

THE ANNALS

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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.')

CONDUCTED BY

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

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

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

J. TAYLOR, *Norwich*, 1818.

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 76  
 ser. 6  
 v. 19



# CONTENTS OF VOL. XIX.

[SIXTH SERIES.]

## NUMBER CIX.

	Page
I. A new Amphipod from New Zealand (Family <i>Pontoporeiidae</i> ). By CHARLES CHILTON, M.A., D.Sc., F.L.S. (Plate V.).....	1
II. Descriptions of new Lizards and Frogs from Mount Victoria, Owen Stanley Range, New Guinea, collected by Mr. A. S. Anthony. By G. A. BOULENGER, F.R.S. (Plates I. & II.) .....	6
III. Descriptions of Four new Species of <i>Lycanidae</i> from the Eastern Archipelago. By HAMILTON H. DRUCE, F.Z.S., F.E.S. ..	13
IV. Contributions from the New Mexico Biological Station.— No. 2. On a Collection of Diptera from the Lowlands of the Rio Nautla, in the State of Vera Cruz. I. By C. H. TYLER TOWNSEND, F.E.S. ....	16
V. The Classification of <i>Oribatidae</i> . By A. D. MICHAEL, F.L.S.	34
VI. Contributions from the New Mexico Biological Station.— III. The Bees of the Genus <i>Colletes</i> found in New Mexico. By T. D. A. COCKERELL .....	39
VII. On Cteniform Spiders from the Lower Amazons and other Regions of North and South America, with List of all known Species of these Groups hitherto recorded from the New World. By F. O. PICKARD CAMBRIDGE, B.A. (Plates III. & IV.) .....	52
VIII. Descriptions of new Malay Frogs. By G. A. BOULENGER, F.R.S. ....	106
IX. On some Trapdoor Spiders of the Family <i>Ctenizidae</i> from South and West Australia, contained in the Collection of the British Museum. By R. I. POCKOCK .....	109
X. Descriptions of two new Species of Scorpions from East Africa. By R. I. POCKOCK .....	116

	Page
Proceedings of the Geological Society .....	119
“The most pious priority purist” on the Lobster, the Crayfish, and Professor Bell, by the Rev. Thomas R. R. Stebbing, M.A., F.R.S., F.L.S.; Note on some Sponges from the Auckland Islands, by Prof. R. von Lendenfeld; On the Sexes of <i>Charaxes mixtus</i> , Rothschild, by A. G. Butler, Ph.D., &c. ....	120-124

#### NUMBER CX.

XI. On a Collection of Homoptera made in Southern Africa. By W. L. DISTANT .....	125
XII. A Contribution to the Biology of the Social Wasps of Brazil. By H. VON IHERING .....	133
XIII. Contributions from the New Mexico Biological Station.—No. IV. Diptera from the Sacramento and White Mountains, in Southern New Mexico. I. By C. H. TYLER TOWNSEND .....	138
XIV. The Physiological Importance of the Air-Spaces in Flying Animals. By Prof. R. VON LENDENFELD .....	149
XV. Description of a new Snake from Sierra Leone. By G. A. BOULENGER, F.R.S. ....	154
XVI. Description of a new Fish from Lake Nyassa. By G. A. BOULENGER, F.R.S. ....	155
XVII. On Movement in a Circle as the Fundamental Form of Movement in Animals: its Cause, Manifestation, and Significance. By Prof. F. O. GULDBERG .....	ib.
XVIII. On the Tsu-shima Representative of the Japanese Sable. By OLDFIELD THOMAS .....	161
XIX. On a new Gazelle from Central Arabia. By OLDFIELD THOMAS .....	162
XX. New Eastern Heterocera. By Col. C. SWINHOE, M.A., F.L.S. ....	164
XXI. Description of a new Species of <i>Delma</i> from Western Australia. By Dr. A. GÜNTHER .....	170
XXII. Descriptions of new Species of Butterflies from the Pacific Islands. By H. GROSE SMITH, B.A., F.E.S., F.Z.S. ....	172
XXIII. On Lepidoptera Heterocera from China, Japan, and Corea. By JOHN HENRY LEECH, B.A., F.L.S., F.Z.S., &c. ....	180
<i>New Books</i> :—The Fauna of British India, including Ceylon and Burma. Published under the authority of the Secretary of State for India in Council. Edited by W. T. BLANFORD.—Moths. Vol. IV. By Sir G. F. HAMPSON, Bart.—The Parasitic Diseases of Poultry. By FRED. V. THEOBALD, M.A., F.E.S. ....	236, 237

	Page
Proceedings of the Geological Society.....	238
The Generic Name of the River Crayfish, by F. Jeffrey Bell: A Gigantic Cephalopod on the Florida Coast, by A. E. Verrill	239, 240

