

List of entozoa, including pentastomes, from animals dying at the Society's menagerie, between the years 1857-60 inclusive, with descriptions of several new species / by T. Spencer Cobbold, M.D.

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Zoological Society of London.
University of Glasgow. Library

Publication/Creation

[England], [1861]

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[From the PROCEEDINGS of the ZOOLOGICAL SOCIETY of LONDON,
March 26, 1861.]

LIST OF ENTOZOA, INCLUDING PENTASTOMES, FROM ANIMALS
DYING AT THE SOCIETY'S MENAGERIE, BETWEEN THE YEARS
1857-60 INCLUSIVE, WITH DESCRIPTIONS OF SEVERAL NEW
SPECIES. BY T. SPENCER COBBOLD, M.D., F.L.S.

(Plate XX.)

During the interval above-mentioned I find that 122 different animals have been specially examined by me with reference to the presence or absence of Entozoa. This number of individuals represents upwards of 100 distinct species, 38 of which (or, in round numbers, about one-third) were found infested. Of these 38 there are 19 mammals, 14 birds, and 5 reptiles. The mammalia harboured 6 trematodes, 8 cestodes, 5 nematodes, and 1 species of pentastome,—larval and immature forms being included. The birds contained 2 trematodes, 6 cestodes, and 14 nematodes; whilst the reptiles were infested by 2 flukes, 1 tape-worm, 6 round-worms, 1 acanthocephalous helminth, and 1 pentastome. Altogether I have found in 38 vertebrate species no less than 51 different forms of Entozoa, comprising 10 trematodes, 15 cestodes, 23 nematodes, 1 acanthocephalous entozoon, and 2 pentastomes.

In very few instances can these parasites be said to have been the entire cause of death; but in several cases they manifestly contributed to bring about that result, and in one instance their presence was the sole cause of death. This was evident in a Ring-tailed Lemur

from Madagascar, where the thorax and liver were crammed with a very singular form of *Cœnurus*: the several bunches or colonies of them in the right side of the chest had caused a remarkable atrophy of the right lung, that of the left side being also much diminished in bulk. The liver was similarly affected.

In all cases I have been careful to ascertain, as far as possible, whether or not the several species of Entozoa found by me were previously known to science; I mention this because I have no wish to imitate those who take little trouble on this score, and carefully describe every parasite as new, which may haply or otherwise come within their possession. Excluding pentastomes, 31 of the following are adult forms, and yet only 11 of these proved new to science; a few of the latter being peculiar and of great interest.

Order I. TREMATODA.

1. DISTOMA COMPACTUM, Cobbold.

Five examples in the left lung of an Indian Ichneumon (*Viverra mungos*, L.), which had lived in the Society's Gardens about twelve months. Examined Feb. 19, 1857.

Cabinet Collection, T. S. C. no. 67.

Desc. Linn. Trans. xxii. p. 363. t. 63. f. 1-3.

2. BILHARZIA MAGNA, Cobbold.

A solitary specimen in the portal blood of the Sooty Monkey (*Cercopithecus fuliginosus*). Ex. Dec. 4, 1857.

Cab. Coll. T. S. C. no. 57.

Desc. Linn. Trans. *l. c.* p. 364. t. 63. f. 8, 9; Synopsis of Distomidæ, Proc. Linn. Soc. v. p. 31.

3. DISTOMA CONJUNCTUM, Cobbold.

Numerous examples in the biliary ducts of an American Red Fox (*Canis fulvus*). Ex. Dec. 24, 1858.

Cab. Coll. T. S. C. no. 88.

Desc. In Synops. Distom., Proc. Linn. Soc. v. p. 8; figs. will be given in Linn. Trans. xxiii. pt. 2.

4. DISTOMA MINUTUM, Cobbold.

Multitudes, scarcely perceptible to the naked eye, in the duodenal mucus of an Oyster-catcher (*Hæmatopus ostralegus*, L.). Ex. Feb. 19, 1857.

