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PARASITIC WORMS

WITH A NOTE ON A FREE-LIVING NEMATODE.

BY

R. T. LEIPER, D.Sc.,

Helminthologist to the London School of Tropical Medicine,

AND

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WITH ELEVEN FIGURES IN THE TEXT AND PLATES I–V.

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INTRODUCTORY.

The material, comprising in all thirty-eight species, was obtained chiefly within the Antarctic Circle. A certain amount of collecting was done, however, during the outward voyage of the "Terra Nova." A preliminary account is given, therefore, of the various forms and their hosts according to the geographical regions in which they were found.

Tropical Zone.—On July 3rd and 4th, 1910, when the "Terra Nova" was in Lat. 22° 28′ N., Long. 23° 05′ W. (Stat. 23), and Lat. 20° 47′ N., Long. 24° 06′ W. (Stat. 25), two flying fish came aboard. From the contents of the alimentary canal of one a few Trematodes were obtained. In the gall-bladder of the other, a fluke, apparently a form of *Polystomum*, was found. Of these specimens only unrecognizable fragments remain, so that no description of them is given. The flying fish were *Exocœtus spilopus*. On the 27th July, 1910, the "Terra Nova" arrived at S. Trinidad, a desert island in the South Atlantic in Lat. 20° 28′ S., Long. 29° 25′ W. (Stat. 36, 37).

The Staff seized the opportunity afforded by a day's stay to make collections of the fishes, birds and crabs. The parasites obtained were :—

(*a*) Three species of Cestode from the Trinidad petrels (*Estrelata arminjoniana* and *E. trinitatis*) ;
(*b*) One species of Cestode from a Frigate bird (*Fregata aquila* or *F. ariel*) ;
(*c*) Two larval *Tetrarhynchus* from a small shark (*Carcharias* sp.) ;
(*d*) Specimens of an Oligochaete, extracted from Land-crabs (*Gecarcinus lagostoma*, H.M.-E.).

The stay of the ship was so brief that the material collected is in no way indicative of the extent of the parasitic Fauna of the Island.

S. Trinidad would probably afford a rich field for the further investigation of parasites, as many hosts, especially birds and fishes, abound and are easily procurable.

Temperate Zone.—On the 3rd October, 1910, when the "Terra Nova" was in Lat. 42° 17′ S., Long. 111° 18′ E. (Stat. 156), a Great Grey Shearwater (*Puffinus cinereus*) was caught, and provided one species of Cestode, *Tetrabothrius heteroclitus*. On the 6th October, 1910, when the ship was in Lat. 41° 46′ S., Long. 121° 39′ E. (Stat. 159), a Sooty Albatros or Hutton's Albatros (*Phœbetria palpebrata*) was caught. This provided two species of Cestodes, one unfortunately only in fragments and without a head. These proved to be :—

(*a*) *Tetrabothrius nelsoni*, n. sp.
(*b*) Unrecognizable.

The following parasites were collected at the Bay of Islands in New Zealand, in Lat. 35° 15′ S., Long. 174° 10′ E. (Stat. 149), by Mr. D. G. Lillie, Biologist to the Expedition, when he was on a whaling cruise with a Norwegian ship :—

(*a*) From a Humpback Whale (*Megaptera*) numerous specimens of a Filariid Nematode, *Crassicauda crassicauda* (Creplin), from the renal tubules.
(*b*) From a Rorqual (*Balaenoptera borealis*, Lesson) one specimen of a Cestode and some pretty examples of the curious *Pomporhynchus turbinella*.
(*c*) From a Shark (*Mustelus antarcticus*) a Nematode, and
(*d*) From a Barracouta (*Lepidopus caudatus*) some larval Nematodes encysted in the caecum, and with them a larval *Tetrarhynchus*.

In Lat. 52° 20′ S., Long. 167° 30′ E. (Stat. 165), off the Campbell Islands :—

(*e*) A Mollymauk (*Diomedea melanophrys*) was caught and provided some Nematodes.

Antarctic Zone.—The larger portion of the collection of parasitic worms was made, however, in the vicinity of Cape Evans in Lat. 77° 38′ S., Long. 166° 24′ E. (Stations 312, 326, etc.), during the winter months of 1911. In the succeeding year conditions were exceedingly unfavourable, and the collection could only be added to very slightly.

During these winter months, as soon as the hosts were killed or caught outside, their bodies or excised portions froze almost immediately. It was therefore necessary to take them back with us to our hut and thaw them out in order to be able to examine them. In the case of larger animals, like the seals, this proved unpleasant for the other members of the party.

The fishes were caught by digging a hole through the ice, and lowering a trap baited with seal-meat or seal-intestine—the latter being the better bait. The trap was made of rabbit-wire, spread over iron bars, seized to hoops of iron. At either end there was a cone-shaped entrance made of wire. By this method as many as three hundred fishes were caught from one hole.

The fishes were all *Trematomus bernacchii*.* Altogether five species of Trematodes, three of Echinorhynchi, some larval Echinorhynchi, larval Nematodes, and Cestodes, besides parasitic Crustacea and Protozoa, were obtained from these fishes.

The seals were of three kinds:—Weddell's Seals, Crab-eating Seals, and Sea-Leopards.

