

## HELMINTHES FROM THE COLLECTION OF THE COLOMBO MUSEUM.

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With three Plates.

THIS report on Parasitic Worms from Ceylon is a continuation of my description of Nematodes in *Spolia Zeylanica*, vol. I., part IV. (1904). There are altogether in the second consignment which was sent to me fifty-one species, of which thirty belong to the Nematoda, one to the Acanthocephala, seven to the Trematoda, and thirteen to the Cestoda; of these, thirty are described as new, and three new genera of Cestoda have had to be established.

The following species are dealt with :—

### NEMATODA.

1. *Ascaris spiculigera*, Rud., from *Plotus melanogaster*.
2. *Ascaris fissicollis*, n.sp., from *Haliastur indus*.
3. *Ascaris coronata*, n.sp., from *Ardeola Grayi*.
4. *Ascaris brachycheilos*, n.sp., from *Tropidonotus asperrimus*.
5. *Physaloptera brevispiculum*, n.sp., from *Felis rubiginosa*.
6. *Spiroptera secretoria*, n.sp., from *Plotus melanogaster*.
7. *Spiroptera orca*, n.sp., from *Manis pentadactyla*.
8. *Spiroptera sanguinolenta*, Rud., from *Canis familiaris*.
9. *Spiroptera*, spec. ? from *Cittacincla macroura*.
10. *Spiroptera*, spec. ? from *Pavo cristatus*.
11. *Spiroptera*, spec. ? from *Sciurus palmarum*.
12. *Heterakis pusilla*, n.sp., from *Gallus Lafayetti*.
13. *Heterakis granulosa*, n.sp., from *Gallus gallinaceus*.
14. *Strongylus digitatus*, n.sp., from *Bos taurus*.
15. *Kalicephalus willeyi*, v. Linst., from *Typhlops braminus*.
16. *Oxyuris megaloon*, n.sp., from *Hemidactylus Leschenaultii*.
17. *Oxysoma falcatum*, n.sp., from *Nicoria trijuga*.
18. *Dispharagus macrolaimus*, n.sp., from *Plotus melanogaster*.
19. *Sclerostomum equinum*, Müller, from *Equus caballus*.
20. *Ankylostomum minimum*, n.sp., from *Felis rubiginosa*.
21. *Ankylostomum trigonocephalum*, Rud., from *Canis familiaris*.
22. *Syngamus trachealis*, v. Sieb., from *Gallus gallinaceus*.
23. *Filaria* ? *Zschokkei*, Meyer, from *Manis pentadactyla*.
24. *Filaria immitis*, Leidy, from *Canis familiaris*.



25. *Filaria piscicola*, n.sp., from Marine Fish.
26. *Filaria equina*, Abilg., from *Equus caballus*.
27. *Filaria digitata*, n.sp., from *Bos indicus*.
28. *Filaria tuberosa*, v. Linst., from *Mabuia carinata*.
29. *Filaria flavescens*, Castellani and Willey, from *Calotes versicolor*.
30. *Trichocephalus discolor*, n.sp., from *Bos indicus*.  
*Tetradenos tiara*, v. Linstow = *Ctenocephalus tiara*, v. Linst.

## ACANTHOCEPHALA.

31. *Echinorhynchus tener*, n.sp., from *Spilornis cheela*.

## TREMATODA.

32. *Lyperosomum squamatum*, n.sp., from *Dissura episcopus*.
33. *Distomum*, spec. ? from *Plotus melanogaster*.
34. *Distomum hepaticum*, L., from *Bos indicus*.
35. *Paramphistomum calicophoron*, Fisch., from *Bos indicus*.
36. *Paramphistomum gracile*, Fisch., from *Bos indicus*.
37. *Gastrothylax crumenifer*, Crepl., from *Bos bubalus*.
38. *Tristomum megacotyle*, n.sp., from *Histiophorus*.

## CESTODA.

39. *Hymenolepis septaria*, n.sp., from *Upupa ceylonensis*.
40. *Hymenolepis clausa*, n.sp., from *Dendrocygna javanica*.
41. *Hymenolepis spinosa*, n.sp., from *Rostratula capensis*.
42. *Dipylidium caninum*, L., from *Canis familiaris*.
43. *Tænia*, spec. ? from *Haliastur indus*.
44. *Diorchis occlusa*, n.sp., from *Phænicopterus roseus*.
45. *Davainea polycalcaria*, n.sp., from *Corvus macrorhynchus*.
46. *Diplochetos volvulus*, n.gen. et sp., from *Lobipluvia malabarica*.
47. *Ophryocotyle ceylonica*, n.sp., from *Lophoceros gingalensis*.
48. *Brochocephalus paradoxus*, n.gen. et sp., from *Ægialitis mongolica*.
49. *Cittotænia bursaria*, n.sp., from *Lepus nigricollis*.
50. *Ichthyotænia cryptobothrium*, n.sp., from *Chrysopelea ornata*.
51. *Aphanobothrium catenatum*, n.gen. et sp., from *Phænicopterus roseus*.

## I.—NEMATODA.

*Ascaris*.

The definition given previously (*S. Z.*, part IV., p. 91) is to be amended in so far that the intestinal cæcum lies dorsad of the œsophagus; the œsophageal gland is produced backwards ventral to the intestine.

1.—*Ascaris spiculigera*, Rud.

From the œsophagus and stomach of the Darter, *Plotus melanogaster*, L.; Wirawila, Southern Province.

2.—*Ascaris fissicollis*, n.sp.

Pl. I., figs. 1-2.

From intestine of the Brahminy Kite, *Haliastur indus*, Bodd.; Nedunkeni, Northern Province.



Three females, 15, 34, and 36 mm. long, 0·79–1·25 mm. wide. Cuticle annulate; behind the lips the annulation is so deep that the contours appear fringed. Lips with intermediate lips; without teeth; dorsal lip semi-circular, 0·083 mm.  $\times$  0·11 mm.\* the two papillæ lie in front; intermediate lips obtusely conical, attenuate from the middle, with an outer groove. Œsophagus  $\frac{1}{6}$ , acuminate tail  $\frac{1}{49}$ .† Eggs thin-shelled, spherical, 0·065 mm.; the small vitellus distant from the shell.

### 3.—*Ascaris coronata*, n.sp.

Pl. I., fig. 3.

From the œsophagus and stomach of the Nestling Pond Heron, *Ardeola Grayi*, Sykes; Tissamaharama.

Cuticle narrowly annulate; lips edentulous with large triangular interlabia; dorsal lips nearly circular, 0·065  $\times$  0·078, with two inner anterior prominences; papillæ anterior; œsophagus  $\frac{1}{6}$ .

Male, 17  $\times$  0·79; tail conical, very short,  $\frac{1}{183}$ . On each side of the caudal extremity 17 præ-anal papillæ in a row becoming more closely placed behind; post-anal papillæ absent; the cirri are 2·37 mm. long, straight, the end bent falciform.

Female, 26  $\times$  1·5; tail rounded, anus nearly terminal; at the posterior end a small finger-shaped appendix; the vulva lies in front of the middle, dividing the body in the ratio 7:15; eggs immature.

### 4.—*Ascaris brachycheilos*, n.sp.

Pl. III., fig. 48.

From intestine of *Tropidonotus asperrimus*, Boulenger; Colombo.

Cuticle smooth; lips depressed, dentiferous, with small conical interlabia; pulp emarginate; papillæ large; dorsal lip 0·078  $\times$  0·177; œsophagus  $\frac{1}{15}$  –  $\frac{1}{16}$ ; tail in male  $\frac{1}{233}$ , in female  $\frac{1}{520}$ , rounded in both sexes carrying a small terminal appendix.

Male, 55  $\times$  0·83; cirri broad, curved like a sabre, rounded at the end, 1·19  $\times$  0·035; at each side of the tail three very small præ-anal and two post-anal papillæ; the last of the latter lies dorsally exactly at the hinder end of the body dorsad of the styliform appendix.

Female, 104  $\times$  1·58; anus nearly terminal; vulva near the end of the anterior third, dividing the length in the ratio 14:39; eggs spherical, thick-shelled, closely beset with small granules, 0·086 mm.

\* All measurements are in millimetres, and the length always precedes the breadth.

† These are fractions of the total body length throughout.



5.—*Physaloptera brevispiculum*, n.sp.

Pl. I., fig. 4.

From stomach of *Felis rubiginosa*, Geoffr.; Kandy.

Cuticle finely annulate; head end with a thickened cuticular collar from which two round lips protrude, each of which carries three small peaks at the summit; at the tail end there is a similar præputium-like cuticular ring from which the tail emerges; œsophagus  $\frac{1}{6.5}$ .

Male,  $11.1 \times .95$ , with rounded tail  $\frac{1}{9.4}$ ; at each side of the cloacal orifice four stalked papillæ; behind these four paired ventral post-anal papillæ, unstalked, in successive couples; cirri very short, feebly curved, .79–.81.

Female,  $11.4 \times 1.06$ ; tail conical,  $\frac{1}{22.3}$ ; eggs thick-shelled, .036  $\times$  .031.

*P. præputialis*, v. Linst., which occurs in *Felis catus* in Brazil, has a similar caudal sheath with a body length of 21–30 mm.

6.—*Spiroptera secretoria*, n.sp.

Pl. I., fig. 5.