Desc. Linn. Trans. xxii. p. 364. t. 63. f. 4, 5.

5. DISTOMA ÆQUALE, Dujardin.

Nine examples detected in the intestines of an American Barn Owl (*Strix perlata*). Ex. Jan. 8, 1858.

Cab. Coll. T. S. C. no. 60.

Note. Linn. Trans. *i. c.* p. 365; Synops. Dist., P. L. S. v. p. 14.

6. *DISTOMA BOSCHII*, Cobbold.

Numerous specimens in the mouth, trachea, and lungs of an American species of *Coluber*, which died from cancer of the stomach.

Cab. Coll. T. S. C. no. 70.

Desc. Linn. Trans. *l. c.* p. 364. t. 63. f. 6, 7. Synops. Dist. in P. L. S. v. p. 19.

7. *DISTOMA CORONARIUM*, Cobbold.

Corpus lineare, depressum, retrorsum parum attenuatum; collum continuum; caput obconicum; os terminale globosum, limbo echinato, spinis ad numerum 24; acetabulum ore duplo minus, apertura circulari.

Long. $\frac{1}{4}$, crassit. $\frac{1}{35}$ unc.

Numerous examples from the intestines of an Alligator (*Alligator mississippiensis*). Ex. Dec. 25, 1860.

Cab. Coll. T. S. C. no. 91.

*Larval and immature Trematoda.*8. *CERCARIA CERVI*.

Numerous degenerated examples in the liver of an Axis Deer (*Cervus axis*). Ex. Feb. 19, 1857.

9. *CERCARIA MACACI*.

Several specimens in the liver of *Macacus radiatus*. Ex. Feb. 19, 1857.

10. *CERCARIA CERCOPITHECI*.

One example in the liver of the Sooty Monkey (*Cercopithecus fuliginosus*). Ex. Dec. 4, 1857.

Order II. CESTODA.

1. *TÆNIA PUSILLA*, Goeze.

A single specimen, upwards of 20 inches in length, in the intestine of a Rat (*Mus rattus*) destroyed in the Society's Gardens. Ex. Jan. 7, 1859.

2. *TÆNIA PARADOXA*, Rudolphi.

Numerous examples in the duodenum of the Oyster-catcher (*Hæmatopus ostralegus*, L.). Ex. Feb. 19, 1857.

Note. Linn. Trans. xxii. t. 63. f. 16-19.

3. *TÆNIA MULTIFORMIS*, Creplin.

Ten or twelve specimens from the small intestines of the Night Heron (*Ardea nycticorax*). Ex. Jan. 2, 1858.

Note. Linn. Trans. *l. c.* p. 365. t. 63. f. 23.

4. TÆNIA INFUNDIBULIFORMIS, Goeze.

Numerous proglottides, but only one head, found in the intestines of the Horned Pheasant (*Phasianus* — ?). Ex. Jan. 15, 1858.

Cab. Coll. T. S. C. no. 63.

Note. Linn. Trans. *l. c.* p. 365. t. 63. f. 25.

5. TÆNIA LANCEOLATA, Bloch.

Several specimens in the intestines of the Dusky Duck (*Anas obscura*). Ex. Jan. 30, 1858.

Note. Linn. Trans. *l. c.* t. 63. f. 20.

6. TÆNIA LÆVIS, Bloch.

Numerous proglottides and fragments, probably of this species, in the intestines of *Anas obscura*, associated with the above.

Larval, immature, and imperfect Cestoda.

7. CÆNURUS LEMURIS.

Several multilocular masses or colonies occupied the lungs and liver of the Ring-tailed Lemur of Madagascar (*Lemur maco*), and had caused the death of the animal, which had been only four months in the Society's possession. Ex. Jan. 1, 1858.

Desc. Linn. Trans. *l. c.* p. 365. t. 63. f. 12-15.

8. ACEPHALOCYSTIS MACACI ?

A single example, floating in some serous fluid within the left cavity of the thorax of a Macaque (?). Length $\frac{1}{4}$ of an inch; breadth $\frac{1}{12}$ inch. Ex. Jan. 8, 1858.

