on either side, is a small projecting tubercle.

Found early in June in Cadder Wilderness, near Glasgow, in a fungus much frequented by dipterous larvæ.

Pompilus perturbans, sp. n.

Niger, pruinosis; alis fusco-violaceis, cellula cubitali 2^a duplo longiore quam 3^a. ♀.
Long. 13 mm.

Hab. Barrackpore (*Rothney*).

Head densely covered with a grey pile, the front and vertex more sparsely with longish blackish hair. Eyes parallel, slightly converging on the top; the ocelli are in a curve, and the hinder are separated from each other by a greater distance than they are from the eyes. Apex of clypeus broadly rounded. Mandibles broadly rufous in the middle, their base thickly covered with depressed pubescence. Pronotum in the middle not quite so long as the head; its apex is broadly rounded. The median segment has a gradually rounded slope; looked at from above the apex is transverse; the sides at the apex bituberculate, the upper tubercle being larger and more rounded, the lower smaller, more distinctly defined, more projecting, and more triangular in form. Wings fusco-violaceous; the radial and second and third cubital cellules are lighter in tint, but not hyaline; the second cubital cellule is about three times longer than the third; the first and second transverse cubital nervures are parallel, the first has a more rounded slope, the third is obliquely bent near the top; the first recurrent nervure has an oblique slope and is received near the transverse cubital nervure as in *Salix*, the second at the apex of the basal fourth of the cellule; the anal nervure in the hind wings is interstitial. Legs densely pruinose; the tibial and tarsal spines are long and stout; the underside of the tarsi is covered densely with short spines; the claws have one long, curved, and a short, thick, bluntly pointed tooth. Abdomen black; the apical halves of the segments with lighter-coloured bands of a dark bluish tinge.

Comes near to *P. parenthope*, Cam.: that is a larger and stouter insect, it has the second cubital cellule longer compared with the third, the second recurrent nervure is received in the middle of the cellule, and the wings are more uniformly coloured and have a deeper more violaceous tint; the head is much more largely developed behind the eyes, it being there nearly as long as the width of the eyes, while in the present species they are not half the length, it being also there more oblique, less rounded.

P. similimus appears to be a close ally of this species. Smith's description is not detailed enough for satisfactory determination; Bingham (*Hymen. of India*, p. 166) says that the second and third cubital cellules are equal in length, but this statement is contradicted in the synoptical table on p. 150, where the second it said to be wider than the third.

Pompilus implacabilis, sp. n.

Niger, dense argenteo-pruinosis; alis brevis, flavis, apice fumatis. ♀. Long. 10-11 mm.

Hab. Bengal (*Rothney*).

Antennæ brownish towards the apex, stout, and placed close to the top of the clypeus. Head rather long and flat and wider than the thorax; the eyes are almost parallel; the ocelli in a curve (· ·) and separated from the eyes by about the same distance they are from each other. Clypeus short, its apex transverse. Mandibles rufous, black at the apex; the base thickly covered with depressed silvery pubescence. Pronotum large, but not quite so long as the head; it is depressed at the base, transverse at the apex. The entire thorax is thickly covered with depressed silvery pubescence; its apex has an oblique slope. Wings short, not reaching to the apex of the second abdominal segment, yellowish hyaline, the apex near the middle of the radial cellule infuscated; the radius is roundly curved from base to apex; the second and third cubital cellules are equal in length above and beneath; the first transverse cubital nervure has an oblique slope on the upper half; the first recurrent nervure is received shortly behind the second, beyond the middle of the cellule; the transverse median nervure is received at a distance—by about its own length—beyond the transverse basal; the anal nervure in the hind wing is appendiculated. Legs densely pruinose, the tibiæ bare, the tarsi bearing thick spines, the claws bifid. Abdomen with the segments bordered with silvery pubescence; it is about as long as the head and thorax united; the second ventral segment has a transverse furrow.

The presence of a transverse furrow on the second (or third according to one method of counting, the first segment forming part of the median segment) brings this species into Bingham's section "*B. Ferreola* Group." It has certainly no near relationship beyond the abdominal furrow to such species as *P. Cameronii*, Bingham. (*fenestrata*, Bingham, nec Smith). The present species has some resemblance to the *Pompilus vivax* group, but is easily known from them by the abdominal furrow, by the transverse basal nervure being widely remote from the transverse median, and by the short wings.

LXXI.—*Plankton Studies*.—III. On *Platydorina*, a new Genus of the Family Volvocidæ from the Plankton of the Illinois River. By C. A. KOFOID, Ph.D.*

[Plate VII.]

THE family Volvocidæ is well represented in the plankton of freshwater ponds and streams. Indeed, with the possible

* From the 'Bulletin of the Illinois State Laboratory of Natural History,' vol. v. pp. 419-440. From a separate impression communicated by the Author.

exception of *Stephanosphaera*, all of the colonial forms included in the subfamily Volvocinæ—*Spondylomorom*, *Gonium*, *Stephanosphaera*, *Pandorina*, *Pleodorina*, and *Volvox*—are pelagic in habit and are found only in the freshwater environment. For the past four years, during the summer and autumn months, a colonial form belonging to this subfamily has occurred in plankton collections from the Illinois River and its adjacent waters, to which I have given the name of *Platydorina caudata*. It appears as early as June 15, and becomes abundant in the months of August and September, diminishing in numbers in October, and disappearing in November. It thus attains its greatest development toward the close of the maximum period of summer heat, when the temperature of the water in which it is found often reaches 36° C. This species has occurred in all the waters examined in the course of the operations of the Illinois Biological Station, viz. in the Illinois River, in Thompson's, Quiver, Flag, Matanzas, and Phelps Lakes, at Havana, Ill., and in the Illinois River and Meredosia Lake at Meredosia, Ill. During the summer and fall of 1899 it was also found in abundance near Urbana, Ill., in Salt Fork, a small stream tributary to the Vermilion River—a confluent of the Wabash. It was not equally plentiful in all these localities, but showed a decided preference for shallow water free from vegetation, reaching its maximum development when the turbid water was but a few feet, or even less than a foot, deep. In such situations the shallowness of the water and the absence of vegetation conduce to a maintenance of the high temperatures which seem to favour its multiplication. The bottom of the lakes in question is usually composed of soft mud, rich in decaying organic matter, and often covered by a mat of *Oscillaria*, but otherwise quite free from vegetation. At Havana we have found *Platydorina* in greatest numbers in Phelps Lake, which in 1896, 1897, and 1898 afforded the conditions above described. It was likewise abundant in Thompson's Lake in the late summer and early fall of 1897 and 1898, when the lake was at a low level and contained little vegetation. In the shallow open waters of Matanzas Lake it was much more abundant than in Quiver Lake, where there was usually a large amount of vegetation. At the time of the maximum abundance of *Platydorina* in Salt Fork in September the stream was reduced by drought to a series of stagnant pools with no vegetation. In the early part of August it was full of algæ and other aquatic vegetation, and *Platydorina* was then present in considerable numbers, although not so abundant as it was in the following month.

On August 2, 1888, Professor H. Garman, while conducting a biological survey of the aquatic life in the vicinity of Quincy, Ill., in the bottoms of the Mississippi River (see Garman, 1890), found a specimen of this interesting species in the waters of Libby Lake. He records and sketches it in notes now on file at this Laboratory, but published nothing concerning it.

The occurrence of this new genus in the waters of the Wabash, Illinois, and Mississippi River systems, and its recurrence in our collections for several successive years indicate its wide distribution and firm establishment in the Mississippi Valley in waters of some permanency. It has not yet been noted in temporary pools.

The associates of *Platydorina* in the plankton have varied with the season, the locality, and the year. It may be said, in a general way, that the plankton in which it occurs is characterized by an abundance of flagellates, of rotifers—especially Brachionidæ—and of immature Copepoda. A water-bloom, composed largely of *Euglena*, *Trachelomonas*, *Carteria*, and other green flagellates, often appears at the surface of waters where *Platydorina* is abundant. *Gonium* is frequently associated with it in large numbers, as are also *Pandorina*, *Eudorina*, and *Pleodorina*, though these three genera may also be plentiful in the early summer, when *Platydorina* may be absent or rare. *Pleodorina californica* was extremely abundant in Salt Fork in August, but had almost entirely disappeared by the time that *Platydorina* had reached its maximum. A few specimens of *Volvox*, which, in this locality, is common in the spring months, were also noted, while perhaps the most interesting associate in Salt Fork was *Ceratium kumaonense*, discovered by Carter (1871) in Hindostan. Other chlorophyll-bearing associates frequently seen are *Pediastrum*, *Scenedesmus*, *Actinastrum*, and *Closterium*. Among the diatoms, *Melosira*, *Fragillaria*, and *Surirella* were to be seen; and among the Peridiniidæ *Peridinium tabulatum* was almost always represented.

The zoöplankton associated with *Platydorina* is not less varied than the phytoplankton. The Protozoa were usually represented by *Arcella*, *Diffugia*, and occasionally by pelagic *Amæba*; by *Synura*, *Mallomonas*, *Dinobryon*, and *Uroglena*; and by *Codonella* and *Coleps*. Among the Rotifera the order Ploima was well represented; *Triarthra* and the Brachionidæ—notably *Brachionus militaris*, *B. angularis*, *B. punctatus*, and *B. Bakeri* and its varieties—were most common during the summer months, while the Synchronidæ increase in numbers in the early autumn. *Polyarthra* was frequently abundant,

and *Rotifer*, *Philodina*, *Asplanchna*, *Euchlanis*, *Cathypna*, *Distyla*, *Monostyla*, and *Pterodina* were often represented by one or more species. The paucity of Entomostraca stands in sharp contrast with the abundance of rotifers, the former group being represented by relatively few species and few adult individuals. The nauplii of *Cyclops* were, however, as a rule, abundant, but only occasional specimens of adult *Cyclops*, *Diatomus*, *Bosmina*, *Chydorus*, *Ceriodaphnia*, *Daphnia*, and *Cypridopsis* were to be seen.

Platydorina caudata, gen. et sp. n.

The species here described consists of a horseshoe-shaped cœnobium or colony (Pl. VII. fig. 1) of 16 or 32 biflagellate cells, the anterior end corresponding to the toe of the horseshoe and the truncate posterior end to the heel, the latter carrying 3 or 5 prolongations or tails formed by the gelatinous substance of the cœnobium. The colony is plate-like and flat, except that the plate is slightly twisted in a left spiral. This spiral is scarcely noticeable in a face view (fig. 1) except by focussing with a high-power objective, but it can be easily detected in a side view (fig. 3). It varies from one eighth to one thirty-second of a turn of the spiral, and in twenty-five colonies especially examined on this point it was invariably a left spiral, with the location of the twisting always in a definite relation to the colony, the right anterior and the left posterior regions of the colony in face view being high, while the left anterior and the right posterior are low. Repeated examinations of specimens, both living and preserved, indicate that this spiral form is a constant feature of structure, that it is not reversed in direction, and that it is subject to but slight variation in the degree of the torsion. No movement within the colony which would produce or vary the spiral was noted in living individuals. The form of *Platydorina* seems to be as constant and as characteristic as that of other genera of the family.

The size of the colony varies with the age, with the number of cells present, and also perhaps with the locality and the season. Colonies of 32 cells in which the first division leading to the formation of daughter colonies is taking place average about 150 μ in length, 130 μ in width, and 20 μ in thickness. The largest colonies are about 165 \times 145 \times 25 μ , and the smallest free-swimming ones about 25 \times 21 \times 4 μ . Colonies of 16 cells are smaller than those of 32 cells and are also narrower in proportion to their length, measuring about 70 \times 43 \times 16 μ .

The colours of *Platydorina* are quite as striking as those of related forms. The cells, which are imbedded in the transparent gelatinous matrix of the colony, are a bright chlorophyll-green, and each has, as a rule, a red stigma or eye-spot of unusual brilliancy.

The substance in which the cells of the colony are imbedded is similar in appearance to that in *Eudorina*. It is a transparent colourless substance of considerable consistency, showing in the living condition, as a rule, no trace of differentiation. The gelatinous nature of the substance is shown by the great numbers of bacteria which swarm within it in moribund specimens. Colonies killed in formalin and stained in Delafield's hæmatoxylin exhibit a difference in the intensity of coloration, indicating the presence of a denser peripheral layer or sheath 3-4 μ in thickness (Pl. VII. figs. 1, 4, *p.sh.*). This is apparent along the edges of the colony and presumably extends over its faces. In several living colonies a granular differentiation of this outer layer was noted about the margin. This sheath is similar to that of *Eudorina* and *Pleodorina*, but shows no trace of the concentric layers so prominent in *Pandorina*.

One of the most characteristic features of the colony is the presence upon the posterior border of 3 or 5 projections or tails, which are merely extensions of the sheath. Colonies of 16 cells have but three tails, while those of 32 cells have uniformly five. These projections are bluntish finger-like processes without structural differentiation, tapering somewhat to a rounded or pointed end. Occasionally the outermost pair, and more rarely the inner one, are slightly divergent. In the 16-cell colony there are two latero-posterior tails and one median one (fig. 2), the former being better developed and measuring 15 to 20 μ in length. The median tail is variable in length, being sometimes a mere rudiment appearing on a slight elevation on the margin. Its average length is about one third that of the adjacent pair, though it occasionally attains two thirds their length. The latero-posterior tails are upon each side of the colony directly behind the marginal row of cells, while the median tail is midway between the central rows. In the 32-cell colony (fig. 1) there is, in addition to the three tails above noted, another pair which may be designated as the lateral pair. These tails are slightly divergent, arising at the outer posterior angles of the marginal row of cells, between the last transverse quartet and the last sextet of cells. They are from 10 to 15 μ in length and are often of the same size as the median tail of the colony. The other three tails occupy the same position with respect to the

posterior quartet of cells that they do in the 16-cell colony, but are, as a rule, much larger, the postero-lateral pair measuring from 20 to 30 μ in length, while the median one reaches only a length of 15 to 18 μ . The five tails do not lie in one plane, but share in the spiral of the colony, at times, indeed, exceeding it in the degree of the twisting. These structures are all subject to considerable variations and irregularities of development (fig. 5), such as suppression, inequality of members of pairs, differences in size and relative development, in attenuation, and in degree of divergence. These irregularities are often correlated with the loss of cells in the colony due to parasites or other causes. The tails nevertheless exhibit such a constancy of position and so much of symmetry and regularity of development that they cannot for a moment be considered as ephemeral features of little structural importance. In their position they recall the protuberances noted by me (1898) at the posterior end of *Pleodorina illinoisensis*. In *Pleodorina*, however, these structures are apparent only in disintegrating maternal colonies, and it may be that they also indicate the point at which the embryonic cup closes. On the other hand, in *Platydorina caudata* these tails are present upon the colonies at the time of their escape from the maternal matrix, and persist throughout the life of the adult, being permanent structures, characteristic of the species.

Within the outer sheath is a homogeneous gelatinous matrix (fig. 1, *m*), which in Delafield's hæmatoxylin stains less readily than the sheath. In the living colony no differentiation of this matrix is to be seen, but, after staining, a delicate sheath showing deeper colour is demonstrated about each of the cells. In most places a considerable space intervenes between this secondary sheath (fig. 4, *s.sh.*) and the inclosed cell, so that the sheaths crowd upon each other and appear to divide the field of the matrix into irregular polygonal areas. These areas, as a rule, fill the greater part of the plate, leaving unoccupied only a few corners, principally about the second transverse row. The two poles of this swollen secondary envelope are not of equal size, the inner being somewhat the smaller, and slightly overlapped by those of the contiguous cells. This is due to the intercalation of the cells of the two sides of the plate and to the fact that the outer ends of the cells are slightly nearer the surface of the plate than are the inner ones. The gelatinous substance within the secondary sheaths does not differ in structure or stainibility from that of the surrounding matrix. As a result of the form of the

colony the amount of the matrix substance is much less in *Platydorina* than in related forms such as *Eudorina*.

The cells of the colony are all of one type, alike in structure, and approximately similar in size. Each is biflagellate and has a central body of protoplasm with a nucleus, two contractile vacuoles, one stigma, and one chromatophore with a single pyrenoid.

The number of cells in the colony is either 16 or 32; at least no normal colony with cells of any other number has been detected among the hundreds, if not thousands, of colonies examined. Colonies are frequently seen which, by reason of parasites or from other causes, have lost one or more cells—indeed, in some cases all but one or two; but the form of these colonies is usually preserved, and the empty secondary sheaths frequently remain as evidence of the original complement of cells. The 16-cell colonies are not mere stages in the development of the 32-cell form, for division of the cells of this type in observed cases leads to the development of new colonies and not to the formation of the 32-cell stage. As in other nearly related genera of the family—for example, *Eudorina*, *Pandorina*, and *Pleodorina*—the number of cells in the colony varies, within narrow limits, in the ratio of geometrical progression. In *Platydorina*, however, this pleomorphism is manifested not only by this difference in the number of cells in the colony, but also by a structural distinction—the presence of three tails in the 16-cell and five tails in the 32-cell colony. Inasmuch as the two types always occur together, and since this pleomorphism is in some respects similar to that of related genera, it does not seem justifiable to regard the two as distinct species of the genus. They are, I believe, two forms of one species.

The arrangement of the cells is characteristic and is strikingly different from that of any other genus of the family. The gelatinous matrix and sheath conform to the horseshoe-shaped plate of cells, and even the caudal appendages bear a fixed relation to the plan of cell-arrangement. The 32-cell colony is composed of a marginal U-shaped row of 12 cells about three sides of a 20-celled somewhat rectangular plate, which, in turn, consists of an outer row of 12 cells on three sides of a row of four pairs of cells. The colony might also be regarded as made up of three U-shaped rows of 12, 12, and 8 cells respectively, nested in such a fashion that the inner two project one cell beyond the outermost. The cells also fall into six quite irregular transverse rows of 4, 6, 6, 6, 6, and 4 cells respectively, and into the same number of corre-

sponding longitudinal ones. As before stated, the lateral tails are posterior to the marginal row, while the postero-laterals are behind the first row within the marginal, and the median one midway between the innermost rows. In the colony of 16 cells (fig. 2) the marginal row has but 10 cells and the central plate but 6. The cells fall into four somewhat irregular transverse rows, and there are the same number of longitudinal ones of 4 cells each. The horseshoe-shape, however, masks somewhat this simple *Gonium*-like arrangement. The plate-like form of the colony and the arrangement of the cells, especially in the 16-cell form, give this new genus a superficial resemblance to *Gonium*. It is, however, fundamentally different, for in *Platydorina* the two faces of the plate are exactly alike, while in *Gonium* the face anterior in locomotion bears all the flagella, and the other face presents only the bases of the cells. This similarity of the two faces in *Platydorina*, neither of which is anterior or posterior, is brought about by the fact that every other cell upon either face presents to that face the pole which bears the stigma and the flagella, while the intervening cells present the opposite pole, with its pyrenoid. This alternation of stigma and pyrenoid is constant, and can be followed in any row of cells except the diagonal ones (*cf.* fig. 1). The cells of the marginal row, in both the 16- and 32-cell colonies, point obliquely outward, the direction alternating, however, in conformity with the arrangement of cells in the central area, as may be seen in a view of the edge of the colony (fig. 3). The alternation of the cells in the colony as a whole is the same whichever face is presented, the right-hand cell of the posterior row of four cells always presenting the basal end uppermost. From this as a starting-point the regular alternation of stigma and pyrenoid can be traced from cell to cell throughout the whole colony. An examination of twenty-five colonies showed that all conformed to the same plan of alternation, there being no case of reversal. In the arrangement of the cells in the colony *Platydorina* is thus more like *Eudorina* than like *Gonium*, being not a simple plate like the latter genus, but, in reality, a flattened ellipsoid so much compressed that the cells of the two faces intercalate regularly, and thus give to the colony its superficial resemblance to *Gonium*.

The individual cells are all substantially alike in size and structure. They have the form of an oblate spheroid, slightly larger in the outer hemisphere*. Some cells, especially the

* As in the case of *Eudorina* and *Pleodorina* the terms "outer" and

marginal ones, often exhibit a slight flattening or even a depression at the outer pole. In the full-grown colony the cells have an equatorial diameter of 15–20 μ and a polar one of 15–18 μ . The cells of young colonies still within the maternal matrix do not exceed 4–6 μ in diameter. I do not find that the cells of the 16-cell colonies are appreciably larger than those of the 32-cell.