The Weddell's Seals (*Leptonychotes weddelli*) were for the most part older than the others and seemed more heavily infected; they contained at least six species of Cestodes, one Trematode of special interest, two Nematodes, and one or two species of Echinorhynchi. An encysted *Echinorhynchus* larva is shown later to be the young of *E. hamanni*, which attains maturity in Weddell's Seal. Mr. D. G. Lillie collected two species of Nematodes and two of Cestodes from the Weddell's Seals caught on the Southern voyage of the "Terra Nova," 1911–1912. The Trematode found in the Weddell's and Crab-eating Seals turned out to be *Ogmogaster plicatus*, previously described in 1829 by Dr. Creplin from the intestine of a Rorqual (*Balaenoptera acutorostrata*) in the Arctic regions. In 1891 this form was again described by L. A. Jägerskiöld from the alimentary canal of *B. acutorostrata* and *B. musculus*,† obtained on the Northern shores of Norway. The infection of the alimentary canal of the old Weddell's Seals was a truly wonderful sight. The stomach contained a mass of Nematodes. Immediately after the pyloric opening there was a bunch of large Cestodes with their heads fixed beneath the first few valvulae conniventes. The remainder of the small intestine was one felted mass of Cestodes, large and small.

The Crab-eating Seal (*Lobodon carcinophagus*) supplied one species of larval Nematode, one species of *Echinorhynchus* and *Ogmogaster plicatus*. These seals were small and immature, and were comparatively lightly infected with parasites.

The Sea-Leopard (*Hydrurga leptonyx*) provided one species of larval Nematode and

* Mr. Regan has pointed out that the fishes caught in traps at the Winter Quarters belonged to two species, *Trematomus bernacchii* and *T. hansoni*; as is shown by Dr. E. A. Wilson's drawings and specimens (see Vol. I, No. 1, p. 3, Pl. 1). The collectors of the material apparently did not distinguish between these two species.—S.F.H.

† The Common Rorqual.—S.F.H.

one species of *Echinorhynchus*. This seal was young and immature, and comparatively free from parasites.

The birds in the McMurdo Sound Quadrant of the Antarctic Circle appear to have exceedingly few parasites. They were as follows:—The Emperor Penguin (*Aptenodytes forsteri*) provided a very interesting Cestode and several larval forms. In the majority of Emperor Penguins, on opening the abdomen, a considerable degree of peritonitis, both recent and old, was discovered. The peritoneal surface of the alimentary canal was covered in places with hard, elastic and fibrinous cysts containing Cestodes, larval and mature. The walls of these cysts were composed of all the elements of the normal gut-wall. Within these were the heads of the Cestodes, while the strobila of the worm hung within the gut-cavity. The canal connecting the cyst-cavity and the gut varied in length and direction.

The number of the occupants of the cyst varied. If they were immature there were several, if mature only a single worm.

The Adélie Penguin (*Pygoscelis adeliæ*) was very disappointing. The many specimens caught provided only a few small Cestodes, otherwise they were free from Entozoa. The range of those caught was from Lat. 69° S. to Lat. 77° 38′ S.

McCormick's Skua (*Megalestris maccormicki*) supplied one Cestode, *Tetrabothrius cylindraceus*. These birds feed largely on the blubber of dead seals, preferring it to any other part. In this blubber there are often cysts of Cestodes. These, unfortunately, could not be brought back, as they were observed when we were away from the base and without facilities, but their occurrence has been noted by Dr. W. S. Bruce, Commander of the Scottish National Antarctic Expedition, 1901–04.

The Giant Petrel (*Ossifraga gigantea*) was only an occasional visitor during the summer, and of those caught and examined none contained parasitic worms.

The method of fixing and preserving the material was as follows:—

Trematodes were placed in a test-tube with water; they were given one or two sharp downward shakes to make them elongate, and then an equal quantity of a saturated solution of corrosive sublimate in water was added rapidly. After washing they were preserved in 70 per cent. alcohol.

Cestodes were fixed by means of Gilson's fluid, and were afterwards washed, and preserved in 70 per cent. alcohol.

Nematodes were killed by dropping into boiling 70 per cent. alcohol, and were afterwards preserved in alcohol of the same strength. By this method good, straight specimens were obtained.

To prevent any damage to the material by the incessant shaking on shipboard, the tubes were filled completely with 70 per cent. alcohol. They were then immersed in large stoppered jars filled also with 70 per cent. alcohol and cotton-wool. The results from these methods have been excellent.

The Expedition is indebted to the Committee of the London School of Tropical Medicine for the opportunity provided by them to Surgeon Atkinson to obtain

practical acquaintance with these methods before starting on the Expedition, and for the facilities afforded in the Helminthological Department for working out the material upon his return.

The elucidation of the anatomical structure of the various forms and the descriptive account of the Cestodes are largely the work of Surgeon Atkinson.

NEMATODA.

FREE-LIVING NEMATODES.

Leptosomatum, Bastian, 1865.

1. *Leptosomatum setosum*, v. Linstow, 1896. (Plate I, figs. 3, 6, 9.)

A tube containing a large number of this species occurred in the collection made by Mr. Lillie from a depth of 250 fathoms in McMurdo Sound. Specimens were also collected from a depth of 150 fathoms off Inaccessible Island, Lat. 77° 38′ S. (Stat. 320).