## NUMBER CXI.

XXIV. Notes from the Gatty Marine Laboratory, St. Andrews.— No. XVII. By Prof. M'INTOSH, M.D., LL.D., F.R.S.....	241
XXV. New Species of Hymenoptera from Central America. By P. CAMERON, F.E.S. ....	261
XXVI. A List of Reptiles and Batrachians from the Congo Free State, with Descriptions of Two new Snakes. By G. A. BOULENGER, F.R.S. ....	276
XXVII. Description of a new Snake from Usambara, German East Africa. By G. A. BOULENGER, F.R.S. ....	281
XXVIII. Description of a new Species of the Genus <i>Pocilopsaltria</i> belonging to the Family <i>Cicadidae</i> . By W. L. DISTANT.....	282
XXIX. Descriptions of some new Oriental <i>Opiliones</i> recently received by the British Museum. By R. I. Pocock .....	283
XXX. A Contribution to the Osteology of the Mesozoic Amioid Fishes <i>Caturus</i> and <i>Osteorachis</i> . By A. SMITH WOODWARD, F.L.S. (Plates VIII. & IX.) .....	292
XXXI. On Lepidoptera Heterocera from China, Japan, and Corea. By JOHN HENRY LEECH, B.A., F.L.S., F.Z.S., &c. ....	297
XXXII. On a new Mouse from Damaraland. By W. E. DE WINTON .....	349
Proceedings of the Geological Society .....	350, 351
What are the Names of the Crayfish and Lobster?, by R. I. Pocock; The Lobster and the Crayfish: a Reply, by the Rev. Thomas R. R. Stebbing, M.A., F.R.S., F.L.S.; Nocturnal protective Coloration in Mammals, Birds, Fishes, Insects, &c., as developed by Natural Selection, by A. E. Verrill .....	352-354

## NUMBER CXII.

XXXIII. Report upon the Scorpiones and Pedipalpi obtained on the Lower Amazons by Messrs. E. E. Austen and F. Pickard Cam- bridge during the trip of Mr. Siemens's Steamship 'Faraday.' By R. I. Pocock .....	357
--	-----

	Page
XXXIV. New Species of Hymenoptera from Central America. By P. CAMERON, F.E.S. ....	368
XXXV. A Contribution to the Osteology of the Mesozoic Amioid Fishes <i>Caturus</i> and <i>Osteoruchis</i> . By A. SMITH WOODWARD, F.L.S. (Plates X. & XI.) .....	379
XXXVI. On a new Dormouse from Mashunaland. By OLDFIELD THOMAS .....	388
XXXVII. Note on <i>Derulea</i> , Westwood ( <i>Lyttidae</i> ), with the Description of a new Species. By Mrs. M. K. THOMAS. ....	389
XXXVIII. On a Collection of Heterocera made in the Transvaal. By W. L. DISTANT. ....	390
XXXIX. Contributions from the New Mexico Biological Station. —V. Some new Hymenoptera from the Mesilla Valley, New Mexico. By T. D. A. COCKERELL .....	394
XL. Descriptions of further new Species of Butterflies from the Pacific Islands. By H. GROSE SMITH, B.A., F.G.S., F.Z.S. ....	403
XLI. New Eastern Lepidoptera. By Col. C. SWINHOE, M.A., F.L.S. ....	407
XLII. On <i>Spirorbis</i> : Asymmetry of these Annelids and Phylo- genic Connexion of Species in the Genus. By MM. MAURICE CAULLERY and FÉLIX MESNIL. With a Note by M. EDMOND PERRIER .....	411
XLIII. On Lepidoptera Heterocera from China, Japan, and Corea. By JOHN HENRY LEECH, B.A., F.L.S., F.Z.S., &c. (Plates VI. & VII.) .....	414
XLIV. Descriptions of Two new <i>Muride</i> from Central and West Africa. By W. E. DE WINTON .....	463
XLV. On a new Species of <i>Lagidium</i> from the Eastern Coast of Patagonia. By OLDFIELD THOMAS .....	466
XLVI. Description of a new Lizard from Obok. By G. A. BOULENGER, F.R.S. ....	467
XLVII. Description of a new Genus and Species of Tortoises from Borneo. By G. A. BOULENGER, F.R.S. ....	468
XLVIII. On a new Nymphalid Butterfly from N.E. Borneo. By ARTHUR G. BUTLER, Ph.D., F.L.S., F.Z.S., Senior Assistant-Keeper, Zoological Department, British Museum .....	469
<i>Astacus</i> vindicated as the Lobster's Genus, by the Rev. Thomas R. R. Stebbing, M.A., F.R.S., F.L.S. ....	470