The protoplasm is small in amount, consisting of a very thin pellicle (fig. 4, *p.*) on the surface of the cell on the outside of the chromatophore, and an axially-placed knob-shaped mass (*pr.*) located somewhat nearer the outer pole than the inner one. Near the centre of this mass lies the spherical nucleus (fig. 4, *n.*), containing a single spherical nucleolus (*ncl.*). Within this protoplasmic mass lie the two contractile vacuoles (*c.v.*) and the stigma (*st.*), while from the outer end of the cell arise the two flagella (*f.*).

There is but a single cup-shaped chromatophore (fig. 4, *chr.*), which is inclosed within the pellicle above noted, and itself contains the knob-shaped protoplasmic mass. It is of a brilliant chlorophyll-green colour, and contains numerous small granules of irregular and somewhat angular outline. Towards the inner end of the cell, imbedded in the thickest part of the chromatophore, there is a single spherical pyrenoid, having a diameter of 4–6 μ .

The stigma or eye-spot, seen from above, is circular in outline, but in lateral view has the form shown in fig. 4, *s.* The slightly convex outer surface appears to project somewhat beyond the rounded contour of the cell. The colour is usually a bright reddish brown, often brightest in the anterior and marginal cells and rarely entirely faded in the posterior ones. The stigma is a homogeneous body, showing no trace of structure beyond the well-defined contour-line, which is best seen in fading and moribund cells. It is normally present in all cells of the colony, and may readily be demonstrated by full illumination. The position of the stigmata in the cells is somewhat unusual, and is significant of the pronounced polarity of the organism. The customary position in other genera is adjacent to the bases of the flagella. In *Platydorina*, however, the location of the stigma is not constant with respect to the flagella, but seems rather to bear a definite relation to the form of the colony, since it lies towards

“inner” are used to designate respectively the ends which bear the stigma and the pyrenoid.

the peripheral and posterior region of the cell (fig. 1), while the flagella are centrally located and project outward in the usual manner. This relation appears not only in the marginal regions, but also in the central. The physiological significance of this arrangement is not apparent, but it seems to be correlated with the pronounced polarity of the organism. *Platydorina* is positively phototactic. A miscellaneous plankton collection placed in a window with southern exposure in an aquarium 6 inches in diameter was, after ten minutes, quite barren of *Platydorina* except along the margin towards the window. On the other hand, this species avoids bright light. This was very evident in collections fresh from the field when examined under low power (75 diameters), a very slight increase above a moderate illumination causing them to leave the field of view with considerable rapidity. In one case, where twenty-eight colonies were in the field when placed under the microscope, only one of them remained after an exposure of twenty-five seconds. A very slight decrease in the amount of light would invariably insure their return to the field with almost equal rapidity, the number increasing as the intensity of the illumination was decreased. It may be that the asymmetrical position and the somewhat unusual arrangement of the stigmata are connected with the pronounced phototaxis of this organism. At least the asymmetrical position has a tendency to place the long axis of the stigma parallel to the main axis of the colony, with the outer end directed towards the source of light in negative, and away from it in positive, phototaxis.

The flagella are uniformly two in number for each cell, are similar in the same cell and in different parts of the colony, and are in the adult colony 20–25 μ in length. From the outer pole of the cell they pass through the matrix, leaving the appearance of a tube-like structure in the gelatinous substance (fig. 4). When not in activity the flagella project beyond the sheath in a position perpendicular to the surface of the colony at the place of exit. As in other genera of this family, the flagella persist after the division of the cell to form the daughter colony, and even after the divisions are completed still provide locomotion for the maternal organism. In some instances the flagella could be seen passing through the matrix toward that cell of the daughter colony which bears the largest eye-spot.

The contractile vacuoles (fig. 4, *c.v.*) are two in number, and are located in the peripheral layer of protoplasm near the outer end of the cell. They lie in the outer part of the knob-shaped mass of protoplasm upon either side of the place

of origin of the flagella, being somewhat widely separated. At diastole the vacuoles of an adult colony have a diameter of $1.5-2 \mu$. The contraction is rhythmical and the two vacuoles usually alternate at regular and equal intervals. At a temperature in the laboratory of 20° C. each vacuole contracted at intervals of forty-five to fifty seconds. In rare instances the contractions of the two vacuoles were separated by unequal intervals, being almost coincident in one case observed.

The method of locomotion in *Platydorina* is similar in many respects to that of other genera of the family. The lashing of the flagella produces a forward movement of the colony, and causes its rotation about the major axis either from left over to right or from right over to left. The rounded end of the colony is uniformly directed forward in locomotion; at least, no instance in which the caudal end led was noticed. The forward movement is, as a rule, accompanied by the rotation of the colony, though the amount of rotation varies somewhat with the individual, the freedom of movement, and the speed of locomotion. When locomotion is blocked by obstructions the rotation continues, as in *Pleodorina*, with frequent reversals in direction. In fact, obstruction to progress seems frequently, though not uniformly, to act as a stimulus to the reversal of the direction of rotation.

The two directions of rotation are not equally prevalent, that from right over to left having a marked predominance. Thus, of twenty-five colonies observed in motion twenty were rotating from right over to left and but five from left over to right. In another twenty-five the corresponding numbers were nineteen and six respectively. Keeping a single colony under observation for some time, it is found to rotate from right over to left about four fifths of the period and to turn in the opposite direction the balance of the time, this proportion representing the totals of the periods of rotation, while the individual periods vary greatly in length, that from left over to right lasting at times but a few seconds.

This predominance of one direction in locomotion is doubtless correlated with the torsion of the colony, whose shape is such that the rotation would necessarily be from right over to left in forward locomotion, as a result of the resistance of the water, unless, of course, there should be some disturbing factor. The immediate and most potent cause of the direction of rotation is doubtless the coordinated action of the flagella, since reversal of direction does not seem to be accompanied by any change in the direction of the torsion of the colony. The evidence upon this point is not conclusive, but repeated efforts have failed to detect any change in the

form of the plate when the direction of rotation is reversed in the living and moving colony; and, again, colonies when killed suddenly have always the usual form of spiral, though some of them were moving in the reverse direction. When the usual direction of rotation is reversed, the forward motion still continues in spite of the fact that then the form of the plate favours a backward movement; the form of the colony, therefore, does not control the direction of rotation, though it is correlated with the direction which predominates. The fact that the rotation from right over to left predominates also in *Pleodorina illinoisensis* and *Eudorina elegans*, where there are no structural features favouring such a predominance, suggests the possibility that the form of the colony in *Platydorina* is the result and not the cause of this predominance, and that the function of turning from right over to left predominantly preceded the structure which favours it. The organization of *Platydorina* suggests a descent from a *Eudorina*-like form, in which event the systematic series and the phylogenetic series alike afford evidence of a function arising in an organism before the structure with which it is correlated appears.

In another connexion (1898) the subject of locomotion and polarity in the different genera of the Volvocinæ was reviewed and discussed. It will suffice, therefore, for the present to give a brief *résumé* of the facts. In the lower genera of the family, *Stephanosphaera* and *Gonium*, as also in *Pandorina*, the rotation seems to be indifferently to the right or left, while in *Eudorina*, and especially in *Pleodorina illinoisensis*, it is oftenest to the left, rotations to the right in observed cases of the latter species being to those to the left as 100 to 117-138. With respect to *Volvox*, there are no data at hand. In *Platydorina* we find by far the most pronounced predominance of one direction of rotation, the ratio in observed cases being 100 rotations from left over to right to 355 from right over to left. In this respect, then, so far as there is evidence, *Platydorina* is the most highly differentiated genus of the family.

The polarity of the lower genera, *Stephanosphaera* and *Gonium*, is likewise of the simplest form, being merely physiological, the same pole or face of the colony always leading in locomotion. In *Pandorina*, *Eudorina*, and *Volvox*, however, there is the added feature of the greater brightness of the anterior stigmata, and in *Pleodorina* the two poles are differentiated by the two types of cells, as well as by the characters found in the genera just mentioned; but *Platydorina* is the only genus of the family in which polarity is

expressed by the arrangement of the cells and by structural features of the envelope. In regard to polarity, also, the new genus is thus the most highly specialized member of the Volvocinæ.

The reproduction of *Platydorina* has been observed by me repeatedly in the past five years, but only the asexual phase has thus far been discovered. All of the cells of the organism are gonidial, each dividing to form a daughter colony. The sequence of the divisions and the position of the successive planes are of the type found in *Eudorina* and *Pleodorina*, the resemblance being so close that the figures illustrating the asexual development of *Pleodorina illinoisensis* (1898, pl. xxxvii.) might almost be used for cleavage in *Platydorina*. There is one difference, however, for in *Platydorina* the curved plate of cells, which becomes first cup-shaped and then ellipsoidal, subsequently flattens, the cells of the two faces intercalating during the process. The daughter colony acquires the adult form, including the tails and the torsion of the plate, before it escapes from the maternal matrix, the young colonies moving about for some time in the disintegrating matrix before making their escape through the ruptured outer sheath. The secondary sheath surrounding the gonidial cell becomes the outer or primary sheath of the new colony. No stages of sexual reproduction have been seen, though the collections examined represent a considerable range of season and locality. It may be that these are to be sought upon the bottom rather than in the superjacent strata of water where plankton collections are usually made. Aquaria about to dry up were also searched in vain for sexual stages of *Platydorina*.

The mode of development of *Platydorina* is significant of its systematic position and its relationships. The number and the original arrangement of the cells, the type of development, and the character of the envelope, all indicate that *Platydorina* is a more highly specialized form descended from some *Eudorina*-like ancestor, and that it is more closely allied to *Eudorina* than to any other existing genus.

Throughout this paper the customary term "colony" has been used to designate the organism herein described and others related to it. The wide use of the term in the literature of the subject is doubtless due to the fact that, as a rule, the organisms are composed of similar cells arranged in symmetrical form with no pronounced axial differentiation, without contact or protoplasmic connexion, separated from each other by a non-living gelatinous matrix, and each capable of performing all the functions necessary for its own life and the

continuance of the species. Furthermore, the destruction of individual cells does not impair the life of the other cells of the organism, for so long as a single cell remains it continues its customary activity. The use of the term colony is, however, objectionable. A number of facts militate against this conception of the organism, and the discovery of the new genus here described adds to the array. (1) The cells are not always similar, for in all forms with poles physiologically or otherwise differentiated the anterior stigmata are brighter than the posterior, and in *Pleodorina* there are two kinds of cells, the vegetative and the gonidial, the former distinctly smaller than the latter. (2) There is in all of the higher genera a well-defined physiological polarity accompanied by the difference in the anterior and posterior stigmata, and also, in *Platydorina*, by a differentiation of the poles by the arrangement of the cells and the structure of the envelope, and by the further differentiation of a transverse axis. (3) In *Pandorina* the cells are almost in contact, and in *Volvox* they are actually connected by protoplasmic processes. (4) The beginnings of histological differentiation are also evident in the cells composing the so-called colony. In *Eudorina*, according to Carter (1858), the cells are differentiated into male and female in definite regions, the male cells developing from the anterior quartet and the remainder becoming female; in *Volvox* sexual and asexual reproduction alike are limited to a few of the cells; and in *Pleodorina* the asexual process is confined to the posterior hemisphere. The cells of the organism are thus histologically and functionally differentiated in this particular in these higher genera. Although the degree of differentiation is slight, it is nevertheless appreciable. (5) In the matter of locomotion the activities of the individual cells of the organism are not independent of each other, but are correlated, the flagella acting together to produce rotation, its reversal, or its cessation. The predominance of the direction in the higher genera plainly exhibits the phenomenon of correlated locomotor activities of the constituent cells.

The facts above cited emphasize the desirability of regarding each of these so-called colonial flagellates of the subfamily Volvocinæ as a unit, with an organization of its own, and not as a colony, that is, an aggregation of independent and similar cells associated merely as a result of descent from a common parental cell, the form being a matter of chance or circumstance. The group of cells as a whole, and not each of the constituent cells, is the unit of descent, of form, and of func-

tion, and the word colony can be applied to it only by the license of usage and as a matter of convenience.

Reference has been made frequently in the preceding pages to the prevalence of colonies whose symmetry has been disturbed by loss of cells. In most instances only the empty secondary sheath remains, giving no clue to the cause of the loss of its contents. In collections made in Phelps Lake, Havana, Ill., in August 1896, however, colonies were often found which were parasitized by one of the Sporochytriaceæ, which upon examination proves to be *Dangeardia mamillata*, described by Schröder (1898) as a parasite of *Pandorina morum*. As these infested colonies frequently showed a loss of one cell or more and exhibited all stages in the destruction of the cell, it seems probable that the loss was due to the parasite. *Eudorina elegans* and *Pandorina morum* occurred in the same collection and were similarly infested. Two additional genera, *Platydorina* and *Eudorina*, are thus to be added to the list of hosts of *Dangeardia*.

For the convenience of systematists a brief statement of the generic and specific characters of the form herein described is now given, followed by a key to the genera and species of the Volvocinæ for the assistance of students of this interesting and not uncommon group of freshwater organisms. Species not as yet reported to my knowledge from Illinois are indicated by an asterisk when found elsewhere in this continent and by a dagger when not as yet reported from it. It is not at all improbable that all the species here listed will yet be found within this State.

PLATYDORINA, gen. nov.

Colony flattened, the two faces compressed so that the cells of the two sides intercalate; flagella upon both faces on alternate cells. Anterior and posterior poles of major axis differentiated by the arrangement of the cells and by the structure of the envelope. Long and short transverse axes differentiated by the flattening of the colony. Cells similar, biflagellate, each with stigma, chromatophore, and pyrenoid. Asexual reproduction by repeated divisions of all of the cells, each forming a daughter colony.

Platydorina caudata, sp. n.

Colony flattened, horseshoe-shaped, twisted about one eighth of a turn from right over to left; cells 16 or 32,

arranged in a marginal row of 10 or 12 and a central area of 6 or 20; posterior end with 3 or 5 prolongations or tails formed by extension of the common outer sheath.

Known habitat, lakes and streams in Central Illinois. Types in the collections of the Illinois State Laboratory of Natural History and deposited in the United States National Museum.

Keys to the Genera and Species of the Subfamily Volvocinæ.

Cells arranged in cœnobia of definite forms varying with the species, biflagellate, with stigma and one or more chromatophores; surrounded by a gelatinous envelope, whose development separates them to a greater or less degree; number not uniform, varying in the different species, often, but not always, definite. Asexual reproduction by repeated divisions of gonidial cells, which constitute the whole or only a part of the parental organism, to form daughter organisms; sexual reproduction in some species (in others unknown) by the conjugation of male and female gametes, resulting in the formation of a resting stage, which later develops into a new organism.

Genera.

- | | | | |
|---|---|---|-------------------------|
| 1 | { | Cells arranged in form of plate, with flagella upon one face only | 2. |
| | | Cells arranged in spherical, ellipsoidal, or flattened colonies; flagella not confined to one face | 3. |
| 2 | { | Cells in a squarish plate; envelope closely adherent | <i>Gonium.</i> |
| | | Cells in a rounded plate; envelope swollen, oval, or spherical | <i>Stephanosphaera.</i> |
| 3 | { | Colony ellipsoidal or spherical; cells crowded together, conical, reaching towards centre, outer membrane of concentric layers | <i>Pandorina.</i> |
| | | Cells not crowded together nor reaching towards centre of colony | 4. |
| 4 | { | Colonies ellipsoidal or flattened; cells uniform in size | 5. |
| | | Colonies spherical or spheroidal, or, if ellipsoidal, with small vegetative and large gonidial cells | 6. |
| 5 | { | Colony ellipsoidal or spherical; poles not differentiated by arrangement or size of cells or by structure of envelope | <i>Eudorina.</i> |
| | | Colony flattened, horseshoe-shaped, with poles differentiated by arrangement of cells; posterior end with tails | <i>Platydorina.</i> |
| 6 | { | Cells not connected by protoplasmic processes, of two sizes, smaller vegetative at anterior pole and larger gonidial at posterior | <i>Pleodorina.</i> |
| | | Cells connected by protoplasmic processes, not markedly different in size | <i>Volvox.</i> |

Species.

GONIUM.

}	Cells 4	<i>sociale</i> (Duj.).†
	Cells 16	<i>pectorale</i> , Müll.

STEPHANOSPHERA.

Represented by a single species, characterized as follows:—Cells 4 or 8, ovoid or spindle-shaped, with numerous processes

pluvialis, Cohn.*

PANDORINA.

Represented by a single species, characterized as follows:—Cells 16 or 32, crowded, each with a single chromatophore and pyrenoid

morum, Bory.

EUDORINA.

Represented by a single species, characterized as follows:—Cells 32, 16, or 64, similar, not crowded together; common outer membrane without marked concentric structure

elegans, Ehrb.

PLATYDORINA.

Represented by a single species, characterized as follows:—Cells 16 or 32, arranged in a horse-shoe-shaped plate, those of the two faces intercalated. Posterior end with 3 or 5 tails

caudata, Kofoid.

PLEODORINA.

{ Cells 64 or 128; gonidial cells about two to three times the diameter of vegetative cells, which constitute about one half the total number and lie in anterior hemisphere.....

{ Cells 32, rarely 16 or 64; gonidial cells not more than twice the diameter of the vegetative cells, which constitute the anterior quartet. .

californica, Shaw.*illinoisensis*, Kofoid.

VOLVOX.

{ Cells about 10,000 (minimum 1500, maximum 22,000), angular, with stout connecting protoplasmic processes into which the chromatophore may enter. Diameter of colony about 700 μ (minimum 400, maximum 1200); diameter of cell-body 3-5 μ

{ Cells 500-1000 (minimum 200, maximum 4400), rounded, with slender connecting protoplasmic processes into which the chromatophore does not enter. Diameter of colony 170-850 μ ; diameter of cell-body 5-8 μ

globator, L.*aureus*, Ehrb.

University of Illinois,
Urbana, Ill., U.S.A.,
Dec. 5, 1899.

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EXPLANATION OF PLATE VII.*

Abbreviations.

A. Anterior pole.	P. Posterior pole.
c.v. Contractile vacuole.	p. Outer pellicle of protoplasm.
f. Flagellum.	pr. Knob-shaped mass of protoplasm.
m. Matrix.	pyr. Pyrenoid.
n. Nucleus.	s.sh. Secondary sheath.
ncl. Nucleolus.	st. Stigma.
p.sh. Outer or primary sheath.	

Fig. 1. *Platydorina caudata*, face view of 32-cell colony, \times 550.

Fig. 2. Face view of 16-cell colony, \times 628.

Fig. 3. Edge view of 32-cell colony, \times 350.

Fig. 4. Lateral view of one of the marginal cells, \times 1400.

Fig. 5, a-e. Outline of the posterior ends of several deformed colonies, \times 280.

LXXII.—*On the Luminous Organs of Selachian Fishes.* By
RUD. BURCKHARDT, Nat. Hist. Mus., S. Kensington.

IN the 'Zeitschrift für wissenschaftliche Zoologie,' vol. lxvi. 1899, Johann, at the instigation and under the guidance of Prof. Blochmann, of Tübingen, published a paper entitled "Ueber eigenthümliche epitheliale Gebilde (Leuchtorgane) bei *Spinax niger*," in which are given the results of some researches he made in this subject.

In this paper he describes some very minute organs with

* Figures drawn by C. A. Kofoid and inked by Miss L. M. Hart.

which the skin of *Spinax niger* is covered in great numbers, more particularly so on its black-coloured parts. In addition to describing their distribution upon the surface of the body and their histological structure, which in the main points corresponds with those of *Phyllirhoë* and the Pennatulidæ, he also compares them with other luminous organs.

He moreover refers to a previous observation on phosphorescence made in another Spinacide species, *Isistius brasiliensis*, by Bennett as early as 1840 during a whale voyage, in which he states expressly that, with the exception of a ring on the throat remaining dark, the whole of the ventral surface of this fish was aglow for about three hours. It struck Johann as being remarkable, when he discovered on the throat in *Spinax* two regions extending towards the median line which were devoid of these structures. From this fact alone, and quite apart from purely structural characters, he was right in his surmise, that in all likelihood they would have to be regarded as organs of luminosity.