The vitreous appearance of the cuticle distinguishes this species from parasitic forms. The cuticle is not striated, but carries fine acicular spines in longitudinal rows on the anterior part of the body, and, in the male, on the ventral aspect in the region of the genital papillae and the anogenital opening. Both extremities of the worms are bluntly rounded. The head-end is somewhat the more abruptly truncated. The head has a subcuticular shield of chitinous substance which gives these forms an exceedingly characteristic appearance (Pl. I, fig. 3, *a*). This is shown in optical section in Pl. I, fig. 9, *a*. The arrangement of the spines on the head has not been fully elucidated. They extend in linear series from the tip of the head backwards for a distance of about 0·12 mm. (Fig. 9, *b*).

In a male, 15 mm. long, the nerve-ring (Pl. I, fig. 3, *d*) crosses the oesophagus at 0·65 mm. behind the head. The oesophagus measures 2·3 mm. (Fig. 3, *b*). The testicular tube is a thick solid tube ending anteriorly at 4·6 mm. from the head in a blunt digitate process. It passes directly backwards without coiling to the anogenital aperture, which lies 0·5 mm. in front of the blunt and rounded tail. The spicule is a bent, short chitinous structure not unlike a boot-last in outline (Pl. I, fig. 6, *sp*). There is a well-developed shoe-shaped accessory piece (*ap*).

The genital papillae are sessile and are all preanal. There are four on one side and, usually, five on the other (Pl. I, fig. 6, *p*). On either side of the middle line is a row of acicular spines. In the male there is also a series of diagonal muscular bands which bring about the ventral coiling of the posterior end of the body, extending forward for 1 mm. from the anogenital aperture. In the midventral line there is a curious little chitinous ring surrounding a sunken disc (Fig. 6, *s*), recalling the relatively large sucker seen in *Heterakis*.

In the female the genitalia are very simple. The genital aperture lies 9·8 mm. behind the head. There is a triangular cavity representing the vagina: the apex of this is the vulva, and from each basal angle there proceeds along the body a straight genital tube. The one which proceeds cephalad terminates in a bluntly rounded end at 3·5 mm. from the oesophageal valves, while the caudad tube ends similarly.

Mention must be made of the pair of beautiful ocelli (Pl. I. fig. 3, *c*) which are present on either side of the oesophagus at 0·46 mm. from the head. Each is composed of a number of globules of a deep crimson colour.

PARASITIC NEMATODES.

Fam. ASCARIDAE.

Kathleena,* Leip. and Atk.

Kathleena, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 226. Genotype, *Ascaris osculata*, Rud.

An Ascarid with three large fleshy lips and three interlabia. The oesophagus has a solid appendage and the intestine has an anterior caecal prolongation.

In this genus may be placed *K. scotti*, *Ascaris radiata*, and *A. rectangula*.

2. *Kathleena scotti*, Leip. and Atk. (Pl. I, figs. 2, 5, 8. Text-fig. 1.)

Kathleena scotti, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 223.

Whitish firm round worms. Male 15 × 0·9 mm. Female the same size or slightly larger. Interlabia very large, pentagonal. Short curved oesophageal appendage 0·2 mm. Intestinal caecum 1·8 mm. Oesophagus 2·53 × 0·4 mm. Spicules 3 × 2·7 mm. The tail of the male terminates in a blunt digitate process.

Host.—Several whitish round worms varying from half to three-quarters of an inch in length were obtained from the intestine of a single specimen of the Mollymauk (*Diomedea melanophrys*) killed off the Campbell Islands, Lat. 52° 20′ S., Long. 167° 30′ E. (Stat. 165).

These worms are typical Ascaridea and show several features in common with *Ascaris osculata* Rud., *A. radiata* v. Linst., and *A. rectangula* v. Linst. of Weddell's Seal. They are accordingly grouped with them in a separate genus, of which *A. osculata* Rud. has been designated the type.

Parasite.—A mature and fairly typical male measures 15·3 mm. in length, by 0·9 mm. in greatest breadth. The posterior extremity curves ventrally and tapers to end in a finger-like process. The anterior end is bluntly truncated owing to the presence of three particularly stout interlabia (Pl. I, fig. 8, *b*) in addition to the usual three large fleshy lips (*a*, *a′*, *a″*) found in all Ascaridae. The female is straight and its posterior end is also digitate. The skin is transversely striated. The interlabia are very large and of pentagonal outline, measuring from base to apex 0·08 mm., and

* The diagnoses of the new forms collected by the Expedition have been reprinted from the Proceedings of the Zoological Society, with a few merely verbal alterations, by kind permission of the Committee of Publications of the Society.

at the broadest portion near the base 0·05 mm. The three lips are 0·135 mm. long and 0·13 mm. broad.

The oesophagus is a muscular tube 2·53 mm. long by 0·4 mm. broad (Pl. I, fig. 2, *a*). The terminal portion is slightly differentiated to form a muscular bulb with a glandular appendix (Pl. I, fig. 2, *b*) characteristically short as compared with other forms possessing this structure. It measures 0·55 mm. in length by 0·22 mm. in breadth.

The chyle-intestine is very voluminous and its wall is markedly folded. It has an anterior caecum extending forward for 1·8 mm. to within 0·7 mm. of the head (Fig. 2, *c*). It occupies the whole of the perivisceral space between the oesophageal tube and the body-wall on one side, and attains a breadth of 0·4 mm. These characters are duplicated in the female specimens; the measurements show a slight variation in accordance with the difference in the sizes of the complete worms.

