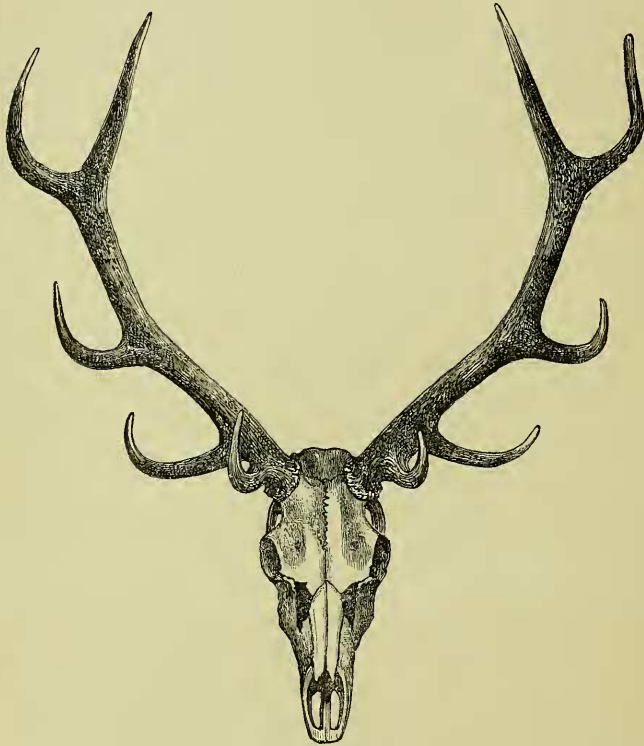


February 16, 1892.

Osbert Salvin, Esq., F.R.S., Vice-President, in the Chair.

Mr. W. T. Blanford exhibited two heads (one mounted) and a skin of the Yarkand Stag. The specimens had been lent for exhibition by Major C. S. Cumberland, who shot the animals in the woods on



Skull and horns of Yarkand Stag (from specimen in Nat. Hist. Mus.)¹.

the Yarkand or Tarim river in 1890, as described by him in 'Land and Water' (vol. li. p. 318, March 14th, and p. 446, April 11th, 1891).

Mr. Blanford made the following remarks:—

The Stag of Eastern Turkestan was first brought to notice by

¹ The head here figured is in the British Natural History Museum, and was presented by Mr. A. O. Hume. The skull measures in basal length 14 inches, in breadth across the orbits 6·75; the two horns are 35 and 34 inches long respectively, measured along the beam and round curves, and the girth of the right horn, just above the burr, is 6·75 inches.

some of the officers who accompanied the Mission under Sir D. Forsyth sent by the Government of India to Yárkand and Káshgar in 1873; and by Colonel Prejvalski, who found this Deer common around the Lower Tarim and Lobnor in 1876, and noticed it (Pet. Mitth., Erg. Heft, No. 53, p. 9) as *Cervus maral*. In the 'Mammalia' of the Scientific Results of the Second Yarkand Mission, p. 92, this animal is mentioned, and a photograph of its horns obtained by Mr. R. Shaw noticed. From the photograph it was surmised that the horns resembled those of *C. affinis*.

Several fine heads have since been obtained by Mr. A. O. Hume from Yarkand; of these three are now in the British Museum. All are very similar: they have 5 tines on each horn, as is generally the case in *C. cashmirianus* and *C. affinis*, but differ greatly from the last named in the curve of the beam, and somewhat from *C. cashmirianus*, to which, however, they appear very closely allied. At the same time the horns of the Tarim Stag appear always distinguishable as spreading less and by the terminal tine never being curved inwards to anything like the extent that it is in *C. cashmirianus*. There is very little resemblance to *C. maral*, in which the crown appears to consist of more than two tines.

C. maral, *C. cashmirianus*, and some other Deer may be ultimately classed as subspecies of *C. elaphus*. The Yarkand Stag is apparently another subspecies, distinguished by its unusually straight horns. As a distinctive name is useful for these races, each of which appears to occupy a small isolated area, the name *C. yarkandensis* may be applied to the Yarkand and Tarim Deer as a subspecific name, it being understood that the form is not regarded as specifically distinct from *C. cashmirianus*.

The skin of the body is unusually pale in colour, with a well marked caudal disk.

Mr. Sclater exhibited and made remarks on some "Spinning or Japanese Mice," as a particoloured breed of *Mus musculus* or one of its allies, now commonly kept in captivity, is usually called. The curious habit of spinning round and round after their tails like a kitten was highly developed in this breed and continually exercised. It was very difficult to imagine a reason how this habit originated, and why it was so readily inherited.

Mr. Sclater exhibited a series of mounted heads of Antelopes belonging to Capt. H. G. C. Swayne, R.E., and made the following remarks:—

My communication upon Capt. Swayne's Antelopes to the last meeting having been rather hurried owing to stress of time, I thought it might interest the Society to examine Capt. Swayne's private collection of heads, which have been beautifully mounted for him by Messrs. Rowland Ward & Co. of Piccadilly, and kindly sent here for exhibition.

They belong, as will be seen, to the eight following species:—

- | | |
|----------------------------------|------------------------------------|
| (1) <i>Bubalis swaynei</i> . | (5) <i>Lithocranius walleri</i> . |
| (2) <i>Neotragus saltianus</i> . | (6) <i>Oryx beisa</i> . |
| (3) <i>Gazella sømmerringi</i> . | (7) <i>Strepsiceros kudu</i> . |
| (4) <i>Gazella spekii</i> . | (8) <i>Strepsiceros imberbis</i> . |

Amongst these, I am specially pleased to be able to draw attention to a beautifully prepared head of Swayne's Hartebeest (*Bubalis swaynei*), the new Antelope of which I pointed out the characters at the last meeting. It will be observed that this mounted head fully confirms the points of difference between Swayne's Antelope and the allied species (*B. tora*) on the North, and Coke's Hartebeest (*B. cokii*) on the South. From both these species, without reference to the form of the horns, of which I spoke on the former occasion, the new species is at once distinguished by the dark chestnut colour of the whole head and neck, which is relieved by the black face below the eyes and the light isabelline of the nose and lips. The ears also are of an isabelline tint, with the hairs edging the interior rim nearly white.

This, I may remark, is the fourth new species of Antelope that we have lately received from Somaliland, and it is even possible that the Water-buck (*Cobus*) met with, but not obtained, by Mr. James's party in the interior, as well as the small Antelope called "Beira" spoken of by Capt. Swayne, may turn out to be novelties also.

Mr. Selater gave the following list of the known Antelopes of Northern Somali-land and their native names:—

List of the Somaliland Antelopes.

1. Swayne's Hartebeest.	<i>Bubalis swaynei</i> .	"Sig."
2. Salt's Antelope.	<i>Neotragus saltianus</i> .	"Sagaro."
3. Klipspringer.	<i>Oreotragus saltator</i> .	"Alikhud."
4. Water-buck.	<i>Cobus</i> sp. inc.	
5. Sømmerring's Gazelle.	<i>Gazella sømmerringi</i> .	"Aiwal."
6. Pelzeln's Gazelle.	— <i>pelzelni</i> .	"Dehro."
7. Speke's Gazelle.	— <i>spekii</i> .	do ?
8. Clarke's Gazelle.	<i>Ammodorcas clarkii</i> .	"Debo Tag."
9. Waller's Gazelle.	<i>Lithocranius walleri</i> .	"Gerenook."
10. Beisa Antelope.	<i>Oryx beisa</i> .	"Bact."
11. Greater Koodoo.	<i>Strepsiceros kudu</i> .	"Gorjali Gôdir."
12. Lesser Koodoo.	— <i>imberbis</i> .	"Arreh Gôdir."

Mr. A. Smith Woodward exhibited and made remarks on specimens of the supposed jaws and teeth of *Bothriolepis* from the Upper Devonian Formation of Canada.

Mr. F. E. Beddard read a paper entitled "Contributions to the Anatomy of the Anthropoid Apes."

This contained a description of the external characters, brain, and muscles of the Bald-headed Chimpanzee "Sally," and the reputed Lesser Orang "George," lately living in the Society's gardens.

The Bald-headed Chimpanzee, *Troglodytes calvus*, was established as a second species of Chimpanzee by M. Du Chaillu. The Natural

History Museum possessed skins and skeletons of this Anthropoid which were obtained from M. Du Chaillu ; a comparison of these with the skin and skeleton of " Sally " showed that the Chimpanzee which lived for so many years (from 1883 to 1891) in the Society's Gardens was undoubtedly referable to Du Chaillu's *Troglodytes calvus*. The late Dr. Gray had refused to admit the validity of this species ; but the present paper afforded additional reasons for accepting *Troglodytes calvus* as a distinct form of Chimpanzee, not synonymous with the *T. tschege* of Duvernoy.

The animal was unfortunately so diseased that the viscera could not be satisfactorily studied ; the bones, too, exhibited pathological appearances, so that the supposed differences in the skulls of *T. calvus* and *T. niger* must probably be liberally discounted. The animal had acquired the permanent incisors and bicuspids of the upper jaw ; the first molar being the only one of the molar series which was in place. The canines were a long way from their definitive position, and protruded through the bone. In the lower jaw the only representatives of the milk-dentition which had not been replaced were the canines. The condition of the teeth, were their possessor a human being, would suggest the age to have been between ten and eleven years : this was in all probability the age of the Chimpanzee.

The muscular anatomy did not, as might be expected, show many differences from the common Chimpanzee, *T. niger*.

At present it was impossible to state how far even these slight differences might be individual. Although so many anatomists—Brühl, Bischoff, Humphrey, Macalister, Sutton, Chapman, Vrolik, Gratiolet, and Alix, &c.—had recorded their dissections of *T. niger*, the normal muscular structure of even that species was not yet beyond dispute. And as the present paper contained the only account yet published of the myology of *T. calvus*, the facts stated must be taken for what they were worth.

In the following table the principal differences between *Troglodytes calvus* and *Troglodytes niger* were shown (according to Sutton's account of the myology of the latter) :—

	<i>T. calvus.</i>	<i>T. niger.</i>
<i>Pect. minor</i>	Insertion : coracoid.	Insertion : capsule of shoulder-joint.
<i>Biceps cruris</i>	Ischial head present.	Ischial head absent.
<i>Soleus</i>	from head of fibula only.	from upper third of posterior surface of fibula only.
<i>Flex. prof. digit.</i>	attached by a vinculum to flex. long. digit.	No such vinculum (?) ¹ .
<i>Flex. long. digit.</i>	supplies digits II., IV., V. three.	supplies digits II., V. four.
<i>Lumbricales</i>	well developed, supplies index and pollex.	absent or feebly developed, supplies only pollex.
<i>Ext. min. digit.</i>	absent.	present.

This vinculum, however, is stated by Macalister to occur. Sutton does not say it is absent ; he does not refer to it.

In the brain the chief differences from *T. niger* were: the greater depth in proportion to the length; the Sylvian fissure was much more upright than in the common Chimpanzee, and therefore approached the Gorilla and the other Anthropoids; the common Chimpanzee came nearest to man in the direction of this fissure. The middle lobe of the cerebellum was overlapped posteriorly, and nearly concealed, by the two lateral lobes.

The Orang "George" was believed on its arrival to be an adult example of the Lesser Orang, *Simia morio*, originally described by Sir R. Owen. It proved to be a much younger specimen than had been supposed. All the milk-teeth were present; and, although they were unusually worn, none had been replaced by the permanent teeth. The shape of the head was, however, rather different from that of the typical *Simia satyrus*, being distinctly longer and not so markedly brachycephalic.

The external characters, particularly the hands and feet, were described and illustrated, and a full account was given of the muscular anatomy of the limbs.

This paper will be published entire in the Society's 'Transactions.'

The following papers were read:—

1. On a Collection of Lepidoptera from Sandakan, N.E. Borneo. By ARTHUR G. BUTLER, F.L.S., F.Z.S., &c.

[Received January 8, 1892.]

(Plate VI.)

The Lepidoptera here enumerated were obtained by Mr. W. B. Pryer and presented by him to the National Collection; many of them have suffered considerably from damp, but, fortunately, the examples of the finest of the new species are in excellent condition.

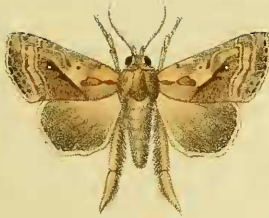
RHOPALOCERA.

This part of the collection is of little value, and the specimens are much damaged; it, however, contains examples of an interesting *Elymnias*. The following is a list of the species:—*Calliploea mazares*, Moore, *Salpinx kadu*, Eschscholtz, *Elymnias* (probably the male of *E. penanga*, Westw., black above, with the interno-basal half and a belt across the apical area of the primaries slaty lilacine), *Eurytela castelnaui* ♀, Felder, *Neptis thamala*, Moore, *Rahinda sandaka*, n. sp.¹, *Athyma nefte*, Cram., *Euthalia dunya*, Hew., *Lebadea padaka*, Moore, *Amathusia phidippus*, Linn., *Hypolimnas*

¹ Exactly like *R. peraka*, excepting that the submarginal band of the primaries is single instead of treble—a distinction which is believed to be constant.



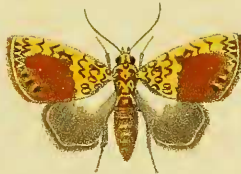
1



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8



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10



4

wallaceana ♂, Butl., *Narathura pryeri*, n. sp.¹, *N. achelous* ♀ var., Hew., *Papilio prexaspes*, Feld., *P. evemon*, Bdv., *P. telephus*, Feld., *P. bathycles*, Zinck., *P. arycles*, Boisd., *P. agamemnon*, Linn., *Astictopterus sindu*, Feld.

HETEROCERA.

Amongst these are several beautiful new insects, as well as others which are by no means abundant in collections. No *Sphingidæ* are represented, but there is a lovely new *Zygenoid Arctiid*.

CHALCOSIIDÆ.

MILLERIA FICTA.

Cyclosia ficta, Walker, Journ. Linn. Soc. vi. p. 97 (1862).

Milleria pontioides, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. vii. p. 35 (1881).

Walker's description of this species is so bad that without examining the type it would be quite impossible to guess at its identity with *M. pontioides*.

CALLAMESIA STRIATA.

Amesia striata, Druce, Ann. & Mag. Nat. Hist. ser. 6, vol. vii. p. 142 (1891).

This species appears to be allied to *C. submaculans* of Walker (Journ. Linn. Soc. iii. p. 185, 1860). I have to thank Mr. Druce for identifying it for me as his species.

CHALCOSIA INDISTINCTA.

Chalcosia indistincta, Swinhoe, *in litt.*

One imperfect female.

ARCTIIDÆ.

MYDROTHAUMA, n. gen.

Nearest to *Eupyra*, the primaries a little narrower, the subcostal branches emitted regularly from the cell instead of branching off from the main nervure; the second and third median branches wider apart at their origins; the secondaries with strongly arched costal margins; three instead of two median branches; palpi extremely short and porrected, instead of very long and almost erect; tibial spurs also very short; abdomen much broader, flattened and tufted at the sides. From *Mydrodowa*, to which it is also allied, it differs in its considerably narrower primaries with sinuous instead of arched inner margin; in the important point of

¹ Differs from *N. amphimuta*, to which it is allied and which it nearly resembles on the under surface, in its much inferior size and in the deep glistening ultramarine (rather than violet) blue colouring of the upper surface; the female, which is in the B.M. from Sarawak, has a much more restricted blue area, especially on the secondaries: expanse of wings, ♂ 43 millim., ♀ 40 millim.

the absence of an accessory cell, in the non-furcate subcostal branches, in the very important point of the absence of a costal vein to the secondaries, the simple instead of forked subcostal vein, the presence of a radial vein, which in *Mydrodoxa* is absent, and the more slender legs with better defined tibial spurs. Altogether, in spite of a similarity in the palpi of *Mydrodoxa* and *Mydrothauma*, the latter is decidedly more nearly allied to *Eupyra*. Type *M. ada*.

MYDROTHAUMA ADA, n. sp. (Plate VI. fig. 1.)