The accuracy of his notions as regards their functions was moreover fully borne out in a note from Th. Beer, dated Jan. 31, 1899, which reached Johann in time to find a place at the end of his paper.

In his note Beer says that, whilst engaged in ophthalmoscopic observations on *Spinax* in a room darkened for this purpose, its phosphorescence was vivid enough to enable him to see it at a distance of from 3-4 metres. "The whole of the ventral surface of the animal," he continues, "from the snout to the root of the tail, was glowing with a feebly shining greenish lustre, as if it were impregnated with phosphorus or had been coated with a luminous paint, with this difference, however, that luminosity appeared and disappeared at short intervals, but invariably increased in intensity just before its disappearance."

In this wise Johann's interpretation was indisputably confirmed. He further, too, more fully entered into those questions of their physiology which are so closely connected with these remarkable structures; and he finally endeavoured to supply proof of their presence in other Selachians which he examined for this purpose, without, however, being able to do so.

The genera investigated by him with the aforesaid object were:—*Stegostoma*, *Carcharias*, *Scyllium*, *Pristiurus*, *Mustelus*, *Crossorhinus*, *Zygæna*, *Chimæra*, *Centrophorus* (*granulosus*), *Læmargus* (*borealis*), and *Scymnus*.

At the time when Johann published his work I had already noticed some peculiar structures in *Læmargus rostratus*, a

rare shark from the Mediterranean. These I had put aside for the purpose of future microscopical use, pending the completion of other anatomical research; I then concerned myself with this shark. Unquestionably they were organs of luminosity, of the correctness of which opinion I became more firmly convinced, since a splendid specimen of *Spinax niger* afforded me an opportunity for confirming Johann's observations.

When, in the spring of 1898, I was working at the Zoological Station in Naples, Dr. Salvatore Lobianco, with his wonted kindness, seized upon the first opportunity that presented itself to procure for me half a dozen living specimens of this species, which, however, arriving one evening, died the next morning. I was greatly struck at the time by the splendour of the spectral colours which these fishes exhibited, and of which, so far as I am aware, no mention anywhere in literature seems to have been made. This latter circumstance induced me therefore to prepare a coloured sketch of this phenomenon from these fishes.

A later scrutiny of this sketch convinced me of the fact that I had been able to observe the phosphorescence of these organs by daylight, so strong was their luminous power*.

It is not my intention here to enter into details relating to the purely histological modifications of these organs amongst other Selachians, feeling sure that they all share more or less the type of form which Johann has ascribed to them for *Spinax*.

A few figures, however, which I made of *Læmargus rostratus* may well find a suitable place here—firstly, because they will prove that the organs observed by myself are really identical with those of Johann; and, secondly, they go to show, as before stated, that the organs pertain to that form whose morphological structure is so much affected by the scales, as is the case with many of the Teleostean fishes.

The transverse section made through the luminous organ of *Læmargus rostratus* (fig. 1) shows an epidermal swelling, projecting crater-like above the ordinary level of the epidermis. Beneath a few layers of epidermal cells of normal texture are some which contain a prismatic corpuscle. The actual limit

* It should be stated here that with regard to its outer appearance *Spinax* has repeatedly been the victim of misrepresentation, *f. v.* :—

1. In the figure which Rafinesque gives of it, by having three gill-openings only.
2. Its natural colours were quite unknown to all iconographers of fishes, from Bonaparte to Fries.
3. In being represented with its abdomen turned upwards in Moreau's drawing, without any reasons given for so doing.

between the epidermis and the cutis could not be established with precision on material which had been preserved in a solution of formalin. Certain it is that here, too, an incursion of large pigment-cells into this prominence took place by means of the strand leading to it, and which itself is enveloped

Fig. 1.

Microscopic section of the luminous organ of *L. rostratus*.

by them. This strand seems to consist of a fibrous tissue admitting a nerve of considerable size. On comparing it with the luminous organ described by Johann, it appears to me in process of atrophy, and may possibly be met with only in a state of perfect development in the fully gestated embryo, afterwards becoming resorbed.

Fig. 2 shows the luminous organ in correlation with the surrounding scales. From a bulbous centre, which latter represents the swelling seen in fig. 1, extend on two sides some epithelial strands which are covered by pigment.

These scales differ from the normal ones in the following points:—

(1) By having a more abundant pigmentation of their pulpa, thus making the parts which these organs occupy, and which are already prominent under ordinary macroscopical observation, more conspicuous.

(2) By having their apices blunter than is the case with the normally constituted scales, in particular those rows of scales which are situated orally with respect to the luminous organs.

(3) By their base not terminating in a simple rhomboidal edge, but possessing finger-shaped projections which secure for these organs a firmer hold.

Fig. 2.



Scale-bases and pigment of the luminous organ of *L. rostratus*.

In *Læmargus borealis* the luminous organ appears to have arrived at a stage of further reduction because its histological structure is more vestigial still than is the case with that described by Johann.

Besides this, the scales which surround the luminous organs of this species differ from the normal ones in their stronger pigmentation only and in being more crowded, but not in variety of form.

I will now proceed to the description of the topographical distribution of these photogenic organs, concerning which it should be said that it differs in every species.

In the genus *Spinax* these organs were discernible, besides in *S. niger*, in *S. pusillus* and *S. granulatus*, of which latter the type is preserved in the British Museum. In *pusillus* they are distributed in an almost identical manner to those in *S. niger*, *i. e.* the whole of the black under surface is densely beset with them, whereas on the upperside they are very widely dispersed or isolated.

On examining several specimens I was greatly impressed with the fact that these organs appear extremely varied in point of distinctness, variations which are clearly attributable to the amount of pigmentation consequent upon the more or less fresh condition the specimens were in at the time they were preserved.

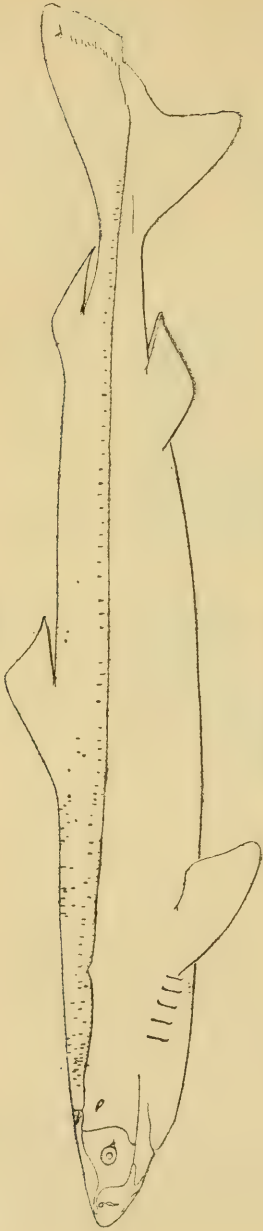
Up to the present time no phosphorescent organs were known to exist in the genus *Læmargus*, although *L. borealis* has been known for many years and is a common inhabitant of the Northern Seas.

The distribution of these organs in *Læmargus rostratus* is as follows:—On both sides of the head and immediately in front of the opercles are two bands which seem to agree with the posterior crura of a circlet consisting of these organs, as described by Johann to exist on the corresponding portion of the head in *Spinax*. The remaining bands are distributed in irregular swarms, resembling small stripes, which are placed transversely. Accumulations of this kind are situated on the occipital region and also on the base of the anterior dorsal fin orally. Moreover, an irregular row of these organs runs along the body, beginning at the back of the head and ending at the root of the caudal fin a short distance from and above the lateral line. Lastly, there is a short row, composed of seven of these organs, situated below the hindmost gill opening, which converges, together with the one on the other side, towards the ventral median line. Excepting these latter, I have not discovered any more of these structures below the lateral line.

Their distribution in *Læmargus borealis* is similar; but whereas 125 of these structures can be counted on one side of *L. rostratus*, in *L. borealis* their number is 95 only. On comparing their distribution in the two species the following are the principal differences in *borealis*:—

The number of occipital organs is fewer. The prædorsal

Fig. 3.



Læmargus rostratus. $\frac{1}{6}$ nat. size.

Fig. 4.



Læmargus borealis, $\frac{1}{2}$ nat. size.

Fig. 5.



Isistius brasiliensis. Showing the distribution of luminous organs. $\frac{3}{4}$ nat. size.

Fig. 6.



Euprotomicrus Labordii. Showing the distribution of luminous organs. $\frac{3}{4}$ nat. size.

cluster is slightly removed towards the snout and more reduced than that of *L. rostratus*. I met with some scattered organs on the anterior dorsal fin itself and also above the foremost gill-opening, while the supralateral row does not extend beyond the posterior dorsal.

With regard to these organs in *Læmargus brevipennis*, I was able, from a specimen in the Paris collection, to prove their presence in this species, and to state the fact that they have a general resemblance to those of *L. borealis*. It is quite probable that luminous organs are functional in the majority of the Læmargidæ, but possibly so in the young only of the two larger species, in which they most likely have escaped observation.

It is to the authentication in *Isistius brasiliensis* of these organs, however, that I attach particular value.

Here, as in *Spinax pusillus*, similar conditions obtained for the non-uniformity of these structures in the different specimens which I consulted. For instance, while they could be seen plainly enough in some of them, in others, whose state of perfection previous to their preservation was probably impaired, absolutely no traces of them were perceptible.

I found their expansion in perfect accord with Bennett's statements concerning this species, who had studied its sphere of luminosity. In place of the non-luminous portion referred to by this author a yellowish-coloured zone was even yet visible on the old spirit-specimen, having its origin above the gill-openings in a breadth of about 1 centim., and widening out ventrally to one of about 2 centim. The zone lying in our figure between the dotted lines contained not a single one of these organs, whilst just behind it the whole of the ventral surface is densely beset with them, though they are more widely dispersed towards the back.

Some isolated organs can nevertheless also be found scattered along the back. In addition to those mentioned above, they further occur on both dorsal fins. On the top of the head they are equally as scarce as on the back of the body, reappearing, however, in somewhat greater numbers dorsally of the posterior angle of the eyes, below the eyes, on the spiraculum, in the angle of the mouth, on the cheeks, and also on the rostrum.

In regard to number these organs stand to the scales in the ratio of about four of the former to one of the latter on the abdomen, as against one to every ten scales on the upperside.

Euprotomicrus Labordii is only slightly longer than *Isistius*, but considerably darker in colour. Its luminous organs are more strongly pigmented and recall to mind rather those of *Spinax*—though present only on the ventral side, where they are densely massed and quite equally distributed,

without any interruption on the throat at all. There are no fewer than twelve to every scale, and in some places they accumulate behind each scale in angle-shaped groups.

Fig. 7.



Centroscyllium granulosum, Günth. $\frac{1}{2}$ nat. size.

Fig. 8.



Luminous organs of *Paracentroscyllium ornatum*, Alcock, n. gen. Nat. size.

Dorsally they scarcely reach to the lateral line, which they certainly do not cross.

Centroscyllium granulosum was first described by Dr. Günther. On the type specimen I found the luminous organs

rather evenly distributed over the entire specimen, though somewhat sparser perhaps when compared with forms previously mentioned.

In fig. 7 I was obliged to have recourse to a restoration in part after *Centroscyllium Fabricii* for the first dorsal and the caudal fin, as well as for the distribution of the photogenic organs, the skin of the specimen of *C. granulatum* having sustained some damage. These organs are also present in *C. Fabricii*, but unfortunately the specimen at my disposal was likewise defective, a circumstance which entirely hindered the study of the distribution of these structures in this species.

An oceanic Spinacid, *Paracentroscyllium ornatum*, which has been described by Alcock, seems to be more closely allied to *Spinax* than to *Centroscyllium*, to judge from the description of its colours by this author. Only one of the three specimens belonging to this species is in the British Museum, and on this I found the organs of luminosity present.

They are relatively large in size, and are confined merely to a few places—for instance, on the muscular portions of the pectoral fins, then again on the two ventrals, and on both dorsal ones. They further occur on the inferior lobe of the caudal, consisting of a single row only, in smaller groups and more widely diffused over and below the eyes. Dorsally they make their appearance between the spiraculum and a little beyond the ventral fin, over the whole of the gill-region, and towards the anus on the ventral surface.

It may here be remarked that I have searched in vain for these photogenic organs in *Centrophorus granulatus*, *C. calceus*, *C. squamosus*, *Scymmodon ringens*, *Scymnus lichia*, *Centrina*, *Notidanus*, *Echinorhinus*, and *Chlamydoselache*.

In conclusion, it will be seen that organs of phosphorescence exist in eleven species of Selachians, inclusive of *Isistius brasiliensis* (Bennett) and of *Spinax niger* (Johann).

In structural characters they are very similar, and exhibit a primitive degree of development*.

The distribution of luminous bodies is characteristic of the respective genera and species. All Selachians which possess them are pelagic, and they belong to the family Spinacidae (Günther) = Spinacidae + Læmargidae of authors.

* Luminous organs of a similar form have been described in a Teleostean fish ("The Phosphorescent Organs in the Toad-fish, *Porichthys notatus*, Girard," by Ch. Wilson Green, Journ. of Morphol. vol. xv. 1899). With reference to this I may mention that I have also noticed their existence in the occipital region of the haddock.

LXXIII.—*Mormopterus Whitleyi*—a new Species of Bat from W. Africa. By R. F. SCHARFF, Ph.D., B.Sc.

THREE specimens of a bat, which I was unable to identify with hitherto published descriptions, were sent to me by Dr. J. C. Whitley from Berin City in West Africa. Before describing them I forwarded one of them to Mr. Oldfield Thomas, of the British Museum, who was good enough to confirm my opinion that it belonged to a new species. I have great pleasure therefore in naming the bat after its discoverer,



Head of *Mormopterus Whitleyi*, Scharff.

Dr. Whitley, and herewith give a description of its most salient external features.

Ears shorter than the head and approaching one another on the forehead to within 2 millim. Both the ears and their short tragus are rounded off above. The antitragus is well developed and separated posteriorly by a distinct notch. The extremity of the muzzle projects very much beyond the mandible, and the end of the nose is distinct from the upper lip. The nostrils open almost laterally. The upper lip is only very indistinctly folded and covered with thick bristles and fine hairs. On the lower lip the bristles are confined to the angle of the mouth, but the hairs extend all over it. The gular sac is small.

The dentition being $\frac{1}{2}$ $\frac{1}{1}$ $\frac{1}{2}$ $\frac{3}{3}$, *M. Whitleyi* differs from all other species of the genus in the possession of four lower incisors instead of the usual six.

The fur is dark brown above, the bases of the hairs being pale. The underside is of a light reddish-yellow colour. Nearly half the tail projects beyond the wing-membranes, which reach to the ends of the tibiae.

The dimensions of the type, now in the British Museum (adult ♂ in formalin), are:—Total length 81 millim.; head 22; body 36; tail 23; length of forearm 36, of lower leg 27.

The height of the ear is 15 millim., the width 10.

Three other species of *Mormopterus* are known to science, viz., *M. albiventer*, *M. acetabulosus*, and *M. setiger*. The first of these is confined to Madagascar, the second has a wide range from South-east Africa to Madagascar and Mauritius, while the last has been taken in German East Africa.

M. Whitleyi differs from *M. albiventer* in being somewhat smaller, in having a well-defined antitragus in the ear-conch, and from all the three in having only four lower incisors instead of six.

M. Whitleyi differs from *M. acetabulosus* and *M. setiger* in having the ears close together on the forehead, in the more regularly triangulate shape of the ears, and in the squareness of the tragus.

Finally, *M. Whitleyi* differs from *M. setiger* in being smaller and in having the tragus rounded off above.

LXXIV.—*A new Bat from Peru.*

By GERRIT S. MILLER, JR.

AMONG some Peruvian bats submitted for determination by Mr. Oldfield Thomas there are three specimens whose superficial appearance is much like that of *Pipistrellus hesperus* (H. Allen), but whose structural characters show relationship with the members of the genus *Rhogeëssa*. The peculiarities of the ear and teeth, however, are so great that the species cannot be placed in any of the known genera of its family.

TOMOPEAS, gen. nov. (*Vespertilionidæ*).

Type *Tomopeas rarus*, sp. nov.

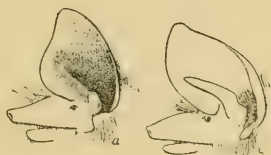
Characters.—Similar to *Rhogeëssa*, H. Allen, except that there are only four incisors in the mandible and the structure of the ear is essentially like that of the small-eared species of *Nyctinomus*. Ear-conch provided with a distinct though rudimentary keel occupying the same position as in the members of the family Molossidæ. Anterior border of ear terminating simply, and without trace of basal lobe or "hem." Tragus low and rounded, no larger than in some of the species of *Nyctinomus*, and barely visible in the dried skin. Nostrils distinctly short-tubular. Upper lip broad and spreading.

Dental formula: $i. \frac{1-1}{2-2}$, $c. \frac{1-1}{1-1}$, $pm. \frac{1-1}{2-2}$, $m. \frac{3-3}{3-3} = 28$.

Tomopeas ravus, sp. nov.

Type.—Adult male (skin and skull), no. 639, collection of P. O. Simons, Yayan, Cajamarca, Peru (alt. 1000 metres), November 4, 1899.

Characters.—Slightly larger than *Rhogeëssa tumida*, H. Allen (total length about 75 millim., forearm about 33); ear broader, its anterior margin concave below tip, its posterior margin convex to base of antitragus; colour yellowish grey, almost exactly like that of *Pipistrellus hesperus* from the desert regions of the western United States, and more pallid than in any known species of *Rhogeëssa*; skull slender, the rostrum and brain-case depressed; teeth much as in *Rhogeëssa tumida*, but first and second upper molars with more distinct hypocone.



a. *Tomopeas ravus*; b. *Rhogeëssa tumida*.
(Somewhat enlarged.)

Muzzle and lips.—Muzzle produced in conformity with the broad lips, its extremity 3.5 millim. in front of incisors. Front of muzzle naked except for a sprinkling of fine short hairs at middle on upper surface. Nostrils with rim of aperture produced into a distinct though very short tube. The rim is slightly more produced at upper outer edge of nostril, forming there a distinct blunt point. Upper lips thin and widely spreading, the outer surface irregularly wrinkled and little swollen, the inner surface distinctly and finely transverse-wrinkled. Edge of lip conspicuously fringed, the hairs longest about midway between nostril and angle of mouth, but the fringe continuous across lower surface of muzzle. The lower lip is unusually tumid in front, but otherwise it shows no peculiarities.

Ears.—The ear is moderately long; laid forward it extends to nostril. The anterior margin arises simply and without trace of lobe or "hem" about 1 millim. above inner canthus of eye. It is at first abruptly convex, the convexity extending through lower three fourths, though less distinct above middle. At termination of main convexity the outline becomes abruptly concave. Beyond this it is straight to

narrow rounded tip. Posterior margin convex from tip to antitragus, though nearly straight through upper third. Antitragus small but well developed, and sharply defined from rest of ear. It is roughly rounded-triangular in outline, the anterior border faintly convex, the posterior slightly concave. The anterior border is continued forward to terminate at a distinct wart on lower lip at angle of mouth. Inner surface of conch nearly smooth, though inconspicuously sprinkled with very fine hairs. About halfway between meatus and tip of ear two or three faint cross-ridges may be detected. From anterior base of tragus there extends forward and upward a distinct keel about 3.5 millim. in length and nearly as well developed as in *Nyctinomus minutus*. Tragus scarcely rising above level of eye. In form it is much like that of a specimen of *Nyctinomus Kainowskii*, though in size it is actually, as well as relatively, somewhat larger. Anterior border faintly concave immediately above base, then strongly convex, the convexity passing directly into that of tip, and this again into that of posterior border. Posterior border expanded near base into a narrow upright plate whose surface is vertical to that of tragus. From tip of tragus spring a few hairs, the length of which is about equal to height of tragus from anterior base.

Membranes.—The membranes are thin, delicate, and in no way peculiar in structure. Wing from ankle, its attachment on outer and lower side. Uropatagium ample, enclosing tail to base or middle of penultimate vertebra.