The anogenital aperture lies 0·34 mm. in front of the tip of the tail, and two chitinous spicules are seen extended in many of the specimens. They are unequal in size, but of similar shape (Pl. I, fig. 5, *sp*). At the proximal end these spicules are slightly dilated. They measure 3 mm. by 0·09 mm., and 2·7 mm. by 0·09 mm. The course of the testicular tube is obscured by the folds of the chyle-intestine, but it can be seen extending forwards at least to the level of the oesophageal appendage.

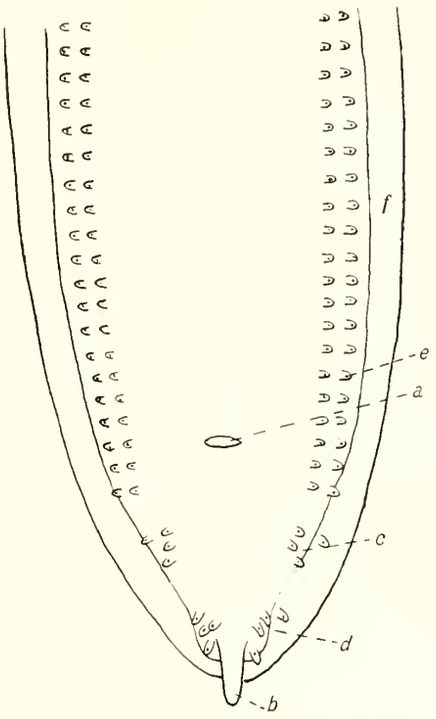

Fig. 1.—*Kathleena scotti*: ventral view of the posterior extremity of the male. *a*, Anogenital aperture; *b*, caudal process; *c*, postanal papillae; *d*, caudal group of papillae; *e*, preanal papillae; *f*, cuticular alae.

The papillae are arranged in three sets. Grouped around the base of the finger-like process (text-fig. 1, *b*) which occupies the posterior end of the body are four pairs of papillae (text-fig. 1, *d*). Half way between these and the anogenital aperture a second set of four pairs (text-fig. 1, *c*) are set on the lateral margins of the ventral aspect of the worms. A long series of papillae then commences, extending to a considerable distance in front of the anogenital aperture (text-fig. 1, *e*). These are arranged in two linear rows on each side. Four double pairs lie behind the level of the anus (*a*), but this number may vary. These papillae, although situated postanally, belong to the preanal series. Twenty double pairs were counted in this series. This number is to be regarded as a minimum, as it was impossible to be certain that the most anterior papillae actually observed were the terminal pairs of the series.

The Females are slightly larger than the males. They present the same characters

in the oesophageal and intestinal diverticula, but these are smaller. The vaginal opening is 4 mm. from the head-end, the worm measuring 25 mm. in length. The vagina is strong and muscular, and the uterus runs caudalwards from this as a single narrow tube. The eggs are in very well-marked groups; they measure 0·1 mm. by 0·06 mm. The tail ends in a finger-shaped process, and the anus is 0·4 mm. from its tip.

3. *Kathleena radiata* (v. Linst.). (Text-fig. 2.)

Ascaris radiata, v. Linstow, 1906 (?1907).
,, *falcigera*, Railliet and Henry, 1907.

Host.—The Weddell's Seals throughout the Antarctic Zone appear to be heavily infected with this parasite. It has been reported in large numbers by the Scottish National Antarctic Expedition and by the first French Antarctic Expedition. It is suggested by Railliet and Henry that some of the forms collected by the Germans in South Georgia in 1882–3 belonged to this species, although ascribed to *Ascaris osculata*.

Parasite.—The parasites are typical Ascarids when seen with the naked eye; *i.e.*, they are stout wiry round worms of a whitish colour in the preserved state and showing a ventral hook-like twist of the posterior end in the males. There is a wide range of size in the material at our disposal, this being due to the relative maturity of the individual specimens. A mature male measures about 12·0 mm. long, a female 13–20 mm. long. The body has a diameter of from 1·5 mm. to 2·0 mm. The mouth is guarded by three large lips, quadrate in outline and with a lateral cuticular ledge prolonged from the free angle. There are three sickle-shaped interlabia which, in specimens in spirit, showed a fine striation of the internal substance of the cuticle. Upon this feature v. Linstow based the specific name.

The results of our examination confirm in the main the details of structure and the minutiae of measurements given by Railliet and Henry and by v. Linstow. In a small male specimen of 12·0 mm. the oesophagus is 1·6 mm. long and its greatest diameter is 0·19 mm. There is posteriorly an oesophageal appendage containing the dorsal oesophageal gland. This extends 0·7 mm. behind the junction of the oesophagus with the chyle-intestine. This organ is stated by v. Linstow to be of the length of the oesophagus. Railliet and Henry mention the presence of the structure, but give no measurements. From the chyle-intestine there passes forward a blind caecum, 0·9 mm. in length, reaching just beyond the middle of the oesophagus.

The chyle-intestine is very voluminous, and its walls are much folded. At 1·6 mm. behind the oesophageal valves are the closely packed coils of the testicular tube. These coils occupy the succeeding 3·0 mm., and thence the tube runs directly backwards to the anogenital opening (text-fig. 2, *a*), 0·19 mm. from the tip of the tail. The spicules are very similar in size and shape. They are transparent and colourless rods, 2·6 mm. in length, and present somewhat characteristic outlines. There is a solid strengthening portion running along the whole length of the spicule to become the blunt tip. In the

spicule there is also a hollow tube, the walls of which taper away towards the tip, thus exposing the lumen.