## NUMBER CXIII.

Page

- XLIX. Notes on the Longicorn Genus *Glenea*, Newm., with Descriptions of new Species. By C. J. GAHAN, M.A., of the British Museum (Natural History) ..... 473
- L. Notes on some South-American *Muride*. By OLDFIELD THOMAS ..... 494
- LI. Descriptions of Five new Species of *Mylabrinae* (*Lyttidae*) in the Collection of the British Museum. By Mrs. M. K. THOMAS .. 501
- LII. A List of the Reptiles and Batrachians collected by Mr. Alfred Everett in Lombok, Flores, Sumba, and Savu, with Descriptions of new Species. By G. A. BOULENGER, F.R.S. .... 503
- LIII. Descriptions of some new Species of Scorpions of the Genus *Tityus*, with Notes upon some Forms allied to *T. americanus* (Linn.). By R. I. POCCOCK..... 510
- LIV. On *Sus verrucosus*, Müll. & Schleg., and Allies, from the Eastern Archipelago. By Dr. C. I. FORSYTH MAJOR ..... 521
- LV. On Lepidoptera Heterocera from China, Japan, and Corea. By JOHN HENRY LEECH, B.A., F.L.S., F.Z.S., &c.—Part II. Family *Geometridæ*; Subfamilies *Enochrominae*, *Orthostixinae*, *Larentiinae*, *Acidaliinae*, and *Geometrinae* ..... 543
- LVI. The Ochre-footed Scrub-Squirrels of East Africa. By W. E. DE WINTON ..... 573
- LVII. Coleoptera collected in the Transvaal. By W. L. DISTANT. 575
- LVIII. On a Collection of Heterocera made in the Transvaal. By W. L. DISTANT ..... 579
- LIX. Descriptions of some new Species of *Acraeidae* collected by Mr. F. J. JACKSON at Ntebi, Uganda. By EMILY MARY SHARPE .. 581
- On the Organization and Affinities of *Pleurotomaria*, by MM. E.-L. BOUVIER and H. FISCHER ..... 583

## NUMBER CXIV.

- LX. Note on a Cast of the Brain-cavity of *Iguanodon*. By CHAS. W. ANDREWS, B.Sc., F.G.S., Assistant in the British Museum (Natural History). (Plate XVI.) ..... 585
- LXI. Ostracoda from the *Chara*-marl of Hitchin, Herts. By FREDERICK CHAPMAN, A.L.S., F.R.M.S. (Plate XV.) ..... 591
- LXII. List of the Neuroptera collected by Mr. E. E. Austen on the Amazons &c. during the recent Expedition of Messrs. Siemens Bros. Cable S.S. 'Faraday,' with Descriptions of several new Species of Odonata (Dragonflies). By W. F. KIRBY, F.L.S., F.E.S., &c. (Plates XII. & XIII.)..... 598

	Page
LXIII. The Otter of Central America. By C. I. FORSYTH MAJOR .....	618
LXIV. On the Relations of <i>Antennophorus Uhlmanni</i> , Haller, to <i>Lasius mixtus</i> , Nyl. By M. CHARLES JANET .....	620
LXV. Diagnoses of new Land-Shells from Flores, Malay Archipelago. By EDGAR A. SMITH.....	623
LXVI. On a new African Pierine Butterfly of the Genus <i>Mylothris</i> . By ARTHUR G. BUTLER, Ph.D. &c. ....	627
LXVII. Some new Forms of American Rotifera.—II. By Dr. ALFRED C. STOKES. (Plate XIV.) .....	628
LXVIII. Descriptions of Eleven new Species of Land and Fresh-water Mollusca from South Africa. By JAMES COSMO MELVILL, M.A., F.L.S., and JOHN HENRY PONSONBY, F.Z.S. (Plate XVII.)	633
LXIX. On Lepidoptera Heterocera from China, Japan, and Corea. By JOHN HENRY LEECH, B.A., F.L.S., F.Z.S., &c.—Part II. Family <i>Geometridæ</i> ; Subfamilies <i>Enochrominæ</i> , <i>Orthostizinae</i> , <i>Larentiinae</i> , <i>Aciduliinae</i> , and <i>Geometrinae</i> .....	640
<i>New Book</i> :—Das Tierreich. I. Lieferung.—Aves: <i>Podargidæ</i> , <i>Caprimulgidæ</i> , and <i>Macropterygidæ</i> . Bearbeitet von ERNST HARTERT .....	679
On the Malpighian Tubes of Orthoptera, by M. L. Bordas; The supposed great Octopus of Florida: certainly not a Cephalopod, by A. E. Verrill .....	680-682
Index .....	684

---

PLATES IN VOL. XIX.