From œsophagus and stomach of *Plotus melanogaster*, L.; Wirawila; in company with *Ascaris spiculigera*.

Dimensions up to  $32 \times 1.6$ , but all specimens immature; both ends strongly attenuated; cuticle annulate; some are larvæ in process of exuviation. At the head a dorsally placed obtusely conical papilla; in a circle behind this are six roundish papillæ, and behind these in the submedian lines four truncate papillæ with a very small one at the inner side. Alongside the œsophagus runs a long gland containing a long granular secretion often projecting through the orifice which lies close behind the papillæ. Tail short with small finger-shaped appendix; lateral lines strongly developed, one-fifth of the diameter of the body, enclosing a lateral canal.

7.—*Spiroptera orca*, n.sp.

Pl. I., figs. 6–8.

From stomach of *Manis pentadactyla*, L.; Horana.

Cuticle annulate; head with two large lips placed dorsal and ventral, expanded in front; behind these in the submedian lines four finger-shaped procumbent processes.

The mouth leads into a vestibule, .2 mm. long; œsophagus in the male  $\frac{1}{3}$ , in the female  $\frac{1}{3.5}$ ; coarse cuticular rings .053 apart, fine rings .0054 mm. apart.



Male,  $25 \times \cdot 71$ ; tail involute; cirri long; the left cirrus measured  $3\cdot 74$  mm. in a young specimen of  $11\cdot 8$  mm., *i.e.* nearly one-third of the body length; the right cirrus is broader and much shorter,  $\cdot 57$  mm.; on each side there are four præ-anal and two post-anal papillæ, large and round; tail rounded,  $\frac{1}{5\frac{1}{2}}$ .

Female,  $32 \times \cdot 95$ ; tail rounded,  $\frac{1}{6\frac{1}{8}}$ ; vulva lies behind the middle dividing the body in the ratio  $7 : 5$ ; immature eggs elliptical,  $\cdot 044 \times \cdot 026$ ; mature, flattened at the poles,  $\cdot 047 \times \cdot 029$ , barrel-shaped, surrounded in front and behind by a raised hoop.

8.—*Spiroptera sanguinolenta*, Rud.

From œsophagus of *Canis familiaris*, L.; Colombo.

*Cf.* A. Railliet, *Traité de zoologie médicale*, Paris, 1895, pp. 536–538, figs. 373–375.

9.—*Spiroptera*, spec. ?

From intestine of Long-tailed Robin, *Cittacincla macroura*, Gmel.; Nedunkeni.

One entire and one half specimen spirally wound, not to be identified.

10.—*Spiroptera*, spec. ?

From œsophagus of *Pavo cristatus*, L.; Buttuwa.

Three imperfectly preserved fragments.

11.—*Spiroptera*, spec. ?

From peritoneum of *Sciurus palmarum*, L.; Colombo.

Fragments of a female.

12.—*Heterakis pusilla*, n.sp.

Pl. I., fig. 9.

From rectal cœca of Jungle Fowl, *Gallus Lafayetti*; Mamadu, Northern Province.

Head with small roundish lips; cuticle smooth; œsophagus thickened, club-shaped behind, in the male  $\frac{1}{5}$ , in the female  $\frac{1}{5\cdot 8}$ .

Male,  $5 \times 0\cdot 19$ ; tail  $\frac{1}{1\frac{1}{2}}$ , finely pointed, adhering to the ventral side by a granular, opaque cement; cirri very unequal, the left  $0\cdot 53$ , the right  $0\cdot 15$ ; in front of the cloacal orifice a round sucker, and behind this, on each side, four large post-anal papillæ, of which the last lies at a greater distance from the third than the three anterior from each other.

Female,  $5\cdot 13 \times 0\cdot 24$ ; tail  $\frac{1}{9\cdot 5}$ , very long and pointed; vulva far behind the middle, the præ-genital region to the post-genital region as  $12 : 5$ ; eggs, thick-shelled,  $0\cdot 065 \times 0\cdot 031$ .



13.—*Heterakis granulosa*, n.sp.

Pl. III., fig. 49.

Intestine of domestic fowl, *Gallus gallinaceus*, L.; Colombo.

Cuticle annulate; head with three low semi-circular lips; tail pointed.

Male,  $27 \times 0.59$ ; œsophagus  $\frac{1}{13}$ ; tail  $\frac{1}{49}$ ; the two straight rod-shaped cirri, 0.57; sucker long, oval, with a small circular groove behind, and surrounded by granulations; on each side three præ-anal and six post-anal papillæ, of which the most anterior is transversely elliptical, the fourth, seventh, and ninth spherical and marginal; radial muscles pass to the sucker.

Female,  $55 \times 0.79$ ; œsophagus  $\frac{1}{14}$ ; tail  $\frac{1}{40}$ ; vaginal orifice immediately in front of the middle dividing the body in the proportion 16:17; eggs thick-shelled,  $0.078 \times 0.042$ .

14.—*Strongylus digitatus*, n.sp.

Pl. I., fig. 10.

Stomach of *Bos indicus*; Colombo.

Cuticle without longitudinal lines, but with very fine annulation; head attenuate, mouth surrounded by four papillæ; œsophagus of male  $\frac{1}{14}$ , of female  $\frac{1}{17}$ ; the nerve ring surrounds the œsophagus at the limit of the first and second quarters and below it the *porus excretorius* opens.

Male,  $24 \times 0.36$ ; cirri very long, 4.54, coalescent throughout their entire length and thickened fusiform at the end; the lateral lobes of the *bursa* are curved claw-like inwardly; each lobe is supported by six ribs, of which one lies at the inner margin, two side by side at the hinder border, and three in a group at the outer margin; there is no median lobe; the end of the body is rounded with a pair of finger-shaped, slightly curved hyaline cuticular lobes.

Female,  $29 \times 0.47$ ; genital orifice lies far back dividing the body in the ratio 8:1; tail pointed,  $\frac{1}{168}$ ; eggs  $0.097 \times 0.053$ .

Eleven species of *Strongylus* have been found in *Bos taurus*, the European domestic ox; ten of them have short cirri; only *Strongylus filicollis*, Rud., has long cirri, but in this species the cuticle shows 18 longitudinal ridges.

15.—*Kalicephalus willeyi*, v. Linst.Rectum of *Typhlops braminus*, Russell; Colombo.

Cf. O. v. Linstow, *Spol. Zeyl.*, vol. I., part IV., 1904, pp. 99–100 pl. I., figs. 14–18.



16.—*Oxyuris megaloon*, n.sp.

Intestine of Gecko, *Hemidactylus leschenaultii*, Dum. et Bibr. Mamadu.

Females only in the collection,  $6.52 \times 0.91$ ; cuticle deeply annulate; head with three small lips; œsophagus  $\frac{1}{6}$ , narrow, ending behind in a spheroidal bulb; tail conically pointed,  $\frac{1}{16}$ ; eggs very large,  $0.083 \times 0.047$ .

*Oxysoma*.

Head with three or more lips; œsophagus with a spheroidal bulb behind; male with two equal cirri and three paired præ-anal papillæ; number of post-anal papillæ variable; tail in both sexes finely pointed; Secernentes-Meromyaria; in reptiles and amphibia.

17.—*Oxysoma falcatum*, n.sp.

Pl. III., figs. 50-51.

Intestine of the Tortoise, *Nicoria trijuga*, Schweigg.; Colombo.

Cuticle smooth; head broadly rounded with six stalked papillæ; the stalks are divided giving off an inner branch; behind the head are four large papillæ in the submedian lines; œsophagus thin, in the male  $\frac{1}{6.6}$ , female  $\frac{1}{6.9}$ ; the bulb is embraced by the cup-shaped commencement of the intestine; excretory pore behind the middle of the œsophagus dividing the latter in the ratio 21 : 16.

Male,  $11.6 \times 0.55$ ; tail  $\frac{1}{20}$ , bent hook-like towards the ventral surface; cirri equal, falciform, very broad before the middle, 0.44, pointed at the end; three præ-anal and five post-anal papillæ (paired).

Female,  $14.1 \times 0.56$ ; tail  $\frac{1}{14}$ ; genital orifice behind the middle dividing the body as 5 : 3; the vagina runs forwards; eggs  $0.14 \times 0.097$ .

*Dispharagus*.

Head with two lips; in the region of the so-called neck the cuticle shows four longitudinal pleats; male with two unequal cirri; on each side of the tail four præ-anal papillæ; it belongs to the Secernentes-Polymyaria; occurring in the œsophagus, stomach, and gastric submucosa of birds.

18.—*Dispharagus macrolaimus*, n.sp.

Stomach of the Darter, *Plotus melanogaster*, L.; Wirawila.

Females only in the collection,  $7.3-11.4 \times 0.28-0.47$ ; cuticle annulate, with elevated lateral lines; head with two small, conical, rounded lips; the mouth leads into a long vestibule;



œsophagus very long,  $\frac{1}{2\frac{1}{6}}$ ; tail  $\frac{1}{3\frac{1}{7}}$ , terminating in a small finger-shaped point; the nuchal pleats run 0·80 mm. backwards, rather beyond the first section of the œsophagus; immediately before their termination there is on each side a cone-shaped nuchal papilla; eggs very numerous, with a double shell,  $0\cdot031 \times 0\cdot011$ .