9. ACEPHALOCYSTIS OVIS TRAGELAPHI.

A solitary specimen filled with a clear serous fluid. Probably an aborted *Cœnurus*. Spherical; 1 inch in diameter. Ex. Jan. 8, 1858.

10. ECHINOCOCCUS ALTRICIPARIENS, Küchenmeister.

Several large cysts filled with the brood of this entozoon in the lungs of the Four-horned Antelope (*Antilope quadricornis*). Ex. Feb. 19, 1858.

Cab. Coll. T. S. C. no. 79.

Note. Linn. Trans. *l. c.* p. 266.

11. LIGULA COLUBRI BLUMENBACHII.

Several specimens in the abdominal cellular tissue and lateral muscles. Ex. Jan. 1, 1858.

Note. Linn. Trans. *l. c.* p. 366. t. 63. f. 31.

12. CESTOIDEUM AMADINÆ.

Numerous proglottides and fragments of a *Tænia* in the intestines of *Amadina cucullata* from Western Africa.

13. CYSTICERCUS TENUICOLLIS.

Two specimens attached to the mesentery of a Spring-Bok (*Gazella euchore*). Ex. April 22, 1859.

14. CYSTICERCUS PHACOCHÆRI ÆTHIOPICI.

One example in a cyst near the colon. Ex. Dec. 19, 1859.

Desc. Proc. Zool. Soc. for March 12, 1861, with figs.

15. CYSTICERCUS POTAMOCHÆRI PENICILLATI.

One example from the liver, and four from the mesentery. Ex. Nov. 16, 1860.

Cab. Coll. T. S. C. no. 94.

Desc. Proc. Z. S. l. c. *supra*, with figs.

Order III. NEMATODA.

1. ASCARIS RETUSA, Rudolphi.

Several examples in the rectum of the Weasel-headed Armadillo (*Dasypus sexcinctus*). Ex. Jan. 15, 1858.

Cab. Coll. T. S. C. no. 81.

Note. Linn. Trans. l. c. p. 365. t. 63. f. 22.

2. STRONGYLUS PARADOXUS, Mehlis.

Three specimens in the bronchial tubes of a Peccary (*Dicotyles torquatus*). Ex. Jan. 22, 1858.

Note. Linn. Trans. l. c. p. 365. t. 63. f. 28.

3. TRICHOSOMA AËROPHILUM, Creplin.

Two individuals in the bronchi of an American Red Fox (*Canis fulvus*). Ex. Dec. 24, 1858.

Note. An egg will be figured in Linn. Trans. xxiii. pt. 2.

4. TRICHOCEPHALUS AFFINIS, Rudolphi.

Numerous examples in the cæcum and colon of a young Giraffe (*Camelopardalis giraffa*). Ex. Dec. 3, 1859.

Cab. Coll. T. S. C. no. 85 & 85 a.

Desc. Will be given in Linn. Trans. xxiii. pt. 2, with several figs. and woodcuts. See also Zool. Soc. Proceed. for Feb. 14, 1860.

5. SPIROPTERA OBTUSA, Rudolphi.

Numerous examples in the stomach of a Mouse (*Mus musculus*), accidentally trod upon in the Society's Gardens. The abdomen was greatly distended from their presence. Ex. Dec. 14, 1860.

6. EUSTRONGYLUS PAPILLOSUS, Diesing.

Three examples within the mouth of the Sarus Crane (*Grus antigone*). Ex. Jan. 16, 1858.

Cab. Coll. T. S. C. no. 78.

Note. Linn. Trans. xxii. p. 365. t. 63. f. 24.

7. TRICHOSOMA LONGICOLLE, Rudolphi.

Three specimens of a nematode from the intestines of the Horned Pheasant (*Phasianus* —?), probably referable to this species. Ex. Jan. 15, 1858.

Cab. Coll. T. S. C. no. 82.