PLATE I. {	New Lizards and Frogs from Mount Victoria.
II. {	
III. {	Cteniform Spiders from the Lower Amazons.
IV. {	
V.	Platyischnopus neozelanicus.
VI. {	Heterocera from China, Japan, Corea.
VII. {	
VIII. {	Osteology of Caturus.
IX. {	
X. {	Osteorachis Leedsi.
XI. {	
XII. {	Neuroptera from the Amazons.
XIII. {	
XIV.	New American Rotifera.
XV.	Ostracoda from the Chara-marl of Hitchin.
XVI.	Brain-cavity of Iguanodon.
XVII.	New Mollusca from South Africa.



# THE ANNALS

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## MAGAZINE OF NATURAL HISTORY.

[SIXTH SERIES.]

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XXIV.—*Notes from the Gatty Marine Laboratory, St. Andrews.*—No. XVII. By Prof. M'INTOSH, M.D., LL.D., F.R.S.

1. On the Spawning of the Lesser Sand-eel (*Ammodytes tobianus*, L.).
2. On the Eggs and Young of the Pollack (*Gadus pollachius*, L.).
3. On the Life-history of the Lump-sucker (*Cyclopterus lumpus*, L.).
4. On the Eggs and Young of the Bimaculated Sucker (*Lepadogaster bimaculatus*, Donov.).
5. On the Life-history of the Short-spined Sea-Scorpion (*Cottus scorpius*, L.).

### 1. *On the Spawning of the Lesser Sand-eel* (*Ammodytes tobianus*, L.).

Some years ago an account of the eggs and larvæ of the sand-eels was given by the author in the 'Report of the Fishery Board'\*, and little fresh light has been thrown on the oviposition since that date, though the able paper by Mr. A. T. Masterman gave much information about the life-history and the rate of growth †, as founded on a careful examination of a most extensive and valuable series from various parts of Scotland. His conclusions from the larval and young forms also fit in with the subsequent remarks.

\* Ninth, p. 331 (1891); also M'Intosh and Prince, Trans. Roy. Soc. Edinb. vol. xxxv. p. 858.

† Ann. & Mag. Nat. Hist., Oct. 1895, p. 282.

XXIX.—*Descriptions of some new Oriental Opiliones recently received by the British Museum.* By R. I. POCKOCK.

Suborder PLAGIOSTETHI, Simon.

Family Phalangiidæ.

Genus GAGRELLA, Stoliczka.

*Gagrella insculpta*, sp. n.

Closely allied to *G. scrobiculata*, Thorell (Ann. Mus. Genov. xxx. p. 117), from Borneo, but apparently differing in the following particulars:—The colour of the trunk is black, but there are some bright yellow spots near the sides of the carapace, one on each side of the tergal shield of the abdomen, and one on the anterior surface of the distal end of the fourth coxa (these spots do not appear to be present in *scrobiculata*). Mandibles yellow, spotted with brown in front in one specimen, but not nigro-piceous as in *scrobiculata*.

Legs black; tarsi testaceous; the adjacent extremities of the tibiæ and protarsi bright yellow. Sternal area of abdomen with a wide flavous stripe on each side of it.

The sculpturing of the trunk appears to resemble that of *scrobiculata*, except that the free abdominal terga are exceedingly finely punctulate and not very finely granular.

The supramandibular processes are not acuminate and narrow, but stout, with the apex digitate, each digitiform process armed apically with small tubercles; immediately behind them on the carapace there is a low smooth eminence.

Length of trunk 8·5 millim., width 5.

*Loc.* Baram, Borneo. Several specimens obtained by Mr. Charles Hose.

Suborder MECOSTETHI, Simon.

Fam. Oncopodidæ, Thor.

Genus PELITNUS, Thor.

(Ann. Mus. Genov. xxx. p. 757 (1890).)

*Pelitnus annulipes*, sp. n.

*Colour* of upper side of trunk and of lower side of abdomen a deep brownish black; coxæ fusco-ferruginous; legs brunneo-fuscous, with the tarsi, trochanters, and apices of femora, patellæ, and tibiæ orange-yellow.

*Trunk* smooth though not polished, piriform; width of abdomen a little more than two thirds length of trunk (5:7). *Carapace* convex transversely, about twice as wide as long, widely and transversely truncate anteriorly, its anterior lateral angles rounded, its sides nearly parallel, the interocular area elevated into an erect triangularly spiniform tooth, at the base of which on each side the eye is situated; the area in front of the tubercle nearly vertical, that behind it horizontal in the middle, strongly sloped away at the sides, where there is a distinct tubercle, and just above and behind it a deep pit leading apparently into a tunnel which passes beneath a kind of bridge formed by the union of the middle of the dorsal surface of the carapace and the corresponding area of the first segment of the abdomen; the middle of the upper surface of this bridge marked with a deep pit, which evidently corresponds to the shallow but wide sulcus which longitudinally divides the anterior abdominal tergal ridges, but dies out on the posterior ones; these ridges are nine in number, counting that in the first that forms the hinder half of the bridge; none of the terga are free and all the sterna are similarly fused, being represented by transverse ridges, and the original sutures between them by grooves.