*Sclerostomum.*

Head with buccal orifice set with one or several rows of teeth; male with two equal cirri and trilobate costiferous *bursa*; female genital orifice posterior; Secernentes-Meromyaria; in mammals and birds.

19.—*Sclerostomum equinum*, Müller.

Intestine of horse; Colombo.

Cf. A. Looss, The Sclerostomidæ, Records Egyptian Government School of Medicine, 1901, pp. 76–77, pl. I., figs. 1–5.

*Ankylostomum.*

Head with chitinous buccal capsule, bent and open towards the dorsal side; often with teeth in its fundus; male with trilobate *bursa* and two equal *cirri*; bursal lobes supported by ribs; female genital orifice behind the middle; Secernentes-Meromyaria; in the intestine of mammals.

20.—*Ankylostomum minimum*, n.sp.

Pl. I., figs. 11–12.

Stomach of *Felis rubiginosa*, Geoffr.; Kandy.

Cuticle thick and annulate; buccal capsule dorsally inclined with four ventral longitudinal “ribs” and a tooth at the bottom.

Male,  $2\cdot38 \times 0\cdot24$ ; œsophagus  $\frac{1}{4}$ ; cirri brown and very short,  $0\cdot062$ ; lateral lobes of *bursa* rounded, supported by six ribs, of which the two anterior lie close together, the third, fourth, and fifth form a group, and the sixth lies isolated.

Female,  $4\cdot46 \times 0\cdot20$ ; œsophagus  $\frac{1}{5\cdot8}$ ; tail  $\frac{1}{3\frac{1}{4}}$ ; genital organs almost confined to hinder half of body; genital orifice posterior, dividing the body as 31 : 12; eggs not numerous,  $0\cdot088 \times 0\cdot053$ ; one branch of the uterus runs forwards, the other backwards.

21.—*Ankylostomum trigonocephalum*, Rud.

Intestine of dog; Colombo.

Cf. A. Railliet *Traité de Zoologie Médicale*, Paris, 1895, pp. 470–473, figs. 327–330.



*Syngamus.*

Mouth with a chitinous capsule, the wall of which is enlarged disc-like in front ; male small with a *bursa* and two equal cirri ; female orifice anterior ; male and female in permanent *copula* ; *Secernentes-Meromyaria* ; in the trachea, bronchi, and nose of birds and mammals.

22.—*Syngamus trachealis*, v. Sieb.

Trachea of domestic fowl ; Colombo.

*Cf.* A. Railliet, *op. cit.*, pp. 453–455, fig. 312, also Neumann's *Parasites of Domesticated Animals*, p. 607, fig. 318.

23.—*Filaria ? Zschokkei*, Meyer.

Peritoneum of *Manis pentadactyla*, L.

*Cf.* Meyer, *Archiv f. Naturgesch. Jahrg.* 61, Berlin, 1896, pp. 56–69, Taf. IV., figs. 1–9. Sexually immature.

24.—*Filaria immitis*, Leidy.

Pleural cavity of dog ; Ragama.

*Cf.* A. Railliet, *op. cit.*, pp. 509–513, figs. 354–356.

25.—*Filaria piscicola*, n.sp.

From supraorbital region of a marine fish (? *Lethrinus*, sp.).

One incomplete female,  $225 \times 0.57$  ; the diameter at the head is 0.13 ; the head is rounded, destitute of lips, teeth, and papillæ ; the tail is lost from the specimen ; genital orifice quite anterior, only 0.79 from cephalic extremity ; eggs  $0.031 \times 0.023$  ; it is ovoviviparous ; the embryos with acuminate tail measure  $0.53 \times 0.016$ .

Filariæ are very rare in fishes, and it is therefore to be regretted that only an imperfect description of this species can be given.

26.—*Filaria equina*, Abildg.

From eye of horse.

*Cf.* A. Railliet, *op. cit.*, pp. 524–526, figs. 364–366.

27.—*Filaria digitata*, n.sp.

Pl. III., figs. 52–55.

Peritoneum of *Bos indicus* ; Colombo.

Head with two straight teeth notched at the summit, thereafter four papillæ in the submedian lines ; cuticle finely annulate ; a long vestibule (in the female 0.59) leads into the œsophagus,  $\frac{1}{2}$



in the male,  $\frac{1}{9}$  in the female; tail rounded, carrying in the female a spherical appendix; in the male the tail is coiled in a close spiral, in the female a loose spiral; in the male  $\frac{1}{2.69}$ ; in the female  $\frac{1}{9.6}$ ; in both sexes in front of the extremity on each side a finger-shaped appendage, 0.044 long in male, 0.10 in female.

Male,  $42.5 \times 0.35$ ; the curved cirri 0.16 and 0.065 respectively; four præ-anal\* and four post-anal\* elongated papillæ; in front of the former on each side about 140 small rod-shaped, close-set papillæ reaching forwards 1.9 mm. from the tail end.

Female,  $56.9 \times 0.55$ ; genital orifice anterior dividing the body as 1 : 71; eggs  $0.039 \times 0.026$ .

## 28.—*Filaria tuberosa*, n.sp.

*Filaria Mansoni*, Castellani and Willey, *Spol. Zeyl.*, vol. II., 1904, pp. 79–80, pl. VI., figs. 1–6.

In the peritoneum of *Mabuia carinata*, Schneid., the Brahminy Lizard; Colombo. Larvæ in the blood.

Only two females in the collection, of which the larger measures  $34 \times 0.37$ ; tail attenuate, ending with a hemispherical dilatation, in front of which there is a papilla on each side; anus absent; head rounded without teeth and papillæ; œsophagus very short,  $\frac{1}{9}$ ; genital orifice 0.44 from head end; thin-shelled eggs  $0.018 \times 0.013$ ; ovoviviparous.

The original name of the species must be altered because Cobbold named one *F. Mansoni*, from the orbit of *Gallus gallinaceus* in 1880.

## 29.—*Filaria flavescens*, Castellani and Willey.

From *Calotes versicolor*, Dum. et Bibr.; Colombo.

*Cf.* Castellani and Willey, *imprim.*

Head rounded without teeth and lips; body attenuate and rounded behind; anus absent; œsophagus very short,  $\frac{1}{17}$  in male,  $\frac{1}{38}$  in female. Male,  $19 \times 0.33$ ; tail,  $\frac{1}{11.9}$ , with five very small post-anal papillæ; cirri, 0.16, conical with very broad base.

Female,  $56 \times 0.63$ ; genital orifice 1.97 from head end; eggs  $0.021 \times 0.016$ ; ovoviviparous.

## *Trichocephalus*.

Body strongly attenuate, œsophagus cellular, hind body thickened, anus terminal. Male with one spiculum; female genital orifice at the end of the œsophagus at the limit between the

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\* These papillæ are always paired unless otherwise given.



thin fore body and thick hind body; eggs barrel-shaped; belongs to the *Pleuromyaria*, with muscles in place of the lateral fields; in the cœcum of mammals.

30.—*Trichocephalus discolor*, n.sp.

Pl. I., figs. 13–14.

From *Bos indicus*, Colombo; said to have occurred in the stomach.

Cuticle annulate at intervals of 0.0091 mm.; contours, at the fore body, serrate.

Male white,  $45 \times 0.14$  in front, 0.55 behind; cirrus sheath spinose; cirrus long and narrow, of even width except at the rounded apex,  $1.76 \times 0.011$ ; hence not to be confounded with *T. affinis*, Rud., from *Bos taurus*.

Female,  $50 \times 0.13$  in front, 0.67 behind; fore body white, hind body yellow; eggs  $0.065 \times 0.031$ , with large spherical opercula at the poles.

*Tetradenos tiara*, v. Linst.

In *Spolia Zeylanica*, vol. I., 1904, p. 102, I described a Nematode from *Varanus bengalensis* under the name *Ctenocephalus tiara*. It happens that Tholenati gave the name *Ctenocephalus* to a Dipteron in the year 1857, and I have therefore altered the generic name of the Nematode to *Tetradenos*.

Cf. Arch. f. Naturg., Berlin, 1904, p. 301.

## II.—ACANTHOCEPHALA.

*Echinorhynchus*.

Nemathelminthes without intestine; at the head a proboscis beset with hooks which can be retracted into a proboscis sheath, alongside which are two lemnisci (fluid reservoirs); male with two testes, six cement glands ("prostate"), and a protrusible, bell-shaped bursa with penis; female with a ligament in which the placentulæ arise; the mature eggs are passed through the sphincter apparatus of the bell-shaped uterus into the vagina; the species live in the adult condition in the alimentary canal of vertebrates.

31.—*Echinorhynchus tener*, n.sp.

Pl. I., figs. 15–17.

Intestine of the Serpent Eagle, *Spilornis cheela*, Daud.; Nedun-keni, Northern Province.

Body extended very long, delicate and fragile, head feebly thickened; rostellum broad and short, thickened in front,  $0.43 \times 0.39$  (in front), the so-called "neck," 0.28, closely covered with



hooks; rostellum hooks in forty-five transverse rings with twenty hooks in each ring; hooks of the twelve anterior rings, 0·042, with a long root, those of the thirty-three posterior rings, 0·021, thorn-like without root.

Male,  $39 \times 0\cdot52$ ; the group of genital organs extends forwards 9·48 mm. from the thickened tail end.