♂. Nearest to *M. semperi* (*Mydrodoxa semperi*, Druce, P. Z. S. 1885, p. 519, pl. xxxii. fig. 1), which is a true *Mydrothauma*, but far more beautiful; primaries above velvety greenish black, with three metallic violet spots forming an arched stripe across the base; a narrow band of gold with diffused greenish edges across the basal third, its inferior extremity not quite reaching the inner margin; the disk almost wholly occupied by two large unequal golden spots or patches with diffused greenish edges: secondaries intense sericeous black; the costal area greyish; a minute steel-blue spot at the end of the cell; a trifid subcuneiform hyaline patch divided by the second and third median branches: head and collar vivid carmine; thorax velvety black, the meso- and metathorax clothed at the sides with deep smoky brown hair: abdomen blackish brown, almost black, with velvety black lateral tufts; each segment marked with lateral metallic violet-blue dashes: wings below very like the under surface of *M. semperi*, excepting that they are blacker, the discocellular veinlets are defined by metallic blue instead of green spots, and the gold and green on the external area is much more extended; body below black, the legs and sides of venter spotted with metallic blue spots. Expanse of wings 48 millim.

A single example only of this charming novelty was captured by Mrs. Pryer, to whom (at her husband's request) I have dedicated it.

PHISSAMA VACILLANS.

Amphissa vacillans, Walker, Lep. Het. iii. p. 685. n. 1 (1855).

LITHOSIDÆ.

CABARDA BIZONOIDES.

Lyclene bizonoides, Walker, Journ. Linn. Soc. vi. p. 111 (1862).

C. molliculana = *C. sequens* is perhaps only a variety of this species.

KATHA, sp. inc.

The single example is not perfect and therefore I think it better not to describe it; it is like a small example of *K. intermixta*, Walk., from Southern India, but the face is greyer.

NYCTEMERIDÆ.

LEPTOSOMA INTEGRUM.

Nyctemera integra, Walker, Lep. Het. Suppl. v. p. 1879 (1866).
Originally described from a Philippine example.

LEPTOSOMA REGULARE.

Leptosoma regularis, Snellen, Veth's Midden-Sumatra, Lep. p. 34 (1880).

The specimen in the present collection differs from the typical form in the abbreviation of the outer marginal border of the secondaries on the upper surface.

LIPARIDÆ.

ADLULLIA GUTTULATA.

Euproctis guttulata, Snellen, Tijd. voor Ent. xxix. p. 36. n. 3, pl. 1. fig. 3 (1886).

One female.

Described from a Sumatran example.

ADLULLIA, n. sp., Swinhoe, *in litt.*

A slightly damaged female.

The generic term *Adullia* of Walker takes precedence of *Chærotricha*, Felder, as in general use. Mr. Kirby, however, holds that the type of *Chærotricha* is synonymous with *Gogane*.

LIMACODIDÆ.

SCOPELODES VENOSA.

Scopelodes venosa, Walker, Lep. Het. v. p. 1105. n. 3 (1855).

A male example.

The female only was previously known to us from Silhet and "E. India"; the male now sent is very like that sex of *S. aurogrisea*, but the abdomen is more decidedly banded with black; the abdominal half only of the secondaries is ochreous and the primaries below are more distinctly veined with whitish.

The following appears to me to be a new genus of *Nycteolidæ*; the male, from Borneo, has been for some years in the Museum collection.

NYCTEOLIDÆ.

SIGLOPHORA, n. gen.

Allied to *Chandica*, primaries with nearly straight costa, slightly arched external margin and more strongly arched inner margin; a deep longitudinal groove behind the costal vein on the under surface; subcostal with four ordinary branches, the two last emitted from a long footstalk; the fifth branch emitted from the end of the cell close to the upper radial, the lower radial emitted near the third median and therefore looking like a fourth median branch: secondaries rather short, deeply excised in the male on the radial interspaces, merely angulated in the female; costal vein united to the subcostal

close to the base, separating from it at about the middle of the discoidal cell and running thence to apex; subcostal emitting two branches from the anterior angle of the cell; discocellular weak, in-arched; radial emitted at the inferior angle of the cell; second and third median branches emitted from a long footstalk near to the radial: body robust, similar to that of *Chandica*; palpi long, thick, and compressed; antennæ, long, thick, simple; legs rather thick, the middle tibiæ armed with two unequal spurs, the inner ones very long; posterior tibiæ with four spurs. Type *S. bella*.

SIGLOPHORA BELLA, n. sp. (Plate VI. fig. 2.)

Basal three-sevenths of primaries bright lemon-yellow, ornamented by little irregular undulated lines and rings of blackish brown and bounded externally by a dark imperfect line; a costal patch beyond this area of the same colour and crossed by dark brown irregular lines; remainder of wing vinous brown in the male, rust-red in the female, varied by a few inconspicuous darker spots; a deeply dentated submarginal line of yellow—indistinct in the male, but sharply defined and partly bounded internally by black spots in the female; fringe vinous, sericeous, spotted with grey: secondaries with the basal half (♂) to third (♀) sericeous semitransparent white, tinted externally with yellow and bounded by a badly defined reddish band; remainder of wing vinous grey; fringe with a pale basal line: thorax bright yellow, varied with rust-red markings: abdomen bright rust-red, with a yellow spot in the centre of the basal segment, in the male specimen before me the sides and margins of the segments are pearly whitish (possibly owing to abrasion) and the anal tuft is blackish; on the under surface the defined markings have all disappeared; the yellow portions of the wings are softened down and the remaining area is grey, a reddish band separating the yellow from the grey areas: body below pearly white; palpi and fore tibiæ yellowish, banded with vinous grey. Expanse of wings, ♂ 24, ♀ 23 millim.

♂, Borneo, 1879 (coll. B.M.). ♀, Sandakan.

NOTODONTIDÆ.

CELEIA, sp. inc.

A much broken example of a fine and apparently new species of this genus.

CAREIDÆ.

CAREA, n. sp.

Fragments of an unnamed species, shortly to be described by Col. Swinhoe, were in the collection.

DREPANULIDÆ.

DRAPETODES NUMMULARIA.

Drapetodes nummularia, Snellen, Tijds. voor Ent. xxxii. n. 11, pl. 1. figs. 4, 4 a (1889).

A single female example.

AGNIDRA CARNEA, n. sp. (Plate VI. fig. 3.)

♂. Sericeous pale brownish flesh-colour, sparsely irrorated with blackish atoms, which are most abundant on the outer half of the secondaries: primaries crossed by two very indistinct oblique darker lines—the first before the middle, irregular, almost }-shaped, the second regular, discal, more oblique, elbowed below apex; a submarginal series of rosy spots on the veins: secondaries with two whitish stigmata on the discocellulars; under surface rosy flesh-coloured, veins ochraceous; wings sprinkled with black atoms; primaries crossed by an oblique grey discal stripe, which is vaguely continued by the black atoms across the secondaries; fore tibiæ scarlet. Expanse of wings 35 millim.

Although the apices of the primaries are broken the specimen of this very distinct species in the collection is sufficiently perfect for description.

BOMBYCIDÆ.

ERNOLATIA SIGNATA.

Ernolatia signata, Walker, Journ. Linn. Soc. vi. p. 131.

One female.

A discoloured male in the Museum from Java is named "*Ocinara lida*," Moore.

CARADRINIDÆ.

PRODENIA LITTORALIS.

Hadena littoralis, Boisduval, Faune Ent. de Madag. p. 91. n. 2, pl. 13. fig. 8.

CALLOPISTRIDÆ.

I have waded laboriously through Walker's long paper on the Lepidoptera of Sarawak in the 'Journal of the Linnean Society' without being able to identify the three following species with certainty; the first, however, is probably his *Eutelia? consentanea*, and therefore I so name it, although it is not a *Eutelia* but belongs to a new genus allied to *Hyperdasys*.

PACHYDASYS, n. gen.

Primaries with straight costa, rectangular apex, and obtusely angulated outer margin; palpi broad, obliquely ascending, compressed, terminal joint short; antennæ of male subserrate, fasciculated: all the femora and tibiæ and the tarsi of the hind legs very broadly fringed and clothed with coarse hair-scales.

PACHYDASYS CONSENTANEA. (Plate VI. fig. 5.)

♀. *Eutelia? consentanea*, Walker, Journ. Linn. Soc. vii. p. 68. n. 313 (1864).

One male example.

PLATYDASYS, n. gen.

Allied to the preceding genus and to *Cotanda*; the wings of the same form as in *Dissolophus*; the antennæ most like those of *Cotanda* but thicker, the femora and tibiæ of all the legs and the tarsi of the middle and hind pairs very densely clothed with coarse hair-scales. Type *P. pryeri*.

PLATYDASYS PRYERI, n. sp. (Plate VI. fig. 6.)

Sepia-brown with faint roseate reflections; the primaries with black and white lines and spots almost exactly as in the European *Methorasa latreillei*; but the reniform spot is larger and more indented in front, and the pink hastate spot immediately beyond the sinuous black-edged white discal line and situated upon the upper radial vein is much less prominent, so that it is scarcely distinguishable from the remaining portion of the pale stripe bounding the external edge of the discal line. Expanse of wings 34 millim.

♂, Sarawak; ♀, Labuan. In coll. B.M.

A fragment of the female was obtained by Mr. Pryer in Sandakan. This species should be among the insects described by Walker; but, if so, the description is not good enough to render its identification possible.

PÆCIOGRAMMA, n. gen.

Nearest to *Gnamptocera*, but in the pied character of its markings very dissimilar, superficially, from any of the allied genera; antennæ normal in character, with short sparse ciliations; palpi broad, compressed, curved obliquely upwards, with short terminal joint; collar and tegulæ ample; metathorax with prominent central crest; basal segment of abdomen probably tufted; legs long, the front tibiæ broad, the external edge being densely fringed with coarse scales; femora of middle pair of legs flattened and grooved, the tibiæ densely clothed with hair and with two long terminal spurs; posterior legs almost naked, the tibiæ with the usual spurs. Type *P. picata*.

PÆCIOGRAMMA PICATUM, n. sp. (Plate VI. fig. 4.)

Primaries above sepia-brown, spotted and streaked with black, the internal area whity-brown; base white, marked with two black spots, an oblique bisinuated white stripe from the base of the costa to an oblique white band across the basal two-fifths of the wing, the latter band is traversed by a black line and is angulated at its costal extremity; an oblique white streak from the apex, interrupted by the reniform spot, which is white, oval, and encloses two unequal black spots, and the postmedian stripe, which is white, internally edged with black, zigzag and very irregular, a slightly sinuous white submarginal stripe, connected on the second median interspace by a white spot, with a marginal series of internally white-edged black dashes; fringe whitish, spotted with grey; secondaries grey, with diffused darker external border: head and collar blackish, partly

white-edged; mesothorax buff, speckled with black; tegulæ and metathorax white, spotted and speckled with black; abdomen whitish with grey dorsal spots: primaries below smoky grey, with dull white inner margin; costa partly whitish; an indistinct transverse dark postmedian stripe and a subapical pure white spot: secondaries whitish irrorated with grey scales; a black crescent at end of cell followed by an arched discal grey stripe and a diffused grey external belt which tapers towards anal angle; body below whitish, palpi brownish, fore and middle tibiæ white barred with blackish. Expanse of wings 33 millim.

A single male example, with slightly damaged abdomen, but otherwise in good condition.

HOMOPTERIDÆ.

HOMOPTERA CRUEGERI.

Homoptera cruegeri, Butler, Trans. Ent. Soc. 1886, p. 411. n. 51.

Evidently a very wide-ranging species.

CATEPHIIDÆ.

MELIPOTIS CYLLARIA.

Phalæna (Noctua) cyllaria, Cramer, Pap. Exot. iii. pl. 251. figs. C, D (1779).

This species, which varies greatly in the coloration of the primaries (like the other species of *Melipotis*), is identical with *M. cyllota* and *M. signivitta*. *Achæa purpureilinea*, Walk., is probably the same species.

OPHIDERIDÆ.

OPHIDERES FULLONICA.

Phalæna-Noctua fullonica, Linn. Syst. Nat. p. 812. n. 16.

OPHIDERES AURANTIA.

Ophideres aurantia, Moore, Proc. Zool. Soc. 1877, p. 607.

PHYLLODIDÆ.

POTAMOPHORA MANLIA.

Phalæna-Noctua manlia, Cramer, Pap. Exot. i. p. 144, pl. 92. fig. A (1779).

The variability of this species is well known; one of Mr. Pryer's specimens is very pretty, the reniform spot and a stripe connecting it with the inner margin being bright ochreous: we have one similar example from Darjiling.

LYGNIODES MAURUS, Staud.

An imperfect example of a fine species allied to *L. endoleuca*, but with the fringes and the abdominal area of the secondaries bright ochreous. Mr. Druce has received examples of this species from Dr. Staudinger with a name above given, but I am not certain that it has been published.

DYSGONIIDÆ.

LAGOPTERA HONESTA.

Thyas honesta, Hübner, Samml. exot. Schmett. ii., Lep. iv., Noct. iii. figs. 1, 2.

LAGOPTERA MAGICA.

Corycia magica, Hübner, Samml. exot. Schmett. Zutr. figs. 535, 536.

OPHIODES DISJUNGENS.

Othiodes (sic) *disjungens*, Walker, Lep. Het. xiv. p. 1360 (1857).

PINDARA ILLIBATA.

Noctua illibata, Fabricius, Syst. Ent. p. 592. n. 8 (1775).

OPHISMA INVERSA.

Ophisma inversa, Walker, Lep. Het. xiv. p. 1384. n. 34 (1857).

ACHÆA FASCICULIPES.

Achæa fasciculipes, Walker, Lep. Het. xiv. p. 1400. n. 20 (1857).

SERRODES CAMPANA.

Serrodes campana, Guenée, Noct. iii. p. 252. n. 1673 (1852).
An unusually lilacine example.

DYSGONIA FULVOTÆNIA.

Ophiusa fulvotænia, Guenée, Noct. iii. p. 272. n. 1710 (1852).

AMPHIGONIIDÆ.

AMPHIGONIA COMPRIMENS.

Amphigonia comprimens, Walker, Lep. Het. xv. p. 1540. n. 5 (1858).

THERMESIIDÆ.

PLATYJA UMMINEA.

♀. *Phalæna-Noctua umminea*, Cramer, Pap. Exot. iii. pl. 267. fig. F (1782).

Ginæa removens, Walker, Lep. Het. xv. p. 1638. n. 1 (1858).

♂. *Sympis subunita*, Guenée, Noct. iii. p. 344. n. 1810 (1852).

Cotusa drepanoides, Walker, l. c. p. 1552. n. 1 (1858).

Both varieties of this species were obtained by Mr. Pryer.

CAPNODES MACULICOSTA.

Capnodes ? *maculicosta*, Walker, Lep. Het. xv. p. 1608. n. 19 (1858).

HERMINIIDÆ.

AMBLYGOES OILEUSALIS.

Herminia oileusalis, Walker, Lep. Het. xvi. p. 116. n. 38.

Madopa ? quadristrigata, Snellen, Tijds. voor Ent. 1877, p. 73, pl. 5. fig. 7.

PYRALES.

STERICTA DIVITALIS.

Glossina divitalis, Guenée, Delt. et Pyral. p. 124. n. 20.

ARTHROSCHISTA HILARALIS.

Margaronia hilaralis, Walker, Lep. Het. xviii. p. 532. n. 33 (1859).

SYLEPTA IOPASALIS.

Botys iopasalis, Walker, Lep. Het. xviii. p. 652. n. 182 (1859).

MESANCHYLA ILLECTALIS.

Desmia ? illectalis, Walker, Lep. Het. xix. p. 931 (1859).

TALANGA SEXPUNCTALIS.

Oligostigma sexpunctalis, Moore, Proc. Zool. Soc. 1877, p. 616, pl. 60. fig. 12.

DICHOCROCIS PANDAMALIS.

Botys pandamalis, Walker, Lep. Het. xix. p. 999 (1859).

SICULODIDÆ.