*Mandibles* only moderately strong, the basal segment distally expanded and terminating above in a bluntly rounded prominence, its upper edge longitudinally straight, the forceps weak, the digits scarcely sinuate; when extended these appendages reach only to the end of the femur of the palp.

*Palpi* reaching just past the tibia of the first leg, bearing a single cylindrical process on the under surface of the maxilla, trochanter, and base of femur.

*Legs* longish; the coxæ sending out in front and behind a buttress to support the narrowed base of the trochanter; this buttress on the posterior face of the second coxa is double, and bears, in addition, a tubercle, while on the upper surface of the segment there is a pair of large tubercles beneath the edge of the carapace, and the inner angle of this segment is armed with a forwardly directed angular tooth projecting partially beneath the coxa of the first leg, upon which close to the lip-like maxillary plate there is a low rounded prominence; the rest of the coxæ and of the segments of the legs are without special processes. The coxo-sternal area between the genital plate and the mouth-parts longitudinally depressed and forming a deep wide channel.

*Genital plate* triangularly heart-shaped, about as wide at the base as it is long.

*Measurements in millimetres.*—Total length of trunk 7;

width of abdomen 5, of carapace 2·5; length of first leg (excluding coxa) 9·5, of second 15, of third 10·5, of fourth 15.

*Loc.* Baram, Borneo. One specimen obtained by Mr. C. Hose.

The only other known species of this genus is *P. armillatus*, Thor. (*loc. cit.*), from Ajer Mantjur in Sumatra, which is based upon a small example 2 millim. long and evidently not adult. But it certainly differs from the species here described in having the abdomen as wide as the trunk is long and more than half the length of the fourth leg. The palpi, moreover, are said to be unarmed, no processes being described as present upon the lower side of its basal segments.

So far as I can judge of the characters of *Gnomulus* from the description of the two known species published by Dr. Thorell—namely *G. rostratus* (Ann. Mus. Genov. xxx. p. 378), from Pinang, and *G. sumatranus* (*loc. cit.* p. 759), from Mount Singalang—the genus *Pelitnus* only differs from it in possessing a triangularly spiniform erect interocular tubercle. The two differ from the following genus *Oncopus* in having the anterior two pairs of tarsi two-jointed and the posterior two pairs three-jointed. In *Oncopus* all the tarsi are composed of a single segment.

#### Genus ONCOPUS, Thor.

(Ann. Mus. Genov. ix. p. 134 (1876).)

#### *Oncopus Hosei*, sp. n.

Nearly allied to *O. Doriae*, Thorell, from Sarawak (Ann. Mus. Genov. ix. p. 138, 1876–77), but differing apparently in the following particulars:—

The body is narrower as compared with its length, the width of the abdominal region being considerably less than two thirds the length of the dorsal surface.

On the abdomen there are only *two* distinct pairs of tubercles, both of which appear to be relatively smaller and a little closer together than those in *O. Doriae*. The third pair of tubercles from the end depicted in the drawing of *O. Doriae* are only just visible in *O. Hosei*.

The genital plate is distinctly longer than wide, and from the inner angle of the coxa of the legs of the third pair a slender spiniform process runs forward, underlying the maxillary process of the coxa of the legs of the second pair.

Palpi extending nearly to the apex of the protarsus of the first legs; femur has no processes below (in *Doriae* there are said to be two processes, one at the base and the other in the

distal half), and I can see nothing of the nature of a blunt bifid spine or process arising from the lower side of the maxillæ, there being at most a low and undivided prominence here. Moreover, on the coxæ of the first leg there are distinctly *four* processes visible below, one a largish conical eminence situated in the middle of its lower surface, a second small blunt tooth-like one on its anterior surface just below

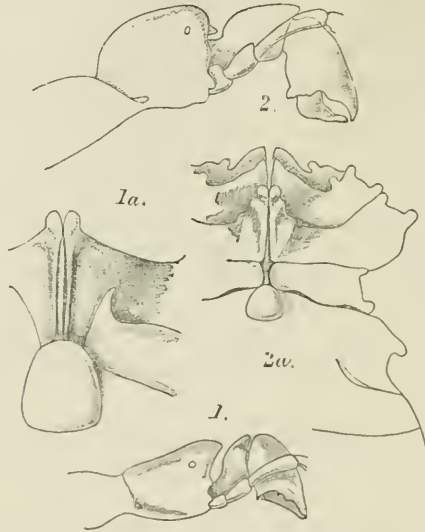


Fig. 1.—*Oncopus Hosei*; head and mandible.  
 Fig. 1 a.—Ditto; coxæ of second and third legs.  
 Fig. 2.—*Oncopus alticeps*; head and mandible.  
 Fig. 2 a.—Ditto; coxal area of carapace.

the maxilla, and the other two on its distal margin. All the trochanters are without tubercles, but there is a distinct process at the base of the upperside of the femur of the second leg.