Female,  $72 \times 0\cdot79$ ; placentulæ ovate,  $0\cdot17 \times 0\cdot097$ ; eggs with double shell, the outer shell showing wavy longitudinal lines,  $0\cdot053 \times 0\cdot023$ ; tail end after copulation carries a layer of cement substance.

### III.—TREMATODA.

#### *Lyperosomum*.

Distomids with long intestinal rami; testes behind one another and behind them lies the ovary; vitellarium on each side laterally behind the ventral sucker; genital orifice in front of latter.

#### 32.—*Lyperosomum squamatum*, n.sp.

Pl. I., fig. 18.

Œsophagus of the White-necked Stork, *Dissura episcopus*; Gould; Palatupana.

Length 4·86, breadth 1·78. Oral sucker 0·59; ventral sucker 0·87, its middle point lying at the limit of the second and third fifths of the body; the cuticle of the ventral surface alone closely beset with scales; cuticle everywhere very thick; the thickness of the body is to the width as 1:2; the Œsophagus divides after a short course into two intestinal diverticula, the epithelium of which is strongly developed; they extend to the hinder end; the genital orifice lies immediately in front of the anterior margin of the ventral sucker; behind this the two testes follow one behind the other and, behind the last testis, the small ovary with the shell-gland; the vitellaria occur as two tracts behind the ventral sucker occupying about  $\frac{1}{3}$  of the body length; the coils of the uterus lie in the posterior half of the body; the eggs are small and numerous, narrow and elongate,  $0\cdot083 \times 0\cdot036$ ; they present a large double black spot which corresponds with the two ocelli of the embryo; the cirrus sac is small, destitute of a cirrus.

#### 33.—*Distomum*, spec.?

Œsophagus of the Darter, *Plotus melanogaster*, Lin.; Wirawila.

Only one opaque specimen which could not be determined without sections, thus destroying it; moreover a single individual would not have sufficed for the investigation. The genus could therefore not be ascertained since the old genus *Distomum* has been broken up into more than 80 genera.



34.—*Distomum hepaticum*, Lin.

Liver of *Bos indicus*, [Scinde Cow] ; Colombo.

Cf. A. Railliet, *Traité de Zoologie médicale*, Paris, 1895, pp. 342–356, figs. 219–235.

The generic name *Distomum* is here adopted instead of *Fasciola*, which was established by Linnæus in 1746 for *Distomum hepaticum*, *Dendrocoelum lacteum*, and *Schistocephalus solidus*, these being taken to be one and the same species. *Fasciola*, L., is therefore a scientific impossibility, incapable of being diagnosed. The definition of *Distomum*, s. str., is as follows :—

The two intestinal rami richly branched towards the outside ; ventral sucker lying well forwards with the *porus genitalis* in front of it, the uterus and branched ovary behind ; farther back the much-branched testis and the vitellarium at the margin of the body ; parasitic in the liver of mammals.

*Paramphistomum*.

A small sucker in front, a large sucker behind ; intestinal rami long ; two testes lying obliquely one behind the other, lobate, without cirrus sac ; *porus genitalis* in front in the median ventral line with the *ductus ejaculatorius* and the uterus opening into it ; ovary and shell-gland behind the last testis ; vitellaria lateral close beneath the surface of the body ; parasitic in the stomach and bile passages of ruminants.

35.—*Paramphistomum calicophorum*, Fisch.

Stomach of *Bos indicus* ; Colombo.

Cf. F. Fischöeder, *Die Paramphistomiden der Säugethiere*, Zool., Jahrb. Syst. XVII., Jena, 1903, pp. 541–546.

36.—*Paramphistomum gracile*, Fisch.

Stomach of Ceylon black cattle (*Bos indicus*).

Cf. Fischöeder, *op. cit.*, pp. 520–524.

*Gastrothylax*.

Amphistomids with ventral pouch which commences as a transverse groove shortly behind the mouth ; genital pore inside the ventral pouch, male and female genitalia immediately in front of the caudal sucker.

37.—*Gastrothylax crumenifer*, Crepl.

Stomach of *Bos bubalus*, the country-bred buffalo of Ceylon.

Cf. Fischöeder, *op. cit.*, pp. 557–563.



*Tristomum.*

Body ovate or circular, flat, with two round suckers in front and a large, disc-shaped posterior sucker with seven rays and small rods; cerebral commissure with four ocelli; genital orifices and vagina in front on the left ventral side; testes numerous; ectoparasitic on the gills and surface of the body of marine fishes.

38.—*Tristomum megacotyle*, n.sp.

Pl. I., figs. 19-20.

From the surface of the body of a sword fish, *Histiophorus*, sp.; Beruwala, February 5, 1904.

Length 7.5, breadth 6 mm.; ventral cuticle, except on the suckers and head, thickly beset with circular papillæ, measuring 0.31 mm.

The two anterior suckers are equal to  $\frac{1}{3}$  of the body length; the caudal sucker has a diameter equal to  $\frac{1}{2}$  the body length, and shows seven radial ribs (pl. 1, fig. 19) which abut upon a central roundish area produced backwards; the sucker is bounded at the periphery by a striated border; in the posterior region of the sucker there are two straight undivided rods attenuated at the ends, 0.48 mm. long; these rods are always described as hooks in the definition of the genus *Tristomum*, but they do not deserve this name since they do not serve for attachment, but, on the contrary, for releasing the sucker from its adhesion, assuming a vertical position by the action of special muscles for this purpose.

A similar, though much larger species, also living upon *Histiophorus*, is *Tristomum læve*, Verrill = *Tr. ovale*, Goto; the length of this species amounts to 13 mm. and its breadth 12 mm.; the diameter of the anterior suckers equals  $\frac{1}{4}$  of the body length; the rays of the caudal sucker are narrow, its margin is unstriated, and the rods are expanded and irregularly laciniate at the roots.

Cf. S. Goto, Studies on the Ectoparasitic Trematodes of Japan. Journ. Coll. Science, Japan, VIII., part 1, Tokyo, 1894, pp. 241-244.

## IV.—CESTODA.

*Hymenolepis.*

Tæniids with armed scolex; proglottids generally broader than long; genital orifices marginal and unilateral; in each segment three testes; the mature uterus completely fills the proglottids; parasitic in mammals and birds.



39.—*Hymenolepis septaria*, n.sp.

Pl. II., fig. 21.

Intestine of *Upupa ceylonensis*, Reich.; Weligatta.

Length 25 ; the proglottids begin directly behind the scolex and measure, in front, 0.13 broad  $\times$  0.022 long, farther back, 0.79 broad  $\times$  0.18 long ; towards the end of the chain they become longer than broad, 0.35 broad  $\times$  0.48 long, the last member rounded ; the dorsoventral diameter is to the transverse as 2 : 3.

The scolex is short, 0.13 long  $\times$  0.22 broad, truncate in front ; suckers 0.089 ; rostellum small and knob-shaped ; hooks absent, no doubt through casual loss. On each side are two vessels, a large dorsal and a small ventral ; outside these occurs the nerve.

Bundles of longitudinal muscles appearing circular in transverse section course beneath the thick cuticle ; calcareous bodies absent.

Cirrus-sac with inner side directed obliquely ventrally ; three small oval testes lie in a row in the middle of the proglottids at the dorsal side. Vagina dorsad of cirrus sac, expanding to a large roundish *receptaculum seminis*, reaching the middle line and touching the anterior margin of the segment. Ovary strongly developed occupying the whole longitudinal extent of the segments ; ventrally a broad transverse branch from which right and left two broad cornua extend horseshoe-shaped towards the dorsal side, leaving room for the testes, the vitellarium, and the shell-gland ; the roundish vitellarium ("Dotterstock") lies in the middle line ventrad of the testes ; the small shell-gland is still more ventral in position. The uterus fills the last segments completely and is subdivided by dorsoventral septa ; the eggs have a triple membrane, the outer 0.073  $\times$  0.064, the inner 0.031  $\times$  0.023.

40.—*Hymenolepis clausa*, n.sp.

Pl. II., figs. 22-23.

Intestine of the Whistling Teal, *Dendrocygna javanica*, Horsf.; Tissamaharama.

Length 18 ; proglottids commence at once behind scolex, measuring in front 0.053 long  $\times$  0.35 broad, behind 0.47  $\times$  1.56.

Scolex small, 0.10  $\times$  0.23 ; suckers 0.10 ; rostellum hemispherical, carrying eight hooks of 0.057 length. In the parenchyme are to be found two layers of longitudinal muscles, outer small numerous bundles, inner large sparser bundles ; calcareous bodies not present ; two very large vessels traverse the chain ; outside them the nerves.

Genital pores absent ; on one and the same side in each proglottid,  $\frac{1}{7}$  of the cross-diameter distant from the margin, the



cirrus-sac (*bursa*) and vagina merge into one another directly ; three testes lie dorsally and posteriorly in each segment, the central one somewhat backwards ; cirrus-sac very large, about  $\frac{3}{5}$  of the cross-diameter of the body, containing a very long cirrus, a uniformly thin chitinous tube coiled several times ; the orifice of the cirrus-sac where it passes into the vagina is closely beset with small equal hooks. The ovary lies unsymmetrically ventrad of the vagina and cirrus-sac, a racemose body, in the centre of each follicle a black granular nucleus ; vitellarium ventral, median, transversely elongate, in front of it the round shell gland ; no eggs developed.