The arrangement of the papillae agrees exactly with the description of Railliet and Henry. There are four pairs of simple papillae at the base of the acicular tip (text-fig. 2, *d*). After a short interval, and lying well on the ventral surface, there is a pair of large double-headed papillae (text-fig. 2, *c*); alongside these on either side commences a double series of simple papillae, which extends forward to become preanal without a distinct break. These papillae continue still further in single series after about the eighth paired set. On either side the cuticle is raised from the body-wall and flattened dorsoventrally to form a shallow keel (text-fig. 2, *b*) not more than 0·15 mm. deep.

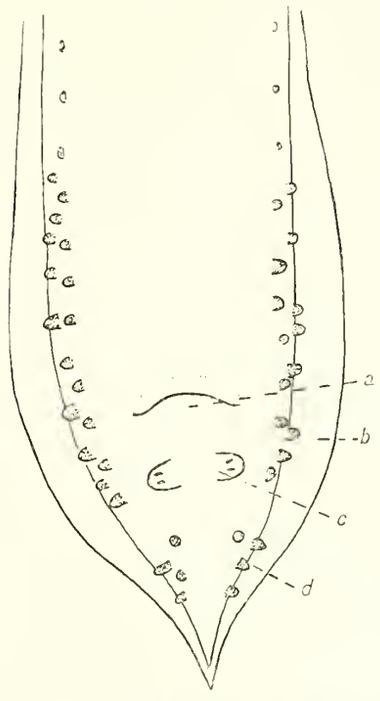

Fig. 2.—*Kathleena radiata* (v. Linst.): ventral view of the posterior extremity of the male, showing the characteristic arrangement of the papillae. *a*, Anogenital aperture; *b*, cuticular alae; *c*, paired double papillae; *d*, caudal group of four papillae.

4. *Kathleena osculata* (Rud.).

Ascaris osculata, Rud. 1802.

A large number of somewhat immature forms of this common species were found in the Sea-Leopard (*Hydrurga leptonyx*) and the Crab-eating Seal (*Lobodon carcinophagus*). Forms which appear to be the larvae of this parasite were encysted in the mesentery and under the peritoneal coats of the pyloric processes and in the liver of *Trematomus bernacchii*. The species has previously been recorded in Antarctic Seals by v. Linstow and by Railliet and Henry.

5. *Kathleena rectangula* (v. Linst.).

Ascaris rectangula, v. Linstow, 1906.
„ *stenocephala*, Railliet and Henry, 1907.

Hosts.—In association with the previously described species, *K. radiata*, in the Weddell's Seal were a number of larger specimens. These have already been recorded by v. Linstow as *Ascaris rectangula*; and about the same time by Railliet and Henry under the name of *Ascaris stenocephala*.

Parasite.—Male measures 2·5 cm. Female 5 cm. Both are stout, opaque and rigid forms. To the naked eye they appear to be large and mature forms of *Kathleena radiata*. The general topography is the same. There are three labia intermedia. The oesophagus has an appendage and the gut has a blind anterior prolongation. The papillae in the tail differ only in detail from those of *K. radiata*.

The spicules are equal and measure 4·4 mm.; they end in a slight dilatation. They are 0·04 mm. across. The anus is 0·27 mm. from the tip of the tail.

The Females generally measure 5 cm. and are larger than the males, which they resemble in most of the characters. The vagina is 5 mm. from the head end. The anus is 0·3 mm. from the tail. The eggs measure 0·09 mm. × 0·06 mm.

Terranova, Leip. and Atk.

Terranova, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 226. Genotype, *Terranova antarctica*, Leiper and Atkinson.

An Ascarid with three large simple lips. No interlabia. Oesophagus simple. Gut with anterior caecal prolongation. No oesophageal appendage.

6. *Terranova antarctica*, Leip. and Atk. (Pl. I, figs. 1, 4, 7.)

Terranova antarctica, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 226.

Female 32 mm. long. Three squat fleshy lips with paired anterior lobes. No labia intermedia. Oesophagus without appendage. The intestine has a long caecum. The anus lies at the base of a deep sulcus.

Host.—A single female specimen of this Ascarid was found in the stomach of a shark (*Mustelus antarcticus*) in the region of the Bay of Islands, New Zealand.

Parasite.—The specimen measures 32 mm. in length, and is coiled in one and a half spirals. The skin is coarse and striated transversely.

The worm is very thick and opaque, having a diameter of 3 mm. in the middle third of the body, which tapers gradually to end in a rounded head and a somewhat more pointed tail. The anus lies at the base of a deep sulcus which can be seen with the naked eye (Pl. I, fig. 4, *a*). Behind this the tail rapidly tapers with a slight ventral inclination. The chyle-intestine is pigmented with dark brown granules. The characteristic features of the worm are as follows :—

There are three squat, round, fleshy lips, each having a pair of spheroidal lobes projecting forwards (Pl. I, fig. 7). The lips are not markedly separated from the neck.

There are *no* labia intermedia.

The oesophagus is a cylindrical muscular organ *without* oesophageal appendage (Pl. I, fig. 1, *a*). It enters the chyle-intestine laterally.

A large caecal prolongation of the gut extends forwards alongside the oesophagus to 1 mm. from the head (Pl. I, fig. 1, *b*).

The absence of intermediate lips and of an oesophageal appendage necessitates a separation of the species from those which constitute the genus *Kathleena*.