Feet.—The foot is small, about one third as long as tibia. Its structure calls for no comment. Calcar about as long as tibia, its tip forming a small but distinct lobe. Keel narrow and inconspicuous.

Fur.—The fur is soft and dense, its length over entire dorsal surface about 8 millim. Beneath it is shorter. It is very closely confined to body, barely extending on extreme base of membranes. The uropatagium both above and below is sprinkled with fine hairs. Basal half of ear and entire face densely furred.

Colour.—Dorsal surface pale wood-brown, faintly washed with ecru-drab across shoulders. Underparts dull buff, fading to whitish cream-buff posteriorly. Face, ears, and membranes blackish. Basal half of fur everywhere dull slaty grey.

Skull.—The skull of *Tomopeas rarus* resembles in a general way that of *Rhogeëssa tumida*, but is less robustly formed, and the brain-case is less elevated. Zygomata very slightly flaring, much less prominent than in *Rhogeëssa tumida*.

Viewed from the side, the rostrum is seen to be much flattened as compared with that of *Rhogeëssa*. The flattening is visible in dorsal view also, though less conspicuous. Ant-orbital foramen separated from rim of orbit by a wide space, in the middle of which the relatively large lachrymal foramen opens directly outward. Bony palate as in *Rhogeëssa tumida*, except that the backward extension behind plane of molars is shorter and without median spine.

Teeth.—Except in their uniformly smaller size and in the absence of the outer incisors the mandibular teeth do not differ appreciably from those of *Rhogeëssa tumida*. The maxillary molars, on the other hand, are immediately distinguishable by their greater development. The first and second are each provided with a distinct hypocone separated from the commissure of the protocone by a deep notch. In *Rhogeëssa* the hypocone is so merged with posterior commissure of protocone as to have practically lost its identity. Third molar much broader than in *Rhogeëssa tumida*, owing to the presence of a well-developed metacone.

Measurements.—External measurements of type (skin): head and body 42 millim.*; tail 32*; tibia 10; foot 5 (4.2); calcar 11; forearm 33.4; thumb 4.6; second digit 27; third digit 56; fourth digit 48; fifth digit 38.

External measurements of an adult female from Chosica, Peru (in alcohol): head and body 39*; tail 34*; tibia 10; foot 5.6; calcar 12; forearm 32.6.

Measurements of an adult female from Tolon, Peru (in alcohol): head and body 36.4; tail 33; tibia 11; foot 5; forearm (broken) 31; ear from meatus 12; ear from crown 10.4; width of ear 11.6; height of tragus from anterior base 1.8.

Cranial measurements of type: greatest length 12.6; basal length 11.4; basilar length 9; zygomatic breadth 7; lachrymal breadth 4.8; least interorbital breadth 3; greatest breadth of brain-case above roots of zygomata 6.6; depth of brain-case 4.4; mandible 8.6; maxillary tooth row (exclusive of incisors) 4.4; mandibular tooth-row (exclusive of incisors) 5.

Remarks.—While *Tomopeas rarus* is so readily distinguishable from other bats as to require no special comparisons, its relationships are much involved. The general external structure, so far as wings, membranes, feet, and tail are concerned, shows no departure from a strictly Vespertilionine type. The somewhat tubular nostrils and the broad upper lip show, on

* Collector's measurement.

the other hand, a distinct tendency toward Molossine characters; while the ear, in all the essentials of structure, is practically identical with that of some of the species of *Nyctinomus*. Probably the questions suggested by this combination of peculiarities can only be answered after detailed study of the skeleton.

The type specimen will be presented by Mr. Thomas to the British Museum* and the spirit-specimen from Chosica to the United States National Museum.

LXXV.—*Reptiles and Batrachians collected in German New Guinea by the late Dr. Erik Nyman.* By Dr. EINAR LÖNNBERG.

DURING his visit to New Guinea last year my late friend, the Swedish botanist Dr. Erik Nyman, made a collection containing the following reptiles and batrachians, which were sent home to Upsala. It is not very large, which can easily be understood, as Dr. Nyman laid most stress on making large botanical collections, in which he succeeded. Nevertheless the zoological collection treated of in these pages is of great value, as it includes several forms new to science and also adds to the zoogeographical knowledge. All the specimens were collected in German New Guinea. The following geographical names are found on the labels:—

Stephansort.

Simbang.—In a bay at the outlet of a river, a missionary station on a hill 50 metres above the sea-level.

Sattelberg.—A missionary station about 800 metres above the sea.

Friedrich Wilhelms Hafen.

Most of the specimens are from Sattelberg. Some of the labels had, however, fallen off during transit. "Sattelberg" was written on all except one, on which "Fr. Wilhelms Hafen" was inscribed. Consequently one of the specimens recorded in this paper, for which no exact locality is given, is from Friedrich Wilhelms Hafen, but all the others are from Sattelberg. In those instances where the locality is indicated it is quite certain, and quoted from an original label

* [B.M. no. O. 3. 1. 101.—O. T.]

tied to the specimen. The fauna of Sattelberg is particularly interesting, because it is to be regarded as most typical for the interior of German New Guinea, and from that place the best specimens of the collection have been obtained.

REPTILIA.

LACERTILIA.

Gymnodactylus pelagicus, Gir.

One example, Stephansort.

Gymnodactylus louisianensis, De Vis.

Description.—Head large; snout longer than the orbit, the diameter of which is nearly equal to its distance from the nostril, but a little shorter than its distance from the ear-opening; forehead concave, loreal region also concave, especially anteriorly; ear-opening roundish, about one third of the eye. Body and limbs rather elongate. Digits somewhat depressed at the base, strongly compressed distally. Head granular, with small tubercles on the temporal, occipital, and posterior part of parietal regions. Rostral subquadrangular, its height being about three fourths of its breadth, with a deep median cleft above; a large supranasal, separated from its fellow by a small azygous shield; nostril pierced between the rostral, the supranasal, the first upper labial, and three or four small granules; twelve upper and ten to twelve lower labials; symphysial triangular; two pairs of chin-shields, median largest and forming a long suture behind the symphysial; throat granular. Upper surface of arm above the elbow covered by subimbricate scale-like granules; with this exception, body and limbs covered above with small granules intermixed with small, round, feebly keeled tubercles; scales covering a fold extending on each side of the body, from axilla to groin, enlarged to similar tubercles. Ventral region covered by scales, larger and more imbricate towards the middle of the body, where their diameter is considerably greater than that of the dorsal tubercles. Male with a long uninterrupted series of femoral and præanal pores, about 30 on each side, forming a right angle in the middle, but (unlike the condition in *G. Loricæ*) this series is not preceded by any additional præanal pores. A distinct præanal groove. Tail cylindrical, tapering, covered by a heterogeneous lepidosis. The proximal third bears the same kind of tubercles as on the back, but the granules between them are larger, scale-like, and subimbricate. Distally the tubercles disappear and the

scales become transversely arranged, more or less. On the lower side there is a median series of transversely enlarged shields. Reproduced tails have a less regular lepidosis. Greyish brown above, a broad, dark brown, light-edged band from eye to eye over the nape; a saddle-band of the same kind over the shoulders, and two similar ones behind each other on the back; the male with a third similar band across the loins. Tail with broad dark brown or blackish rings, which are less regular on the lower side. Lower parts of body and limbs uniformly brownish white (in spirit). Two smaller specimens, probably young of the same kind, are brown above, with narrow undulated bands of a darker shade across the back; tail as in the large specimens.

	♀. millim.	♂. millim.
Total length	185	203
Head	27	33
Width of head	19	23
Body	63	84
Tail	95	86*

One male, two female, and two young specimens from Sattelberg.

Gonyocephalus dilophus, Dum. & Bibr.

Two specimens, Sattelberg.

Gonyocephalus modestus, Meyer.

One specimen.

Varanus indicus, Daud.

A young specimen.

Lygosoma elegantulum, Ptrs. & Dor.

Three specimens.

Lygosoma jobiense, Meyer.

One specimen.

Lygosoma Baudinii, Dum. & Bibr.

One specimen.


* Distally reproduced.

Lygosoma rufescens, Shaw.

One specimen.

OPHIDIA.

Chondropython viridis, Schleg.

"Yamomong." Two specimens from Sattelberg. The larger is dark bluish black (in spirit), with small, widely scattered, yellow spots, which usually only occupy one scale. These spots are not systematically arranged, and are found as well on the back as on the sides. The scales in three or four of the outer rows are edged with yellow, and those in the series next to the ventrals are completely yellow, like the latter. The young specimen is entirely different in colour, being yellow with red markings. These are partly regular. A streak running from the temporal region through each eye and joining that from the other side just above the rostral; a short transverse streak between the eyes; a -shaped band on the parietal region; a round spot on the nose and two elongate rings in front of the parietal band; a longitudinal median streak beginning on the nape and extending to the tail; in connexion with the latter small subtriangular rings, often alternating with each other and with the tips pointing downwards; on the flanks numerous small rings and round spots of a paler colour than the other markings. The tip of the tail is provided with dusky spots. All these markings make the specimen deserve the epithet "beautiful" written by the collector on the label; but it seems peculiar that the young animals should have such a striking coloration, when that of the full-grown animal might be termed protective. The body of this young snake is extremely compressed. At the middle it is fully 2 centim. deep, but hardly 1 centim. broad. The back is compressed to an edge.

Enygrus asper, Gthr.

Two specimens from Stephansort.

Tropidonotus Mairii, Gray.

Two specimens, both with the frontal once and two thirds as long as broad. The number of ventrals resp. 145 and 154, and the number of caudals resp. 66 and 88.

Stegonotus modestus, Schleg.

Two specimens.

Dendrophis calligaster, Gthr.

Two specimens, one resembling var. D in Boulenger's 'Catalogue of Snakes,' the other var. G. (*ibid.*). Both are from Simbang.

Dipsadomorphus irregularis, Merr.

Two adult and one young specimen from Simbang.

PSEUDAPISTOCALAMUS, gen. nov.

This genus is allied to *Apistocalamus*, Blgr., and *Pseud-elaps* (D. & B.), Blgr.

Maxillary extending forwards fully as far as the palatines, with two grooved teeth, anteriorly followed by four grooved teeth, gradually, but feebly, decreasing in length. Head small, depressed, hardly distinct from neck. Eye very small, with round pupil. Nostril pierced in a single nasal, but the margin of the latter bordering the first labial and the inter-nasal comparatively narrow; a large præocular, in contact with the single nasal. Body cylindrical; scales smooth, in 15 rows; ventrals rounded. Tail short; subcaudals in two rows.

Pseudapistocalamus Nymani *, sp. n.

Snout short, bluntly rounded. Rostral broader than deep, visible from above, but the visible portion hardly one fifth of its distance from the frontal; internasals rather small, about half as long as the præfrontals. Præfrontals not quite so long as the frontal. Frontal almost as broad as long, almost as long as its distance from the rostral, much shorter than the parietals; præocular single, longer than deep, forming a suture with the nasal. Normally two postoculars, upper much larger than lower, sometimes both fused to one. Temporals 1 + 2; six (or seven) upper labials, third and fourth entering the eye, sixth largest, sometimes divided; five lower labials, three in contact with the anterior chin-shields; posterior chin-shields smaller, more or less separated by a scale, which sometimes reaches the anterior chin-shields, sometimes

* In memory of the late Dr. Erik Nyman:

extends only to the middle of the posterior ones. Scales smooth, in 15 rows. Ventrals 196-205; anal divided; subcaudals 26-29. Dark bronzy brown (almost blackish in the largest specimen), somewhat iridescent above, lighter on the flanks; ventrals and subcaudals blackish brown, edged with light grey (in the youngest specimen the outer rows of scales coloured in a similar manner). Upper lip and a spot on each side of the nape yellowish, as is also a transverse band across the prefrontals from lip to lip, although the latter is less pronounced.

The largest specimen measures about 445 millim. in total length; tail about 47 millim. This specimen is a female and contains eggs measuring about 13 millim. in length.

Three specimens from Sattelberg.

BATRACHIA.

ECAUDATA.

Rana papua, Less.

Three large and five half-grown specimens from Sattelberg. The interorbital breadth compared with that of the upper eyelid seems to be variable, and to be greater in old specimens.

Cornufer corrugatus, A. Dum.

Several specimens from Sattelberg.

Mantophryne robusta, Blgr.

A fine specimen from Sattelberg. This species was described in 1898 from specimens collected on St. Aiguan Island, British New Guinea.

Hyla eucnemis, sp. n.

Tongue broadly heart-shaped, nicked and free behind. Vomerine teeth in two large but confluent groups, behind the level of the choanæ, which are large, but not quite so large as the patches of vomerine teeth. Head large, about as broad as long. Snout subtriangular, the tip truncate, longer than the diameter of the orbit; canthus rostralis very distinct, curved; loreal region concave. Interorbital space broader than the upper eyelid. Tympanum distinct, about two thirds the diameter of the eye. A glandular fold extending from the eye backwards above the tympanum. Three outer fingers extensively webbed, the membrane reaching the disks of the

second and fourth; disks about the same size as the tympanum; toes entirely webbed; subarticular tubercles well developed. The hind limb being carried forward, the tibio-tarsal articulation reaches just beyond the eye. Upper surfaces of body and head very minutely granulate; belly and lower surfaces of thighs coarsely granulate. Throat covered with scattered warts; a series of similar warts along the margin of the lower jaw. A well-developed denticulated fringe along the outer side of the forearm and the outer finger; a similar fringe along the outer side of the tarsus and the outer toe. Heel with a triangular dermal appendage; some smaller dermal flaps near the vent. Colour (in spirit) dark plum above, uniform, with the exception of some very indistinct cross-bands on the hind legs; light below. The largest specimen measures 67 millim. from snout to vent.

Two specimens from Sattelberg.

With regard to the great development of the web between the fingers, this species resembles *Hyla gracilentata*, Ptrs., but differs from it in so many characteristics that there can hardly be any close relationship between them.

Hyla dolichopsis, Cope.

A large specimen from Sattelberg, and a young from which the following notes are taken:—

The vomerine teeth being wanting, this little frog might be classed as belonging to the genus *Hylella*.

Tongue almost round, nicked and free behind. Head longer than broad. Snout longer than the eye; canthus rostralis indistinct, rounded; loreal region concave. Interorbital space much broader than the upper eyelid. Tympanum distinct, two thirds the diameter of the eye. Fingers webbed at the base; toes nearly entirely webbed. Disks smaller than the tympanum. The hind limb being carried forward, the tibio-tarsal articulation reaches the tip of snout. Upper surface of head granulate; back and upper surface of fore legs also granulate, but less coarsely; a fold over the tympanum. Belly coarsely granulate; lower surface of thighs less so. Colour (in spirit) dark bluish brown, light below; a white streak along the margin of the lower jaw to the axilla; a less distinct similar streak along the outer side of the tarsus.

Hyla obsoleta, sp. n.

The most striking characteristic of this form is that the tympanum is completely covered by the granular skin, so that no trace of it can be seen outwardly.

Tongue broadly rounded anteriorly, nicked and free behind. Vomerine teeth in two small well-separated groups between the choanæ. Snout subtriangular, longer than the diameter of eye, truncate at the tip; canthus rostralis distinct; loreal region concave; interorbital space broader than the upper eyelid. Fingers with a short web at the base; toes nearly entirely webbed; disks about half the diameter of the eye. A slight cutaneous fold with a row of tubercles along the outer side of the forearm; a less pronounced row of tubercles along the outer side of the tarsus; a short dermal appendage at the heel. The hind limb being carried forward, the tibio-tarsal articulation reaches beyond the snout. Upper surfaces minutely granulate; a fold from the eye to the axilla; another fold across the throat. Belly and lower side of thighs granulate. Colour (in spirit) dark brown above, light below, without markings. From snout to vent 34 millim.

A single specimen from Simbang.

Hyla impura, Peters & Doria.

Habit slender. Tongue subelliptic, slightly nicked and free behind. Vomerine teeth in two obliquely transverse series between the choana. Head longer than broad; snout longer than the diameter of the eye, rather acuminate; canthus rostralis angular, loreal region concave; interorbital space broader than the upper eyelid. Tympanum distinct, but small, about half the diameter of the eye. Fingers nearly free, a short web at the base of the outer fingers. Second finger longer than the first, which has a brown wart on its inner side in the male; disks of fingers somewhat smaller than the tympanum. Toes broadly webbed, the web reaching the disks of the fifth and third toes; disks of the toes smaller than those of the fingers; subarticular tubercles well developed. A large inner metatarsal tubercle connected by a short web with the hallux, thus producing the impression of a rudimentary toe; another small metatarsal tubercle at the base of the third toe. The hind limb being carried forward along the body, the tibio-tarsal articulation reaches between the eye and the snout. A cutaneous fold along the side from above the tympanum, another fold across the throat. Skin minutely granular above, coarsely granular on the belly and under the thighs; scattered granules on the throat and a row of similar granules along the forearm. Greyish brown (in spirit), with some irregular darker brown markings; there is, however, no anal blotch as described in *H. impura*.

This species is represented by a single female specimen

from Sattelberg, which agrees well with *Hyla impura* as described by Mehely (Termeszetr. Füzetek. 1898).

The herpetology indicates, as other branches of zoology, the mixed origin of the fauna of Papuasias. There are ancient forms, such as Geckonidæ, Typhlopidae, and Boidæ, the members of which have had time to become widely distributed, cosmopolitan so far as the climatological conditions allow it. Others originating from Asia reach their extreme limit, in a south-easterly direction, in Papuasias (and Australia), as, for instance, *Dendrophis*, *Dipsadomorphus*, *Tropidonotus**, and Ranidæ. Another group has reached New Guinea from Australia, and there become checked from further distribution: Ilylidæ is typical in this respect. This family, being chiefly † Australian and South-American, has extended from the latter to North America, and from there to Eurasia, as its distribution clearly shows. This family is thus a typical representative of Australia in the fauna of Papuasias. But the great number of endemic genera and species in the herpetological fauna of Papuasias indicates its long isolation.

BIBLIOGRAPHICAL NOTICE.

The Story of Bird-life. By W. P. PYCRAFT.
London: George Newnes, Ltd., 1900. Pp. 244.

THIS recent addition to the "Library of Useful Stories" is by a rising ornithologist whose name is well known to specialists by the admirable work which he is doing in the physiology and comparative anatomy of birds. We believe that this is about his first appearance before the general public, and we hope it will not be the last, for he has succeeded in compressing a large amount of useful elementary information respecting birds, much of which is not easily accessible in a convenient form elsewhere, into a very moderate compass. The structure of birds, especially of the wings and feathers, their courtship, nests, migration, geographical distribution, pedigrees, &c. are discussed in an easy and attractive style in twelve chapters. There is also a series of text-illustrations, among others a restoration of *Archæopteryx*, and two full-page illustrations, "The summer home of the Ruff and Reeve" and "The love-display, or 'showing off,' of the Great Bustard, *Otis tarda*." Those interested in the latter subject will find a beautiful group of Great Bustards in the Ornithological Gallery of the Natural History Museum at South Kensington. We congratulate Mr. Pycraft on the production of this interesting little book, for it is not every specialist who is able to write successfully and popularly on his subject, as well as scientifically.

W. F. K.

* The two former perhaps on driftwood or by the agency of man, the last by swimming.

† Like Cystignathidæ.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

February 7th, 1900.—W. Whitaker, B.A., F.R.S.,
President, in the Chair.

The following communication was read:—

‘Foraminifera from an Upper Cambrian Horizon in the Malverns.’
By Frederick Chapman, Esq., A.L.S., F.R.M.S.

The foraminifera described in this paper were found in a shaly limestone which Prof. Groom obtained ‘from the débris of a small ridge composed of black shales, with intercalated basalts, which forms a spur on the north-west side of Chase End Hill. The rock belongs to the well-known and widely-spread zone of *Spherophthalmus*, *Peltura*, and *Ctenopyge*, which in Britain forms the upper half of the Dolgelly Beds or Upper *Lingula*-Flags.’ The specimens have been sliced, and have yielded a few forms other than *Spirillina*; sections of echinoderm-spines, ostracod-tests, and occasionally sponge-spicules (?) are also to be seen in the slides. The tests of the foraminifera are infilled with a crystalline substance.