I agree with Wolffhügel in the opinion that the absence of genital pores is not of systematic importance, and therefore the species is assigned to *Hymenolepis*.

41.—*Hymenolepis spinosa*, n.sp.

Pl. II., figs. 24-25.

Intestine of the Painted Snipe, *Rostratula capensis*, Lin.; Vavuniya.

Length 15 mm., anterior proglottids 0.12 broad  $\times$  0.044 long ; hindmost proglottids greatly expanded at the hinder margin, 0.62 broad  $\times$  0.35 long ; all are therefore broader than long.

Scolex thickened towards the fore-body with breadth of 0.22, the foremost portion of the chain being 0.11 broad.

The rostellum carries ten hooks 0.028 long ; the hooks are slender and have a long root and small hook and lever ; genital orifices marginal and unilateral, approximately at the end of the first quarter of each member of the chain. The cirri are remarkably large, 0.14 long, 0.018 broad at the base, closely spinose. The broad cortical layer occupies on each side  $\frac{1}{4}$  of the dorsoventral diameter ; a layer of transverse muscles occurs at its inner side and inside these numerous small groups of longitudinal muscle-bundles, inside these again eight stronger bundles of longitudinal muscles ; on each side a large ventral and a smaller dorsal vessel, ectad of these, the nerve.

The large cirrus-sac occupies nearly  $\frac{2}{3}$  of the transverse diameter ; dorsad in the middle of the proglottis, three large testes, one in front beside the cirrus-sac, the two others side by side farther back. The coiled vagina lies below the cirrus-sac and expands to form a small *receptaculum seminis* which does not reach to the middle line ; the ovary lies in the middle third of the transverse diameter, behind it the vitellarium, a transverse strand of about  $\frac{1}{4}$  the cross-diameter ; the ovate shell-gland



occurs in the middle between the second and third testes. The eggs have a triple membrane, the outer irregular, 0·047; the oncosphere is 0·026 long  $\times$  0·018 broad.

*Dipylidium.*

Rostellum with several circlets of rosethorn-shaped hooks; genital pores marginal and bilateral; genital organs in each proglottid duplicated; testes numerous; parasitic in mammals.

42.—*Dipylidium caninum*, Lin.

Intestine of *Canis familiaris*; Colombo.

Cf. A. Railliet, *op. cit.*, pp. 284-290.

43.—*Tænia*, spec. ?

Intestine of *Haliastur indus*, Bodd.; Nedunkeni.

Defective fragments without scolex, indeterminable.

*Diorchis.*

Scolex with simple crown of hooks; in each member two testes; genital pores marginal and unilateral; the mature uterus fills the proglottids completely; parasitic in birds.

44.—*Diorchis occlusa*, n.sp.

Pl. II., figs. 26-27.

Intestine of the Flamingo, *Phaenicopterus roseus*, Pall.; Weligatta.

Length 75 mm.; the body is thick, ovate in cross section, the dorsoventral diameter is to the transverse as 7 : 9; formation of proglottids commences at once behind the scolex; anterior proglottids 0·40 broad  $\times$  0·018 long, posterior 0·97 broad  $\times$  0·18 long, the breadth always exceeding the length and the contours serrate.

The scolex, 0·53 broad, is triangular in profile; the rostellum is in some cases retracted, in others protracted, appearing short and broad; it carries eight hooks, 0·14 mm. long; the root-branch is shorter than the hook, in the proportion 25 : 29; at the base there is a small finger-shaped prolongation, and the concavity thus produced articulates with a roundish body, eight of which occur in a circle at the summit of the rostellum.

Genital pores absent; male and female ducts fuse together on the same side in all segments at a distance of 0·03 from the margin; radial bundles of longitudinal muscles occur not far from the cuticle; calcareous bodies are present in small quantity; on each



side a large ventral and small dorsal vessel, the latter strongly and regularly sinuate, outside these the usual nerve, round in section.

A long thin convoluted chitinous cirrus lies in the cirrus-sac, the duct is finely spinulose, and a seminal vesicle leads into the cirrus-sac ; two small oval testes,  $0.10 \times 0.06$  lie dorsally.

The wide vagina is ventral to the cirrus-sac ; it is finely spinulose internally and presents a forcipate apparatus ; it leads into a *receptaculum seminis* reaching to the middle line ; the fusiform dilatation of the vagina is  $0.042$  wide. The ovary lies ventrally in the middle third and consists of separate aggregates ; the horseshoe-shaped vitellarium lies near the dorsal side and dorsad of it, the shell-gland.

Eggs not present.

#### *Davainea.*

Scolex with hundreds of very small, generally hammer-shaped hooks in two circles ; suckers generally beset with hooks at the margin ; genital pores unilateral or irregularly alternating ; numerous testes ; eggs in capsules ; parasitic in mammals and birds.

#### 45.—*Davainea polycalcaria*, n.sp.

Pl. II., figs. 28–29.

Intestine of *Corvus macrorhynchus*, Tem. ; Colombo.

Length 65 mm. ; in front the proglottids measure  $0.03$  long  $\times$   $0.25$  broad, in the middle  $0.20 \times 1.78$ , behind  $0.99 \times 1.34$  ; they become at the end slightly narrower and longer, but always broader than long ; the scolex is button-shaped and very short,  $0.31$  broad by  $0.088$  long ; the suckers,  $0.10$ , carry several hundreds of small hooks at the margin ; the likewise very numerous hooks of the rostellum are closely packed in circlets, they are pointed and measure  $0.015$ . A transverse muscular layer marks off the broad cortical zone from the medullary layer ; ectad of the transverse muscles are numerous longitudinal muscles which do not form bundles ; calcareous corpuscles are closely packed throughout the body ; two large vessels run  $\frac{2}{100}$  of cross-diameter distant from margin and are connected by a transverse *ramus communicans* in the posterior part of the segment ; close beside them outside is the nerve. The pyriform cirrus-sac occupies  $\frac{1}{12}$  of the cross-diameter ; numerous testes occur in the medullary substance ; they are oval, about  $0.039$  by  $0.026$  ; female organs not yet developed.



*Diplochetos*, n.gen.

Genital pores marginal bilateral ; genital glands in only one group ; at the scolex a double crown of hooks ; testes numerous ; three layers of longitudinal muscles ; segments much broader than long ; uterus with ventral orifice right and left of the middle line.

46.—*Diplochetos volvulus*, n.sp.

Pl. II., figs. 30–31.

Intestine of Yellow-wattled Lapwing, *Sarciophorus malabaricus*, Bodd.; Weligatta.

Length 8.5 ; anterior segments 0.018 long  $\times$  0.21 broad, middle segments 0.10  $\times$  0.40, posterior 0.37  $\times$  0.70, always broader than long. The pyriform scolex is 0.35 broad  $\times$  0.26 long ; the rostellum carries twenty-four hooks in two circles of twelve, the hooks 0.047 long ; in the parenchyme are three layers of longitudinal muscle-bundles, which become stronger towards the interior ; on each side two strongly sinuate vessels, the dorsal larger ; the nerve runs along much nearer the margin ; calcareous deposits not present. Genital pores marginal, right and left in each proglottid ; the cirrus-sac occupies  $\frac{1}{5}$  of the cross-diameter and contains coils of the *vas deferens* ; entad of the cirrus-sac occur extensive convolutions of the *vas deferens* ; the vagina lies ventral to the cirrus-sac and expands into an irregularly shaped *receptaculum seminis* which reaches about  $\frac{1}{3}$  of the cross-diameter. In each transverse section about ten oval testes are to be found. The ovary lies in the inner third of the medullary substance and consists of separate follicles ; the round vitellarium lies ventrally in the middle ; the site of the uterus breaks through the musculature and parenchyme ventrally about  $\frac{1}{3}$  of the cross-diameter from the margin, sometimes to the right, sometimes to the left without opening to the exterior ; I have not found it in full development. The eggs are 0.016 long  $\times$  0.013 broad. Other Tæniid genera with biserial genital pores are the following :—

*Diploposthe*, with simple hook-crown and three testes in each segment.

*Amabilia*, with double cirrus-sac and simple vagina opening ventrally.

*Diplophallus*, with double male organs and simple female organs.

*Dipylidium*, with several rings of hooks on the rostellum and elongate segments.

The large genera from ruminants and rodents do not concern the question.



*Ophryocotyle.*

Scolex without rostellum, with five depressions, the margins of which are beset with numerous small hooks; the margins of the suckers are also armed with numerous small hooks; genital pores marginal, irregularly alternating or bilateral; parasitic in birds.

47.—*Ophryocotyle zeylanica*, n.sp.

Pl. II., figs. 32–34.

Intestine of the Ceylonese Hornbill, *Lophoceros gingalensis*, Shaw; Nedunkeni, Northern Province.

Length 55; anterior proglottids 0.035 long  $\times$  0.097 broad, posterior 0.12 long  $\times$  0.70 broad. Scolex, 0.29 long  $\times$  0.19 broad, club-shaped, the so-called neck behind it, strongly attenuate, 0.079 broad; no rostellum; the suckers occur laterally behind the middle of the scolex; the inner ring enclosing the lumen is beset with very numerous hooks; at the apex two parallel loops forming five finger-shaped rays whose margins are beset with very numerous small thorn-like hooks without root and lever, measuring 0.0053.