8. ASCARIS VESICULARIS, Froelich.

The cæca of a Ring-necked Pheasant (*Phasianus torquatus*) were crowded with this species, the females being much more abundant than the males. Ex. Jan. 15, 1858.

Cab. Coll. T. S. C. no. 34 a.

Note. Linn. Trans. *l. c.* p. 365. t. 63. f. 21.

A few examples also in the cæca of a Black-backed Kaleege (*Euplocomus melanotis*) bred in the Society's Gardens. Ex. Dec. 14, 1858.

Multitudes also in the cæca of a Cheer Pheasant (*Phasianus wallichii*). Ex. Dec. 31, 1858.

9. ASCARIS DISPAR, Schrank.

Several examples in the cæca of the Sandwich Island Goose (*Bernicla sandwichensis*), associated with two other kinds of nematode. Ex. Jan. 30, 1858.

Cab. Coll. T. S. C. no. 75.

Note. Linn. Trans. *l. c.* t. 63. f. 26, 27.

10. TRICHOSOMA BREVICOLLE, Rudolphi.

Several specimens in the intestines of *Bernicla sandwichensis*, associated with the foregoing.

Cab. Coll. T. S. C. no. 76.

11. SPIROPTERA CRASSICAUDA, Creplin.

One individual in the intestines of *Bernicla sandwichensis*, along with the above.

12. ASCARIS TRIBOTHRIOIDES, Cobbold.

Two specimens in the intestines of the Dusky Duck (*Anas obscura*), associated with two kinds of Tæniæ. Ex. Jan. 30, 1858.

Desc. Linn. Trans. *l. c.* p. 365. t. 63. f. 10, 11.

13. ASCARIS DEPRESSA, Rudolphi.

One specimen in the stomach of the Bearded Vulture (*Gyps barbatus*). Ex. Jan. 31, 1859.

14. STRONGYLUS TUBIFEX, Nitzsch. (Pl. XX. f. 1, 2.)

Two specimens, one in the proventriculus and the other in the small intestine of an Ashy-headed Goose (*Chloephaga poliocephala*, Gray). Ex. Dec. 24, 1858.

15. STRONGYLUS NODULARIS, Rudolphi. (Pl. XX. f. 3, 4.)

Numerous specimens in the proventriculus of *Chloephaga poliocephala*, associated with the above.

16. *STRONGYLUS ACUTICAUDATUS*, Cobbold. (Pl. XX. f. 5, 6.)

Caput angustatum obtusum, nudum; corpus flexuosum, compressiusculum; bursa maris biloba, subterminali, magna, lobo singulo quinquerradiato; extremitate caudali maris acuta; cauda feminae subulata recta, apice acuminata.

Longit. mar. $\frac{1}{2}$ – $\frac{3}{4}$, fem. $\frac{1}{2}$, crassit. $\frac{1}{75}$ unc.

Numerous examples in the cæca of *Chloephaga poliocephala*, associated with the foregoing.

17. *STRONGYLUS SPICULATUS*, Cobbold. (Pl. XX. f. 7, 8.)

Ascaris strongylina, Rudolphi, Dujardin, Diesing.

Caput conicum, nudum; corpus æquale, flexuosum; bursa maris biloba, lobis flabellatim multiradiatis; extremitate caudali maris longe spiculata, parum inflexa; cauda feminae subulata, recta.

Longit. mar. et fem. $\frac{3}{8}$ unc.

Numerous specimens in the intestines of a species of Tinamou (*Tinamus* —?). Ex. Feb. 16, 1859. Natterer found it at Brazil in *T. tataupa* and *Perdix dentata*.

18. *ASCARIS LINEATA*, Cobbold.

Caput nudum, conicum; os labiis indistinctis; corpus utrinque æqualiter attenuatum, rectum; extremitate caudali feminae obsusata.

Longit. $1\frac{3}{4}$, crassit. $\frac{1}{40}$ unc.