DURDARA OVIFERA, n. sp. (Plate VI. fig. 7.)

Nearest to *D. fenestrina*, but differing from all the named forms of the genus in its grey coloration above and in having an oblique oval hyaline spot near the base of the first median interspace of the primaries; the outer half of the fringe of the secondaries is white; the primaries below are almost wholly glaucous grey, with white internal border, and in the secondaries the costa and veins are greyish; the palpi are even longer than in *D. plagifera*, and are whitish internally and along their inferior margins. Expanse of wings 28 millim.

Mr. Meyrick says (Trans. Ent. Soc. 1887, p. 185) that "*Microsca plagifera* is a variety of *Striglina myrtæa*, Drury (= *fenestrina*, Feld., and *fenestrata*, Gn.), with the spot (which varies very much and is sometimes absent) unusually large. With every wish not to admit too many species, I cannot conceive that Mr. Meyrick is correct in this assertion; for, however much a spot on the wing may vary in size and shape, it appears highly improbable that the palpi would follow suit, and assuredly there is little resemblance between the palpi of *D. fenestrina* and *D. plagifera* (which I described as a *Microsca*). Our example of *D. fenestrina* is a female, and so far as can be judged from the type of *D. plagifera*, in which the frenulum

on one side is concealed and on the other broken, the latter is of the same sex ; it has the last joint of the palpi much more slender and of nearly twice the length of that of *D. fenestrina*.

When it is proved beyond question, by careful breeding, that dissimilar forms are varieties of one and the same species, the sooner they are put together the better ; but this guesswork, especially when concealed under the guise of an authoritative declaration, is a positive hindrance to the acquirement of accurate knowledge. In many cases where Mr. Meyrick has stated his conviction that a long series of described forms belong to one variable species, he has been subsequently obliged to alter his opinion ; surely he cannot claim that his first action advanced science, since he must know of a truth that it only retarded it.

DURDARA ROBUSTA.

Durdara robusta, Warren, *in litt.*

The type of Mr. Warren's unpublished description is from Sarawak ; it is just possible that Walker may have described it as an *Anisodes* or a *Capnodes* in his Supplement, or in one of the papers published in the Linnean Journal ; but I cannot venture to attempt its identification.

PHARAMBARA VINOSA, n. sp. (Plate VI. fig. 8.)

Pale vinous-brown ; wings reticulated with darker brown : primaries crossed by six imperfect darker bands, the outer edges of which, and the inner edge of the third one, are defined by blackish lines ; the fourth and fifth lines are inarched towards the costa ; the sixth, which is submarginal, is abbreviated and cuts off the apical half of the external border ; on the secondaries there are about three black-edged, ill-defined, abbreviated bands from the costa, the central one is acutely elbowed and bounded on each side near the centre of the wing by a hyaline, subquadrate, white spot ; on the under surface all the markings are more sharply defined, and on the primaries is a subcostal, basal, shining, pearly tuft covering the base of the frenulum. Expanse of wings 26 millim.

A single male example.

The species does not appear to be very closely allied to any named form.

URAPTERYGIDÆ.

SYNGONORTHUS, n. gen.

Allied to *Gonorthus* : of the same form and with similar neuration ; but the male antennæ much shorter and with very short fine ciliations instead of being strongly pectinated.

SYNGONORTHUS SUBPUNCTATUS, n. sp. (Plate VI. fig. 9.)

Pale creamy stramineous, slightly sericeous ; the wings irrorated with greyish argillaceous ; the primaries crossed by two nearly parallel, straight, transverse stripes of the same colour ; outer margin and fringe forming a third stripe rather more ferruginous in tint ;

costal margin narrowly ochraceous, speckled with blackish : secondaries with only a discocellular spot to represent the inner stripe of the primaries, but with a well-defined subangulated outer stripe from outer fourth of costa to inner margin, close to anal angle ; marginal stripe blacker than on the primaries : head and collar rufous-brownish : wings below without irrorations, but crossed by a straight discal series of blackish spots on the veins ; primaries tinted with pink, with a transverse blackish dash on the discocellulars ; pectus whitish. Expanse of wings 38 millim.

This very distinct species is unfortunately only represented by one imperfect specimen ; it is, however, so unlike anything else that I have seen or of which I can find a description, that I have no hesitation in naming it.

BOARMIIDÆ.

ELPHOS HYMENARIA, var.

Elphos hymenaria, Guenée, Phal. i. p. 285. n. 446, pl. 16. fig. 4 (1857).

The single female obtained by Mr. Pryer has lost the white patch upon the secondaries.

TERPNIDIA NELEARIA.

Hypochroma nelearia, Guenée, Phal. i. p. 279. n. 444 (1857).

HYPOCHROMA NETUNARIA ?

Hypochroma netunaria, Guenée, Phal. i. p. 279. n. 445 (1857).

The two examples, both females, seem to agree fairly well with the description of this species.

HYPOCHROMA VITTICOSTA.

Hypochroma vitticosta, Walker, Lep. Het. xxi. p. 438. n. 25 (1860).

A male example in good condition.

I have to thank Col. Swinhoe for the identification of this species ; he tells me that the type from Sarawak is somewhat faded.

ASCOTIS SELENARIA.

Geometra selenaria, Schiffermüller, Wien. Verz. p. 101 ; Hübner, Geom. pl. 31. fig. 163.

A damaged female only was obtained.

ZERENIDÆ.

PANÆTHIA GEORGIATA.

Panæthia georgiata, Guenée, Phal. ii. p. 196. n. 1243.

NAXA TEXTILIS.

Naxa textilis, Walker, Lep. Het. vii. p. 1743 (1856).

EUSCHEMIDÆ.

EUSCHEMA DOUBLEDAYI.

Hazis doubledayi, Snellen, Tijds. voor Ent. xxvii. pp. lxxxii and 96-98 (1884).

IDÆIDÆ.

CHRYSOCRASPEDA VINOSA.

Chrysocraspeda vinosa, Warren, *in litt.*

A beautiful little bright yellow species, maculated and banded with plum-colour; it is to be hoped that a description of it will soon be published.

A much-worn example, apparently of a true *Idæa*, new to the Museum collection, was also obtained by Mr. Pryer.

MESOSTROPHE OVISIGNATA.

Anisodes ovisignata, Moore, Lep. Ceylon, iii. p. 444 (1884-7).

The specimen from Sandakan agrees perfectly well with the Ceylonese type.

CABERIDÆ.

MAREZIA ? UNDEFASCIATA, n. sp. (Plate VI. fig. 10.)

Basal area of wings white, speckled with black and transversely striated with pearl-grey; remainder of wings pearl-grey, striated with white and crossed to near costa by white-edged, zigzag, dark brown stripes, three on the primaries and two on the secondaries, also by a submarginal stripe, slightly waved on the primaries, but distinctly zigzag on the secondaries, the third and sixth angles filled in so as to form blackish, more or less triangular spots; a slender, slightly zigzag, black marginal line; fringe, excepting along the abdominal margin of the secondaries, very short: head and collar blackish; thorax white, speckled with black; abdomen wanting: under surface pale pearl-grey; the disk of the wings crossed by two subparallel darker grey bands, enclosing a white belt; the outer band angulated on the primaries; legs silvery whitish. Expanse of wings 33 millim.

I have been unable to find any description or figure of this lovely little moth; judging by the descriptions alone, it would seem to be allied to *Acidalia destituta* and *Maresia binotata*, described by Walker from specimens coming from Sula and in Mr. Saunders's collection.

MACARIIDÆ.

PLUTODES CYCLARIA.

Plutodes cyclaria, Guenée, Phal. ii. p. 118. n. 1111, pl. 20. fig. 3.

TRYGODES DIVISARIA.

Macaria divisaria, Walker, Cat. Lep. Het. xxiv. p. 107 (1861).

MICRONIIDÆ.

ACROPTERIS LEPTALIATA.

Micronia leptaliata, Guenée, Phal. ii. p. 28. n. 935.

PSEUDOMICRONIA CÆLATA.

Pseudomicronia cœlata, Moore, Descr. Lep. Atk. p. 257 (1887).

EUMELEIDÆ.

EUMELEA LUDOVICATA.

Eumelea ludovicata, Guenée, Phal. i. p. 393. n. 629 (1857).

GEOMETRIDÆ.

ORNITHOSPILA SUBMONSTRANS.

Geometra submonstrans, Walker, Lep. Het. xxii. p. 526. n. 36 (1861).

ORNITHOSPILA CINCTA.

Geometra cincta, Walker, Lep. Het. xxii. p. 527. n. 38 (1861).

This species is of the same size and general colour as the preceding, but differs in the nearly straight instead of distinctly dentate-sinuate dark green lines across the wings and in the uniformly vinous-coloured fringes.

COMIBÆNA MEGASPILARIA.

Phorodesma megaspilaria, Guenée, Phal. i. p. 371. n. 593.

ZAMARADA, n. sp.

One much shattered example of an apparently new species; its condition unfits it for description.

HYBLÆIDÆ.

The position of this family is somewhat doubtful; the aspect of the species forcibly reminds one of the Tortrices, but the neuration does not altogether correspond with that of the *Tortricidæ*; at the same time the *Hyblæidæ* do not appear to be true Noctuites.

HYBLÆA CONSTELLATA.

Hyblæa constellata, Guenée, Noct. ii. p. 391. n. 1251.

EXPLANATION OF PLATE VI.

- Fig. 1. *Mydrothauma ada*, p. 122.
 2. *Siglophora bella*, ♀, p. 124.
 3. *Agnidra carnea*, p. 125.
 4. *Pœcilogramma picata*, p. 126.
 5. *Pachydasy consentanea*, p. 125.
 6. *Platydasy pryeri*, p. 126.
 7. *Durdara ovifera*, p. 129.
 8. *Pharambara vinosa*, p. 130.
 9. *Syngonorthus subpunctatus*, p. 130.
 10. *Maresia?* *undifasciata*, p. 132.

2. Third Account of the Fishes obtained by Surgeon-Major
A. S. G. Jayakar at Muscat, East Coast of Arabia¹.
By G. A. BOULENGER.

[Received January 19, 1892.]

Two further collections received from Mr. Jayakar in 1891 enable me to supplement the list of Muscat Fishes with the names of seventeen species, of which one (*Histiopaterus typus*) belongs to a genus previously unknown from the Indian Ocean.

TELEOSTEI.

ACANTHOPTERYGII.

PERCIDÆ.

1. *SERRANUS HOEVENII*, Blkr.
2. *HISTIOPTERUS TYPUS*, Schleg.

This fish is on record from Japan only; but a fine specimen from Duke-of-York Island is preserved in the British Museum. The genus *Histiopaterus* is an important addition to the fauna of the Indian Ocean, and it seems surprising that so striking a form should have hitherto escaped notice on the coasts of India and Ceylon, where it will no doubt be eventually found.

SPARIDÆ.

3. *BOX LINEATUS*, sp. n.

D. $\frac{13}{14}$. A. $\frac{3}{14}$. L. lat. 70. L. tr. $\frac{5}{13}$.

Length of head a little more than one fourth of the total (without caudal); diameter of the eye a little greater than the length of the snout, two sevenths the length of the head. Pectoral three fourths the length of the head. Depth of the body thrice and one third in the total length (without caudal). Caudal deeply forked. Upper half of body greyish olive, lower half yellow; four rather indistinct dark lines along each side of the body, the uppermost running along the lateral line; a black spot in the upper axillar portion of the pectoral.

Total length 250 millim.

A single specimen.

This species is very nearly related to the Atlantic and Mediterranean *Box vulgaris*, from which it differs in the deeper body, the somewhat larger scales, and the slightly different number of rays. The fin-formula and the axillar spot differentiate it from Cuvier and Valenciennes's *B. salpoides*, stated to be from the Indian Ocean.

4. *PIMELEPTERUS FUSCUS*, C. & V.

¹ Cf. P. Z. S. 1889, pp. 236-246.

SCIÆNIDÆ.

5. SCIÆNA SINA, C. & V.

SCOMBRIDÆ.

6. THYNNUS ALBACORA, Lowe.

Thynnus macropterus, Schleg.

Several large Tunnies sent by Mr. Jayakar belong to this species, being undistinguishable from Atlantic specimens. In my first report I recorded the true Tunny, *T. thynnus*, from Muscat. And if I am right in not separating the Pacific *T. macropterus* from the Albacore, it must be admitted that both the true Tunny and the Albacore roam over the Atlantic, Indian, and Pacific Oceans.

In the Indian Ocean *T. thynnus* must be by far the rarer of the two species, since it was not on record until discovered at Muscat by Mr. Jayakar.

CARANGIDÆ.

7. CARANX ROTTLEI, Bl.

8. CARANX LIOGLOSSUS, Gthr.

A specimen 29 inches long. It differs from the much smaller specimens described by Bleeker as *Lioglossus carangoides* in the total absence of teeth, the still greater projection of the lower jaw, and the very small extent of the scaleless portion of the breast. The differences are, however, ascribable to age; and I have not the slightest hesitation in referring this large example to the species described by Bleeker, of which a type specimen is now in the British Museum.

9. LACTARIUS DELICATULUS, C. & V.

PHYSOSTOMI.

CYPRINIDÆ.

10. DISCOGNATHUS LAMTA, Ham. Buch.

This well-known Indian freshwater fish has been previously recorded from Aden, in Arabia. It is also found in Abyssinia.

MURÆNIDÆ.

11. MURÆNA AFRA, Bl.

CHONDROPTERYGII.

CARCHARIIDÆ.

12. CARCHARIAS ACUTUS, Rüpp.

13. CARCHARIAS ELLIOTI, Day.

This Shark is very closely allied to *C. murrayi*, Gthr.; but differs

in having the upper teeth narrower and more oblique, and the snout longer, the distance between the mouth and the end of the snout being equal to the width of the mouth. Fig. 2 on pl. 189 of Day's 'Fishes of India' refers to *C. acutidens*, whilst fig. 1 represents *C. ellioti*.

14. *CARCHARIAS LAMIA*, Risso.

RHINOBATIDÆ.

15. *RHYNCHOBATUS ANCYLOSTOMUS*, Bl. Schn.

TRYGONIDÆ.

16. *TRYGON SEPHEN*, Forsk.

17. *TÆNIURA MELANOSPILA*, Blkr.

3. Descriptions of Three new Species of Earthworms. By
W. BLAXLAND BENHAM, D.Sc. (Lond.), Aldrichian
Demonstrator in Anatomy in the University of
Oxford¹.

[Received February 1, 1892.]

(Plates VII. & VIII.)

In July of last year (1891) I received from Professor Jeffrey Bell three bottles containing Earthworms which had been presented to the National Collection. With the permission of Dr. Günther, I was allowed to make an examination of these specimens, and to treat them in any way necessary for their identification.