*Measurements in millimetres.*—Total length of trunk 9·3; length of carapace 3, width 3; width of abdomen 5; length of first leg (excluding coxa) 9, of second 13, of third 9, of fourth 13·5.

*Loc.* Baram, Borneo. A single specimen obtained by Mr. C. Hose.

From the other known species of *Oncopus*, namely *O. Foa*, Thorell (Ann. Mus. Genov. xxx. p. 375, 1890), from Pinang, and *O. truncatus*, id. (tom. cit. p. 764), from Singapore, this new species seems to differ in the same respects as those pointed out by Thorell as distinctive of *O. Doria*.

*Oncopus alticeps*, sp. n.

*Colour* deep blackish brown, carapace and mandibles paler; extremities of the leg-segments and the entire tarsus pale.

*Carapace* very high, abruptly elevated behind at its junction with the abdomen, strongly rounded from side to side, without any broad elevated interocular prominence such as is seen in *O. Hosei*.

*Mandibles* very strong, the basal segment suddenly raised at the base and projecting forwards to a point nearly on a level with the tip of the femur of the palp, which curves round it, armed externally below with a spiniform tooth, only a small portion of the second segment visible from above.

The *palp* with the tarsus stouter than in *Hosei*, the claw thick, short, tarsiform, and forming a small pincer with a short process from the apex of the tarsus.

*Legs* as in *Hosei*; the coxæ of the second, however, on each side of the middle line are thickened and raised into a warty eminence, which projects forwards and terminates in a black bilobed maxillary process, and there are no forwardly-directed processes on the inner extremities of the coxæ of the third legs.

*Genital plate* broader as compared with its length than in *Hosei*.

*Abdomen* as in *Hosei*, but as broad as long, with three pairs of distinct tubercles, the posterior being much the longest; the five smooth transverse ridges on the lower surface not so thick as in *Hosei*.

*Measurements in millimetres*.—Total length of trunk 9.5; width of abdomen 6, length up to the lateral pit 7, to posterior border of head 6.

*Loc.* Pinang Hill (2260 feet alt.). A single specimen obtained by Mr. Stanley Flower, of the Royal Museum, Bangkok, Siam.

The annexed table will serve to show the distinctive characters of this and the other species of the genus known to me:—

- a. The carapace very high and convex, its posterior portion abruptly elevated above the level of the abdomen; the basal segment of the mandible very long, reaching nearly to the extremity of the femur of the palp, only a small portion of the second segment visible from above; maxillary process of second leg very large and thick . . . . . *alticeps*, sp. n.
- b. Carapace low, posteriorly but little or no higher than the adjacent area of the abdomen; mandibles

much smaller, almost as much of the second segment visible from above as of the first, the latter not extending beyond the middle of the femur of palp; maxillary process of second leg relatively small.

- a*<sup>1</sup>. The anterior portion of the carapace produced forwards and upwards into a blunt interocular beak; the last tergite of the abdomen with two large tubercles; coxa of third leg furnished at the base with a forwardly-directed spiniform process ..... *Hosei*, sp. n.
- b*<sup>1</sup>. The anterior portion of the carapace low, with at most a small prominence; last tergite of abdomen without tubercles; coxa of third leg without basal spiniform process..... *truncatus*, Thor.

The type of the genus, *O. Doriae*, and the remaining species, *O. Feæ*, which seem to be closely allied, will fall, apparently, alongside of *Hosei* under section *a*<sup>1</sup> of the above table; but there is no mention in the description of either of them of the presence of a spiniform process on the coxa of the third leg. *O. Feæ* is said to differ from *O. Doriae* in having the dorsal part of the abdominal region longer, namely, more than three times as long as the carapace instead of two and a half times, the femur of the palp having only one tubercle below at the base instead of two, &c. In *Hosei* there is no tubercle in this position.

Of the Singapore species *O. truncatus* the British Museum has from time to time received a number of specimens from Mr. H. N. Ridley.

#### Suborder ANEPIGNATHI, Thorell.

(Ann. Mus. Genov. 1882, p. 22.)

#### Family SIRONIDÆ, Simon.

#### Genus PETTALUS, Thor.

(Ann. Mus. Genov. viii. p. 469 (1876).)