One female specimen only in the intestines of an Alligator (*Alligator mississippiensis*), evidently not referable to *A. tenuicollis*, but probably distinct. Ex. Dec. 25, 1860.

Cab. Coll. T. S. C. no. 93.

Larval, immature, and doubtful forms of Nematodes.

19. *FILARIA COLUBRI AMERICANI*.

In a cyst within the walls of the small intestine. Ex. Feb. 20, 1857.

20. *FILARIA COLUBRI BLUMENBACHII*.

Enclosed in a cyst in the muscular substance of the heart. Ex. Jan. 1, 1858.

Note. Linn. Trans. xxii. p. 366. t. 63. f. 30.

21. *FILARIA ARDEÆ NYCTICORACIS* (in ovo).

I have thought it worth while to notice under this head some very peculiar encysted ova, whose chitinous shell or chorion consists of regularly disposed coils like those described by Claparède in the eggs of *Ascaris spirotheca*, which infests the intestines of *Triton tæniatus**.

Some genetic relation may subsist here. The cysts were nume-

* Claparède, 'De la formation et de la fécondation chez les vers nématodes.' Genève, 4to, 1859.

rous, and attached to the mesentery, and varied from $\frac{1}{12}$ th to $\frac{1}{8}$ th of an inch in length. Ex. Jan. 2, 1858.

Cab. Coll. T. S. C. no. 77.

22. *FILARIA GRUIS ANTIGONES* (in ovo).

Numerous ova, with embryos in various stages of development, resembling the foregoing. Chorion consisting of a coiled chitinous band. Ex. Jan. 16, 1858.

23. *FILARIA LACERTARUM*.

One example in the intestine of an East Indian Lizard (*Calotes versicolor*). Ex. Jan. 29, 1858.

24. *NEMATOIDEUM COLUBRI AMERICANI*.

One specimen in the small intestine. Ex. Feb. 20, 1857.

25. *NEMATOIDEUM COLUBRI BLUMENBACHII*.

One example in the stomach. Ex. Jan. 1, 1858.

Note. Linn. Trans. l. c. t. 63. f. 29.

Order IV. ACANTHOCEPHALA.

1. *ECHINORHYNCHUS INFLEXUS*, Cobbold. (Pl. XX. f. 9, 10.)

Proboscis cylindrica, uncinorum seriebus sex; collum nullum; corpus elongatum, inflexum, compressiusculum, antrorsum crassius, retrorsum parum attenuatum et transverse rugosum.

Longit. $\frac{1}{2}$ -1 unc.

Numerous examples in, and attached to the mucous surface of, the intestines of a Snapping Turtle (*Chelydra serpentina*). A few were also within the abdominal cavity. Ex. Feb. 21, 1860.

PENTASTOMATA.

1. *PENTASTOMA OXYCEPHALUM*, Diesing.

Many specimens in the lungs of an Alligator (*Alligator mississippiensis*). Ex. Dec. 25, 1860.

Cab. Coll. T. S. C. no. 92.

2. *PENTASTOMA DENTICULATUM* *, Rudolphi.

Numerous examples from the surface of the lungs and intestines of a Bubale (*Antilope bubalis*). Some encysted beneath the pleura. Ex. Feb. 10, 1859.

Cab. Coll. T. S. C. no. 84.

Desc. Experiments in Quart. Journ. of Microsc. Sc. vii. p. 202; further notice will be given with figs., Linn. Trans. xxiii. part 2.

* Leuckart's researches leave us in no doubt as to this being the young of *P. tænioides*. See his recent work, 'Bau und Entwicklungsgeschichte der Pentastomen,' Leipzig und Heidelberg, 1860; also my translation (of a Memoir by him) in Microsc. Journal, vol. vii. p. 182.—T. S. C.

Several individuals were also obtained from the abdominal cavity of a Cape Guevi (*Cephalopus pygmæus*). Ex. Feb. 21, 1860.

Systematic arrangement of the infested animals, with the Entozoa found in them :—

MAMMALIA.