The cortical zone is very wide and separated from the medullary zone by a transverse muscular layer, outside of which are regularly placed large bundles of longitudinal muscles and farther outside numerous, irregularly grouped, smaller bundles; two large vessels run ventral in the medullary layer forming a posterior anastomosis in each segment; the nerve occurs near the transverse muscles. In the layer between the subcuticular cells and the outer longitudinal muscles lie calcareous bodies. Genital pores marginal bilateral at the anterior lateral margin of the segment; cirri protruded, 0.19 long and 0.035 broad at the base, they are finely spinulose; cirrus-sac carries outwardly longitudinal muscles, thereunder circular muscles; it occupies almost  $\frac{1}{4}$  of the cross-diameter; numerous testes lie in the medullary substance, about twelve appearing in a transverse section; the *vas deferens* is coiled and leads into a sigmoid seminal vesicle which has a narrow lumen and a very thick hyaline wall.

The vagina courses ventral from the cirrus-sac and the *receptaculum seminis* reaches almost to the middle of the segment; the ovary consists of large isolated cells and occupies a large place in the medullary substance, not forming a closed body; the vitellarium abuts ventrally upon the transverse muscles and is a roundish body of  $\frac{1}{12}$  the size of the cross-diameter; the eggs are 0.036 by 0.029.

The genus *Ophryocotyle* hitherto comprised three species:—*O. proteus*, Friis (1869), from *Tringa*, *Callidris*, *Charadrius*, and



*Larus*; *O. Lacazei*, Villot (1875), from *Limosa*; and *O. insignis*, Lönnerberg (1880), from *Hæmatopus* and *Mergus*.

Friis and Villot describe at the apex of the scolex five distinct suckers in a row armed with hooks, whereas Lönnerberg speaks of undulating loops; in *O. proteus* and *O. insignis* the genital pores alternate irregularly; the similarity in the formation of the scolex seemed to require that the species here described should be placed in the genus *Ophryocotyle*.

*Brochocephalus*, n.gen.

Scolex with long rostellum with six backwardly directed loops of hooks; genital pores marginal, regularly alternating; cirri large, strongly and closely spinulose; no *réceptaculum seminis*; three testes in each segment; segments (proglottids) broader than long; eggs two-shelled, the inner shell narrowed at the poles.

48.—*Brochocephalus paradoxus*, n.sp.

Pl. II., figs. 36 and 38; Pl. III., figs. 35 and 37.

Duodenum of the Lesser Sand Plover, *Ægialitis mongolica*, Pall.; Weligatta.

Length 85 mm.; without "neck;" anterior proglottids 0.062 broad  $\times$  0.0088 long, posterior 0.75 broad  $\times$  0.18 long, always much shorter than wide; scolex with four suckers and long protruded knobbed rostellum, 0.10 long  $\times$  0.062 broad in front; at the apex six backwardly directed tracts of thirteen hooks each, *i.e.*, seventy-eight hooks in all; the hooks are slender with very small hook and lever, measuring 0.029.

Two layers of longitudinal muscle-bundles are seen in cross-section under the cuticle; on each side two vessels, the larger forming a posterior anastomosis in each segment; the nerve runs near the margin. Genital pores marginal and almost regularly alternating, rarely two follow on the same side; no calcareous deposits. Cirri very large, broad and spinulose, as long as half the cross-diameter of the proglottid; the large muscular cirrus-sac is expanded outwardly and occupies about  $\frac{1}{3}$  of the cross-diameter; three small ovate testes in the middle line, one in front, the others symmetrical behind it; behind the testes a transverse vitellarium occupying  $\frac{1}{8}$  of the cross-diameter; the ovary surrounds the testes in the middle third; vagina and cirrus-sac lie between the two vessels; the eggs are elliptical and two-shelled; outer membrane 0.081  $\times$  0.047, oncosphere spherical; the inner thick shell is narrowed at the poles.

The genus *Gyrocœlia* shows a zigzag line, interrupted at eight points, with forty hooks on the rostellum; four testes in each segment, and the spherical eggs have two appendices.



*Cittotænia.*

Both the genital organs and their ducts are duplicated in each segment ; proglottids broader than long ; scolex unarmed ; uterus transverse ; eggs with pyriform apparatus ; parasitic in rodents.

49.—*Cittotænia bursaria*, n.sp.

Pl. II., figs. 39-40.

Intestine of *Lepus nigricollis*, Cuv. ; Nedunkeni.

No complete examples were present in the collection, the largest fragments measuring 55 mm. in length. The body is broad, rounded in front ; no "neck" ; anterior segments 0.20 long  $\times$  5 broad, posterior 1.34 long  $\times$  7 broad. The scolex is not protruding ; the four suckers measure 0.14 in diameter ; rostellum absent. In the parenchyme, two layers of longitudinal muscles, transverse muscles and many dorsoventral muscles ; on each side two longitudinal vessels, ventral larger, dorsal smaller ; outside these, the nerve ; no calcareous bodies. In each segment there are two groups of genital organs, each occupying  $\frac{1}{5}$  of the cross-diameter and having their several ducts. The cirri protrude behind the middle of the margin of the proglottid ; they measure 0.44 long  $\times$  0.035 broad at the base ; the cirrus-sacs are short and club-shaped ; entad of them lies a fusiform *bursa ejaculatoria* provided with longitudinal and circular muscles ; entad of this a fusiform seminal vesicle and still further inwards a convoluted *vas deferens* ; the very numerous spherical testes, 0.044 diameter, are distributed through the entire proglottids without forming two lateral groups. The vagina is broad, with high endothelium, expanding to a large *receptaculum seminis* ; it runs ventrad of the cirrus-sac ; entad of the receptaculum and ventral in position lies the roundish ovary surrounding the vitellarium.

The uterus traverses the proglottid from right to left and has roundish protuberances in front and behind ; eggs round, 0.078, with triple membrane ; the inner membrane forms the so-called pyriform apparatus ; the spherical oncosphere measures 0.014.

*Ichthyotænia.*

Scolex unarmed with four suckers, and often a fifth apical sucker ; genital pores marginal, irregularly alternating, testes numerous ; the vagina forms coils at the posterior margin of the proglottids in the middle, which replace a *receptaculum seminis* ; parasitic in fishes and reptiles.



50.—*Ichthyotænia cryptobothrium*, n.sp.

Pl. III., figs. 41-42.

Intestine of *Chrysopelea ornata*, Russell, a tree-snake; Kuru-negala.

Length 130 mm.; head end rounded, scolex retracted, the four suckers being found only in transverse sections surrounded by a parenchyme-ring with eight vessels; the suckers extend 0.40 mm. backwards; their lumen communicates outwardly by two lacunæ, a dorsal and a ventral, which ceases in the midst of the suckers; a median plug projects freely.

The anterior proglottids are very short, 0.02 long  $\times$  1.00 broad; the middle are 0.59 long  $\times$  1.69 broad; the posterior 2.48 long  $\times$  0.87 broad, much longer than broad; the last proglottid is rounded behind.

Calcareous bodies sparsely distributed; two layers of longitudinal muscle-bundles parallel with the cuticle traverse the parenchyme, outer thinner numerous bundles, inner thicker and sparser; at the margin on each side run two vessels, ventral stronger, dorsal thin and highly sinuous; outside these the stout nerve.

The genital pores are marginal and irregularly alternating in the anterior third of the margin of the proglottid. The cirrus is small, rod-shaped and plain; the cirrus-sac occupies  $\frac{1}{7}$  of the cross-diameter; the genital sinus is retracted; the *vas deferens* forms abundant coils reaching to the middle of the cross-diameter; the numerous testes lie in a transverse row in the dorsal half of the medullary substance and measure 0.052 to 0.065. The vagina runs ventral straight inwards; ventrad of the ovary it forms numerous coils as equivalent of a *receptaculum seminis*.

The ovary consists of very large cells and occupies scarcely  $\frac{1}{4}$  of the cross-diameter; dorsal lies the roundish *vitellarium* ventral to which the shell-gland is applied and ventral to this a *haustorium* (Schluckapparat). The spherical eggs have a double membranous shell, measuring 0.047 to 0.052.

*Aphanobothrium*, n.gen.

Body broad and thick like a *Schistocephalus* larva, with short posteriorly acute-angled proglottids; in the frontal region a dorsoventral slit leading to five suckers; destitute of scolex and hooks; genital organs simple, ducts double, marginal; the uterus discharges ventral in the middle line; cortical layer broad; cirrus closely beset with hooks; on each side two vessels, the larger with transverse anastomosis; ovary resolved into coils which lie dorsoventral and transverse; belongs to the Anoplocephalinæ.



51.—*Aphanobothrium catenatum*, n.sp.

Pl. II., figs. 43 and 46 ; Pl. III., figs. 44, 45, and 47.

Duodenum of the Flamingo, *Phoenicopterus roseus*, Pall.; Weligatta.