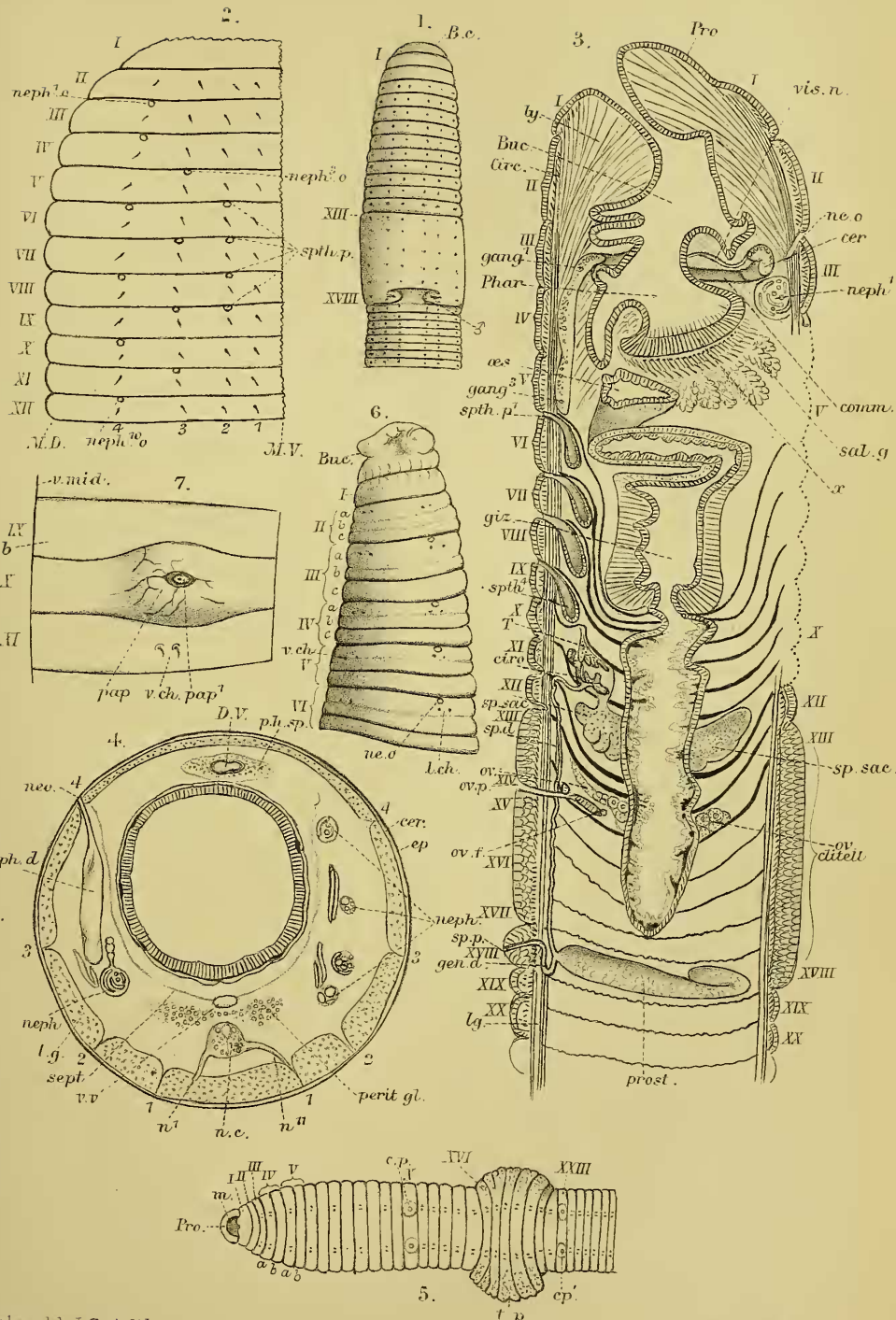
I wish to express my thanks to Dr. Günther for this privilege, and to record my appreciation of Prof. Bell's kindness in allowing me to examine many Earthworms which from time to time have come into his hands for identification.

The contents of the bottles were as follows:—

- A. Three small worms [*Plutellus perrieri*, n. sp.] collected at Masset, Queen Charlotte's Island, British Columbia. Presented by the Rev. T. H. Keen.
- B. A single specimen [*Microchæta papillata*, n. sp.] from Port Natal. Collected and presented by H. A. Spencer, Esq.
- C. A single specimen [*Microchæta belli*, n. sp.] from East London, Cape Colony. Collected and presented by H. A. Spencer, Esq.

A. In the bottle from Queen Charlotte's Island were three worms, two mature and one apparently immature; the latter I cut into a series of transverse sections after the examination of one of the mature forms, under the impression that it belonged to the same

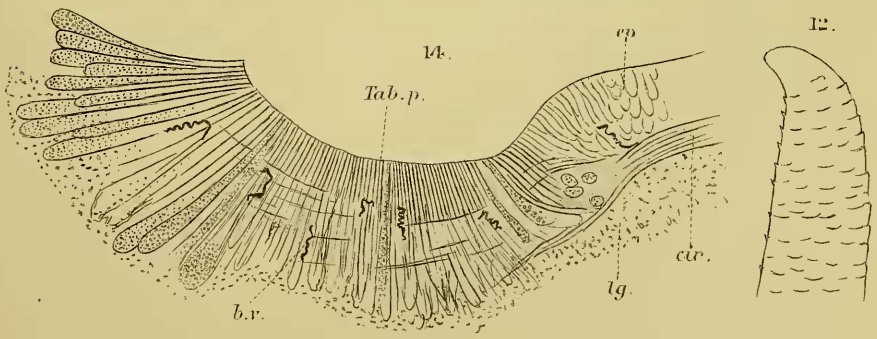
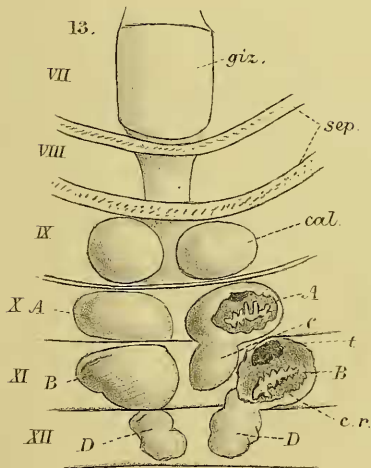
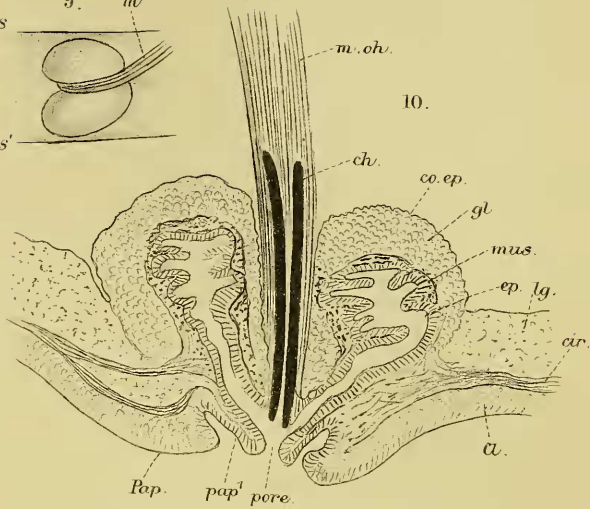
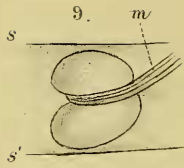
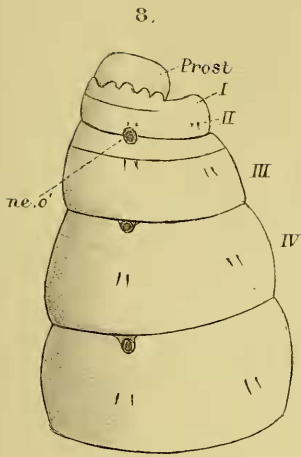
¹ Communicated by FRANK E. BEDDARD, M.A. Oxon., Prosector to the Society.



Berham del. J. Smit lith.

Mitern Bros. imp.

NEW SPECIES OF EARTHWORMS.



species as the other two, but I find that it is an Enchytræid, the anatomy of which, however, I have not yet worked over.

Of the two other specimens one remains entire, and was returned to the British Museum, the drawing of the external surface (Plate VII. fig. 1) being taken from it; the second was partially cut into sections—after being opened and examined—the anterior twenty somites being cut sagittally, the posterior portion transversely.

The chief characters of the worm may be summed up as follows:—

- (1) The eight *chætæ* are isolated, though they are not all equidistant.
- (2) The *clitellum* is complete, and occupies somites xiii. to xviii.
- (3) The *male pores* are on somite xviii.
- (4) The *nephridiopores* alternate in position, one series being in line with the *chætæ* "3," the other with the *chætæ* "4."

There are (5) one pair of *testes* in somite x.; (6) one pair of *sperm-sacs* in somite xi.; and (7) four pairs of *spermathecæ*, without diverticula, in somites vi., vii., viii., and ix.

- (8) The cylindrical *prostate* lies in somite xviii.
- (9) The *gizzard* occupies somite v.; there are no definite cesophageal diverticula.

The Earthworm which appears to agree most clearly with this diagnosis is *Plutellus heteroporus*¹ from Pennsylvania; but this worm, according to Perrier's description, presents two very striking anomalies, which do not occur in the present instance: (*a*) the nephridia are entirely confined to one somite, *i. e.* the funnel does not perforate the septum; (*b*) the "ovary" is placed anteriorly to the testes.

But these two peculiarities are anomalous, not amongst Earthworms only but amongst all the *Oligochaeta*; the post-septal position of the nephridiostome is indeed totally at variance with the arrangement met with throughout the whole group of *Chaetopoda*; hence, we must look with very great suspicion on these supposed characters, and indeed Perrier himself, in writing of the presumed "ovary" in the tenth somite, recognizes its abnormal position and expresses himself, not only with great caution, but also with a good deal of doubt—"Mais nous devons dire qu'à cet égard notre conviction est loin d'être aussi complète qu'en ce qui concerne les testicules."

Most zoologists working on this group have thrown doubts on the accuracy of these supposed facts, and this without impugning the carefulness of M. Perrier, for he had two specimens only, and these, having lain in spirit for 50 years and more, were in a very bad condition of preservation; moreover, his statements were drawn from observations on the dissected specimens, which are not so likely to be correct as those obtained from examination of serial sections.

We must then remove these two characteristics from the diagnosis of the genus *Plutellus*, and thereby we bring the worm into accord with what has become regarded as the normal condition of things.

I believe the worm which forms the subject of this communication

¹ Ed. Perrier, Arch. de Zool. Expér. ii. 1873.

belongs to Perrier's genus, and name it after that zoologist. I shall reserve certain histological points for later consideration.

PLUTELLUS PERRIERI, n. sp.

It has a length of 2 inches (50 mm.) and a comparatively great diameter—namely a little more than $\frac{1}{8}$ inch (4 mm.); the length of the clitellum is 4 mm., and the distance from its anterior margin to the tip of the prostomium is 7 mm.¹ There are 126 somites in the specimen which remains uninjured; they are all well marked and are only obscurely annulated. The two extremities of the worm are rounded, obtuse, and not noticeably attenuated, and at the posterior extremity the body is slightly dilated.

The *prostomium* is distinct and completely dovetailed into the buccal somite, as it is in *P. heteroporus*.

The *clitellum*, when the worm is fully developed, extends all round the somites xiii. to xviii., with the exception of the median ventral region of the last somite and a short portion of the first somite.

The intersegmental grooves are entirely obliterated and the anterior and posterior boundaries are very sharply defined. In the specimen dissected, where the clitellum was not so fully developed, the ventral surface of the somites was less glandular and the grooves less obliterated than in the entire specimen, and a pair of papillæ exist on somite xviii. between the chætæ "1" and "2." In the fully matured form, the glandular modification of this somite extends ventrally so as to become continuous with these papillæ, which are then no longer evident.

[In *P. heteroporus* the clitellum is also complete, occupying somites xiv. to xvii., but overlapping the anterior part of somite xviii.]

The *chætæ*, eight in number, are isolated; the ventralmost—constituting the series of chætæ "1"—on each side is close to the middle line; if the space between "1" and "2" be taken as the unit, represented by *S*, the space between the ventral chætæ of the two sides is *2S*, that between the second and third is $1\frac{1}{2}S$, that between "3" and "4" is *2S*, and the dorsal area, between the dorsalmost chætæ of the two sides, is *5S*; the chætæ "4" lie dorsally (Plate VII. figs. 2 and 4). Posteriorly the space "1-2" is slightly greater than it is anteriorly; and anteriorly to the clitellum, space 1-1 is less than it is posteriorly.

[In *P. heteroporus* the chætæ are equidistant, but posteriorly the dorsal and ventral spaces are a little greater than the lateral spaces, and spaces 1-2 and 3-4 are a little less than anteriorly.]

The chætæ themselves are of the usual lumbricid form, without ornamentations; there are no modified, copulatory chætæ of any sort.

The *nephridiopores* are not visible externally in my specimens, which are very well preserved, and the segments probably a good deal closer together than in life; but I find from my longitudinal sections that they have the following arrangement (Plate VII. figs. 2 & 4):—The first pore lies on the anterior margin of somite iii., and,

¹ These figures for *P. heteroporus* are 15 cm. as length of body, 6 mm. as length of clitellum, and 4 mm. as its distance from the extremity of the body.

like the pore of the next somite, is in line with the chætæ "4"; the pores in somites v., vii., ix., xi., xiii., xv., &c. are in line with chætæ "3"; those of the even-numbered somites are in line with chætæ "4"; but in the case of somites vi., viii., x., xii., I did not actually see the pores, as the dorsal body-wall in this region of the body had been injured in dissecting the worm, but there is no pore in either of these somites in line with either of the other chætæ.

[In *P. heteroporus*, the nephridiopores of somites iii., iv., v., vi. are in line with the third chætæ, those of vii., ix., xi., &c. with the fourth chætæ, and those of viii., x., xii., &c. with the second chætæ, with some divergence from regularity in certain somites.]

The *male pores* are on somite xviii., just between the first and second chætæ; but in the immature specimen, as I have mentioned, there is a pair of papillæ in this position, which carry the pores; the papillæ in the fully developed individual being continuous with the rest of the glandular modification of the clitellum.

With regard to *P. heteroporus*, Perrier states (p. 255) "il nous semble que les orifices mâles étaient accompagnés chacun d'une papille en avant et en arrière," but owing to the state of preservation of the worm he was uncertain on the point. The figure (Plate VII. fig. 1) which accompanies the present paper might suggest these papillæ, but the slight pit represented between somites xvii. and xviii. is not the male pore, which lies on the slight papilla on somite xviii.

I was unable to see the pores in somite x. which Perrier regarded as those of his "oviducts"; they, in fact, do not exist in the present worm. With regard to these pores, his figures are not in agreement with one another.

The spermathecal pores (which are in line with chætæ "2," at the anterior margin of somites vi. to ix.) and oviducal pores (on somite xiv.) are not visible in surface view.

There appear to be no dorsal pores; this is one of the few points in which my specimen differs from *P. heteroporus*.

Internal Anatomy.

The *septa* bounding posteriorly each of the somites v. to xi. are considerably pouched centrally, so that the organs in these somites are carried backwards in such a way that they appear to occupy a more posterior position than they actually have; the septa behind the somites viii. to xii. are slightly stronger than the others (Plate VII. fig. 3).

The *nephridia* conform to the usual type; the coiled tube presenting the three regions which I have described¹ in those of *Lumbricus* and which appear to be pretty generally present in "meganephric" Earthworms.

The muscular region or "bladder" is very large, and differs in size in the two series of nephridia. The funnel has the normal structure and position—*i. e.* it is præseptal.

The *genital organs* have the following arrangement, as determined

¹ "The Nephridium of *Lumbricus*," Quart. Journ. Micr. Sci. xxxii. p. 294.

by dissection, controlled by examination of a series of longitudinal sections.

A single pair of testes lies in somite x. enclosed with the ciliated rosettes in a special sac, continuous below the gut from side to side, and with the sperm-sacs in the following somite; of the latter there is but one pair in the specimen examined—which, it must be remembered, may not have been *quite* mature; they do not extend into either of the neighbouring somites, but are entirely contained in somite xi. (Plate VII. fig. 3, *sp. sac*).

[In *P. heteroporus*, Perrier places the “testicules,” *i. e.* sperm-sacs, in somite xii.]

The sperm-ducts were traceable to somite xviii., in which lies a pair of prostates (*Prost.*, fig. 3). Each prostate is cylindrical, and curved upwards, so that the free end, which is slightly recurved, lies above the gut, the ventral end is continued as a narrow muscular duct (*gen. d.*) along the body-wall to the external pore; this “genital” or penial duct receives the sperm-duct immediately after its origin from the glandular portion of the organ.

The prostates are entirely confined to their somite, and their histological structure agrees with that of *Perichæta* and other worms.

[In *P. heteroporus* the gland is several times bent, as in *Acanthodrilus*, and is wider ventrally, where the penial duct originates.]

A pair of ovaries lies in somite xiii. (Plate VII. fig. 3, *ov.*), and the oviducts have the usual position. The gonad is fairly large, and in section is seen to occupy the greater part of the cavity of the somite, extending upwards and outwards on each side.