The great opacity of the worm, even after clearing in creosote, obscures the arrangement of the ovarian and uterine tubules. The vulva is 14 mm. behind the head ; from it the vagina passes almost directly backwards. The uterine tubules are filled with eggs apparently of small size, but these could not be measured *in situ*.

Fam. ? FILARIIDAE.

Crassicauda, Leip. and Atk.

Crassicauda, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 226. Genotype, *Filaria crassicauda*, Creplin.

7. *Crassicauda crassicauda* (Crepl.).

Filaria crassicauda, Creplin, 1829.

A number of portions of long white *Filaria*-like worms were collected by Mr. Lillie from the renal tubules and from the stomach (wall?) of the Humpback Whale (*Megaptera*). No complete specimen was recovered; the portions, in some cases extending to 16 inches in length, belonged to both males and females.

There was upon both male and female portions a curious bulbous dilatation, which appears to have served as a "holdfast," since the worms are almost all severed in the neighbourhood of one of these swellings. The largest worm is the posterior part of a female. This portion measures 45 cm. in length and is torn across at a holdfast. The males are similarly broken, and are likewise entirely posterior parts.

The cuticle is transversely striated, but these striae differ very markedly in various parts of the worm. At some places they appear more like rugae than striae, but in others the cuticular markings are typically striae.

The longest male portion is 28 cm. long, and has a transverse measurement of 3 mm. The posterior end is helicoid in all specimens. The tail tapers in the last half-turn to a blunt tip. There are well-formed nipple-like papillae arranged in paired series and numbering on either side eight.

In no case have we been able to discover any sign of a spicule. In view of the perfect transparency of some of the cleared specimens it must be concluded that in this species the spicules are absent.

The female also has a very peculiar feature in the arrangement of the genitalia. The genital aperture lies just in front of the posterior end of the worm. The vagina is reduced to little more than the site of fusion of the two long uteri, measuring only 0·45 mm. The worm is oviparous. The ovum measures 0·05 × 0·04 mm., has a thick chitinous wall, and contains a coiled embryo.

The alimentary canal discharges into a depression formed by the puckering of the posterior end of the worm. About 3 mm. in front of the tip of the tail the body is constricted. This constriction is figured by Creplin and usually appears just behind the vulvar opening.

The uteri have a transverse diameter of 0·29 mm., extending forwards from the vulva without kink or coil for some distance into the body of the worm.

In spite of some difference in the number of papillae in the male, and certain other minor features, we regard these specimens as of the same species as that described in 1829 by Creplin from a Northern Rorqual. It should be pointed out, however, that the

terminal position of the anus, the posterior situation of the vulva, and the production of thick-shelled eggs, necessitate the separation of this form from the genus *Filaria* in its modern acceptation. We regard the present species as the type of a distinct genus, for which we have proposed the name *Crassicauda*.

ACANTHOCEPHALA.

Corynosoma, Lühe.

8. *Corynosoma hamanni* (v. Linst.). (Pl. II, figs. 11, 12.)

Echinorhynchus hamanni, v. Linstow.
Corynosoma antarcticum, Rennie.
Echinorhynchus antarcticus, Rennie.
,, *sipho*, Railliet and Henry.

Hosts.—These thorn-headed worms were found in considerable numbers in Weddell's Seal, the Crab-eating Seal, and the Sea-Leopard, attached firmly to the mucous membrane of the small intestine.

Parasite.—The parasites are pyriform and might in haste be mistaken for Amphistomes. The rostellum (Pl. II, fig. 11, *a*) is partially sunken into the broader and globular end, thus producing some resemblance to the ventral sucker of many of the Paramphistomidae. The species was also found by the Scottish Antarctic Expedition, and has recently been the subject of a monograph by Dr. John Rennie. With his account our findings tally, save in three respects.

(*a*) The number of hooks upon the rostellum is, according to our reckoning, 150 to 170, whereas Rennie states that there are about 28 rows, each having ten hooks.

A re-examination of the type-material of *E. antarcticus* shows that this discrepancy is probably attributable to a different mode of counting. Owing to their peculiar alternating arrangement, the hooks may be counted in a spiral fashion as well as in vertical rows.

(*b*) We have not found any departure from the normal arrangement in the male genital system.

As this has not been previously portrayed, it is illustrated in Fig. 11.

(*c*) In dealing with its systematic position, Rennie contrasts this form with allied forms parasitic in aquatic birds.

The species which Dr. Rennie regarded as new would appear to be even more closely related to *Echinorhynchus semerme* Forskål from *Phoca vitulina*, and to be synonymous possibly with *E. hamanni* v. Linstow from Weddell's Seal. In all three forms the spines on the body extend along the whole of the ventral aspect and envelop the posterior extremity (Pl. II, fig. 11, *b*). The number of longitudinal rows of hooks in *E. semerme* is stated to be twenty-four to twenty-six; v. Linstow gives for

E. hamanni fifteen longitudinal rows and eighteen transverse rows. In *E. antarcticus* (type-material and that in the present collection) the hooks are arranged in ten longitudinal and fifteen to seventeen transverse rows. Through the kindness of Dr. W. Michaelsen, of the Hamburg Museum, we have been able to examine the type-material of *E. hamanni* v. Linstow also. We find that the specimens correspond in every essential with the types of *E. antarcticus* and with our own material.

We therefore ascribe *E. antarcticus* Rennie and *E. sipho* Railliet and Henry to *Corynosoma hamanni*, in addition to the material which forms the basis of the present note. A number of larval stages (Pl. II, fig. 12) of this species were obtained from *Trematomus bernacchii*; in some cases the rostellum was not evaginated.