The following species are mentioned:—*Lagena levis*, Montagu, *L. apiculata*, Reuss, *L. ovum*, Ehrenberg, *Nodosaria pygmaea* (?) Terquem, *N. abnormis* (?) Reuss, *Marginula soluta* (?) Reuss, *Cristellaria acutauricularis* (?) (Fichtel & Moll); and a new species of *Spirillina* is described. The *Spirillinae* are in a good state of preservation; and the valves of mollusca, cut through in section, are sometimes seen to be quite filled with the tests of this genus.

A record is given of some of the earliest known foraminifera, including the somewhat doubtful forms described by Cayeux from pre-Cambrian rocks in Brittany, those by Ehrenberg from the so-called ‘Silurian Clay’ near St. Petersburg, by W. D. & G. F. Matthew from the rocks bearing the *Protolenus*-fauna in New Brunswick, by Keeping from the shales above the Bala Limestone near Welshpool, by Blake from the Llandovery of Cwm Symlog, by Brady from the Woolhope Limestone of the Malverns, and by Terquem from the Upper Silurian rocks of Indiana. The Author has also frequently met with *Lagena* in the Wenlock Limestone of Shropshire.

INDEX TO VOL. VI.

- ABLABES, new species of, 409.
 Abriesa, characters of the new genus, 312.
 Actæa pulchella, note on, 251.
 Agelena, new species of, 199, 326.
 Akodon, new species of, 468.
 Alcimus, new species of, 176.
 Alepas, new species of, 195.
 Amaxia, new species of, 66.
 Amphipoda, revision of the British, 32.
 Anasida, new species of, 59.
 Anaxa, new species of, 308.
 Anaxandra, new species of, 229.
 Ancistrogaster, new species of, 85.
 Ancylis, new species of, 439.
 Anderson, Dr. John, on the presence of *Echis coloratus* in Africa, 419.
 Andersonia, characters of the new genus, 528.
 Andrena, new species of, 19.
 Anechura, new species of, 79, 99.
 Anoplocnemis, new species of, 373.
 Apeletherus, characters of the new genus, 73.
 Apobletes, new species of, 268.
 Apterygida, new species of, 83.
 Apus, on the name, 248.
 Arachnida, new, 199, 316, 363, 489.
 Araneus, new species of, 324.
 Archips, new species of, 442.
 Argentina silus, on the abundance of, on the market of Boston (Lincolnshire), 160.
 Argyroploce, new species of, 236.
 Arnouldia, new species of, 398.
 Asopinæ, revision of the, 55.
 Aspongopus, new species of, 221.
 Asteromphalus malleus, new variety of, 487.
 Atylotus, new species of, 165.
 Automolis, new species of, 66.
 Auximus, new species of, 323.
 Bactra, new species of, 334.
 Barbus, new species of, 479.
 Barilius, new species of, 480.
 Barrett-Hamilton, G. E. H., on variation in the common hedgehog and weazel, 243.
 Basicryptus, new species of, 223.
 Bather, F. A., on the Lower Palæozoic Crinoids of Bohemia, 102.
 Batrachians, new, 181, 186, 579; on, from German New Guinea, 574.
 Beblecia, characters of the new genus, 71.
 Bell, Prof. F. J., on the name of the swift, 248.
 Bernard, H. M., on the origin of the segmented worms, 509.
 Bessia, characters of the new genus, 320.
 Birchippia, characters of the new genus, 450.
 Boarmia, new species of, 308.
 Books, new:—Système Silurien du centre de la Bohême, vol. vii. pt. 2, 102; Hampson's Catalogue of the Arctiadae in the Collection of the British Museum, 157; Willey's Zoological Results, pt. iv., 246; Matthews's Monograph of the Coleopterous Families Corylophidæ and Sphæriidæ, 247; Lankester's Treatise on Zoology, pt. iii., 341; Andrews's Monograph of Christmas Island, 343; Pike's In Birdland with Field-glass and Camera, 425; Cory's Birds of Eastern North America, 426; Tutt's Natural History of the British Lepidoptera, 426; Catalogue of Eastern and Australian Lepidoptera Heterocera in the Oxford University Museum, pt. ii., 506; Cunningham's Sexual Dimorphism in the Animal Kingdom, 507; Newbiggin's Colour in Nature, 507; Pycraft's The Story of Bird-life, 582.
 Boulenger, G. A., on a new sea-horse from Muscat, 51; on fishes from the Falkland Islands, 52; on the abundance of the greater siil-smelt on the market of Boston (Lincolnshire), 160; on new batrachians and reptiles from Peru, 181; from Perak, 186; on new lizards from Jamaica and British East Africa,

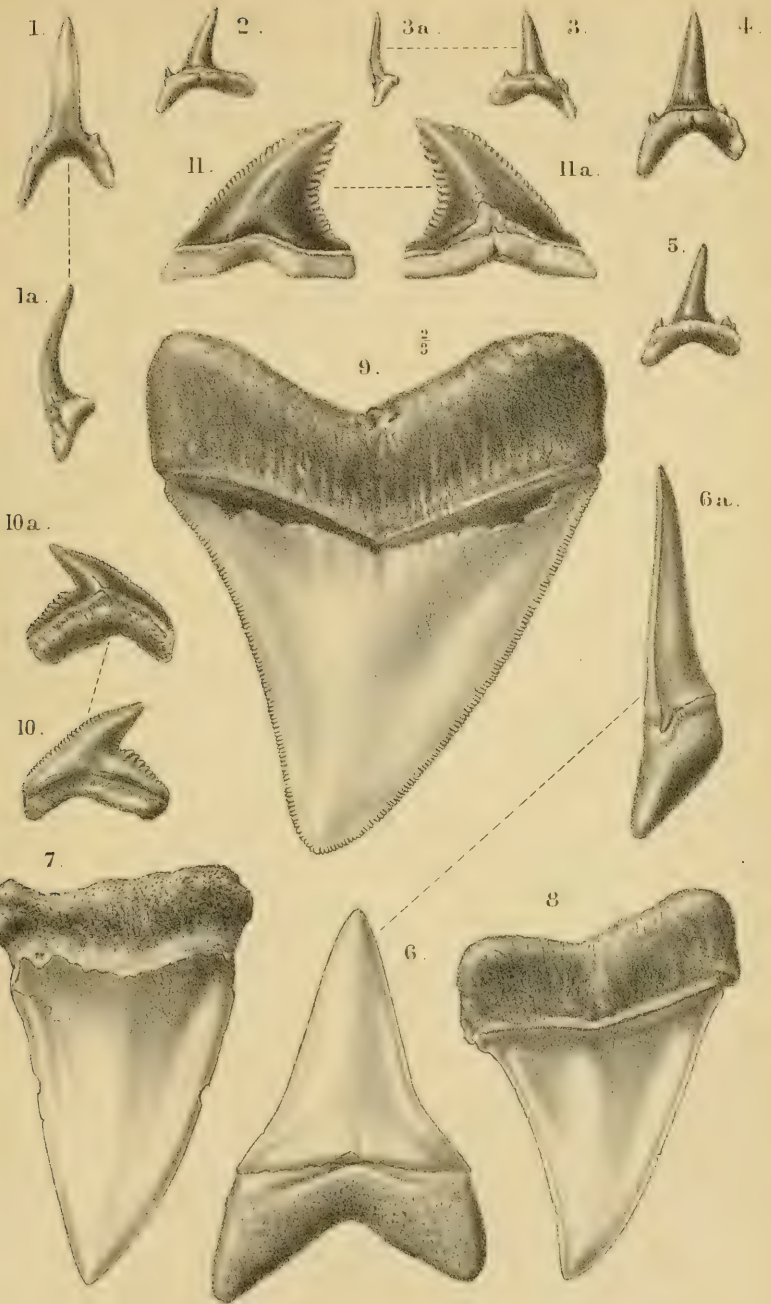
- 193, 194; on a new species of *Ablabes*, 409; on new fishes from Lake Tanganyika, 478; on African Silurid fishes, 520.
- Broom, Dr. R., on a new theriodont reptile from S. Africa, 314.
- Bufo, new species of, 181.
- Burckhardt, Prof. R., on the luminous organs of Selachian fishes, 558.
- Burr, M., on new species and a new genus of *Forficularia*, 79; on *Forficularia* from Sarawak, 88.
- Butler, Dr. A. G., on butterflies from Hunan, 382.
- Cadicera, new species of, 161.
- Calletæra, new species of, 309.
- Callianassa *Martensi*, remarks on, 261.
- Calocaris, new species of, 476.
- Camarcus, new species of, 322.
- Cameron, P., on new genera and species of Hymenoptera, 410, 495, 530.
- Capoeta, new species of, 478.
- Caponia, new species of, 321.
- Carpenter, G. H., on two new British spiders, 199.
- Carposina, new species of, 121.
- Catada, new species of, 311.
- Cervicapra *bohor*, observations on, 303.
- *redunca*, new subspecies of, 304.
- Cervus, new species of, 204.
- Chætoceros, new species of, 483.
- Chætospasia, new species of, 93.
- Chapman, F., on foraminifera from the Malverns, 583.
- Chariobas, new species of, 325.
- Chasmoptera, characters of the new genus, 462.
- Chelisoche, new species of, 96.
- Chiloglanis, new species of, 522.
- Chondropsis, new species of, 355.
- Chondropython *viridis*, note on, 577.
- Chrysichthys, new species of, 480.
- Cirrhochrista, new species of, 313.
- Cnephalcotes *silus*, on the occurrence in Britain of, 201.
- Coccidæ, new, 389, 448.
- Cockerell, Prof. T. D. A., on the New Mexico species of *Megachile* and a new *Andrena*, 7.
- Coleoptera, new, 219, 265.
- Conepatus, new species of, 466.
- Crinoids, on the Lower Palæozoic, of Bohemia, 102.
- Crocidosema, new species of, 441.
- Crustacea, new, 39, 195, 256, 472; on Malacostracous, from Malaysia, 249.
- Cryptoloba*, new species of, 310.
- Crystallus*, new species of, 399.
- Ctenochiton*, new species of, 449.
- Ctenomys*, new species of, 301, 383.
- Cyclopelta*, new species of, 220.
- Cyclopes didactylus*, new subspecies of, 302.
- Cydrellichus*, characters of the new genus, 325.
- Cypræa*, new species of, 207.
- Cyrtacanthacris*, new species of, 381.
- Cyrtomaia*, new species of, 472.
- Cytharischius*, characters of the new genus, 492.
- Dactylopius*, new species of, 395.
- Dæsia*, new species of, 317.
- Dalader*, new species of, 376.
- Deroca*, new species of, 306.
- Diatoms from Chinchaguano, on, 481.
- Diploglossus*, new species of, 193.
- Diptera, new, 161, 291.
- Distant, W. L., revision of the *Asopinæ* and *Tessaratominaæ*, 55; of the *Dinidorinæ*, *Phyllocephalinæ*, *Urolabidinæ*, and *Acanthosominæ*, 220; of the *Coreidæ*, 366.
- Draco*, new species of, 189.
- Dresserus*, new species of, 322.
- Druce, H., on new species of *Heterocera* from South America, 64.
- Dudua hesperialis*, note on, 134.
- Dycladia*, new species of, 64.
- Dyscliona*, characters of the new genus, 352.
- Echis coloratus*, on the presence of, in Africa, 419.
- Elasmopoda, new species of, 368.
- Elasmostethus, new species of, 231.
- Eligmodontia, new species of, 297.
- Enarmonia*, new species of, 438.
- Epiechinus*, new species of, 290.
- Epiplema*, new species of, 307.
- Epitoxus*, characters of the new genus, 278.
- Equus*, new species of, 465.
- Erephrosis*, new species of, 292.
- Eressa*, new species of, 305.
- Eresus*, new species of, 322.
- Eriococcus*, new species of, 393.
- Erylus*, new species of, 351.
- Ethusa*, new species of, 474.
- Eucelis*, new species of, 407.
- Eucereon*, new species of, 65.
- Euchilichthys*, characters of the new genus, 522.

- Eucosma*, new species of, 337.
Eulota, new species of, 455.
Eumenophorinæ, synopsis of genera of, 494.
Eusthenes, new species of, 61.
Evagrius, characters of the new genus, 369.
Exartema, new species of, 124.
 Fishes, new, 51, 53, 478, 522; on remains of, from the Argentine Republic, 1; on the luminous organs of Selachian, 558.
Foraminifera from the Malverns, on, 583.
Forficula, new species of, 82, 100.
Forficularia, new species of, 79; on, from Sarawak, 88.
Frisimelica, characters of the new genus, 225.
 Frog, note on an hermaphrodite, 179.
Ganesella, new species of, 455.
Gasteracantha, new species of, 324.
Gazalina, new species of, 306.
Gehyra, new species of, 188.
 Geological Society, proceedings of the, 533.
Gonopsis, new species of, 224.
Gordonerius, characters of the new genus, 56.
 Green, E. E., on new Australian Coccidæ, 448.
 Gregory, Prof. J. W., on the West-Indian species of *Madrepora*, 20.
 Grose-Smith, H., on a new species of *Papilio*, 210; on a new species of *Ornithoptera*, 383.
 Gruvel, A., on a new species of *Alepas*, 195.
 Gude, G. K., on new Japanese land-shells, 398, 453.
Gymnodactylus louisianensis, note on, 575.
 Halter, new species of, 460.
Harkeria, characters of the new genus, 537.
 Hedgehog, on variation in the common, 243.
Hedylepta, new species of, 313.
 Hempel, A., on Brazilian Coccidæ, 389.
Hendecaneura, characters of the new genus, 401.
Hermachastes, characters of the new genus, 319.
 Hermaphrodite frog, note on an, 179.
Heterometrus, new species of, 363.
Heteroptera, new, 56, 221, 366.
Hippocampus, new species of, 51.
Hister, new species of, 279.
Histeridæ, new, 265.
Hololepta, new species of, 266.
Holopterna, new species of, 368.
Homalopygus, new species of, 285.
Homoptera, new, 389, 448.
Hyla, new species of, 579.
Hymenoptera, new, 7, 410, 495, 530.
Hypephyra, new species of, 308.
Hysterochrates, new species of, 489.
Hysterosia, new species of, 446.
Hystrichoscelus, characters of the new genus, 335.
Icaria, on the males of, 495; new species of, 496.
Icerya, new species of, 389.
Ictidosuchus, characters of the new genus, 314.
Idalus, new species of, 67.
Isbarta, new species of, 305.
Isistius brasiliensis, on the luminous organs of, 566.
Iulus, new species of, 206.
Ixalus, new species of, 187.
Kaliella, new species of, 453.
 Kirby, W. F., on *Odonata* from Sierra Leone, 67; on African *Phasgonuridæ*, 211; on insects from the Yang-tse-Kiang, 380; on the Neuropterous family *Nemopteridæ*, 456.
 Kirkpatrick, R., on sponges from Funafuti, 345.
 Kofoid, Dr. C. A., on *Pleodorina illinoisensis*, 139; on *Platydorina*, a new genus of *Volvocidæ*, 541.
Labus, new species of, 536.
Lælia, new species of, 307.
Læmargus, on the luminous organs in species of, 558.
Lamadatha, characters of the new genus, 538.
 Lanchester, W. F., on Malacostracous crustaceans from Malaysia, 249.
Laparus, new species of, 166.
Laphria, new species of, 171.
Laspeyresia, new species of, 429.
Latrunculia, new species of, 354.
Lepidoptera, new, 64, 121, 210, 234, 305, 334, 388, 401, 429.
Leptobrachium, new species of, 186.
 Lewis, G., on new species of *Histeridæ*, 265.
Liopygus, new species of, 270.

- Lönnberg, Dr. E., on reptiles and batrachians from German New Guinea, 574.
- Lophonotus, new species of, 178.
- Loxopera, new species of, 444.
- Luffariella, new species of, 357.
- Lycodes, new species of, 53.
- Lycodon, new species of, 193.
- Lycosa, new species of, 327.
- Lydekker, R., on an undescribed type of Rusine deer, 204.
- Lygosoma, new species of, 191, 194.
- McArdle, Capt. A. F., on some results of Indian dredging, 471.
- Macromia, new species of, 77.
- Madrepora, on the West-Indian species of, 20.
- Mammals, new, 138, 204, 294, 383, 387, 465, 466, 470, 569, 570.
- Megachile, new species of, 7.
- Melioptis, new species of, 311.
- Melucha, new species of, 374.
- Melville, J. C., on new species of *Cypræa*, 207.
- Menardus, characters of the new genus, 366.
- Mereschkowsky, C., on diatoms from Chinchua guano, 481.
- Metopa, new species of, 42.
- Metopina, characters of the new genus, 45.
- Microcystis, new species of, 400.
- Microhyla, new species of, 188.
- Microstylum, new species of, 168.
- Mictis, new species of, 372.
- Miller, G. S., jr., on a new bat from Central America, 470; on a new bat from Peru, 570.
- Mollusca, new, 207, 398, 453.
- Montezuma, new species of, 535.
- Mormopterus, new species of, 569.
- Mozena, new species of, 375.
- Myriopoda, new, 206.
- Mytilaspis, new species of, 448.
- Navicula Henedyi, new variety of, 481.
- Nemopteridæ, notes on the, 456.
- Neuroptera, new, 69, 460.
- Norman, Canon A. M., revision of the British Amphipoda, 32.
- Notoccelis, characters of the new genus, 283.
- Nototrema, new species of, 181.
- Ochrochira, new species of, 370.
- Odonata, new, 69.
- Odynerus, new species of, 504.
- Olethreutes, new species of, 129.
- Ommatius, new species of, 177.
- Opharus, new species of, 67.
- Opisthocosmia, new species of, 85.
- Ornithoptera, new species of, 388.
- Orthetrum, new species of, 75.
- Orthoptera, new, 79, 89, 216, 381.
- Oxymycterus, new species of, 298.
- Pachycærus, new species of, 274.
- Paludicola, new species of, 182.
- Palystes, new species of, 330.
- Pammene, new species of, 435.
- Papilio, new species of, 210.
- Parana formation, on the age of the, 6.
- Pelatea, new species of, 335.
- Perixera, new species of, 310.
- Peucetia, new species of, 329.
- Phæcadophora, characters of the new genus, 130.
- Phæcasiophora, new species of, 135.
- Phalonia, new species of, 445.
- Pharmacis, new species of, 443.
- Phasgonuridæ from the Transvaal, on, 211.
- Philodryas, new species of, 185.
- Phractura, definition of the new generic name, 527.
- Phyllotis, new species of, 296, 467.
- Pidorus, new species of, 305.
- Placinastrella, new species of, 350.
- Placinolopha, new species of, 350.
- Platydorina, characters of the new genus, 555.
- Platylister, new species of, 271.
- Platynopus, new species of, 56.
- Platysoma, new species of, 273.
- Plectotropis, new species of, 400.
- Plectronia, new species of, 347.
- Pleodorina, new species of, 139.
- Pocock, R. L., on two English millipedes, 206; on new Arachnida from Cape Colony, 316; on the scorpions of the genus *Heterometrus*, 362; on new African spiders, 489.
- Polistes, new species of, 410.
- Polyfibrospongia, new species of, 359.
- Pompilus, new species of, 539.
- Potamon, new species of, 256.
- Prionolomia, new species of, 367.
- Pristopera, characters of the new genus, 309.
- Probolosternus, characters of the new genus, 275.
- Procavia, new species of, 387.
- Proctoporus, new species of, 185.
- Proechimys, new species of, 300.
- Promachus, new species of, 173.
- Promops, new species of, 470.