I may again remark that I find no structures in somite x. which would answer to Perrier’s “ovaries”; indeed, he himself felt uncertain as to the correctness of his interpretation of these grape-like glands, and suggested that they might be an anterior pair of “testicules” (sperm-sacs). He remarks, however, that their structure differs from that of the sperm-sacs in somite xii. and states (on p. 259): “Ce sont des grosses granulations réfringentes, groupées de manière à constituer des sphères, au centre desquelles nous avons vu souvent *une apparence* de vésicule transparente et des taches germinatives,” but adds his doubt on the matter of interpretation which I have quoted above; there is, indeed, nothing in his description which leads me to believe that these structures are ovaries, and when he mentions that a large funnel, like that of the sperm-duct, lies below this organ—*i. e.* in the position in which I find the ciliated rosettes—I think we may conclude that these organs, whatever they may be, are *not* ovaries.

It is possible, indeed, that they are masses of young stages in the development of spermatozoa, which have become free in this somite, or a portion of the sperm-sac, which after rupture of the septa might come to lie here, or again cysts of *Monocystis*.

As to the organs which he described as “testicules” in somite xii., there is little doubt but that he was dealing with the sperm-sacs, for he found “spermatiques filaments” attached to central

spheres, and younger stages in the development of spermatozoa, though their position in this somite is rather difficult to explain, except on the idea that the septa, here delicate, may have become ruptured or displaced in dissection. But Perrier was a very careful dissector, and he had had great experience in the dissection of Earthworms, so that it is scarcely justifiable to suggest a mistake in the matter.

In *P. perrieri* there are four pairs of spermathecæ lying in somites vi. to ix. ; each is an ovoid sac, without any distinct neck or duct and without a diverticulum (Plate VII. fig. 3, *spth.*). Each sac opens at the anterior margin of its somite—practically intersegmentally—in a line with the second chætæ.

[In *P. heteroporus* there are five pairs, the additional pair being in somite v. ; each sac has a diverticulum.]

I may add that in the genus *Perichæta* we find species with and species without diverticula to the spermathecæ.

In the *alimentary tract* the position of the gizzard is to be noted ; it lies, as seen in sections, entirely in somite v., though its hinder extremity is carried back to the level of somite ix. (Plate VII. fig. 3, *giz.*).

The following region of the gut, as far back as somite xvi., has very vascular walls, which are considerably folded (Plate VII. fig. 3). But there are no definite “pouches” or diverticula, though the general structure recalls that of calciferous glands ; and I find in the hinder somites crystalline bodies, resembling those of carbonate of lime present in the glands of *Lumbricus*, but there is no effervescence on the application of acetic acid. This vascular region of the gut is not so extensive as it appears on paper, for the cavities of somites vi., vii., viii. are exceedingly short, the septa being almost in contact centrally.

The thin-walled intestine commences in somite xvii. or xviii. and is very wide, occupying a considerable extent of the body-cavity ; there is no typhlosole (Plate VII. fig. 4).

[In *P. heteroporus* the gizzard is in somite vii. ; there are three pairs of reniform diverticula, with short ducts, in somites x., xi., xii.]

B. MICROCHÆTA PAPILLATA, n. sp.

We are acquainted with only two species¹ of this genus, which was instituted by Beddard² for a worm originally described by Rapp under the name of “*Lumbricus microchæta*,” collected in Cape Colony. Mr. Beddard named the species *M. rappi*, and it received a description at my hands³ almost simultaneously with that published by him. I described the second species, from Natal, under the name of *M. beddardi*⁴. In a recent paper⁵ I have pointed

¹ After the MS. of this paper had left my hands, I received from Dr. D. Rosa a copy of his memoir, “Die exotischen Terricolen des k. k. Naturhistorischen Hofmuseums,” published in the ‘Annalen d. k.-k. Nat. Hofmuseums,’ Wien, 1891, Bd. vi. Heft. 3 & 4. Herein he describes a third species, *M. benhami*.

² Trans. Zool. Soc. xii. 1886, p. 63.

³ Q. J. M. Sc. vol. xxvi. p. 267.

⁴ *Ibid.* xxvii. p. 77.

⁵ “An Attempt to Classify Earthworms,” *ibid.* xxxi. p. 215.

out that the numbering of the somites, as it stands in my description, requires some alteration, and Beddard¹ has likewise made certain corrections in regard to the interpretation of certain organs, which have become necessary from the advance in our knowledge of the anatomy of the group². I here give a figure (Plate VIII. fig. 8) of the anterior end of *M. beddardi*, in illustration of my remarks on the alteration of numbering of this somite.

Microchæta papillata has a length of 10 inches and a breadth of half an inch; it is thus smaller than either of the two previously known species. As to its colour, I am unable to speak, for, as is so generally the case, it has evidently been considerably changed by the spirit.

The *prostomium* (Plate VII. fig. 5) is, as in *M. beddardi*, broad and marked by longitudinal grooves, which extend into the first somite (cf. Plate VII. fig. 6, representing *M. belli*); this somite is similarly grooved on the ventral surface. The following somites are bi- or tri-annulated, but the grooves between the annuli are in some cases almost as marked as those between the somites, so much so, indeed, that in fixing the position of the various external characters I at first reckoned the annuli as somites. The first three somites are not annulated; the fourth to the ninth inclusive are bi-annulated (*a, b*), the grooves between the annuli being very deep; posteriorly the somites are not so noticeably annulated. This same well-marked annulation of the somites exists, as I have pointed out and figured, in *M. rappi*.

The *chætæ*, however, serve to define the somites, and, as in the other two species, are in four couples per somite, the individuals of a couple being close together; the outer couple is quite lateral in position, being about midway between the dorsal and ventral median lines; whilst the inner couples are latero-ventral. The interspace between the outer and inner couples is about equal to the space between the two inner couples. The *chætæ* themselves are very small, and in the anterior somites, indeed, I had to make use of Zeiss's B, as a hand-lens, in order to see them; they commence in somite iii. It might be suggested that the first somite is biannulate, but in *M. belli* (Plate VII. fig. 6) the *chætæ* occur in the second somite, which is in other respects similar to the second ring of the present species. The four species exhibit an interesting series of stages in "cephalization." In *M. belli* the first and second somites are distinct, the *chætæ* being present on the latter. In *M. beddardi* these somites are not distinctly marked off from one another (Plate VIII. fig. 8), and the apparent first somite carries *chætæ* in its hinder part; in *M. papillata*, though the somites are distinct, the *chætæ* are absent on the second: in *M. rappi* the two somites are with difficulty distinguishable from one another; the first annulus

¹ "The Classification and Distribution of Earthworms," Proc. Roy. Phys. Soc. Edinb. x. pp. 242, 243.

² Rosa points out this necessary correction in the paper just referred to, on p. 384.

probably is somite i., and the next two annuli belong to somite ii. (see pl. xv. fig. 1 of my paper, *loc. cit.*).

The chætæ of both the new species differ from those of the previous species in the presence of an "ornamentation," similar to that of the chætæ in *Rhinodrilus*¹, and consisting of longitudinal rows of obliquely transverse ridges².

The *clitellum* is evidently not fully developed, but the intersegmental grooves on the dorsal surface of somites xix. to xxviii. are partially obliterated (this area includes the 26th to 35th annuli). Along each side of the body there is a very pronounced latero-ventral ridge extending across somites xvi. to xx., the body being here flattened, though probably the appearance, as represented in the figure (Plate VII. fig. 5, *t.p.*), is less marked during life. This ridge is glandular and appears to correspond with the structures known as the "tubercula pubertatis" in *Lumbricus*, *Allolobophora*, *Rhinodrilus*, &c.

By teasing up the body-wall, and by the examination of sections, I find the clitellar cells to occur over a much wider area than that represented by the above numbers, viz. as far forwards as somite x., so that we may, I think, conclude that the clitellum, when fully developed, covers the somites x. to xxx. This agrees closely with the extent of the same organ in *M. rappi* as described by Beddard; in the specimen examined by myself it occupied somites xiv. to xxvi.³ In *M. beddardi* the clitellum is less extensive, covering somites xi. to xxiii.; but in neither of these species did I find the limits well defined.

Although I did not observe, when I was engaged upon the previous species, anything like *tubercula pubertatis*, yet I figured for *M. rappi*⁴ the ventral edges of the clitellum as being well marked and thickened; a re-examination, too, of specimens of *M. beddardi* reveals, though in a very indistinct manner, owing to their very poor condition, a band along each side of the clitellum, which is no doubt of the same nature.

The *nephridiopores* are, as in the other two species, very distinct even along the clitellum; they are placed in front of the outer chætæ, *i. e.* along the sides of the body, the first nephridiopore occurring in somite iii. There are no dorsal pores, nor could I detect any of the generative apertures. But on either side of each of the somites x. and xxiii., that is on the somites which carry the 8th and 21st nephridiopores respectively, occupying the position of the inner chætæ, is a rounded papilla (Plate VII. fig. 5, *cp.*, *cp'*.), slightly pitted

¹ Perrier, "Lomb. terr.," *Nouv. Arch. d. Muséum*, 1872, pl. i. fig. 11; Horst, *Notes from Leyden Museum*, 1887, pl. i. fig. 7.

² Mr. Beddard has recently described, in the 'Annals & Mag. Nat. Hist.' Feb. 1892, ornamented chætæ in *Anteus*, *Geoscolex*, and *Pontoscolex*, Schmaroda (*Urochæta*, Perrier).

³ As I have remarked in my "Attempt to Classify Earthworms," we must increase the numbers given in my description of *M. rappi* by one, as the apparent first somite is in all probability somite i. and ii., the chætæ of somite ii. having disappeared.

⁴ *Loc. cit.* pl. xv. fig. 1.

at the tip; and projecting from this pit is a smaller whitish papilla provided at its apex with a minute pore (Plate VII. fig. 7).

I expected, at first sight, that the hinder pair of the papillæ would be in connection with the sperm-ducts, but no such relation exists. Each of the four papillæ is represented internally by a rounded or kidney-shaped swelling (Plate VIII. fig. 9), from the centre of which (or from the hilum as the case may be) there passes to the body-wall a bundle of fibres (*m*). These are muscle-fibres and surround a "chætophore" or sac containing the chætæ, which replace the ordinary ventral chætæ, from which they differ only in their greater length.

The papilla itself has the following structure (which is closely similar to that of the next species, of which a figure is appended (Plate VIII. figs. 10, 11): the pore at the apex of the inner papilla (*pap.*) leads into a sac lined by columnar cells (*ep.*) forming a definite epithelium; the lumen of the sac extends in an irregular way for some distance all round the aperture, and its epithelium is, at places, considerably folded. Outside the epithelium are numerous bundles of muscle-fibres (*mus.*), some radially arranged, some circularly, and some longitudinally (as seen in a transverse section of the body-wall passing through the papilla). These fibres can be traced into the muscular layers of the body-wall, from which they are evidently derived by its invagination. Outside the muscular coat—though not separated from it by any marked line such as the figure suggests—is a thick coat of clitellar cells arranged in groups (fig. 11, *gl.*). Blood-vessels ramify between the groups and amongst the muscle-bundles. Surrounding the whole is a layer of flattened cœlomic epithelial cells (*co.ep.*), which dips down between the groups of clitellar cells. The muscle-fibres are found only near the aperture in that part of the organ which forms the external papilla; in the remainder of the gland the clitellar cells abut immediately upon the epithelial cells.

There is a remarkable resemblance in structure between this organ—which is evidently copulatory in function and capable of slight eversion—and the prostates (or atria) of *Perichæta*, *Acanthodrilus*, *Trigaster*, &c.; the epithelium, however, is more definitely marked off from the gland-cells than in these, and recalls, rather, the prostates of *Pontodrilus*; or if we compare the structure of the organ near its pore with the atrium of *Moniligaster* we shall see a still greater resemblance, except that in the latter genus there is, according to Beddard's description¹, no membranous cœlomic epithelium, for the "clitellar cells" represent this layer.

Amongst the families *Rhinodrilidæ*, *Geoscolecidæ*, and *Lumbri-cidæ*, a "prostate" is not usually recognized as being present, but in several genera there is a more or less conspicuous swelling of the body-wall, which is perforated by the sperm-duct in its passage to the exterior. In *Geoscolex*, *Brachydriilus*, *Criodrilus*, and *Callidrilus* such structures exist; of the histology of these, however,

¹ Q. J. M. Sc. xxix. pp. 119 &c. pl. xii. fig. 11.

records are scanty. In *Criodrilus* I mention¹, briefly, the "hemispherical gland, which may be called a prostate," and which "consists of cells similar to those forming the epidermis of the clitellum and quite continuous with them; the gland appears to be formed only by a hemispherical thickening of the epidermis over this area." Rosa² refers to this organ as "atrium." In the case of *Callidrilus*, Michaelsen³ states that this "doubtful prostate" consists of small granular cells, with indistinct boundaries, the nuclei sometimes being scarcely recognizable; in the same place he describes—though very briefly—structures of the same nature as those in *Micr. papillata* as occurring in *Kynotus madagascariensis*; to which I shall refer later on in this paper.

The nature of the organ in *Geoscolex* is unknown. But *Microchæta* (and probably *Kynotus*) differs from the rest in that this gland is entirely independent of the sperm-duct; whereas in prostatiferous worms (that is, those of the families *Cryptodrilidæ*, *Perichætidae*, *Acanthodrilidæ*, *Eudrilidæ*, &c.) this gland is always in connection with the sperm-duct, or in its immediate neighbourhood; moreover, it is tubular in general character and is apparently a more efficient organ of copulation than in these other cases.

We are in ignorance of the real function of the prostate or of the "genital duct" in these prostatiferous worms; but there is, probably, a protrusion of the muscular duct during copulation, and an insertion thereof into the spermatheca, as there is undoubtedly in such forms as the *Tubificidæ*: but in the case of *Microchæta* such a penial function is impossible, for there is no sac into which such a papilla could be inserted; it probably, however, serves as a *sucker*. The small papilla in the terminal pit of the larger one, the muscular arrangements, and the folded cavity suggest such a sucking-organ; and, no doubt, the copulating chætæ serve to aid this apparatus in holding on to another worm⁴.

It is not necessary to think that this sucking-apparatus in *Microchæta* is the forerunner of the prostates with their protrusible duct, though it is quite possible that this latter organ may have arisen from some such apparatus as is present in *Brachydrilus*, *Geoscolex*, &c., where the "sucker" is perforated by the sperm-duct. During copulation in *Lumbricus*, &c., the ventral surface of the clitellum itself, bounded by the tubercula pubertatis, very probably acts as a sucker; here in *Microchæta* a more specialized apparatus, on

¹ "Studies in Earthworms, III.," Q. J. M. Sc. xxvii. p. 568.

² "Sul *Criodrilus lacuum*," Mem. d. R. Accad. d. Sci. d. Torino, ser. 2, tom. xxxviii.

³ "Terricolen d. Berliner Zool. Samml.," Arch. f. Naturgesch. 1891.

⁴ Rosa describes (Ann. d. k. k. Natur. Hofmus. 1891) certain glandular bodies in *M. benhami* (in somites xi. to xxviii.) which appear to have a somewhat similar structure; but he mentions no external papillæ: he compares them with the "pyriform glands" of *Urobenus* and *Urochæta*, and suggests, as I have done, their possible connection with the prostates of other worms; and his species forms an interesting link between the arrangement in *Urobenus* and *M. papillata*, though the structures in *M. benhami* do not appear to have any copulatory functions.

definite spots, has taken the place of, or is developed in addition to, this clitellar sucking arrangement.

It is very generally believed that in *Lumbricus herculeus*, Savigny (*L. terrestris*, auct.), a mucous band is developed around the bodies of the two worms during the process of copulation: but, from my own repeated observations of the act in *Lumbricus*, I can state, as some of the older authors have stated, that such a band does not exist. There is such a band in *Allolobophora foetida* and no doubt in other species, but in *Lumbricus* the two worms are joined together, and that pretty firmly, by the action of the *tubercula pubertatis*, and no doubt by a certain amount of sucking-action, exerted by the ventral region, not only of the clitellum, but also of all that part of the body lying between that and the fifteenth somite, which is converted into a groove by the action of a band of muscles passing from one side to the other—the arched muscles¹.