Pomporhynchus, Porta.

9. *Pomporhynchus turbinella* (Dies.) Porta. (Pl. II, fig. 10.)

Echinorhynchus turbinella, Diesing, 1850.

Host.—Numerous specimens of this curious form were collected by Mr. D. G. Lillie from the Humpback Whale (*Megaptera*) in the Bay of Islands, New Zealand (Stat. 149).

Parasite.—The two sexes are of almost similar size and shape; in some cases the bursa in the male is extruded from the centre of the posterior rounded end as a shallow funnel. The body is cylindrical, of about 1·0 cm. to 1·3 cm. in length and 0·3 cm. in diameter. The body tapers anteriorly to form a narrow neck 2 mm. long (Pl. II, fig. 10, *c*), which terminates in an almost globular head. This spheroid head has an armature of spines set upon coarse chitinous bases on its upper aspect (Fig. 10, *b*). The spines are arranged in somewhat irregular series; there are five distinct rows on the peripheral portion, but those lining the sulcus surrounding the rostellum are very irregular. There are about ten rows in all. Their arrangement is somewhat irregular and the exact determination of their number is difficult. The shape of the head and the roughened appearance, due to the spines, remind one vividly of the rose of a watering-can. At the summit of the head there is a partially retracted rostellum (Fig. 10, *a*), the armed base of which extends through the head to the insertion of the neck. The hooks on the rostellum differ markedly from those on the head; they are smaller and more pointed. There are twenty longitudinal rows, each composed of three hooks.

In the male the prostatic glands (Fig. 10, *c*) are greatly elongated and deeply pigmented.

Echinorhynchus, O. F. Müller, 1776.

10. *Echinorhynchus campbelli*, Leip. and Atk. (Pl. II, fig. 13).

Echinorhynchus campbelli, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 223.

Male 9 mm. long. Female 10 mm. Thin-walled. 2·5 mm. broad. Proboscis 2 mm. Hook-bearing rostellum 0·5 mm. Hooks 14 linear series of 8 hooks each. Testes oval, occupying the third fifth of the body.

Host.—Among the Echinorhynchi from *Trematomus bernacchii* were a pair of relatively large forms which are the co-types of the present species.

Parasite.—Male 9 mm. long. Female 10 mm. Both are flattened forms, but whether this is due to treatment after death or not cannot be stated. The greatest breadth of both male and female is 2·5 mm. The worms are almond-shaped, the male tapering more rapidly towards the posterior end than the female. The proboscis (Pl. II, fig. 13, *a*) measures 2 mm., the hook-bearing portion being 0·5 mm. long. The hooks on the rostellum are arranged in fourteen linear series, each having eight hooks. There are no cuticular swellings around the hooks. In these features of the proboscis these forms differ from the succeeding species, to which they show considerable resemblance. The lemnisci (*l*, *l'*) are stout and club-shaped, having a length double that of the internal part of the proboscis. The testes (*d*, *d'*) are oval, 0·2 mm. by 0·25 mm., are diagonally situated, and occupy the third fifth of the body. The prostatic glands are aggregated into two large masses.

Fig. 3.—*Echinorhynchus rennicki:* Female, filled with eggs. The cuticular lapels covering the hooks on the proboscis are shown.

11. *Echinorhynchus rennicki*, Leip. and Atk. (Pl. II. fig. 15. Text-fig. 3.)

Echinorhynchus rennicki, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 223.

Male 3·7 mm. long. Female 4 mm. Proboscis 1 mm. Hook-bearing rostellum 0·3 mm. Hooks in 12 linear series of 6 each. Those of alternate rows are in line transversely. Each hook protrudes from a transparent cuticular lapel. Lemnisci long and slender.

Host. — These medium sized thorn-headed worms were obtained from *Trematomus bernacchii* at Cape Evans, Lat. 77° 38′ S. (Stat. 326).

Parasite.—The male and female of this species are similar in shape, and can only be differentiated by their internal structure save where, in the male, the bursa is extruded posteriorly. The greatest breadth is quickly attained in the anterior half of the body. The posterior half tapers gradually and uniformly to the tail. The male measures 3·7 mm. in length and 0·8 mm. in breadth. The female averages 4 mm. by 1 mm. The proboscis (Pl. II., fig. 15, *a*), in the male is 1 mm., in the female 1·2 mm. long; the hook-bearing portion being 0·3 mm. by 0·12 mm. There are twelve longitudinal rows of hooks with six hooks in each row. The hooks of every second row are in line transversely. A striking feature of the proboscis is the presence of a transparent cuticular swelling from which each hook protrudes. By this character alone the species can be distingnished readily from the other forms found in the same host. The lemnisci (Fig. 15, *l*, *l'*) are long slender bodies, from the posterior end of which a bundle of muscle-fibres passes backwards and becomes attached to the body-wall half

way along its length. These lemnisci are sometimes contracted, but their normal length appears to be about the same as that of the proboscis. The females are filled with eggs. The genital tube, as characteristically illustrated in text-fig. 3, is visible as a rule.

12. *Echinorhynchus debenhami*, Leip. and Atk. (Pl. II, fig. 14. Text-fig. 4.)

Echinorhynchus debenhami, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 223.

Male 2·2 mm. long. Female 2·2 mm. Sickle-shaped. Stout, cylindrical rostellum with hooks in 12 linear series of 6 each. Lemnisci bag-like, extending but little behind proboscis. Testes large, occupying anterior half of body-cavity, deeply lobed. Female crowded with eggs.