- Propedesis, characters of the new genus, 122.
- Prout, L. B., on the Ankündigung eines systematischen Werkes von den Schmetterlingen der Wiener-gegend of Schiffermüller and Denis, 158.
- Pseudapistocalamus, characters of the new genus, 578.
- Psioloptera, new species of, 219.
- Pterinochilus, new species of, 318.
- Punnett, R. C., on an hermaphrodite frog, 179.
- Pyramidula, new species of, 454.
- Reptiles, new, 182, 188, 193, 194, 314, 409, 578; on, from German New Guinea, 574.
- Rhegmatopoda leptocera, new name for, 215.
- Rhodoneura, new species of, 312.
- Rhynchium, new species of, 530.
- Ricardo, Miss G., on Diptera from South Africa, 161; on new Pangoninæ from S. America, 291.
- Rothus, new species of, 326.
- Saprinus, new species of, 287.
- Sastragala, new species of, 228.
- Scharff, Dr. R. F., on a new bat from West Africa, 569.
- Schiffermüller & Denis's Ankündigung eines systematischen Werkes von den Schmetterlingen der Wiener-gegend, on the date of, 158.
- Sciøne, new species of, 291.
- Sciurus, new species of, 138, 294, 385.
- Scylaticus, new species of, 170.
- Selachian fishes, on the luminous organs of, 558.
- Selenops, new species of, 331.
- Sicarius, new species of, 321.
- Sitalia, characters of the new genus, 285.
- Skeletonema costatum, new variety of, 485.
- Solpuga, new species of, 316.
- Sparassus, new species of, 330.
- Sparatta, new species of, 92.
- Spermatogonia antiqua, note on, 488.
- Sponges from Funafuti, on, 345.
- Spongiphora, new species of, 89.
- Stasiomopus, new species of, 319.
- Stenocercus, new species of, 182.
- Stenothoe, new species of, 39.
- Stewart, F. H., on a variation in the number of genital pouches in *Thalassema neptuni*, 218.
- Stictocarenus, new species of, 230.
- Strongylopsalis, characters of the new genus, 80.
- Swinhoe, Col. C., on new eastern and Australian moths, 305.
- Synodontis, new species of, 480.
- Tabanus, new species of, 164.
- Tedania, new species of, 355.
- Terapus, new species of, 286.
- Teretrius, new species of, 289.
- Tessarotominæ, revision of the, 55.
- Thalassema neptuni*, on a variation in the number of genital pouches in, 218.
- Thermorthemis, new species of, 72.
- Thiodia, new species of, 405.
- Thomas, O., on giant squirrels from the Amazonian region, 137; on new rodents from Western S. America, 294, 383; on the E. African reedbuck currently known as *Cervicapra bohor*; 303; on a new dassie from Nyasaland, 387; on *Equus Penricei*, 465; on new Peruvian species of *Conepatus*, *Phyllotis*, and *Akodon*, 466.
- Thomisus, new species of, 322.
- Tohi, on the, 303.
- Tomopeas, characters of the new genus, 570.
- Tortricidæ, new Asiatic, 121, 234, 333, 401, 429.
- Tortrix, new species of, 443.
- Trishoplita, new species of, 400, 454.
- Trithemis, new species of, 69.
- Tropidurus, new species of, 184.
- Tylopsis, new species of, 216.
- Urochela, new species of, 226.
- Volvocinæ, key to the genera and species of, 556.
- Walsingham, Lord, on Asiatic Tortricidæ, 121, 234, 333, 401, 429.
- Waterhouse, C. O., on a new species of Buprestidæ, 219.
- Weasel, on variation in the, 243.
- Woodward, Dr. A. S., on fish-remains from the Argentine Republic, 1.
- Worms, on the origin of the segmented, 509.

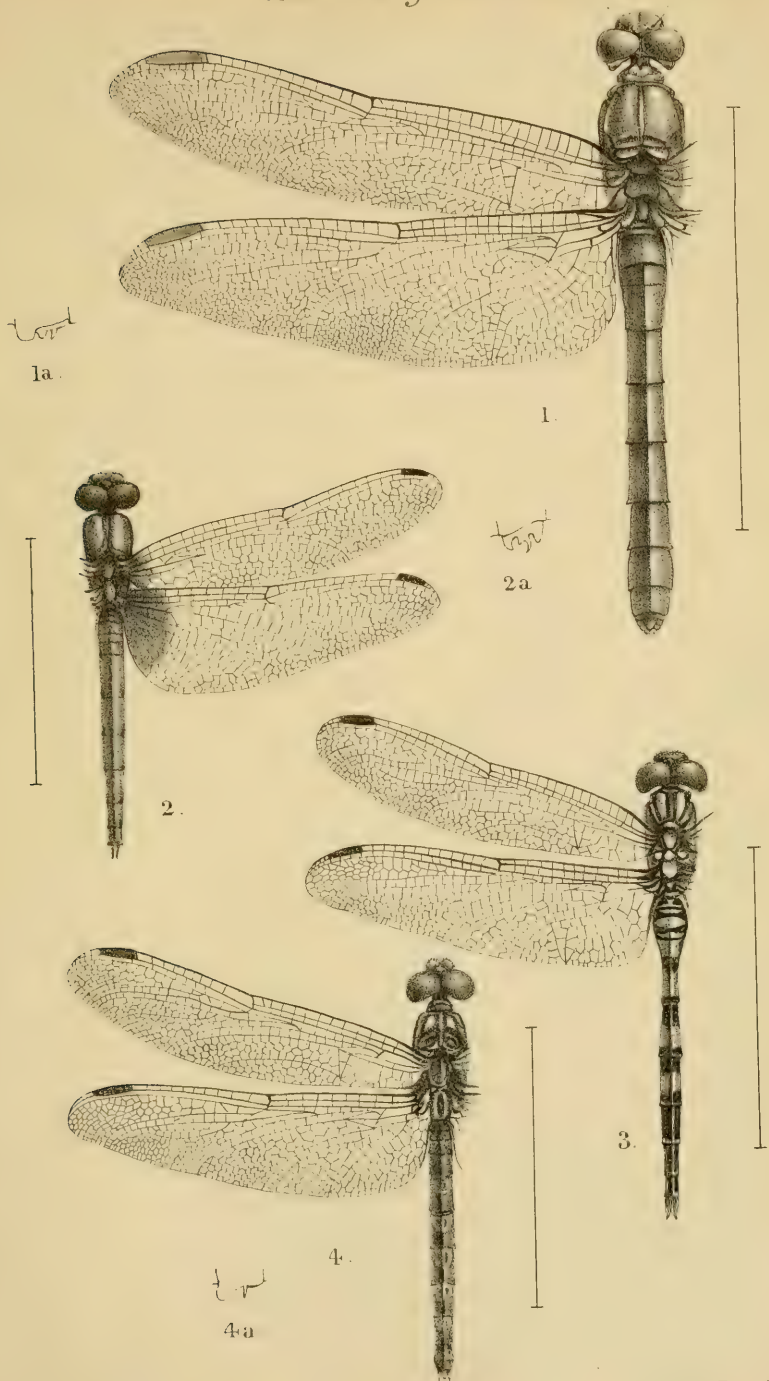
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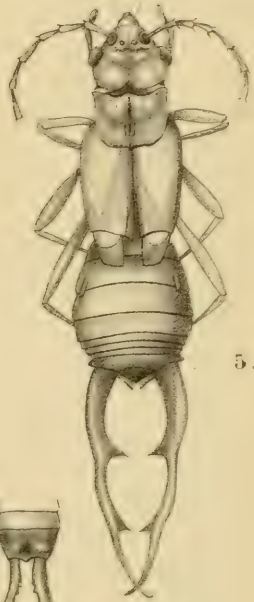
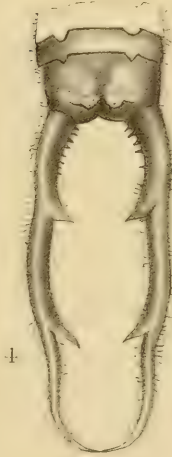
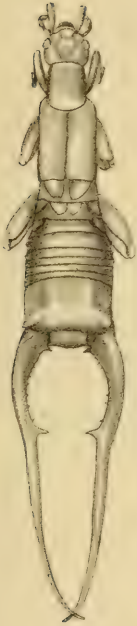
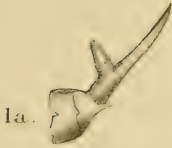
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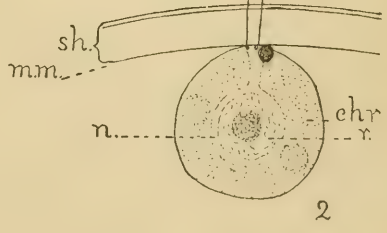
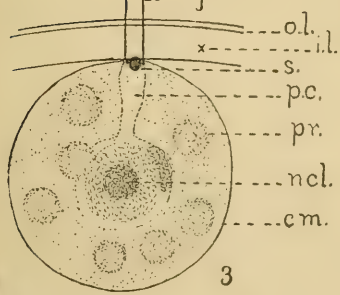
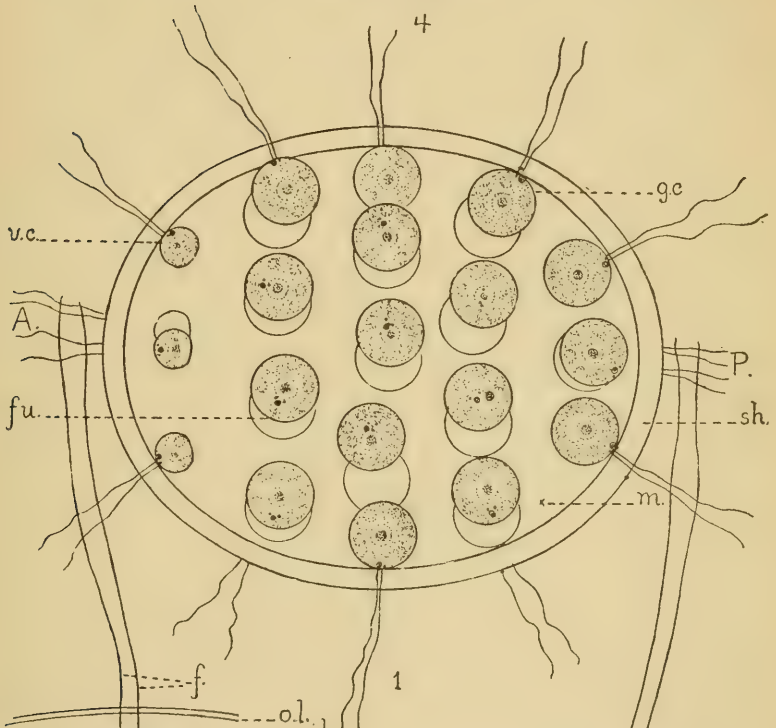
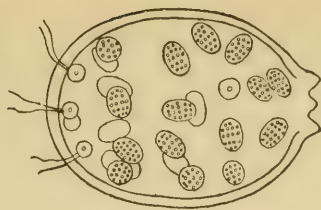
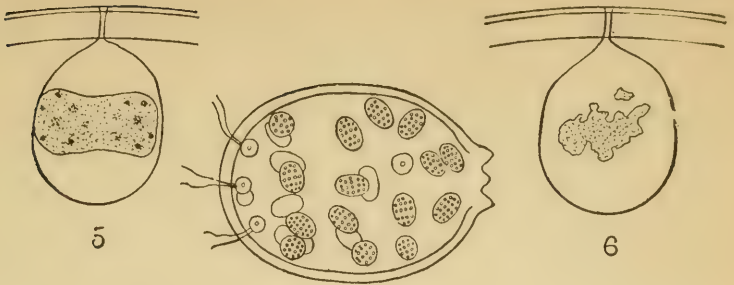
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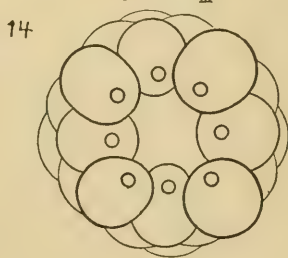
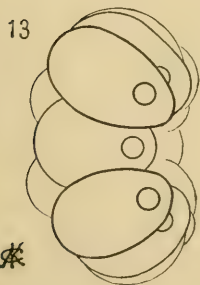
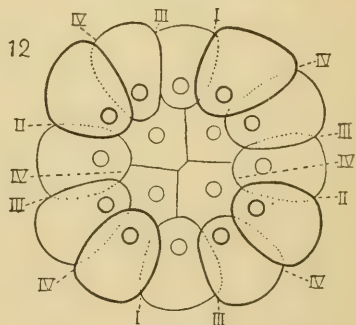
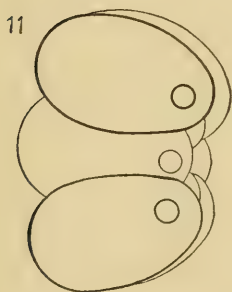
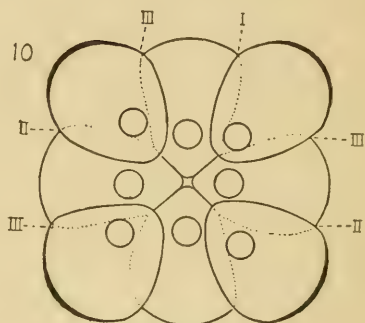
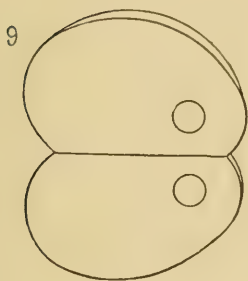
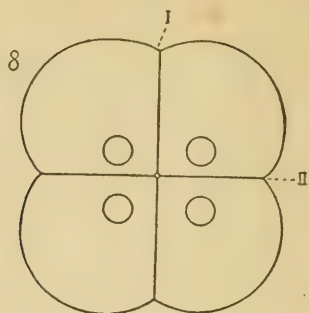
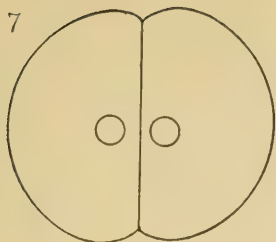


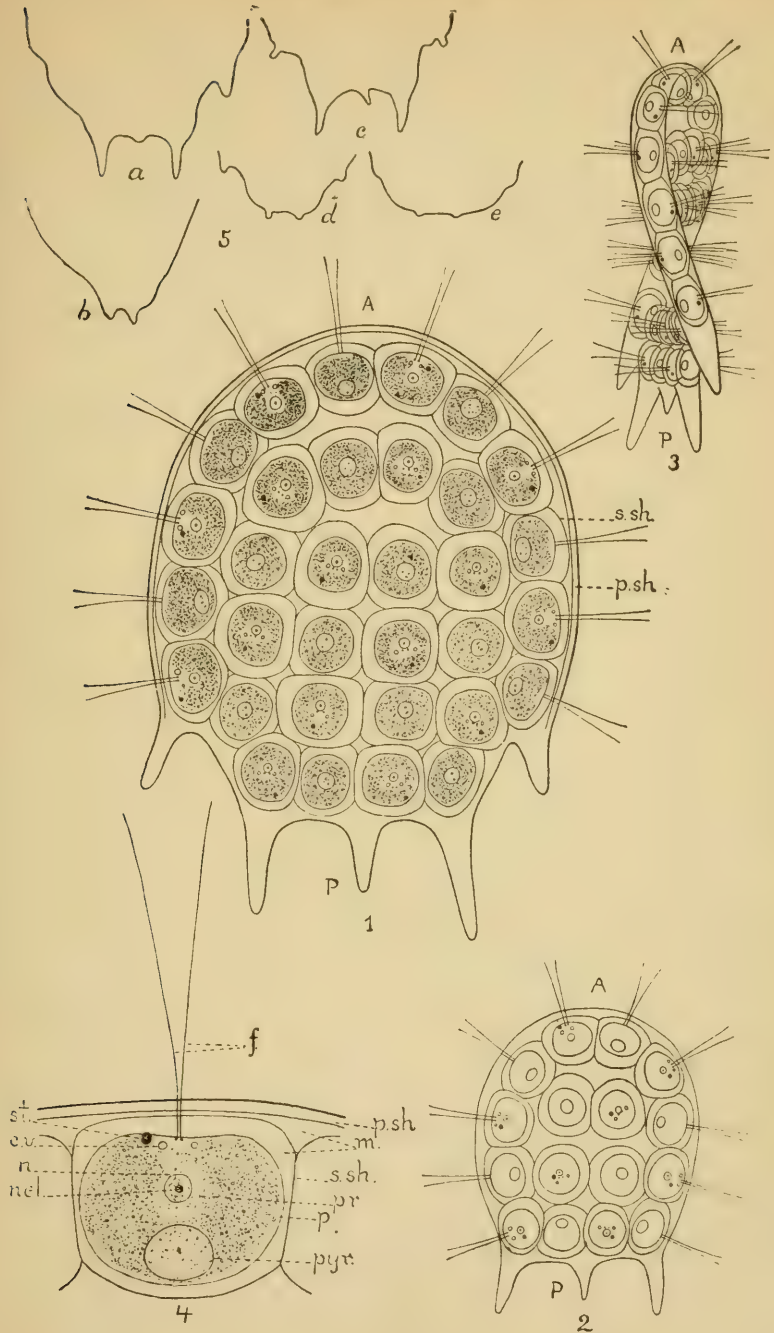


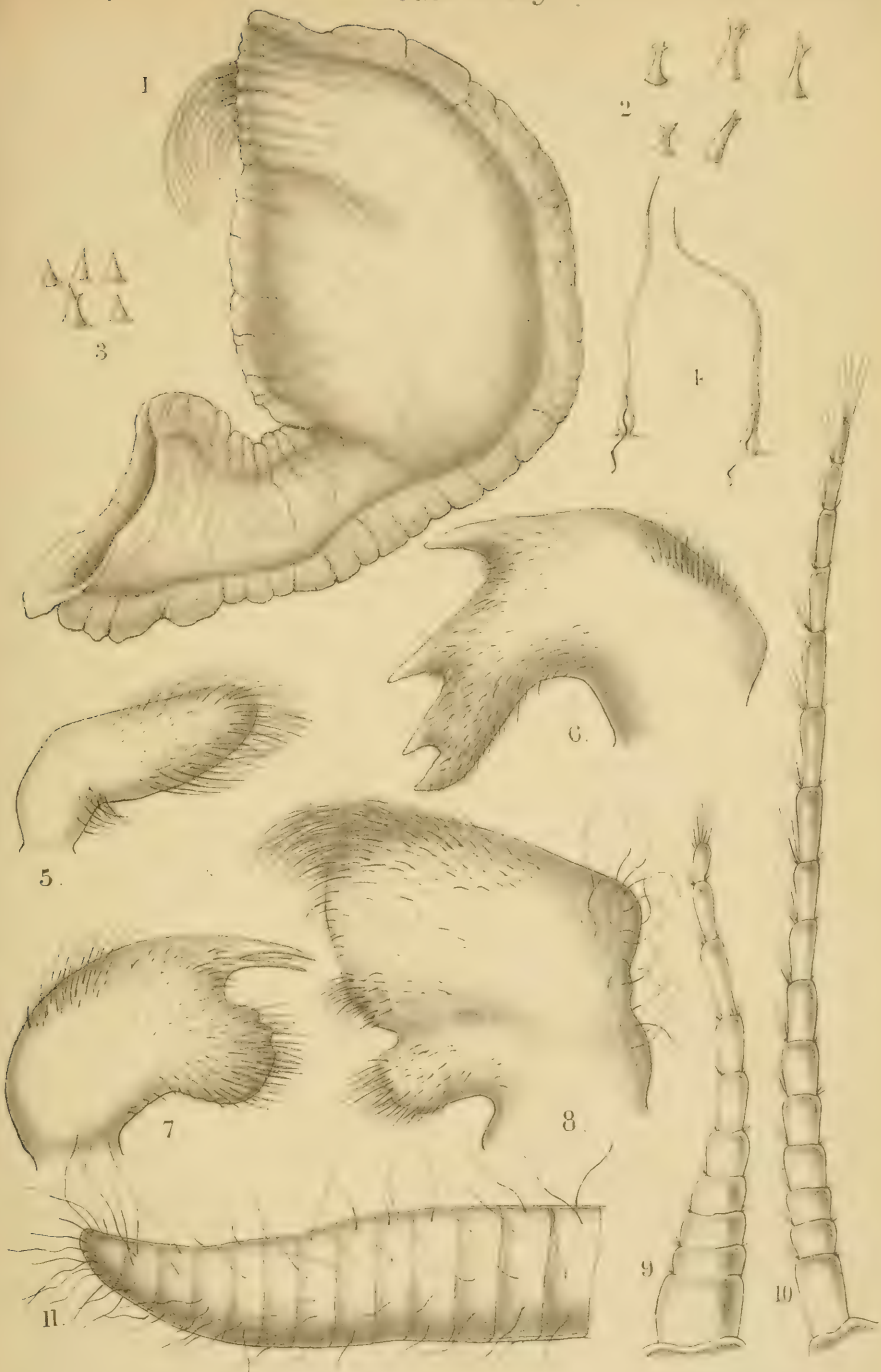




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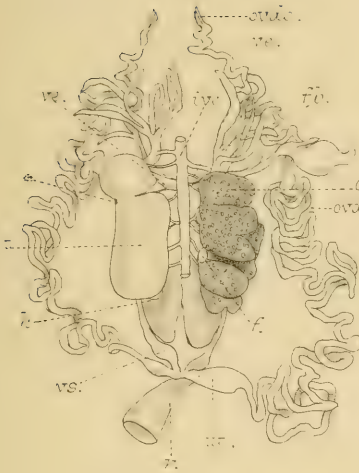