In worms, such as *Perichæta* and *Acanthodrilus*, &c., where the clitellum is “complete” or nearly so, and where no *tubercula pubertatis* exist, there is no evidence of any power of converting the ventral surface of the body into an adhesive apparatus: and it is in these forms that a (probably) protrusible penis—or muscular duct of the prostate—exists. This organ has either (1) actually replaced the adhesive arrangement such as exists in *Lumbricus*, in which case the sucking-papillæ, independent of the sperm-duct in *Microchæta* and the (probably) similar apparatus around the male pore in *Geoscoleæ*, *Brachydrilus*, *Criodrilus*, may represent stages in the process; or (2) the two modes of copulation may have arisen independently.

The Internal Anatomy.

In the arrangement of its internal organs *M. papillata* agrees closely with that of the previous species.

The *nephridia*, though smaller, present the characteristic tuft of coiled tubules at the end of a fairly large bladder; the “fine tube”² presents the same peculiar branching and anastomoses that I have described for *M. rappi*³.

The dorsal *blood-vessel* is doubled in the somites v., vi., vii., viii., and ix., and in the last somite is dilated to form a double heart-like organ; in each case the two vessels unite at each end of the somite to form a single tube perforating the septa; in *M. rappi* this doubling occurs in the same somites, but in *M. beddardi* it is limited to somites vii., viii., and ix.

Large moulliform “lateral hearts” exist in the present species in somites ix., x., xi., and smaller ones in somites vii. and viii., as in *M. rappi*.

With regard to the *alimentary tract*, the chief features to be noted are (a) the gizzard, which appears to occupy somite vi., and (b) the oesophageal diverticula or calciferous glands; of these there is but

¹ Cerfontaine, “Rech. sur le Syst. cutané et sur le Syst. musculaire du Lomb. terr.,” Arch. de Biologie, x. 1890, pl. xii. fig. 26, p. 407.

² “The Nephridium of *Lumbricus*,” Q. J. M. Sc. xxxii.

³ Q. J. M. Sc. xxvi. pl. xvi. fig. 21, and pl. xvi. *bis* fig. 31.

one pair in somite ix.—one somite anterior to that of *M. rappi*. In *M. beddardi*, however, the gland is partly in somite ix. and partly in somite x., occupying, as it were, an intermediate position between that of the other two species.

The *genital organs*.—There are apparently three pairs of sperm-sacs, but in reality only *two* pairs are present, each sac being constricted into a larger anterior portion, and a small posterior and more ventrally situated lobe. The two larger sacs (Plate VIII. fig. 13, *A, B*) lie in somites x. and xi.; the posterior lobes, constricted by the septa, lie in somites xi. and xii. (*C, D*). There are no median sacs.

The two pairs of *testes* and of ciliated rosettes, which lie in somites x. and xi., are enclosed in the larger portions of the sacs.

In *M. rappi* there is the same kind of subdivision of the sperm-sacs, the anterior lobe, however, of each being the smaller and containing the testes; they occupy (according to the amended numbering of the somites) the same position as in the present species.

The two sperm-ducts of one side unite in somite xii., but I was unable to trace them onwards; they have no connection with either of the copulatory apparatus mentioned above.

The *spermathecæ* have the same arrangement as in the other species; that is, a row of ten or twelve very small oval sacs on the anterior margin of each side of somites xiii. and xiv.

In *M. rappi* there are fewer in each row, but four rows on each side, and some of them are curved. Similar spermathecæ exist in *Brachydrilus*¹ and in *Kynotus*.

C. MICROCHÆTA BELLI, n. sp.

This species agrees in its anatomy very closely with *M. beddardi*, I name it after my friend Prof. Jeffrey Bell, who has enabled me to examine and study a large number of Earthworms presented to the National Collection².

Its length is 8 inches and its diameter is $\frac{3}{4}$ inch.

It had apparently been allowed to become dry at some period before it reached me, as the worm is much shrivelled, and a dark brown, hardened, plate-like structure occupies the dorsal surface of somites xiii. to xxi. and part of the next somite; this "saddle" extends laterally as far as the nephridiopores, or line of the outer chætæ. This brown area appears to represent the clitellum. Along the lateral boundary of part of the clitellum is a broadish band, having a glandular appearance, crossing the somites xv., xvi., xvii., xviii., and part of xix. This recalls the *tubercula pubertatis* of the *Lumbricidæ*, and a similar structure is already known in *Rhinodrilus* and *Hormogaster*, and Horst speaks of something of the sort in *Glyphidrilus*³. On the ventral surface these segments, though dis-

¹ Benham, "An Attempt to Classify Earthworms," Q. J. M. Sc. xxxi. p. 256, fig. 28.

² The specimens of *M. papillata* and *M. belli* are now in the collection of the British Museum.

³ In *M. benhami*, Rosa, *loc. cit.* also describes *tubercula pubertatis*.

tinctly marked off from the clitellum, are more sharply separated from one another than is the case elsewhere in the body. The histological structure of the tubercula is represented in Plate VIII. fig. 14.

On each side of somite xiii., between the outer and inner couples of chætæ, and rather nearer to the former, is a copulatory papilla, similar to those I have described above for *M. papillata*.

The nephridiopores and the oviducal pores have the usual positions; I could not detect any other apertures.

The chætæ have the same arrangement and markings as in *M. papillata*; they are longer than in that species and commence on the second somite.

The annuli of the anterior somites are extremely well marked by deep grooves (Plate VII. fig. 6). The first somite is simple; the second is triannulated; the third is biannulated; somites iv. to ix. (inclusive) are triannulated, the third annulus in each case being very distinctly marked off; the tenth is biannulated; the following ones are bi- or triannulated, though the annuli are not so distinctly separated.

Of the internal organs, one or two features are worthy of note. Three septa are stronger than the others; the first lies between somites iv. and v., the second strong one lies in the *middle* of the somite viii., the third in the *middle* of somite ix.

The œsophageal glands are nipped by the septum between somites ix. and x., as in *M. beddardi*. There is only one pair of ciliated rosettes (and probably, therefore, of testes) in somite x. and one pair of sperm-sacs in the same somite.

In *M. beddardi*, also, there is but a single pair of each of these organs—the testes in somite x., the sperm-sacs in somite xi.

I traced the sperm-duct as far as somite xvi., where it enters the muscles of the body-wall. But I have been unable to determine the position of the external aperture; for I did not wish to injure the single specimen.

In *M. rappi* the spermducal pore lies in somite xx.; but I was unable to find the pore in *M. beddardi*, where, however, it has probably the same position¹.

The *spermathecæ* are eight in number, arranged in couples on the anterior margin of each side of somites xii. and xiii.; they are larger than in *M. papillata*, though of the same shape. In number and position they agree with the condition in *M. beddardi*.

The four species of *Microchaeta* can thus be arranged in two groups:—

I. *M. rappi* and *M. papillata* have two pairs of testes, and very numerous spermathecæ arranged in rows of several in a row; the œsophageal glands lie wholly in one somite; the dorsal vessel is doubled in each of the somites v. to ix.

II. *M. beddardi* and *M. belli* have but one pair of testes; have eight spermathecæ arranged in couples; the œsophageal glands are

¹ In *M. benhami* this pore is between somites xx. and xxi.

indented by a septum, so as to lie partially in two somites; the dorsal vessel is doubled in three somites only.

Remarks on the genus Kynotus, Michaelsen.

Dr. Michaelsen has recently described two species of this new genus which present certain anatomical features that are so unusual as to deserve a reconsideration.

*Kynotus madagascariensis*¹ and *K. longus*² both come from Madagascar.

The description of them is very incomplete, both as regards external and internal anatomy, owing to the bad condition of the specimens. These were not mature, and no clitellum was present.

The *chætæ* are absent in the anterior part of the body in the first twenty-six "segments" (Mich.), so that the correct interpretation of these external markings is a matter of considerable uncertainty; nor does the position of the nephridiopores aid us in determining the value of these surface-markings, as the author does not state where these pores commence; they are in line with the inner (ventral) couples of *chætæ* in those segments where these are present; in the anterior twenty-six "segments," however, they are on alternate rings. The grooves separating the rings are stated to be well marked, and in *K. longus* each "segment" is biannulated.

Thus, from external characters, there is nothing to guide us to a correct enumeration of the true *somites*.

Internally, the septa are, in most worms, of use, to some extent at least, for the determination of somites, and the position of the sperm-sacs and ovaries is so generally constant that these organs are frequently of considerable help in confirming any otherwise doubtful determination of somites.

But according to Michaelsen's view of the anatomy of these two worms, the first septum lies between "segments" 7 and 8; and the ninth septum between "segments" 23 and 24; so that two "segments" (instead of a single one as is usually the case) occur between every two successive septa. Behind the ninth septum, however, the condition of things usual in *Oligochaeta* obtains. But although there are two "segments," yet there is only one pair of nephridia.

Michaelsen gives no information as to the condition of the vascular or nervous system, which might have aided us in solving the difficulty as to the value of his "segments."

When I read his description of these worms I was reminded of my own difficulty in determining the value of the external rings and the limits of the somites in *Microchaeta rappi*, and this difficulty still further impressed itself on me when I examined the specimens of the two new species of the genus described in the present paper; at first I reckoned as somites the markings which I have above termed "annuli."

Now, when we consider the very abnormal condition of things

¹ Michaelsen, Arch. f. Naturgesch. 1891.

² Michaelsen, Jahrb. d. Hamburg. wiss. Anstalt, ix. 1891.

presented by the position and arrangement of the internal organs, which I have just mentioned, in *Kynotus*, and, still further, the position of the few genital organs described by Michaelsen, I am inclined to put a different interpretation on his "segments," and hence a different enumeration of "somites."

In *K. madagascariensis* the only genital organs observed are the *spermathecæ*; these are in a condition similar to that of *Microchaeta*; they are in rows of 22, 26, and 25 small sacs along the anterior margins of the "segments" 23, 24, and 25 respectively; the rows extending nearly all round the body.

In *K. longus* there are four rows of eight spermathecæ—one row on each side of the anterior margin of the "segments" 25 and 26. In this species he observed the *sperm-sacs*, of which there appears to be a pair in front of each of the *septa* vi. and vii. ["Ein Paar umfangreicher Säcke, vor den Dissepimenten vi. und vii., deutete ich als Samensäcke"].

Now, if it be borne in mind that between the *septa* v. and vi. there are, according to Michaelsen's mode of reckoning, two "segments," namely the 16th and 17th, and between the *septa* vi. and vii. likewise two "segments," the 18th and 19th, we get the sperm-sacs occupying a very abnormal condition indeed; for in what Earthworm, of all the many genera, do we find the sperm-sacs originating as far backwards as the 16th "somite"?¹ They usually occur in any somite from the eighth to the twelfth, and where there are two pairs they nearly always originate in somites x. and xi., or in somites xi. and xii.

I believe this apparently abnormally posterior position of the genital organs and the other peculiarities of *Kynotus* can be explained by interpreting the external rings, not as "segments" but as *annuli*; then between every two consecutive *septa* in the anterior part of the body we shall have not two "segments" but two *annuli*, that is one *somite*, and we shall find that matters work out more in accordance with what we find in other Earthworms.

Granting that the gizzard lies in somite vi., which is a very usual position for the organ in the family *Rhinodrilidæ* (amongst which Michaelsen places the worm), as well as in other families, the first septum lies, not between "segments" 7 and 8, but behind *somite* vi., the second behind *somite* vii., and so on; this brings the sperm-sacs into *somites* xi. and xii. (where they *do* occur in *Mic. rappi*, in *Rhinodrilus*, *Hormogaster*, and perhaps in *Brachydrilus*), and the spermathecæ are then in *somites* xv. and xvi. in *K. longus*, and in *somites* xiv., xv., and xvi. in *K. madagascariensis*; and this position agrees with that of the sacs in *Mic. rappi*.

Again, the nephridia will be *one* to each somite. Michaelsen remarks on the variation in the position of the pores in the anterior region of the worm, where they lie in some "segments" just behind the *septa*, in others in the middle of the "segments"; he sees only one explanation of this, that the nephridia were originally one

¹ The condition of the sacs in *Geoscolex*, *Urochaeta*, and *Diachæta* is quite different; they may *extend* into these somites, but *originate* in a more normal position.

pair to each "segment" and that has disappeared. It seems to me that we can just as readily explain the apparent anomaly of the nephridiopores being in the *middle* of the space between two septa by a reference to other genera in which the areas of attachment of septa have shifted from their original position, as I have mentioned in *M. belli*. Rosa notes it in *Hormogaster*¹ and Beddard has referred to a similar partial shift of the septa in *Libyodrilus*².

With regard to the papillæ which exist on the 25th annulus ("segment" of Michaelsen) in *K. madagascariensis* and on the 26th in *K. longus*, the suggested modification of enumeration brings each to *somite xvi*. Michaelsen refers to them as carrying the apertures of the sperm-ducts; but as he saw no sperm-duct it is quite as probable that they are independent copulatory structures, similar to those I have described in the two species of *Microchaeta*. The interpretation which he gave to them, however, is quite natural, and I myself, till I cut sections through them, presumed that they were the indications of the spermducal pores, and we, as I have mentioned, know of no other instance (except certain papillæ in *Perichaeta*, sp., whose structure is unknown) of such organs independent of the sperm-ducts.

According to my view, then, the genus *Kynotus* is not so aberrant as Michaelsen believes. The genus is a near ally of *Microchaeta*, if, indeed, it be not identical with it, the link between it and *M. rappi* (the "type" of the genus) being provided by the new species described in the present paper; and were it not for the very close agreement between these species and the two earlier known species of *Microchaeta* (especially in regard to calciferous gland, "hearts," doubling of dorsal vessel, extent of clitellum, position of nephridiopore), I should have referred them to Michaelsen's genus.

EXPLANATION OF PLATES VII. & VIII.

Figures 1 to 4 illustrate the anatomy of *Plutellus perrieri*.

- Fig. 1. View of the ventral surface of the anterior end of the worm, showing the arrangement of the chaetæ (the dorsalmost on each side not being visible), the male pores (σ), the extent of the clitellum. *Bc.*, protruded buccal cavity.
2. Diagrammatic view of a portion of the body-wall, extending from the mid-ventral line (*M.V.*) to mid-dorsal line (*M.D.*). The chaetæ (1, 2, 3, 4) have the true relative spacing; *neph.o.*, nephridiopores; *spth.p.*, spermathecal pores.
3. Semidiagrammatic view of a sagittal section through the first twenty segments: parts represented as cut through are drawn from the actual section; organs lying beyond these cut surfaces are put in from other sections. The dotted lines on the dorsal surface indicate the boundaries of somites—in the actual sections they are not present. The septa are represented black, in order that their course may be the more readily followed.

Buc., buccal cavity; *cer.*, brain; *ci.ro.*, ciliated rosette; *circ.*, circular muscles of the body-wall; *Comm.*, the peripharyngeal nerve commissure; *gang'*, the subpharyngeal or first ventral ganglion; *gen.d.*, the "genital duct"; *giz.*, gizzard; *lg.*, longitudinal muscles of the

¹ "Sulla strutt. d. *Hormogaster redii*," Mem. d. R. Accad. d. Sci. d. Torino, ser. 2, vol. xxxix.

² "On the Structure of an Earthworm allied to *Nemertodrilus*," Q. J. M. Sc. xxxii. p. 546.

body-wall; *lg'*, their distribution to the wall of the buccal cavity; *ne.o.*, the aperture of the first nephridium; *neph'*, the first nephridium; *ov.*, ovary; *ov.f.*, oviducal funnel; *ov.p.*, oviducal pore; *æs.*, cesophagus; *Phar.*, pharynx; *pro.*, prostomium; *prost.*, prostate; *sal.g.*, salivary glands; *sp.d.*, sperm-duct; *sp.p.*, male pore; *sp.sac.*, sperm-sac; *spth.*, spermatheca; *spth.p.*, spermathecal pore; *T.*, testis; *vis.n.*, visceral nerve, from brain to wall of buccal cavity and pharynx; *x.*, ciliated cells on roof of pharynx.