Length up to 135 mm.; breadth 9–10 mm.; body attenuated in front, truncate behind and very thick; the dorsoventral diameter is to the cross-diameter as 9 : 20; anterior end rounded and retracted in the middle and confined by arching cross lines; scolex not visible externally; proglottids sharply delimited, at first 0·20, then 0·27, behind 1·18 long. The middle  $\frac{2}{3}$  of the body width are, dorsally and ventrally, occupied by five longitudinal rows of flat dells which are also disposed in transverse rows; posteriorly these deepen into small grooves; the cortical layer is to the medullary substance dorsoventral as 2 : 5; in the tissue occur oval calcareous bodies measuring on the average  $0\cdot018 \times 0\cdot012$ . Under the cuticle are circular and longitudinal muscles; a strong transverse muscular layer divides the cortex from the medullary substance; in the cortex run radial bundles of longitudinal muscles; on each side two vessels run close together, dorsal a smaller thick-walled vessel, ventral a larger thin-walled; the latter forms in each proglottid a strongly sinuous cross-anastomosis; the longitudinal nerve-trunk runs close outside the vessels.

The scolex is retractile; in transverse sections 0·05 to 0·07 mm. from the frontal point are found four suckers of 0·10 diameter, and a fifth in the middle; these are circular and open outwards through a dorsoventral slit. The cirrus,  $0\cdot39 \times 0\cdot079$  (0·12 broad at the base), is regularly beset with hooks like the rostellum of an *Echinorhynchus*, arranged in transverse rings of sixteen each; it protrudes from a hemispherical protuberance; the cirrus-sac occupies  $\frac{1}{4}$  of the cross-diameter; the numerous round testes of 0·26 diameter lie in the medullary substance approximated to the transverse muscles.

The vagina runs dorsad of the cirrus-sac; both lie between the vessels. The ovary consists of strands extending from the dorsal to the ventral side and then bending inwards where they unite in a short transverse branch; dorsad of this lies the radiate shell-gland, and dorsad of the latter the small vitellarium consisting of nodular strands; the ovarian cells are 0·013 large, those of the vitellarium 0·0052; only the efferent duct of the uterus was developed, perforating the transverse muscles ventral in the middle line; eggs not yet present.



EXPLANATION OF PLATES

*Illustrating Dr. von Linstow's Paper on Helminthes of Ceylon.*

*g.* vessel ; *n.* nerve ; *c.* cirrus-sac ; *vd.* vas deferens ; *h.* testis ;  
*v.* vagina ; *rs.* receptaculum seminis ; *k.* ovary ; *d.* vitellarium ;  
*u.* uterus ; *s.* male seminal vesicle ; *sch.* shell-gland ; *schl.* haus-  
torium.

PLATE I.

- Fig. 1.—*Ascaris fissicollis*. Dorsal lip.  
Fig. 2.—Same. Accessory lip.  
Fig. 3.—*Ascaris coronata*. Dorsal lip with accessory lips.  
Fig. 4.—*Physaloptera brevispiculum*, ♂. Tail from below.  
Fig. 5.—*Spiroptera secretoria*. Head ; *f.* free projecting secretory  
filament.  
Fig. 6.—*Spiroptera orca*, ♂. Tail from below.  
Fig. 7.—Same, ♀. Immature egg.  
Fig. 8.—Same. Mature egg.  
Fig. 9.—*Heterakis pusilla*, ♂. Tail from below.  
Fig. 10.—*Strongylus digitatus*, ♂. Tail from below.  
Fig. 11.—*Ankylostomum minimum*. Head from the right side.  
Fig. 12.—Same, ♂. Tail from the right side.  
Fig. 13.—*Trichocephalus discolor*, ♂. Tail from right side.  
Fig. 14.—Same, ♀. An egg.  
Fig. 15.—*Echinorhynchus tener*. Anterior hook of rostellum.  
Fig. 16.—Same. Posterior hook.  
Fig. 17.—Same. An egg.  
Fig. 18.—*Lyperosomum squamatum*, from below.  
Fig. 19.—*Tristomum megacotyle*, from below.  
Fig. 20.—Same. Rod from the caudal sucker.

PLATES II. AND III.

- Fig. 21.—*Hymenolepis septaria*. Transverse section.  
Fig. 22.—*Hymenolepis clausa*. Transverse section.  
Fig. 23.—Same. Hook.  
Fig. 24.—*Hymenolepis spinosa*. Transverse section.  
Fig. 25.—Same. Hook.  
Fig. 26.—*Diorchis occlusa*. Transverse section.  
Fig. 27.—Same. Hook.  
Fig. 28.—*Davainea polycalcaria*. Transverse section.  
Fig. 29.—Same. Hook.  
Fig. 30.—*Diplochetos volvulus*. Transverse section ; on one  
side the vas deferens is figured, on the other the vagina.



Fig. 31.—Same. Hook.

Fig. 32.—*Ophryocotyle zeylanica*. Transverse section ; on the one side the male organs are figured, on the other the female.

Fig. 33.—Same. Scolex from the frontal surface.

Fig. 34.—Same. Hook.

Fig. 35.—*Brochocephalus paradoxus*. Horizontal section ; this figure is reproduced on Plate III.

Fig. 36.—Same. Rostellum in side view.

Fig. 37.—Same. Hook (on Pl. III.).

Fig. 38.—Same. An egg.

Fig. 39.—(Pl. II.). *Cittotænia bursaria*. Portion of a transverse section ; s. I. Bursa ejaculatoria ; s. II. Seminal vesicle.

Fig. 40.—(Pl. II.). Same. An egg.

Fig. 41.—(Pl. III.) *Ichthyotænia cryptobothrium*. Transverse section through the scolex, 0.30 mm. from the apical point.

Fig. 42.—(Pl. III.). Same. Transverse section.

Fig. 43.—(Pl. II.) *Aphanobothrium catenatum*. Head end in flat view.

Fig. 44.—(Pl. III.). Same. Head end in frontal view.

Fig. 45.—(Pl. III.) Same. Transverse section through the retracted suckers.

Fig. 46.—(Pl. II.). Same. Surface view of posterior end.

Fig. 47.—(Pl. III.). Same. Portion of a transverse section.

N.B.—The remaining figures are on Pl. III.

Fig. 48.—*Ascaris brachycheilos*. Dorsal lip.

Fig. 49.—*Heterakis granulosa*, ♂. Tail from below.

Fig. 50.—*Oxysoma falcatum*. Head end.

Fig. 51.—Same, ♂. Tail from right side.

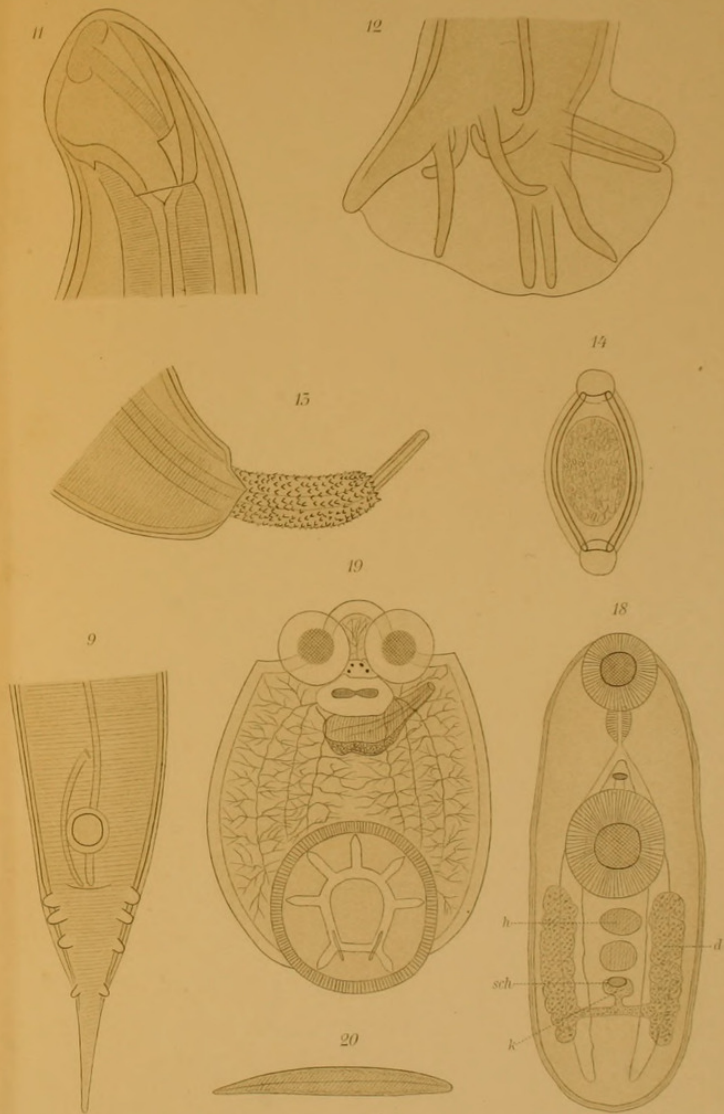
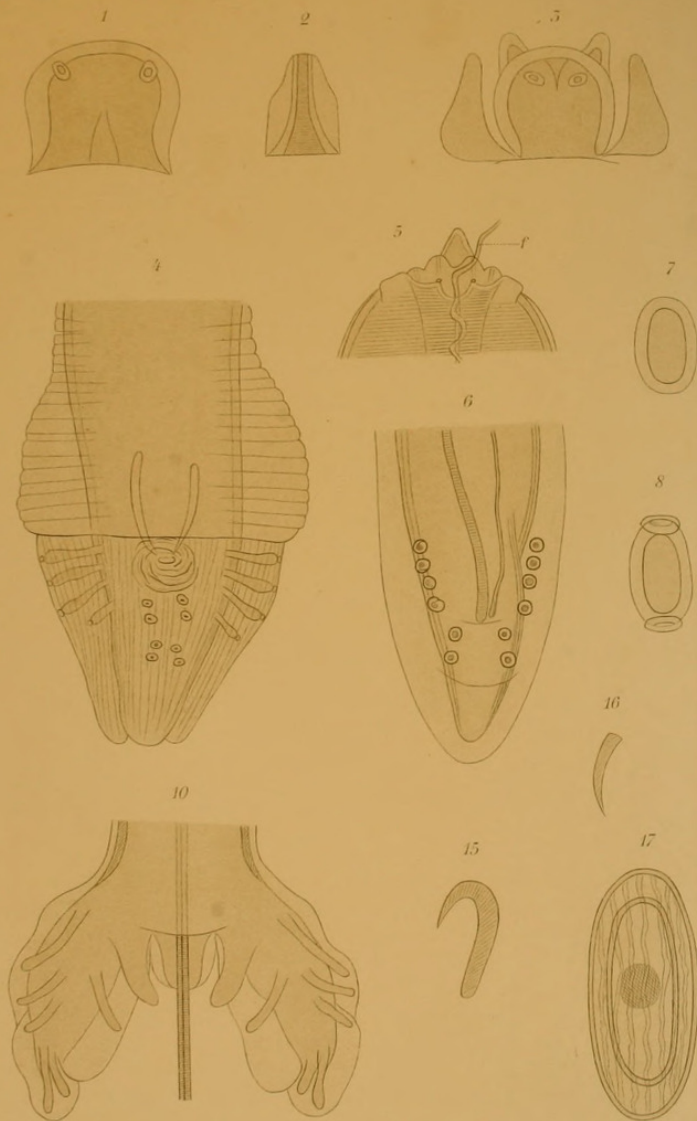
Fig. 52.—*Filaria digitata*. Head end.