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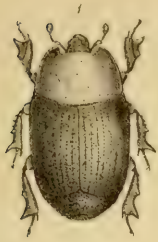


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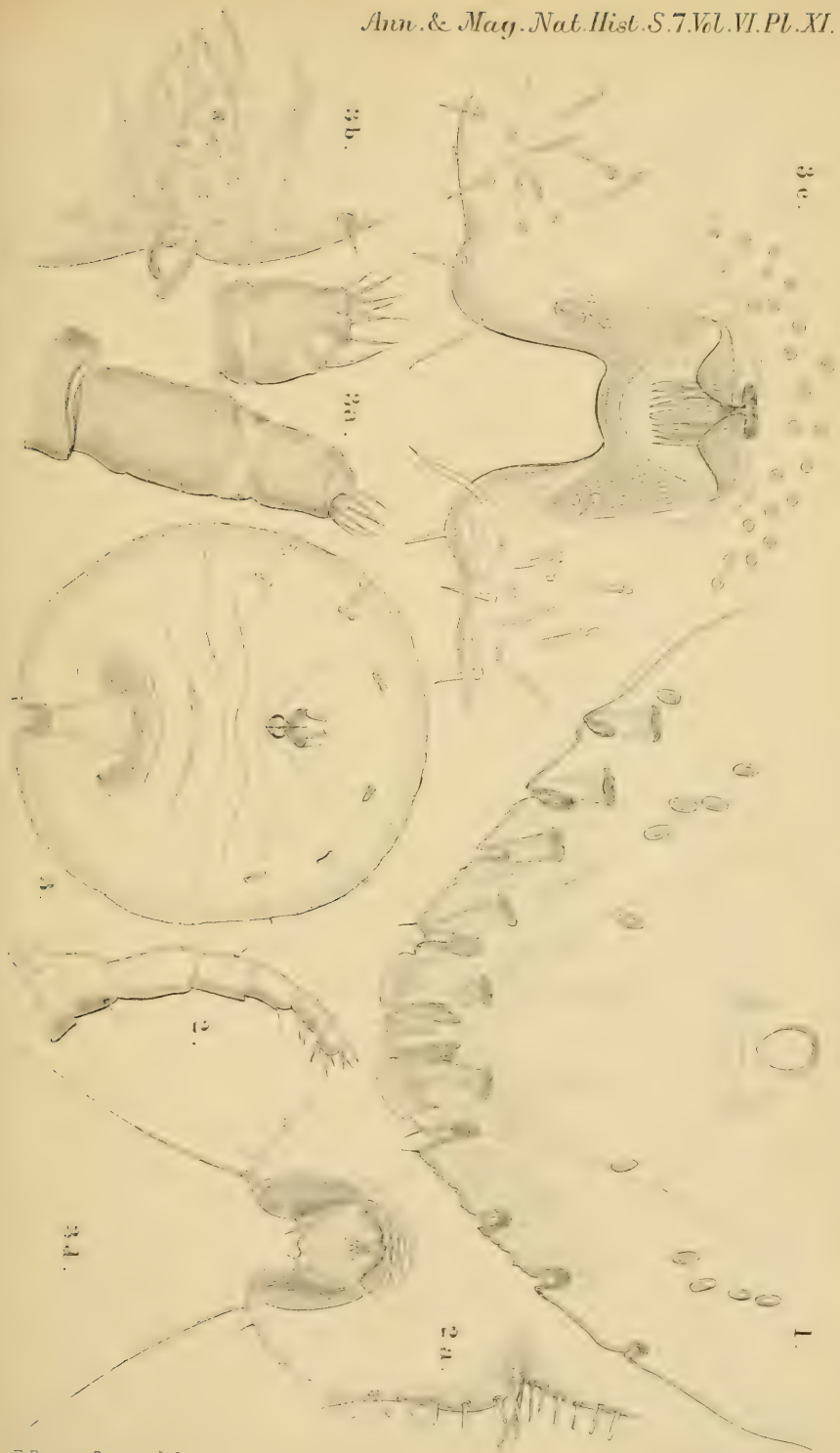


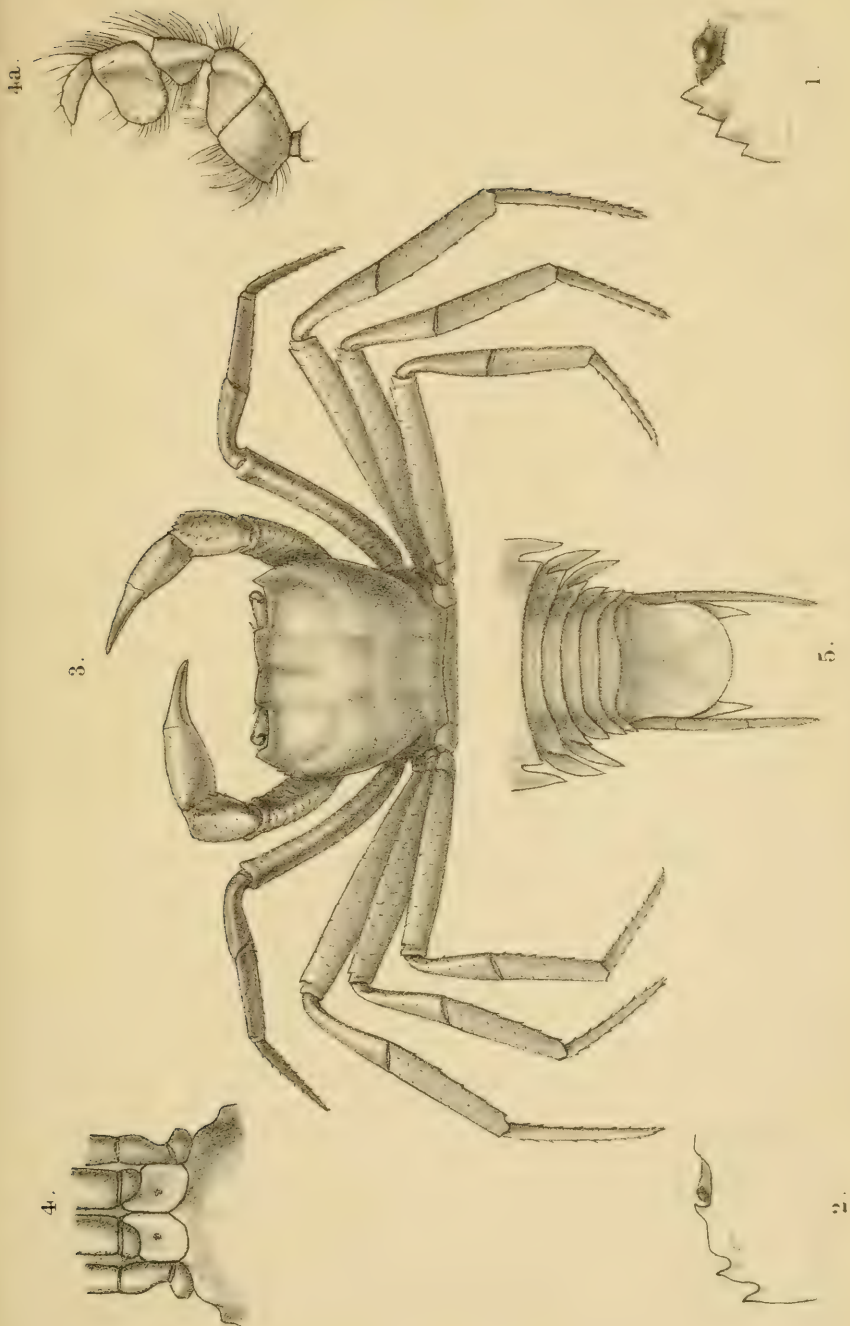


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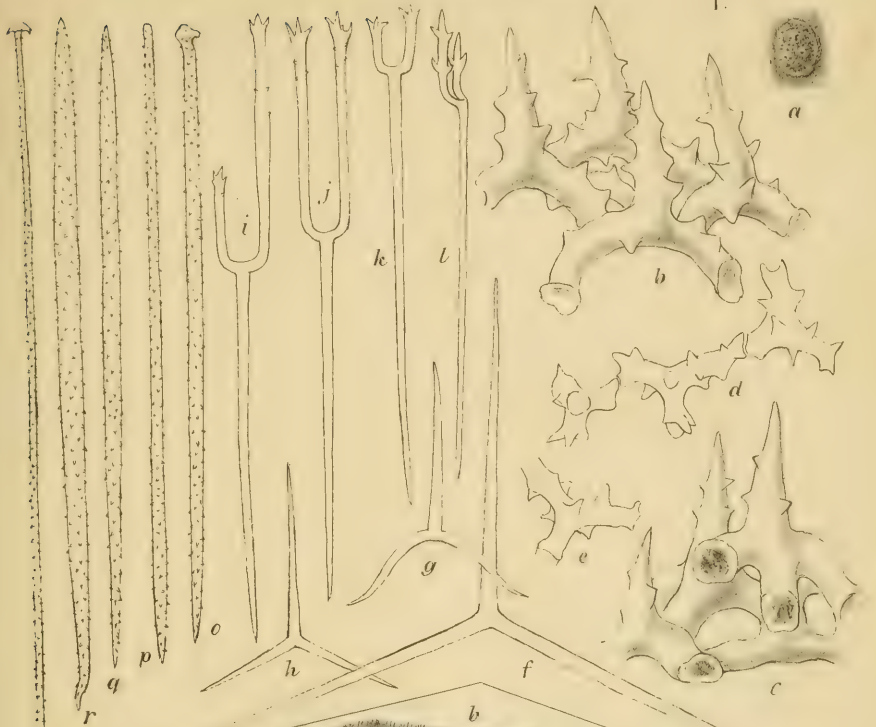
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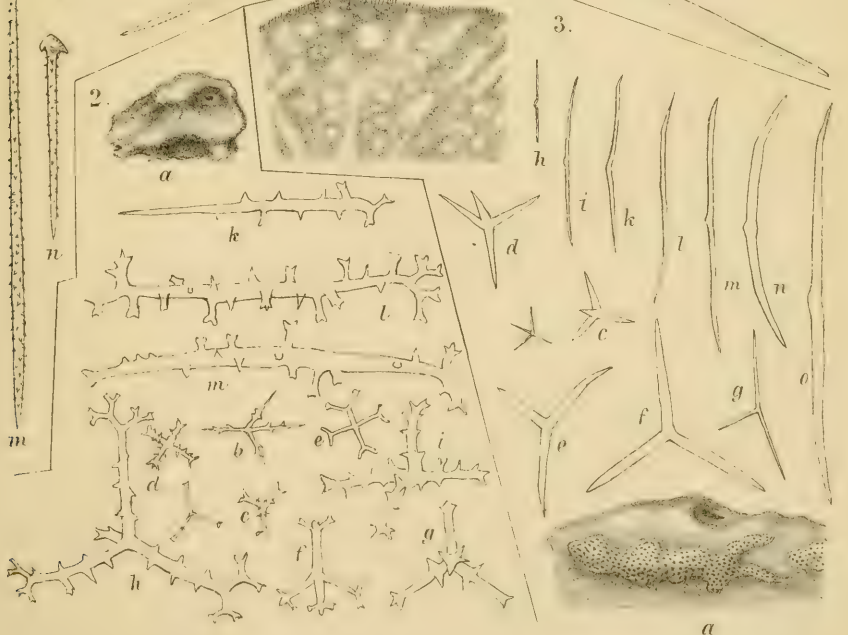


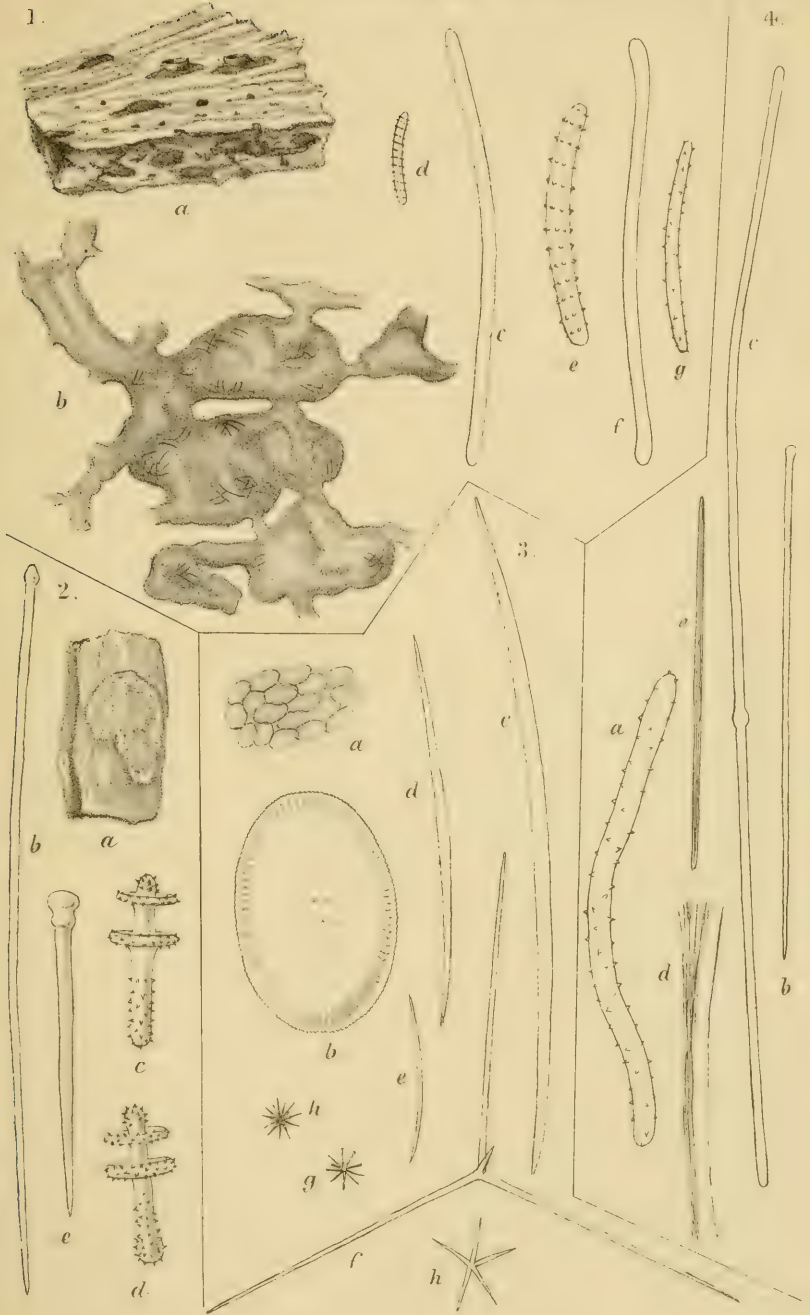
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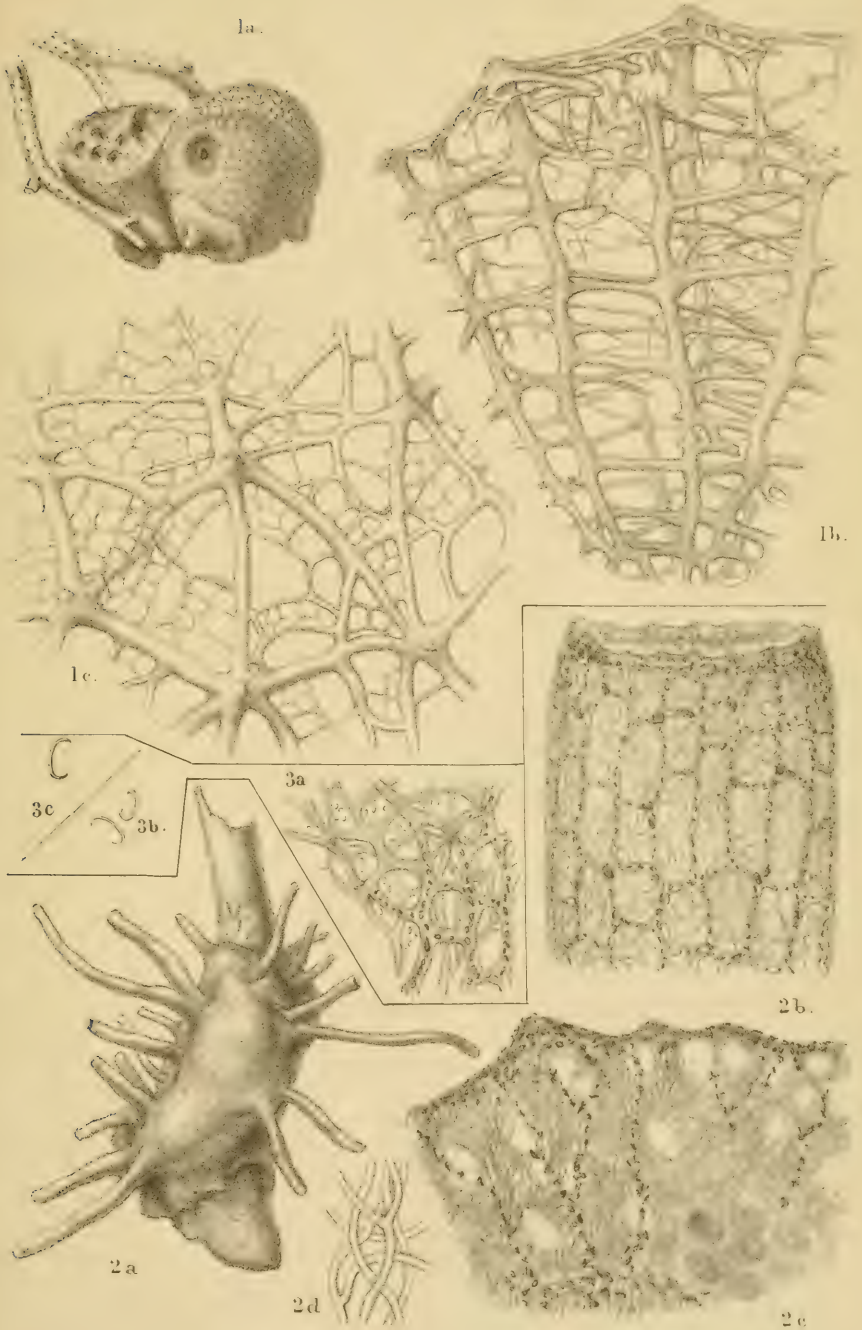
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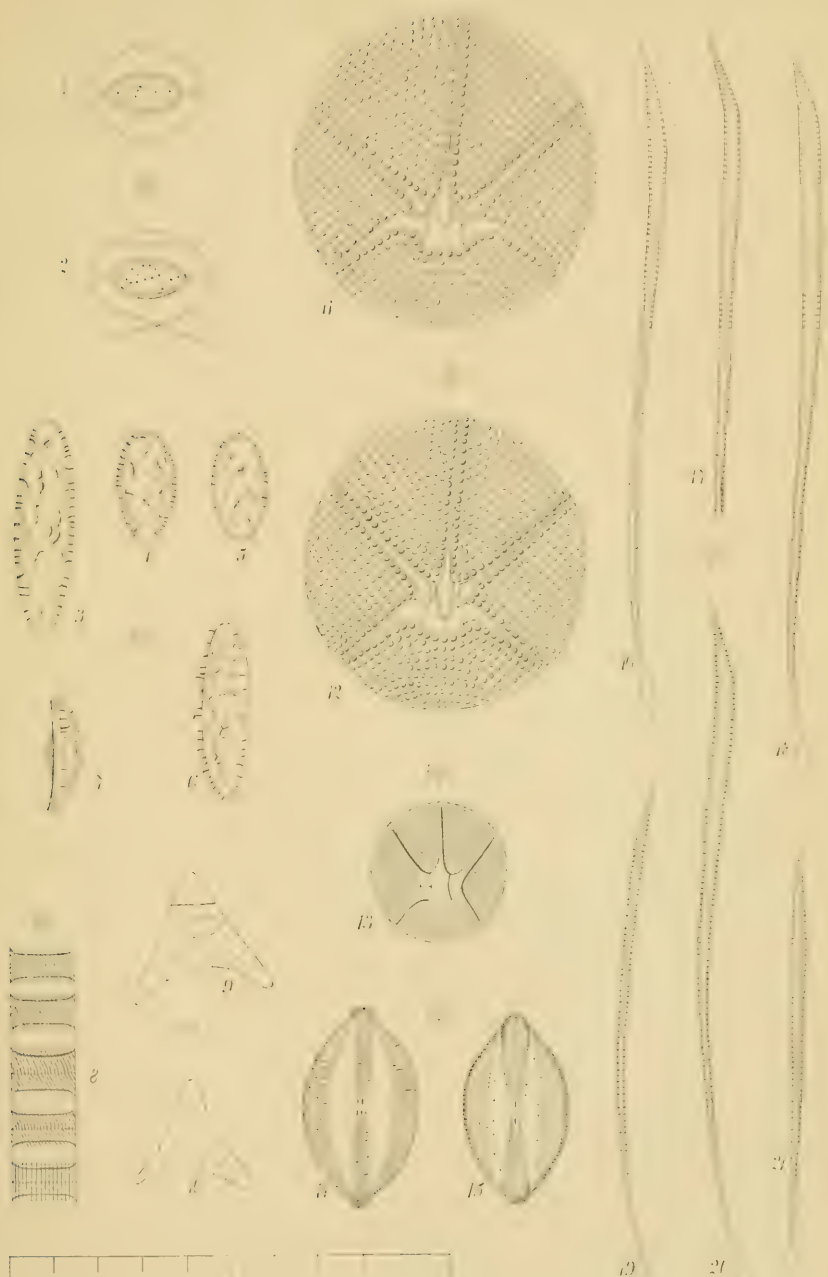