Fig. 4. Transverse section through *Plutellus*. 1, 2, 3, 4, the positions occupied by the four chætæ on each side; *ep.*, epidermis, represented as a black line; *cer.*, circular muscles of body-wall; *lg.*, longitudinal muscles, which form a thinner layer dorsally than ventrally; *D.v.*, dorsal vessel lying partially surrounded by a "perihæmal cavity" (*p.h.sp.*); *N.C.*, nerve-cord; *n'*, ventral nerve; *n'l.*, ventro-lateral nerve; *neph.*, portions of the loops of a nephridium; *neph.d.*, nephridial duct, opening at *ne.o.*; *perit.gl.*, a "peritoneal gland"; *sept.*, septum; *v.v.*, ventral vessel.

5. Ventral surface of *Microchæta papillata* (nat. size). *c.p.*, *c.p'*, the copulatory papillæ (suckers) on somites x. and xxiii.; *m.*, mouth; *Pro.*, prostomium; *t.p.*, ridge at each side of clitellar region, probably representing tubercula pubertatis. The roman numerals indicate the somites, some of which are biannulated (*a*, *b*).
6. Side view of *M. belli*, in order to show the deeply marked annulation of the somites. *a*, *b*, *c*, the three annuli into which the surface of the somite is divided. The roman numerals indicate the somites. *Buc.*, the protruded buccal cavity; *ne.o.*, nephridiopore; *l.ch.*, the outer couple of chætæ; *v.ch.*, the inner couple of chætæ.
7. The copulatory papilla of somite x. of *M. papillata*. *Pap.*, the papilla; *pap'*, the small papilla in the apical cup, showing the pore of the internal organ as a small dot; *V.ch.*, the ventral chætæ of somite xi.; *v.mid.*, the ventral midline.
8. Side view of anterior end of *M. beddardi*, in order to show the fusion of somites i. and ii., referred to in the text. *prost.*, prostomium; *neol.*, first nephridiopore.
9. The "sucker" or internal organ, corresponding to the external papilla of somite xxiii. of *M. papillata*. *s.s'*, the septa of the segment; *m.*, the muscle of the chætophore.

10. A somewhat diagrammatic view of a transverse section of the "sucking-organ" (combined from a series of sections).

Ch., the chætæ surrounded by the apparatus; *circ.*, circular muscles of the body-wall, continued over the "sucker"; *cl.*, clitellum; *co.ep.*, cœlomic epithelium covering the organ; *ep.*, the epithelium lining the "sucker"; *gl.*, the gland-cells of the organ; *lg.*, longitudinal muscles of the body-wall; *m.ch.*, the muscles of the chætophore; *mus.*, the muscles surrounding the "sucker"; *pap.*, the external papilla; *pap'*, the smaller papilla contained in the apical cup of the larger; *pore*, the pore of the apparatus.

11. A portion of the wall of the sucker of *M. papillata*; only a small portion is filled in in detail. *co.ep.*, the cœlomic epithelium, dipping down between the groups of gland-cells (*gl.*); *b.v.*, blood-vessels; *ep.*, epithelium of the organ; *mus.*, muscles in various directions in the wall; *ner.*, nerves cut across.
12. The tip of an ordinary chætæ of *M. belli*.
13. The sperm-sacs of *M. papillata*. *A*, *B*, the chief sacs; *C*, *D*, the smaller posterior lobes of these. *A*, *B* have been opened on the right side, showing the contained ciliated rosettes (*c.r.*) and testes (*t.*): *cal.*, calciferous gland; *giz.*, gizzard; *sep.*, the strong septa.
14. A transverse section of the tuberculum pubertatis of *M. belli* (only a portion is filled in with detail). *ep.*, epidermis of clitellum; *circ.*, circular muscles of the body-wall, between the fibres of which the gland-cells of the tuberculum pass inwards; *lg.*, longitudinal muscles; *b.v.*, blood-vessels.



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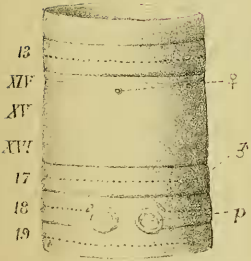


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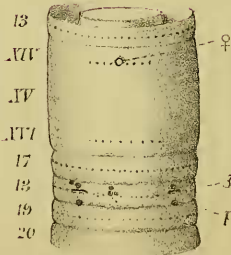
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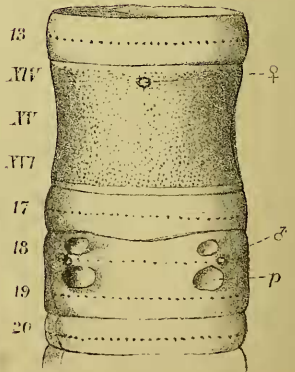
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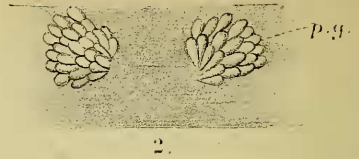
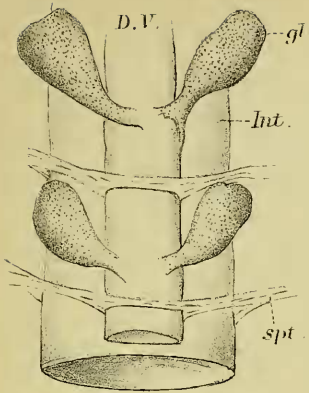


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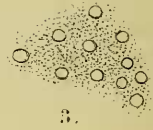


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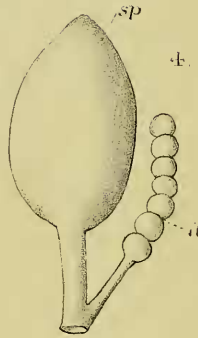




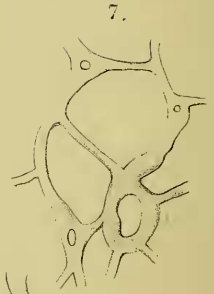
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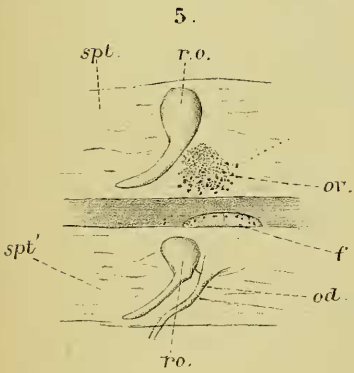
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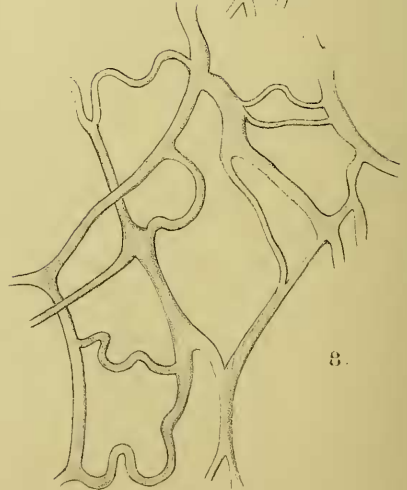
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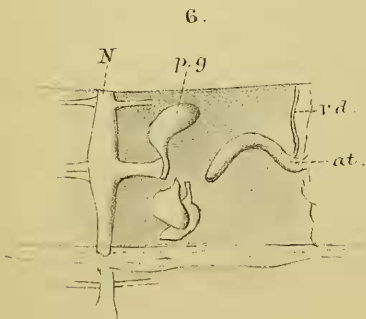
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4. On some Species of the Genus *Perichæta* (*sensu stricto*).

By FRANK E. BEDDARD, M.A., Prosector to the Society.

[Received February 5, 1892.]

(Plates IX. & X.)

I have already communicated to this Society¹ some observations upon the family Perichætidæ and upon the generic types which may be recognized in it. In the present paper I propose to describe some species of *Perichæta* (*s. s.*). I regard those Perichætidæ as referable to the genus *Perichæta* in the strict sense in which the setæ are disposed in a perfectly continuous circle round each segment, being generally (? always) disposed along a distinct ridge in the middle of the segment; this gives to the species of the genus a very different feel from either *Megascolex* or *Perionyx*, since the setæ necessarily project more and thus produce a roughening of the skin, very perceptible when the worms are handled.

My experience of living Earthworms of the genus *Megascolex* is limited to the examination of a specimen (as yet unidentified) from the Seychelles. These worms are far more lethargic in demeanour than the extremely active *Perichæta*, and it is quite possible that this difference may be general.

Another distinguishing character of the genus is the presence of a pair of cæca² projecting forwards from the intestine in the xxvth segment. The gizzard, moreover, lies in segments viii.-x. and the septa are wanting which should divide those segments. No true *Perichæta* is known in which the spermatheca have more than a single diverticulum apiece³. The clitellum never consists (with one exception, *P. feæ*) of more than three segments (xiv.-xvi.), and the oviducal pore is generally, if not always, single and median⁴.

Most naturalists who have described species of *Perichæta* have mentioned the number of setæ on the segments; but a segment has generally been selected at random, and frequently no mention has been made of the particular segment chosen. Prof. Bourne points out that it is desirable to count the setæ upon more than one segment, and he selects segments v., ix., & xxv.; he finds "that the

¹ "Observations upon an American Species of *Perichæta*, and upon some other Members of the Genus," P. Z. S. 1890, p. 52.

² I refer later on in this paper (p. 165) to one exception to this rule.

³ The second "diverticulum," in the form of a pear-shaped pouch, which occurs in *Perichæta houlleti* does not belong to the same category as the true appendix of the spermatheca; this I have pointed out elsewhere [Q. J. Micr. Sci. vol. xxx. p. 462].

⁴ Fletcher has described and figured an Earthworm ("Notes on Australian Earthworms: Part II.," Proc. Linn. Soc. N. S. W. ser. 2, vol. i. pl. 13. fig. 6 ♀, and p. 962), *Perichæta queenslandica*, which has the internal organization of a true *Perichæta*, but "interrupted" setæ and paired oviducal pores; *Perichæta darnleiensis*, described on p. 966 of the same memoir, appears to be in every respect a true *Perichæta*, but has also paired oviducal pores. This matter, however, requires looking into again, as Mr. Fletcher suggests a slight doubt as to whether the said apertures are really separate.

relation of these numbers to one another varies with other important characters rather than the actual numbers themselves."

Prof. A. G. Bourne¹ considers that in all true *Perichætæ* there are setæ between the male pores. So far as my own experience goes I agree with Prof. Bourne. The only possible exception that occurs to me is *Perichætæ taprobana* described in the present paper (on p. 163). That species has setæ between the male pores, but differs from *Perichætæ* in a few other points to which I direct attention. Another point which appears to me to be of importance is the size of the setæ upon the anterior as contrasted with the posterior segments; in all the species of *Perichætæ* described in the present paper the setæ of the eight anterior segments are very much larger than those upon the segments which follow; there is an abrupt break at the end of segment viii.; up to this point the setæ get gradually larger upon successive segments. In *Perichætæ taprobana*, which may perhaps be a distinct genus, there is no such marked difference between the segments in front of and those behind the eighth. Although there is a sudden diminution in size of the setæ there is not always a corresponding increase in their numbers, but there generally is an increase.

So much, then, for the generic distinctions of *Perichætæ*.

As to the species there exists already some little confusion, and I am not prepared to guarantee absolutely the novelty of the species described in the present paper. When there were only a very few species of the genus known, their discrimination was a much easier matter than it is now; at the time that Perrier wrote his first descriptions of *Perichætæ* it was a nearly sufficient definition to state merely the number and position of the spermathecae. There are therefore a good many points, now known to be of systematic importance, which are omitted or not clearly set forth in some of the papers which record new species of *Perichætæ*. So far as we know at present, the following are the principal external features which are of systematic importance:—

- (1) Whether the ventral setæ are larger than the rest.
- (2) The number of setæ upon the segments.
- (3) Whether the clitellum includes the *whole* of segments xiv.—xvi.²
- (4) Whether the setæ are present or absent from some or all of the clitellar segments; and if present whether they are modified (as, for instance, in *Perichætæ houletti*).
- (5) The number and arrangement of the anterior and posterior genital papillæ.
- (6) The position of the atrial pores upon the xviiiith segment, *i. e.* whether they are more lateral or ventral.
- (7) Colour and size (including number of segments).

I should like to take this opportunity of calling attention to the importance of illustrating these and other Earthworms by accurate

¹ "On *Megascolex cæruleus*, Templeton, &c.," Q. J. Micr. Sci. vol. xxxii.

² My attention was directed to the importance of this point by Prof. Bourne's paper upon *Megascolex cæruleus* (Q. J. Micr. Sci. vol. xxxii. p. 49).

coloured figures. The species of *Perichæta* generally (so far as my experience goes, *always*) show characteristic differences of colour which it is difficult to express in words so as to convey a sufficiently accurate idea. The characters, moreover, which separate the species of *Perichæta* are not always available; some species are separable by very well-marked characters, but others again hardly differ, except in the number and position of the genital papillæ with which are associated peculiar glands, and *in their colour*; immature specimens often want the papillæ, and, in the absence of coloured figures for reference, new species may be described which have no existence or important facts in distribution may be ignored. At present there are only two coloured figures of *Perichætidae* extant on which any reliance can be placed: these are Bourne's figure of *Megascolex cæruleus* and my own of *Perichæta indica*¹. Several coloured figures accompany Schmarda's descriptions of *Perichæta* in his 'Neue wirbellose Thiere,' but these are not so useful as they would be if the descriptions were sufficiently full to render identification of the species possible².

The chief internal characters which show variations are the spermathecæ and the atria. The number and position of the spermathecæ, and perhaps the relative size of the spermatheca and its diverticulum, offer useful characters; but they are rather difficult to make use of, as the quantity of sperm in the diverticulum is responsible for considerable variations in its form, as I point out in the case of *Perichæta sinensis* (see p. 159). The atrium is sometimes furnished at its point of opening with a dilated sac, the presence or absence of which is very characteristic of a given species. The extent of the glandular part of the atrium is perhaps often a valid specific distinction, especially in such forms as *Perichæta taprobanae*, where it is extraordinarily small. The intestinal cæca are also subject to some variation, which is, however, not common; in two species only are they absent, and in two others there are six pairs instead of the normal one pair. There seems also to be some variety in the position of the specially thickened intersegmental septa; but this character is one which is best appreciated in large species such as *Perichæta forbesi*, and is not always so clearly marked in the smaller forms.

Whether the receptacula ovarum really vary from one to two pairs is a matter which requires further investigation. At present I am almost inclined to think that the existence of the two pairs of these structures placed in segments xiii. and xiv. will prove to be characteristic, not of particular species, but of the genus itself.

? *PERICHÆTA SUMATRANA*, Horst.

Megascolex sumatrana, Horst, Notes Leyden Mus. vol. v. p. 189.

Perichæta sumatrana, Horst, Midden-Sumatra, Vermes, p. 5.

I have examined five or six specimens of this species, which has a

¹ Vaillant's figure of "*Megascolex diffringens*" may be *Perichæta indica*.

² Since the above was written I have received, through the great kindness of Prof. Claus, these worms for identification.

very conspicuous coloration, illustrated in Plate IX. (fig. 4). The specimens were all received alive from Kew Gardens; they were brought to Kew in Wardian cases from Barbados and from Hong Kong; it may be that the specimens from the two localities were accidentally mixed, but the fact that each box contained another and a distinct species in each case is against the supposition that there had been an accidental transference of specimens from one box to another. The occurrence of the same species of *Perichæta* in two such widely-separated regions of the World is interesting, but it is not the only instance seen in this genus; both *Perichæta indica* and *Perichæta houletii* have been recorded from the tropics of both the New and the Old World.

The accompanying drawing (Plate IX. fig. 4) illustrates the coloration of the species, which varies somewhat in individuals, preserving, however, the same general plan. The body is markedly ringed as in our own *Allobophora fœtida*; there are alternate bands of olive-brown and pale brownish yellow; in the individual figured the darker bands are of a more distinctly green colour than in other specimens.