This genus was founded by Thorell for the reception of the species from Ceylon described by Cambridge as *Cyphophthalmus cimiciformis* (Ann. & Mag. Nat. Hist. (4) xvi. pp. 388-389, pl. xiii. fig. 3, 1875). The characters upon which it was based and distinguished from *Siro* (*Cyphophthalmus*) were the alleged presence of a fourth segment on the mandibles and the bifurcation of the last dorsal plate of the abdomen.

In the species of this genus, however, that I have seen there is no fourth segment on the mandible and the bifurcation of the abdominal segment may be almost absent, varying within the limits of the same species. Apart from this

character, however, the genus may be distinguished from *Siro* by having the tarsi composed of a single segment, whereas in *Siro* the proximal end of the tarsus is, according to Simon ('Arachnides de France,' vii. p. 144, pl. xxii. figs. 10-13), separated off. Also in *Siro* the eyes appear to be marginal as in *Stylocellus*, whereas in *Pettalus* the two tubercles are nearly as far from the margins as they are from each other. *Miopsalis*, Thor. (Ann. Mus. Genov. xxx. p. 381, 1890), will probably prove synonymous with *Pettalus*.

Some facts connected with the structure of the stomotheca and sternal surface of the carapace are perhaps worth recording. The *maxillæ* lie vertically between the coxæ of the first pair of legs, their lip-like apices just appearing at the hinder end of the stomotheca; these lips, which are defined by a suture, are the maxillary lobes. The posterior ends of the first coxæ close the stomotheca behind, since they just meet in the middle line; and lying alongside of their inner edges is a narrow sclerite, ending below in a lip-like piece, which appears to represent the maxillary lobe of this coxa. The *coxæ* of the second pair end in long processes, which meet in the middle line behind those of the first and separate them from a large pentagonal plate lying between the coxæ of the third and fourth appendages. This plate is furnished with a pair of conical elevations, and in the middle line behind them there is a small crescentic genital aperture.

*Pettalus brevicauda*, sp. n.

*Colour* (in alcohol) a uniform yellowish brown.

*Body* oval, short, not much longer than broad, broadest at the posterior border of the carapace, covered above and below with somewhat coarse granulation.

*Carapace* with its posterior border mesially convex above, lightly concave at the side; ocular tubercles conical, broad and circular at the base; the margin just above the base of the mandibles prominent. Upper surface of abdomen composed of eight distinct plates, separated by grooves, the grooves scarcely granular, the granules along the anterior and posterior edge of the plates coarser than the rest; the last segment much smoother, marked with a deep longitudinal groove and a deep posterior notch; beneath the bilobed plate, and separating it from the circular anal plate, there is a crescentic tergite, the sternite of which is a narrow plate immediately in front of the anal sclerite. Rim of stigmata forming nearly a complete circle.

*Appendages*.—*Mandibles* with basal segment cylindrical,  
*Ann. & Mag. N. Hist.* Ser. 6. Vol. xix. 21



about four times as long as wide, with a transverse crest at its proximal end above and a strong prominence below, granular throughout and about two thirds the length of the second segment, which is smooth and polished. *Palpi* about equal to the mandibles in length, the tibia one third longer than the tarsus; finely granular above and below; the tibiæ longer than the patellæ, the pro-tarsi nearly half the length of the tarsi; lower surface of first tarsus distally finely scopulate, much swollen in the middle of its length; tarsus of fourth with a rounded tubercular knob on its posterior (inner) surface at the proximal end, and from this a short tooth-like process projects forwards and upwards.

Length 3·8 millim., width 2·5.

*Loc.* Punduloya, Ceylon (E. E. Green).

Differs from *Pettalus cimiciformis* (Cambridge) in its relatively weakly lobate "tail" and much smaller process on the fourth tarsus. A second smaller specimen, obtained by Mr. Green, has no process on the fourth tarsus, and the last tergite scarcely lobate and not grooved. This specimen is probably either young or a different sex from the type.

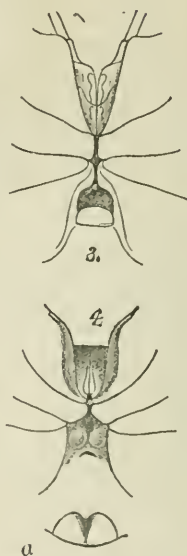


Fig. 3.—Coxal area of *Stylocellus lionotus*.

Fig. 4.—Ditto of *Pettalus brevicauda*.

Fig. 4 a.—Last tergite of *Pettalus brevicauda*.

### Genus STYLOCELLUS, Westw.

*Stylocellus*, Westw. Thesaurus Ent. Oxon. p. 200, pl. xxxvii. fig. 7 (1874).  
*Leptopsalis*, Thor. Ann. Mus. Genov. xviii. p. 23 (1883).