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	Page
I. On some Fish-remains from the Parana Formation, Argentine Republic. By A. SMITH WOODWARD, LL.D., F.L.S. (Plate I.)	1
II. The New Mexico Bees of the Genus <i>Megachile</i> and a new <i>Andrena</i> . By T. D. A. COCKERELL, Professor of Entomology, New Mexico Agricultural College	7
III. On the West-Indian Species of <i>Madrepora</i> . By J. W. GREGORY, D.Sc., F.G.S., Professor of Geology in the University of Melbourne	20
IV. British Amphipoda.—IV. Families <i>Stegocephalidae</i> to <i>Ædiceridae</i> (part.). By Canon NORMAN, M.A., D.C.L., LL.D., F.R.S., &c. (Plate III.)	32
V. Description of a new Sea-Horse (<i>Hippocampus</i>) from Muscat. By G. A. BOULENGER, F.R.S.	51
VI. A List of the Fishes collected by Mr. Rupert Vallentin in the Falkland Islands. By G. A. BOULENGER, F.R.S. With Notes by the Collector	52
VII. Rhynchotal Notes.—V. <i>Heteroptera: Asopinae</i> and <i>Tessartominæ</i> . By W. L. DISTANT	55
VIII. Descriptions of some new Species of Heterocera from Tropical South America. By HERBERT DRUCE, F.L.S. &c.	64
IX. Report on the Neuroptera Odonata collected by Mr. E. E. Austen at Sierra Leone during August and September 1899. By W. F. KIRBY, F.L.S., F.E.S. (Plate II.)	67
X. Notes on the <i>Forficularia</i> .—V. Descriptions of new Species and a new Genus. By MALCOLM BURR, F.Z.S., F.E.S. (Plate IV. figs. 3, 5, 7.)	79
XI. Notes on the <i>Forficularia</i> .—VI. On a Collection of <i>Forficularia</i> from Sarawak. By MALCOLM BURR, F.Z.S., F.E.S. (Plate IV. figs. 1, 2, 4, 6.)	88
XII. The Lower Palæozoic Crinoids of Bohemia. By F. A. BATHER, M.A., F.G.S.	102
XIII. Asiatic <i>Tortricidae</i> . By the Rt. Hon. LORD WALSLINGHAM, M.A., LL.D., F.R.S.	121
XIV. On Giant Squirrels from the Amazonian Region. By OLD-FIELD THOMAS	137
XV. Plankton Studies.—II. On <i>Pleodorina illinoisensis</i> , a new Species from the Plankton of the Illinois River. By C. A. KOFOID, Ph.D. (Plates V. & VI.)	139

BIBLIOGRAPHICAL NOTICE.

Catalogue of the Lepidoptera Phalænæ in the British Museum. Volume II. Catalogue of the <i>Arctiadae</i> (<i>Nolinae</i> , <i>Lithosiinae</i>) in the Collection of the British Museum. By Sir GEORGE F. HAMPSON, Bart.	157
---	-----

MISCELLANEOUS.

On the 'Ankündigung eines systematischen Werkes von den Schmetterlingen der Wienergegend' of Schiffermüller and Denis. By LOUIS B. PROUT, F.E.S.	158
Abundance of the Greater Siil-Smelt (<i>Argentina silus</i> , Ascan.) on the Market of Boston, Lincolnshire. By G. A. BOULENGER, F.R.S.	160

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CONTENTS OF NUMBER 32.—*Seventh Series.*

	Page
XVI. Notes on Diptera from South Africa (<i>Tabanidæ</i> and <i>Asilidæ</i>). By Miss GERTRUDE RICARDO	161
XVII. Note on a Hermaphrodite Frog. By R. C. PUNNETT, B.A. (Plate IX.)	179
XVIII. Descriptions of new Batrachians and Reptiles collected by Mr. P. O. Simons in Peru. By G. A. BOULENGER, F.R.S.	181
XIX. Descriptions of new Batrachians and Reptiles from the Larut Hills, Perak. By G. A. BOULENGER, F.R.S.	186
XX. Description of a new Lizard from Jamaica. By G. A. BOULENGER, F.R.S.	193
XXI. Description of a new Lizard from British East Africa. By G. A. BOULENGER, F.R.S.	194
XXII. On a new Species of the Genus <i>Alepa</i> (<i>A. Lankesteri</i>), from the Collection of the British Museum. By A. GRUVEL, Chargé de Cours à la Faculté des Sciences de Bordeaux. (Plate VIII.)	195
XXIII. Two Spiders new to the British Fauna. By GEORGE H. CARPENTER, B.Sc. Lond., of the Science and Art Museum, Dublin . .	199
XXIV. An undescribed Type of Rusine Deer. By R. LYDEKKER.	204
XXV. On Two English Millipedes (<i>Iulus londinensis</i> , Leach, and <i>Iulus teutonicus</i> , sp. n.). By R. I. POCOCK	206
XXVI. Descriptions of Two Species of <i>Cypræa</i> , both of the Subgenus <i>Trivia</i> , Gray. By JAMES COSMO MELVILL, M.A., F.L.S.	207
XXVII. Description of a new Species of <i>Papilio</i> from Bwool, North Celebes. By H. GROSE-SMITH, F.E.S., F.Z.S., &c.	210
XXVIII. Notes on the Collection of African <i>Phasgonuridæ</i> formed by Mr. W. L. Distant in the Transvaal &c., with Descriptions of Two new Species. By W. F. KIRBY, F.L.S., F.E.S., &c.	211
XXIX. Note on a Variation in the Number of the Genital Pouches in <i>Thalassema neptuni</i> , Gaertner. By F. H. STEWART, M.A., Gatty Marine Laboratory, St. Andrews	218
XXX. Description of a new Species of <i>Buprestidæ</i> . By CHAS. O. WATERHOUSE, V.P.E.S.	219
XXXI. Rhynchotal Notes.—VI. <i>Heteroptera</i> : <i>Dinidorinae</i> , <i>Phyllocephalinae</i> , <i>Urolabidinae</i> , and <i>Acanthosominae</i> . By W. L. DISTANT . .	220
XXXII. Asiatic <i>Tortricidæ</i> . By the Rt. Hon. LORD WALSLINGHAM, M.A., LL.D., F.R.S.	234
XXXIII. Note on Variation in the Weasel and Hedgehog. By G. E. H. BARRETT-HAMILTON	243

BIBLIOGRAPHICAL NOTICES.

Zoological Results based on Material from New Britain, New Guinea, Loyalty Islands, and elsewhere, collected during the Years 1895, 1896, and 1897, by Arthur Willey, D.Sc. Lond., Hon. M.A. Cantab. Part IV.	246
A Monograph of the Coleopterous Families <i>Corylophidæ</i> and <i>Spharididæ</i> . By the Rev. A. MATTHEWS, M.A.	247

MISCELLANEOUS.

Priority or Usage. By F. JEFFREY BELL, M.A. &c.	248
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	Page
XXXIV. On some Malacostracous Crustaceans from Malaysia in the Collection of the Sarawak Museum. By W. F. LANCHESTER, M.A., King's College, Cambridge. (Plate XII.)	249
XXXV. On new Species of <i>Histeridae</i> and Notices of others. By G. LEWIS, F.L.S. (Plate X.)	265
XXXVI. Descriptions of Five new Species of <i>Pangoninae</i> from South America. By Miss GERTRUDE RICARDÓ	291
XXXVII. Descriptions of new Rodents from Western South America. By OLDFIELD THOMAS	294
XXXVIII. On the "Tohi," the East-African Reedbuck currently known as <i>Cervicapra bohor</i> . By OLDFIELD THOMAS	303
XXXIX. New Species of Eastern and Australian Moths. By Colonel C. SWINHOE, M.A., F.L.S., &c.	305
XL. On a new Theriodont Reptile (<i>Ictidosuchus primævus</i>) from the Karoo Beds, South Africa. By R. BROOM, M.D., B.Sc.	314
XLI. Some new Arachnida from Cape Colony. By R. I. POCKOCK	316
XLII. Asiatic <i>Tortricidae</i> . By the Rt. Hon. LORD WALSLINGHAM, M.A., LL.D., F.R.S.	333

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A Monograph of Christmas Island. Physical Features and Geology by CHARLES W. ANDREWS, B.A.; with Descriptions of the Fauna and Flora by numerous Contributors	343

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	Page
XLIII. Description of Sponges from Funafuti. By R. KIRKPATRICK, Assistant, Natural History Museum. (Plates XIII.—XV.)	345
XLIV. The Scorpions of the Genus <i>Heterometrus</i> . By R. I. Pocock	362
XLV. Rhynchotal Notes.—VII. <i>Heteroptera</i> : Fam. <i>Coreidae</i> . By W. L. Distant	366
XLVI. Notes on some Insects from the Yang-tse-Kiang. By W. F. Kirby, F.L.S., F.E.S., &c.	380
XLVII. Descriptions of new Rodents from Western South America. By Oldfield Thomas	383
XLVIII. A new Dassie from North Nyasaland. By Oldfield Thomas	387
NLIX. Description of a new Species of <i>Ornithoptera</i> . By H. Grose-Smith, B.A., F.E.S., F.Z.S., &c.	388
L. Descriptions of Brazilian <i>Coccidæ</i> . By Adolph Hempel, S. Paulo, Brazil	389
LI. Descriptions of new Species of Japanese Land-Shells. By G. K. Gude, F.Z.S.	398
LII. Asiatic <i>Tortricidæ</i> . By the Rt. Hon. Lord Walsingham, M.A., LL.D., F.R.S.	401
LIII. Description of a new Snake of the Genus <i>Ablabes</i> from Burma. By G. A. Boulenger, F.R.S.	409
LIV. Descriptions of new Genera and Species of Hymenoptera. By P. Cameron	410
LV. On the Presence of <i>Echis coloratus</i> , Günther, in Africa. By John Anderson, M.D., LL.D., F.R.S.	419

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In Bird-land with Field-glass and Camera. By Oliver G. Pike	425
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	Page
LVI. Asiatic <i>Tortricideæ</i> . By the Rt. Hon. LORD WALSHINGHAM, M.A., LL.D., F.R.S.	429
LVII. Descriptions of some Species of <i>Coccidæ</i> collected by Mr. James Lidgett in Victoria, Australia. By E. ERNEST GREEN, F.E.S., Government Entomologist, Ceylon. (Plate XI.) ...	448
LVIII. Descriptions of new Species of Japanese Land-Shells. By G. K. GUDE, F.Z.S.	453
LIX. Notes on the Neuropterous Family <i>Nemopteridæ</i> . By W. F. KIRBY, F.L.S., F.E.S.	456
LX. On <i>Equus Penricei</i> , a Representative of the Mountain Zebra (<i>Equus zebra</i> , L.) discovered by Mr. W. Penrice in Angola. By OLDFIELD THOMAS	465
LXI. New Peruvian Species of <i>Conepatus</i> , <i>Phyllotis</i> , and <i>Akodon</i> . By OLDFIELD THOMAS	466
LXII. A new Free-tailed Bat from Central America. By GERRIT S. MILLER, Jr.	470
LXIII. Natural History Notes from H.M. Royal Indian Marine Survey Ship 'Investigator,' Commander T. H. Heming, R.N., commanding.—Series III., No. 4. Some Results of the Dredging Season 1899–1900. By A. F. McARDLE, B.A., M.B., Capt. I.M.S., Surgeon-Naturalist to the Survey	471
LXIV. Diagnoses of new Fishes discovered by Mr. J. E. S. Moore in Lake Tanganyika. By G. A. BOULENGER, F.R.S.	478
LXV. Note on Diatoms from Chinha Guano. By C. MERESCHKOWSKY. (Plate XVI.)	481
LXVI. Some new African Theraphosoid Spiders in the British Museum. By R. I. Pocock	489
LXVII. Descriptions of new Genera and Species of Hymenoptera. By P. CAMERON	495

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Catalogue of Eastern and Australian Lepidoptera Heterocera in the Collection of the Oxford University Museum.—Part II. <i>Noctuidina</i> , <i>Geometrina</i> , and <i>Pyralidina</i> . By Col. C. SWINHOE, M.A., F.L.S., F.Z.S., F.E.S. <i>Pterophoridae</i> and <i>Tineinae</i> by the Right Hon. Lord WALSHINGHAM, M.A., LL.D., F.R.S., &c., High Steward of the University of Cambridge, and JOHN HARTLEY DURRANT, F.E.S., Memb. Soc. Ent. France.	506
Sexual Dimorphism in the Animal Kingdom. By J. T. CUNNINGHAM, M.A.	507
Colour in Nature. By MARION I. NEWBIGIN	<i>ib.</i>

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CONTENTS OF NUMBER 36.—*Seventh Series.*

	Page
LXVIII. A suggested Origin of the Segmented Worms, and the Problem of Metamerism. By H. M. BERNARD, M.A. Cantab.	509
LXIX. On some little-known African Silurid Fishes of the Sub-family <i>Doradinae</i> . By G. A. BOULENGER, F.R.S.	520
LXX. Descriptions of new Genera and Species of Hymenoptera. By P. CAMERON	530
LXXI. Plankton Studies.—III. On <i>Platydorina</i> , a new Genus of the Family <i>Volvocidæ</i> from the Plankton of the Illinois River. By C. A. KOFOID, Ph.D. (Plate VII.)	541
LXXII. On the Luminous Organs of Selachian Fishes. By RUD. BURCKHARDT, Nat. Hist. Mus., S. Kensington	558
LXXIII. <i>Mormopterus Whitleyi</i> —a new Species of Bat from W. Africa. By R. F. SCHARFF, Ph.D., B.Sc.	569
LXXIV. A new Bat from Peru. By GERRIT S. MILLER, Jr.	570
LXXV. Reptiles and Batrachians collected in German New Guinea by the late Dr. Erik Nyman. By Dr. EINAR LÖNNBERG	574

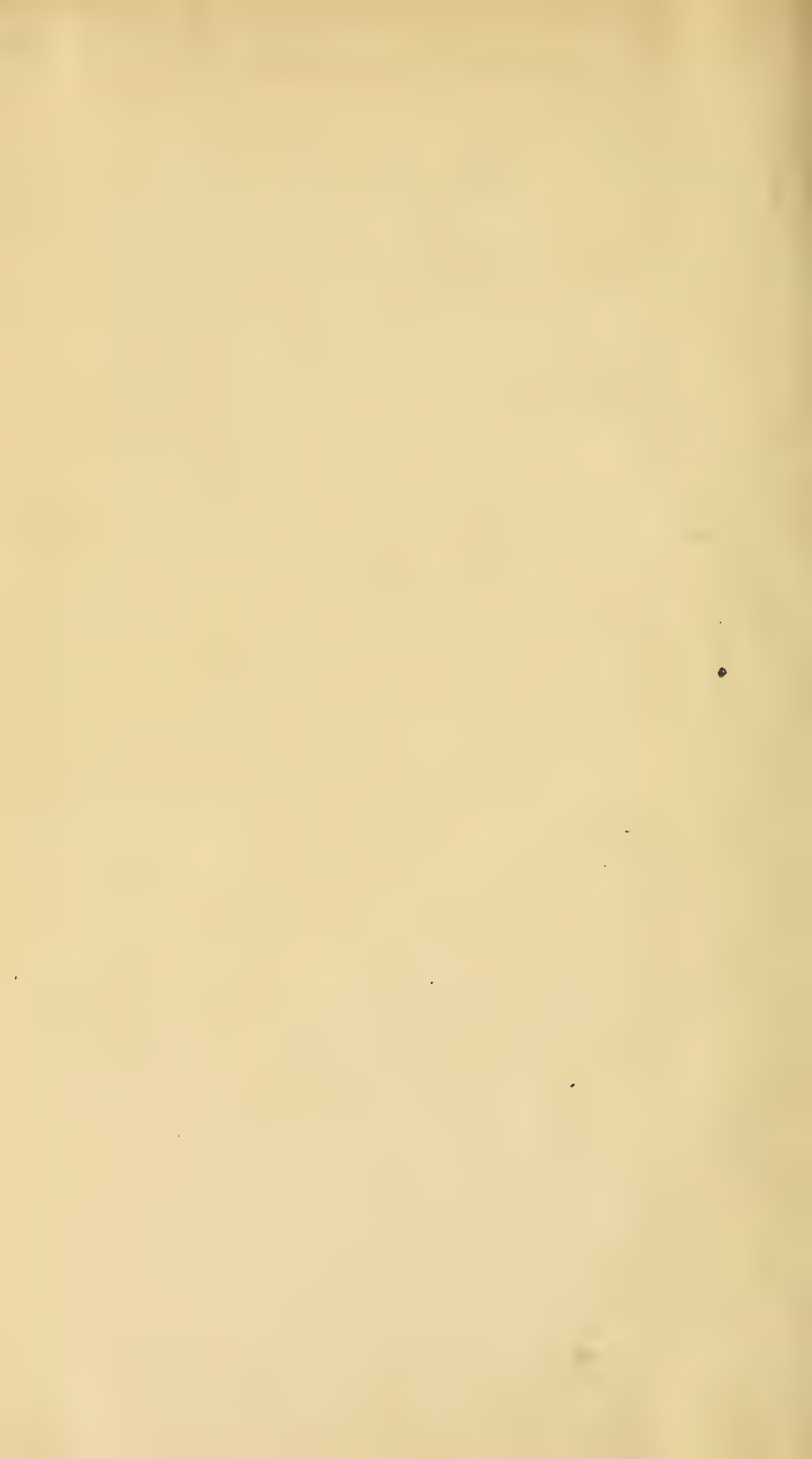
BIBLIOGRAPHICAL NOTICE.

The Story of Bird-life. By W. P. PYCRAFT	582
--	-----

PROCEEDINGS OF LEARNED SOCIETIES.

Geological Society	583
Index	58

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