- | | |
|---|--|
| 1. CERCOPITHECUS FULIGINOSUS.
<i>Bilharzia magna.</i>
<i>Cercaria cercopitheci.</i> | 10. CERVUS AXIS.
<i>Cercaria cervi.</i> |
| 2. MACACUS RADIATUS.
<i>Cercaria macaci.</i> | 11. CAMELOPARDALIS GIRAFFA.
<i>Trichocephalus affinis.</i> |
| 3. MACACUS ———?
<i>Acephalocystis macaci.</i> | 12. ANTILOPE QUADRICORNIS.
<i>Echinococcus altricipariens.</i> |
| 4. LEMUR MACO.
<i>Cœnurus lemuris.</i> | 13. ANTILOPE BUBALIS.
<i>Pentastoma denticulatum.</i> |
| 5. CANIS FULVUS.
<i>Distoma conjunctum.</i>
<i>Trichosoma ærophilum.</i> | 14. GAZELLA EUCHORE.
<i>Cysticercus tenuicollis.</i> |
| 6. VIVERRA MUNGOS. .
<i>Distoma compactum.</i> | 15. CEPHALOPUS PYGMÆUS.
<i>Pentastoma denticulatum.</i> |
| 7. MUS RATTUS.
<i>Tænia pusilla.</i> | 16. OVIS TRAGELAPHUS.
<i>Acephalocystis tragelaphi.</i> |
| 8. MUS MUSCULUS.
<i>Spiroptera obtusa.</i> | 17. PHACOCHÆRUS ÆTHIOPICUS.
<i>Cysticercus phacochoæri.</i> |
| 9. DASYPUS SEXCINCTUS.
<i>Ascaris retusa.</i> | 18. POTAMOCHÆRUS PENICILLATUS.
<i>Cysticercus potamochoæri.</i> |
| | 19. DICOTELES TORQUATUS.
<i>Strongylus paradoxus.</i> |

AVES.

- | | |
|--|--|
| 20. GYPS BARBATUS.
<i>Ascaris depressa.</i> | 23. TINAMUS ———?
<i>Strongylus spiculatus.</i> |
| 21. STRIX PERLATA.
<i>Distoma æquale.</i> | 24. PHASIANUS TORQUATUS.
<i>Ascaris vesicularis.</i> |
| 22. AMADINA CUCULLATA.
<i>Cestoideum amadinæ.</i> | 25. PHASIANUS ———?
<i>Tænia infundibuliformis.</i>
<i>Trichosoma longicolle.</i> |

- | | |
|---|--|
| <p>26. PHASIANUS WALLICHII.
<i>Ascaris vesicularis.</i></p> <p>27. EUPLOCOMUS MELANOTIS.
<i>Ascaris vesicularis.</i></p> <p>28. ARDEA NYCTICORAX.
<i>Tænia multiformis.</i>
<i>Filaria ardeæ.</i></p> <p>29. GRUS ANTIGONE.
<i>Eustrongylus papillosus.</i>
<i>Filaria gruis.</i></p> <p>30. HÆMATOPUS OSTRALEGUS.
<i>Distoma minutum.</i>
<i>Tænia paradoxa.</i></p> | <p>31. ANAS OBSCURA.
<i>Tænia lanceolata.</i>
<i>Tænia lævis.</i>
<i>Ascaris tribothrioides.</i></p> <p>32. BERNICLA SANDWICHENSIS.
<i>Ascaris dispar.</i>
<i>Spiroptera crassicauda.</i>
<i>Trichosoma brevicolle.</i></p> <p>33. CHLOËPHAGA POLIOCEPHALA.
<i>Strongylus tubifex.</i>
<i>Strongylus nodularis.</i>
<i>Strongylus acuticaudatus.</i></p> |
|---|--|

REPTILIA.