Judging from the species of this genus that I have had an opportunity to examine, the sternal region of the cephalothorax differs in some important and puzzling particulars from the same area in *Pettalus*. The stomotheca is closed behind by the coxæ of the second pair of legs, which, like those of the first pair, have their inner edges strongly elevated. Moreover, the coxæ of the legs of the fourth pair apparently meet each other in the middle line in front of the large transversely reniform genital aperture, and separate it from a small sternal plate, which is wedged in between the coxæ and second pair of legs. The genital aperture is bounded

behind by a semilunar genital plate, which is fused behind with the first abdominal sternite. I say that the coxæ apparently meet each other in front of the genital aperture, because there appears to be no distinct suture, only integumental folds, between their main portions and their inwardly-directed processes. From a comparison of the figures of the coxal areas of *S. lionotus* and *Pettalus brachyurus* it seems that the maxillary lobes of the legs of the first pair in the former are not represented in the latter, where the maxillary lobes of the palpus appear to be the only organs that can be called lips, and that the pentagonal plate with its two elevations that lies in *Pettalus* between the coxæ of the second, third, and fourth pairs of legs and before the genital aperture is represented in *Stylocellus* by the minute sternal plate and by the inwardly-directed pregenital coxal lobes of the fourth legs. But whether in the case of the *Stylocellus* the coxæ have grown inwards and obliterated the sternal area of *Pettalus*, or whether they have merely fused with it, I cannot at present say. In *Siro* (cf. Thorell, Ann. Mus. Genov. xviii. 1882, p. 24, in note) there is a largish sternal plate lying longitudinally between the coxæ of the first, second, and third pairs of legs at the sides, the genital aperture behind, and the apex of the stomotheca in front. *Siro*, therefore, is in some respects intermediate between *Pettalus* and *Stylocellus*.

*Stylocellus lionotus*, sp. n.

*Colour* of trunk black, of appendages very deep ferruginous.

Upper surface of *trunk* and lower surface of abdomen smooth; coxæ mesially granular below, the first more thickly so than the others.

*Body* about twice as long as wide.

The sessile *eyes* situated some distance—*i. e.* by a space that slightly excels their diameter—in front of the ocular tubercle.

*Mandibles* nearly as long as the palpi; basal segment thickly granular below and bearing two tubercles, one at the base, the other in the middle of their length, towards the outside of the lower surface; the second segment granular above at the base, smooth and polished elsewhere.

The legs and other organs apparently as in *S. sumatranus*, Westw. (Thes. Ent. Oxon. p. 200, 1874).

*Measurements in millimetres.*—Total length 6; width 3; height 2·2; length of first leg 9, of second 6·3, of third 6·5, of fourth 8·8.

*Loc.* Sandakan, N. Borneo. A single specimen obtained by Mr. Douglas Cator.

This species may be at once recognized from *S. sumatranus* (= *S. Beccarii*, Thorell, Ann. Mus. Genov. xviii. p. 25, 1882) from Sumatra and from *S. javanus* (Thorell, *loc. cit.* p. 30) from Java by having the upper surface of the trunk smooth and not densely granular.

XXX.—*A Contribution to the Osteology of the Mesozoic Amioïd Fishes Caturus and Osteorachis.* By A. SMITH WOODWARD, F.L.S.

[Plates VIII.—XI.]

THE well-known Leeds Collection from the Oxford Clay of Peterborough has already furnished many important illustrations of the osteology of the Mesozoic fishes. Several more examples, however, still remain to be utilized, and the present contribution to our knowledge of the early Amioïds is chiefly based on a fine series of new specimens of *Caturus* and one of *Osteorachis* in this collection. The description of these is followed by a brief note on a unique example of the Liassic *Osteorachis macrocephalus*, which has hitherto been imperfectly known, but can now be elucidated with greater precision. The whole series of observations shows more clearly than ever how extraordinarily similar are certain Mesozoic rhombic-sealed notochordal genera to the existing *Amia*, even in some of the minute features of osteology.

I.—*CATURUS*, SP. IND., FROM THE OXFORD CLAY OF NORTHAMPTONSHIRE AND WILTSHIRE.

There is still so much uncertainty as to the distinction of the various species of *Caturus* known even by whole skeletons that it seems inadvisable at present to give any specific names to the comparatively fragmentary examples of this genus from the English Oxford Clay. Their great interest consists not in their precise systematic relationships, but in their naturally dissected condition, which adds so much to our knowledge of the osteology of the fish. It must suffice to remark that most of the specimens belong to a species closely related to, if not identical with, the typical *Caturus furcatus* of the Bavarian Lithographic Stone; while some have comparatively larger and fewer teeth. All these fossils have now been acquired