Fig. 53.—Same. Tail end of male from right side.

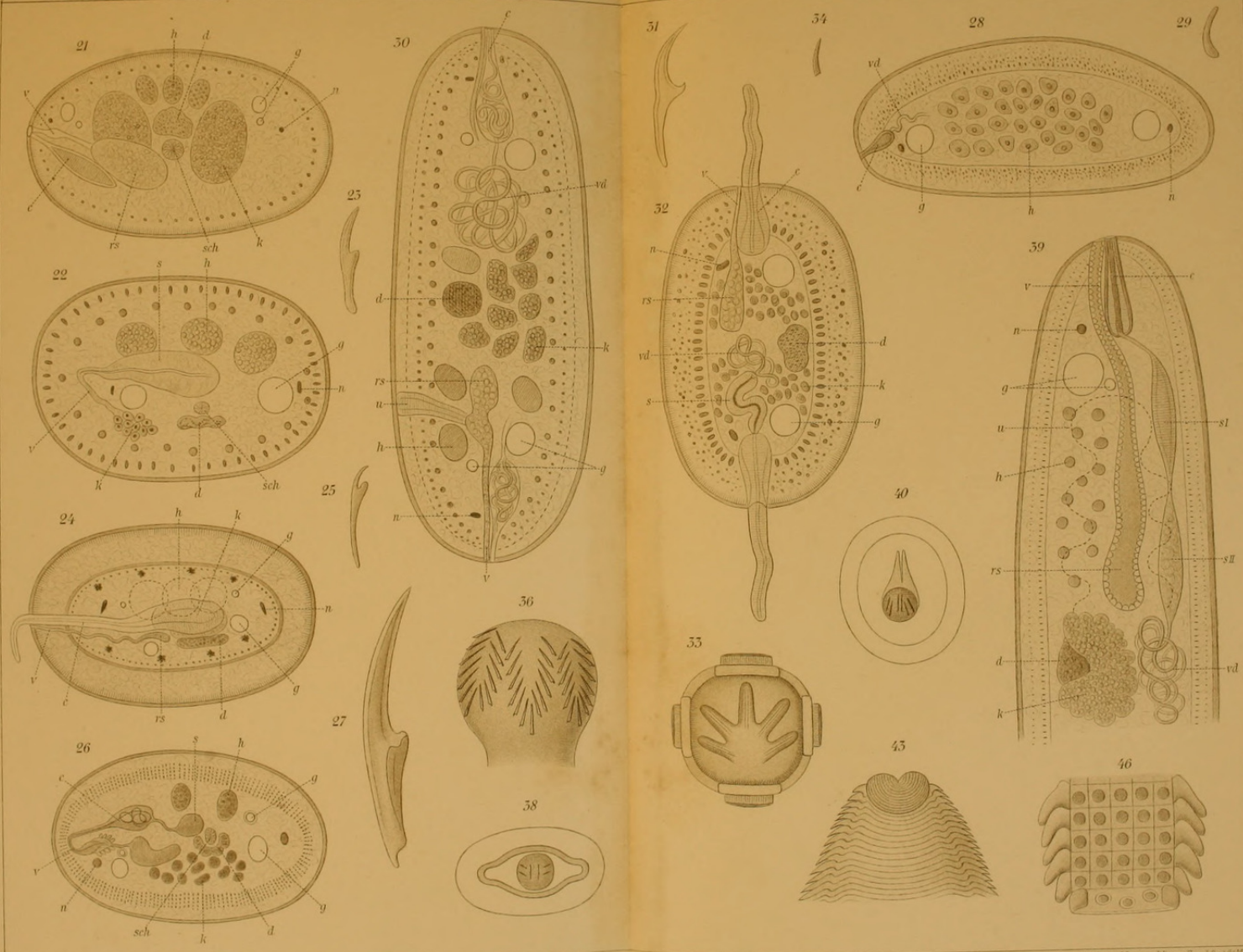
Fig. 54.—Same. Tail points of male from below.

Fig. 55.—Same. Tail points of female from below.



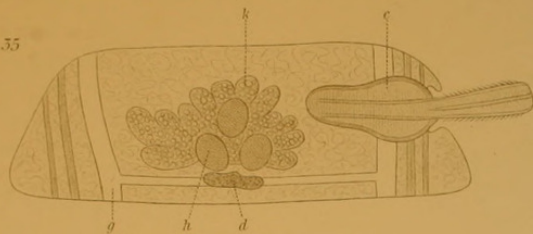








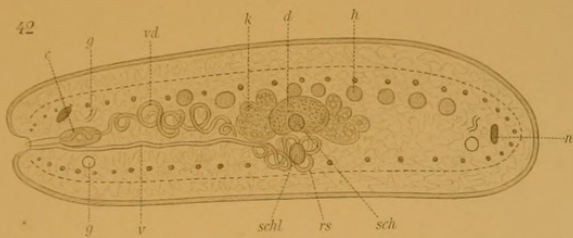
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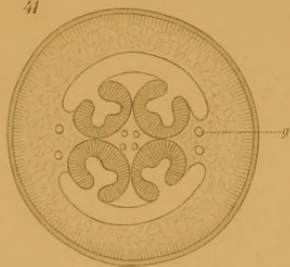
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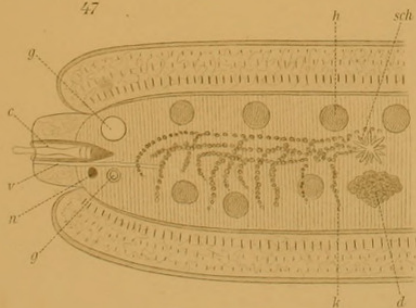
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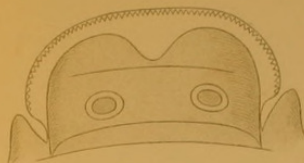
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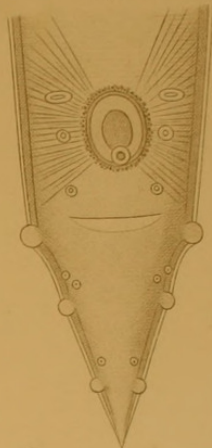
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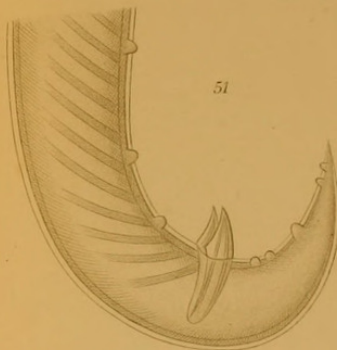
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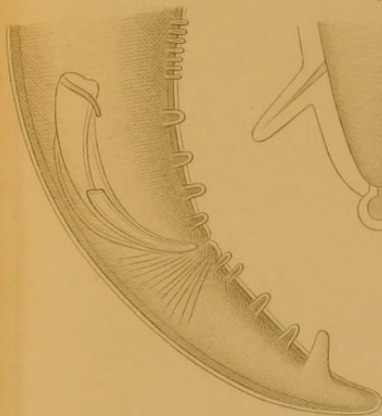
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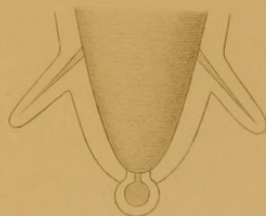
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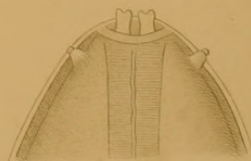
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