- | | |
|--|---|
| <p>34. COLUBER BLUMENBACHII.
<i>Lingula colubri.</i>
<i>Filaria col. blumenbachii.</i>
<i>Nematoideum col. blumenbachii.</i></p> <p>35. COLUBER — ?
<i>Distoma boscii.</i>
<i>Filaria col. americani.</i>
<i>Nematoideum col. americani.</i></p> | <p>36. CALOTES VERSICOLOR.
<i>Filaria lacertarum.</i></p> <p>37. CHELYDRA SERPENTINA.
<i>Echinorhynchus inflexus.</i></p> <p>38. ALLIGATOR MISSISSIPIENSIS.
<i>Pentastoma oxycephalum.</i>
<i>Distoma coronarium.</i>
<i>Ascaris lineata.</i></p> |
|--|---|

TABLE of the Mature Entozoa, excluding the Acarine genus Pentastoma.

TREMATODA	{	BILHARZIA * DISTOMA	{	magna. æquale. boscii. conjunctum. compactum. minutum. coronarium. lanceolata. lævis. multiformis. paradoxa. pusilla.
CESTODA		TÆNIA.....	{	

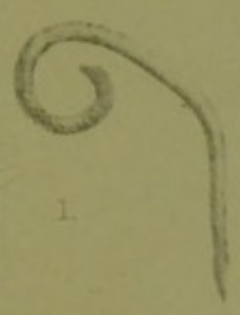
* Prof. Leuckart of Giessen very justly observes, in regard to this generic name, "Der Genusnamen Bilharzia kann nicht bleiben, da Diesing dafür bereits die Bezeichnung Gynæcophorus," etc.; yet I discovered my species (*magna*) Dec. 4, 1857, six months before Diesing read his "Revision" to the Vienna Academy. See "Bericht der nied. Thiere," in 'Archiv für Naturgeschichte,' viertes Heft, S. 136, 1860.

	NEMATODA	{	SPIROPTERA	{	crassicauda.
					obtusa.
					depressa.
					dispar.
					lineata.
		ASCARIS	{	retusa.	
		tribothrioides.			
		vesicularis.			
		papillosus.			
		acuticaudatus.			
	EUSTRONGYLUS	{	nodularis.		
				paradoxus.	
				spiculatus.	
				tubifex.	
				affinis.	
	STRONGYLUS	{	aërophilum.		
			brevicolle.		
			longicolle.		
			inflexus.		
ACANTHOCEPHALA.....		TRICHOCEPHALUS			
		TRICHOSOMA			
		ECHINORHYNCHUS.....			

DESCRIPTION OF PLATE XX.

- Fig. 1. *Strongylus tubifex*, ♀. Natural size.
 Fig. 2. Tail of the same. Enlarged.
 Fig. 3. *Strongylus nodularis*. Tail of male.
 Fig. 4. The same. Caudal extremity of female.
 Fig. 5. *Strongylus acuticaudatus*. Tail of female.
 Fig. 6. The same. Caudal end of male.
 Fig. 7. *Strongylus spiculatus*. Tail of female.
 Fig. 8. The same. Tail of male.
 Fig. 9. *Echinorhynchus inflexus*. Natural size.
 Fig. 10. Head of the same. The *lemnisci* were twisted in the specimen here drawn. Enlarged.

Figures 3 to 8 inclusive are variously magnified, from 30 to 60 diameters linear.



1.



2.



3.



5.



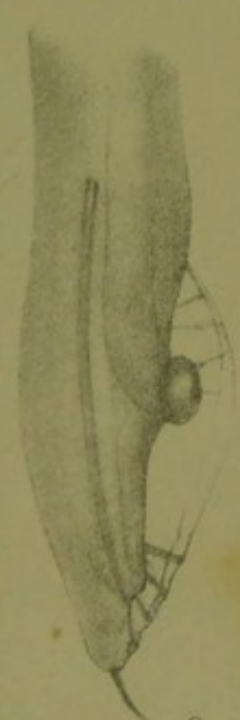
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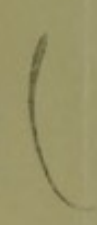
7.



6.



8.



9.



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