When treated with Perenyi's solution the green, both of the greener and browner individual, became very much brighter and more distinctly green, and was finally dissolved out when the worms were transferred to alcohol. This change of colour appears to be due to the acid in the Perenyi's fluid, as it was not produced by alcohol alone.

This species is extremely strong and active and it is most difficult to catch; the buccal cavity is protruded when the animal is moving, as in all other species of the genus that have been examined in the living condition. The length is 70 mm. by 4 mm. in breadth¹.

Number of segments 86.

The *ditellum* occupies the usual three segments, beginning and ending sharply. There are no setæ upon it.

The *oviducal pore* is single and median upon the xivth segment.

The *atrial pores* are not prominent; they are transversely elongated slits upon the xviiiith segment.

There are *no genital papillæ*.

The *intestine* commences in segment xiv.; it has the usual pair of cæca.

There are, as in most species of *Perichæta*, especially thick tufts of nephridia on the septa in front of segment vii.

The ventral blood-vessel is not enclosed by the sperm-sacs.

The *spermathecæ* lie in segments vii. and viii.; each has a diverticulum bent upon itself three times.

The *atrium* has a large terminal sac.

I am not quite certain whether to identify this species with *Perichæta sumatrana* or whether to regard it as new. The diverticulum appears to be somewhat different in form, but this may perhaps be accounted for by the distribution of the spermatozoa in the pouch.

¹ Another specimen measured 3 inches and consisted of 93 segments.

PERICHÆTA DYERI, n. sp.

I obtained a single specimen of this *Perichæta* from Kew Gardens in August of last year; Mr. Crisp, one of the employés at the Royal Gardens, brought me the worm, which had been remarked for some days on account of its active habits; it had obviously come from some foreign country, but at that season so many plants in Wardian cases arrive from abroad that I found it impossible to ascertain its exact locality.

The colour of this species when alive (Plate IX. fig. 2) is a rich brown, darker posteriorly; the cuticle is markedly iridescent, the iridescence being probably more strongly marked on account of the dark background of pigment. During life it protruded, as other *Perichætæ* do, the whole of the buccal cavity during its movements; the clitellar region was also continually contracted: in preserved specimens this region of the body is, it should be observed, frequently much narrower than the rest; the older term of cingulum is thus particularly applicable, as the impression given is that of a belt tightly drawn round the middle of the worm. When placed in weak spirit, the worm threw out a quantity of turbid yellowish fluid.

After preservation the specimen measured 117 mm. and was composed of 72 segments. The circumference of the body in the region of the spermathecæ is 13 mm.

The *clitellum* occupies the three usual segments, but does not exactly coincide with the boundaries of those segments; it commences a little after the beginning of the xvth segment and terminates a little before the end of the xvth. There are no setæ upon the clitellum. The seta formula is

Segment I.	V.	XII.	XXV. ¹
27	27	39	45

The *oviducal pore* is single and occupies the usual position.

The *male pores* lie upon the xviiiith segment within the line of setæ, which are, however, interrupted for a short distance on either side of each pore. On the same segment are two pairs of large sucker-like *papillæ*, which seem to have a concave surface. The anterior pair (Plate IX. fig. 8) lie in front, and to the inside, of the male pores; the other pair occupy a corresponding position behind the circle of setæ of the segment, and touch the border-line between the xviiiith and sixth segments.

The *spermathecal pores* were not evident.

As to the internal anatomy. The alimentary tract is furnished with a *gizzard* occupying the usual position and number of segments. The paired *cæca* of the intestine arise between the xxvth and xxviii segments and reach forward as far as the xxvth.

From segment xxviii. backward are paired series of "*septal glands*"

¹ The segments selected for enumeration are not quite the same as those chosen by Prof. Bourne (Q. J. Micr. Sci. vol. xxxii. p. 53, footnote); but I find that the proportions and numbers are not altered by the segments which I give.

such as I have described in other species of *Perichæta*¹. They appear, however (Plate X. fig. 1), to arise rather from the dorsal vessel than from the septum; each gland is somewhat pear-shaped, with a narrow stalk which approaches that of its fellow.

The *sperm-sacs* are in segments xi., xii.

The *atria* are very extensive; the glandular part occupies segments xvi.–xxi. inclusive; the muscular duct opens directly on to the exterior and is unprovided with a thin-walled sac.

The segments xvii., xviii., and xix. are masses of white glands which are no doubt connected with the papillæ already spoken of.

The *ovaries* (which are, as usual, attached to the front wall of segment xiii.) are very large and bunched.

The *spermathecæ* are present to the number of four pairs, and lie in segments vi., vii., viii., and ix.; they open at the anterior boundary of these segments and are very dorsal in position, the external apertures being about 6 mm. from the nerve-cord. The pouch has the usual shape; the diverticulum is half again as long as the pouch.

The characters of the papillæ appear to distinguish this species from all other *Perichæta* with four pairs of spermathecæ. It comes nearest to *P. modiglianii*.

The above description refers to a single specimen which I shall keep as the type of the species. Since the description was written I have received a large number of other examples, all living, from Trinidad and Jamaica, and from Lagos on the W. African coast; the specimens from Trinidad I owe to the kindness of Mr. Hart, Superintendent of the Botanical Gardens; the other specimens came from Kew. I kept a number of them alive for some weeks in the hope that they might possibly produce cocoons; unfortunately they died without producing any. One of these specimens (which I have also kept) is illustrated in the accompanying coloured drawing (Plate IX. fig. 2). The examination of a large number of individuals has shown that the characters of the genital papillæ as described above are not quite distinctive of the species. In a good many individuals the papillæ were precisely as I have described them, but in others there were only a single pair present, that pair lying behind the male pores. These individuals therefore bear a very close resemblance to *Perichæta sinensis*. If one had only alcoholic specimens to examine and were not allowed to dissect them, it would indeed be impossible to distinguish the species by any at all marked characters. The colour, however (*cf.* figs. 2 & 3, Plate IX.), is here quite distinctive of the species.

PERICHÆTA SINENSIS, n. sp.

Of this species of *Perichæta* I received a number of living specimens from Kew Gardens; they came from Foochow in China. A coloured drawing which I exhibit (Plate IX. fig. 3) was made by Mr. Smit from the living worm. I ought to mention, however, that that

¹ P. Z. S. *loc. cit.*

sketch does not show the prismatic colours, which were very evident. The hinder part of the body is extremely transparent and of a pale brown colour; the blood-vessels and the paired septal glands were quite clearly visible through the thin integument. The last dozen segments or so are yellow-coloured; beyond the clitellum, which is grey, is a patch of yellow due to the prostate.

The activity of this species is quite on a par with that of other *Perichætes*, and it possesses the same power of everting the buccal cavity that I have referred to in the case of *Perichæta indica*¹ and the other species described in the present paper. M. Vaillant has also figured the same protrusion of the buccal cavity in *Perichæta posthuma*. In *Perichæta sinensis* the length of the fully everted buccal cavity was quite equal to that of the first three segments of the body.

The length of the species is 126 mm., the circumference at the viiith segment 10 mm.

The individual with the above measurements had 104 segments.

The *clitellum*, as is occasionally the case, does not coincide exactly with the limits of the three segments (xiv.–xvi.) of which it is composed; it begins *after* the furrow separating segments xiii./xiv., and ends *before* the intersegmental groove xvi./xvii. I could discover no setæ upon it.

The *oviducal pore* is single and median upon segment xiv.

The *atrial pores* lie upon segment xviii.

Genital papillæ.—There are two large sucker-like papillæ of circular outline lying between segments xviii./xix.; each is placed a little to the inside of (and of course below) the atrial pore of its own side.

The *spermathecal orifices* were not visible.

As to the internal anatomy, this species shows the usual characters peculiar to the genus *Perichæta*.

There are a pair of *cæca* in the usual position.

There are four pairs of *spermatheca* lying in segments vi., vii., viii., and ix. In several individuals which I dissected the proportions between the pouch and its single diverticulum, as well as the shape of the diverticulum, varied. The normal condition appears to be for the diverticulum to be quite as long as the pouch; like the pouch it consists of a distal sac where the spermatozoa are retained and a narrowed duct. The pouch itself contained no spermatozoa, only a quantity of material presenting the appearance shown in the accompanying drawing (Plate X. fig. 3); it is of a fluid consistency and contains minute granules as well as spherical bodies; the drawing, I should say, represents the contents of the pouch of a living worm. The diverticulum frequently shows a beaded appearance represented in fig. 4; in one case the upper end of the diverticulum was divided by constrictions into seven spherical chambers full of sperm; quite as often the diverticulum was tubular and of equal calibre throughout, except of course the proximal end, which is always narrower. My investigations upon the living worm, which I had

¹ P. Z. S. *loc. cit.*

hoped would be more thorough, were cut short by the drying up of the specimens; I had proposed to study the vascular system in detail, but my failure to do so is the less to be regretted since Prof. A. G. Bourne has recently published¹ an excellent account of the circulatory organs of the large *Megascolex cæruleus*, which would probably in any case have rendered a similar account of the circulatory organs of *Perichæta* unnecessary.

I may, however, call attention to figs. 7 & 8, which represent a portion of the capillary network upon the spermathecal diverticulum drawn from the living organ. It will be noticed that this network is of some vertical thickness; its branches lie in two planes, both of which are contained in the superficial layers of the pouch and do not penetrate between the cells of its lining epithelium.

The *atrium* is not furnished with a terminal sac.

A crowd of closely pressed white egg-shaped glands corresponds to each of the genital papillæ (Plate X. fig. 2).

The *setæ* of segments vi., vii., viii., ix. are longer and stouter than those upon the anterior and posterior segments; this is especially the case with the more laterally placed.

The seta formula is as follows:—

Segment I.	V.	XII.	XXV.
28	26	42	48

PERICHÆTA BERMUDENSIS, n. sp.

I received thirty or forty examples of this *Perichæta* preserved in spirit from the Bermudas; I am indebted for them to Surgeon-Major Windle.

The specimens were all of about the same size; the length of one specimen chosen at random is 120 mm., breadth 4 mm., number of segments 93. The colour (in alcohol) is a reddish brown dorsally, passing into a yellowish colour ventrally.

The *prostomium* extends back over about half of the peristomial segment.

The *setæ* are small on the first setigerous segment; they gradually increase in size on the next three, and then get small again; they are quite small on segment ix. They form complete circles.

The *clitellum* shows the unusual, though not unique (see description of *Perichæta dyeri*, p. 157), character of not *completely* occupying three segments. Instead of being developed over the entire circumference of segments xiv.–xvi., it only commences to be visible 1 mm. after the boundary-line of segments xiii./xiv. and terminates at about the same distance in front of the boundary-line between segments xvi./xvii. This gives the clitellum a peculiar and very characteristic appearance. As it occurred in all the specimens which I examined, I regard this reduction of the clitellum as a valid specific character.

The clitellum is not entirely unprovided with *setæ*; there is a

¹ "On *Megascolex cæruleus*, Templeton, from Ceylon, &c.," Q. J. Mier. Sci. vol. xxxii. p. 49.

single row present at the posterior boundary of the clitellar region, which belong therefore to segment xvi.; it is at this point that the thick clitellar epithelium ceases. The setæ do not form a continuous ring round that segment (the xvith); they are visible only upon the ventral surface and are developed for an equal distance on either side of the ventral median line; they extend for a distance of about one quarter of the entire circumference of the segment. The clitellar setæ are quite obvious without having recourse to a microscopical investigation of the integument, since the thick clitellar epithelium is much broken along the line of their emergence. The setæ themselves do not appear to present any differences in shape from those which are found in other parts of the body; they may perhaps be a trifle smaller, but there is no such differentiation as occurs, for example, in *Perichæta houlleti*. The most careful search failed to show any setæ on either of the two remaining segments of the clitellum: in one specimen I counted 20 setæ on segment xvi.; in another there seemed to be rather fewer, but there was no perceptible variation in the length of the line occupied by the setæ in different individuals.

I have been particular in calling attention to the characteristics of the clitellum, not only because the points to which I have directed attention are of specific importance, but also for the special reason that they serve to discriminate *Perichæta bermudensis* from *Perichæta aspergillum*. I was at first inclined to regard the species described in this paper under the name of *Perichæta bermudensis* as being identical with *Perichæta aspergillum*. The latter was first described by Perrier¹ as being "sans désignation d'origine." As I received a few years ago some Earthworms collected by Mr. Shipley in the Bermudas which seemed to be *P. aspergillum*, I considered that the present species was the same, as the individuals agreed, on a superficial inspection, with *Perichæta aspergillum*. However, in Perrier's description of *P. aspergillum* there are characters mentioned which appear to show that I am right in regarding *Perichæta bermudensis* as a distinct though closely allied form; in the figure² illustrating *Perichæta aspergillum* setæ are figured upon all the segments of the clitellum; but in the text the matter is left a little obscure. M. Perrier says (p. 120), "Je n'ai vu sur la ceinture que de faibles traces . . . des ceintures de soies."

The great difference in size may possibly also be a valid specific difference; no doubt this character is one which has to be used with special caution in the case of Earthworms. There are other points, too, which I shall call attention to in referring to the characters offered by the male generative pores and the spermathecal pores.

The dorsal pores commence, as in *Perichæta aspergillum*, between segments x./xi.

The oviducal pore lies upon the middle ventral line of segment xiv.

¹ "Recherches pour servir à l'histoire des Lombriciens terrestres," Nouv. Arch. Mus. t. viii. p. 5.

² *Loc. cit.* pl. iv. fig. 71.

The *male pores* are upon segment xviii., comparatively near to the ventral median line; they are not, as is, for example, the case with *Perichæta affinis*, at the sides of their segment. The setæ of segment xviii. are present between the two pores, but they cease to be visible some little way from the pores on each side. The pores themselves lie in the direct line of the circle of setæ. Close to each of the apertures of the atria is a group of rounded orifices, which in one specimen showed the following arrangement:—There were four on one side and five upon the other, each group of pores lying in a circle below, and to the inside of, the atrial pores. The arrangement therefore, as well as the number of these pores, shows some differences from *Perichæta aspergillum*; I occasionally observed fewer than four pores, but never anything like so many as eleven, which Perrier states to be the number found in *Perichæta aspergillum*. When the cuticle is stripped off, these pores become very obvious and can be easily counted with a lens. Examined under the microscope they do not present the appearance of pores, but of solid papillæ covered by a reticulation; they are in fact, as I have already pointed out¹ for *Perichæta aspergillum* and other species of the genus, the openings of masses of unicellular glands.

I could not see the *spermathecal pores*, and there was no development of accessory papillæ corresponding to those which have just been described as occurring near the atrial pores. This is another point in which *Perichæta bermudensis* differs from *Perichæta aspergillum*, where such papillæ have been described and figured by Perrier.

The *gizzard* occupies segments viii.–x., the septa of those segments being absent; the remains of the septa are to be recognized in a series of ligamentous bands which attach the gizzard to the parietes; of these there are three pairs: two on each side are attached, close to each other, not to the gizzard itself, but to the septum which lies just in front of it; they pass obliquely backwards and outwards; behind these and nearly at the posterior extremity of the gizzard is another band on each side. The walls of the œsophagus behind the gizzard are much folded (internally) and very vascular in segments xii.–xiv., particularly in segment xiii.; this region no doubt represents the calciferous glands of other Earthworms, which do not here form distinct diverticula.

In segments v. and vi. are “*blood-glands*” which present a racemose appearance.

The *intestine* is provided with the usual pair of cæca.

The *sperm-sacs* are in segments xi. and xii.

The curved duct of the *atrium* opens directly on to the exterior, and not through a dilated terminal portion; it is surrounded by innumerable small white glands, which correspond to the pores which surround the external orifice of the atrium.

The *ovaries* are in segment xiii.

¹ “Contributions to the Anatomy of Earthworms, with Descriptions of some New Species,” Q. J. Micr. Sci. vol. xxx. p. 461 *et seq.* pl. xxix. figs. 3, 4, 5.