Host.—A number of very small but sexually mature and egg-bearing Echinorhynchi, of this species, were found in *Trematomus bernacchii*, in association with the preceding forms.

Parasite.—Male 2·2 mm. long. Female 2·2 mm. All the specimens are sickle-shaped, the dorsal aspect being convex. The rostellum is cylindrical and relatively stout. It bears twelve linear rows of six spines each. The proboscis (Pl. II, fig. 14, *a*) measures 0·24 mm. in length, and is 0·14 mm. in diameter; the portion anterior to the attachment of the invagination of the body-wall being twice the length of that which protrudes posteriorly into the body-cavity. The lemnisci (Fig. 14, *l*, *l'*) are bag-like and extend only a slight distance beyond the internal end of the proboscis. In the male there are two large testes (Fig. 14, *d*, *d'*) occupying the anterior half of the body-cavity and reaching the posterior end of the proboscis. The testes are constricted in such a way as to give the impression that there are actually four separate testicular masses; they measure 0·2 mm. by 0·1 mm. There are present in this form, as in *E. remicki*, cuticular lapels upon the rostellum protecting the hooks; but they are not nearly so well developed. The eggs measure 0·065 mm. in length. Some of the specimens were filled with cell-masses from which the eggs ultimately develop (text-fig. 4, *e*).

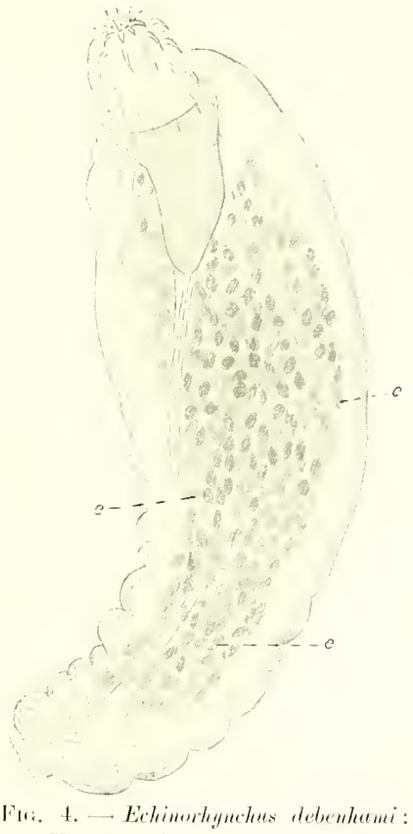

Fig. 4. — *Echinorhynchus debenhami*: Female, showing cell-masses (*e*) which eventually form eggs, free in the body-cavity.

TREMATODA.

DISTOMOIDEA.

Fam. HEMIURIDAE.

Hemiurus, Rud. 1809.

13. *Hemiurus oatesi*, Leip. and Atk. (Pl. III, fig. 17.)

Hemiurus oatesi, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 224.

Length 2 mm. Abdomen present but retracted wholly. Skin sharply striated. Ventral sucker 0·34 mm. in diameter, twice that of the oral sucker. Enormous muscular seminal vesicle. Yolk-masses compact, lobulated. Eggs exceedingly numerous and small.

Host.—Six specimens of this species were collected from the fish *Trematomus bernacchii*.

Parasite.—An average example is 2 mm. long, bluntly rounded at both ends, but tapering more at the anterior than at the posterior extremity. The greatest breadth, 0·68 mm., occurs just behind the middle of the body, at the level of the yolk-glands. There is a well-defined "abdomen" (Pl. III, fig. 17, *d*), which is wholly retracted in the preserved state. The skin is sharply striated transversely, and these striae, although best seen on the ventral aspect, extend to the dorsum. The ventral sucker (*b*) is near the oral sucker (*a*), and is about twice its size, measuring 0·34 mm. in external and 0·18 mm. in internal diameter. Owing to contraction the mouth and the oral sucker are somewhat bent ventrally. The pharynx is globular, measuring 0·12 mm. longitudinally and 0·1 mm. transversely. The two main gut-branches (*g*, *g*) terminate blindly some way in front of the base of the abdomen, whereas in other species they usually extend for a varying distance into this structure. The genital pore (*gp*) opens immediately behind the lip of the oral sucker. A very noticeable feature is the enormous seminal vesicle (*sv*), which has a thick muscular coat. The yolk-glands (*y*, *y'*) are compact and lobulated, and lie in the middle region of the body between the "abdomen" and the ventral sucker. Immediately in front of these is a large ovary (*ov*) 0·34 mm. transversely and 0·16 mm. longitudinally, and anterior to this two testes (*t*, *t'*), 0·2 mm. × 0·2 mm., situated slightly diagonally to one another. The uterus (*ut*) is filled with eggs, 0·05 mm. × 0·03 mm., and occupies most of the interstices between the posterior lobule of the yolk-glands and the ventral sucker. The eggs are very small as compared with those in the succeeding Hemiuridae.

Aponurus, Looss.

14. *Aponurus bowersi*, Leip. and Atk. (Pl. III, fig. 18.)

Aponurus bowersi, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 224.

Length 1 mm. The oral sucker has a characteristic fleshy lip along its dorsal rim only. Gut-branches greatly dilated, and extending to the posterior end of the body. The yolk-glands are peculiar: two half-moon shaped solid masses lying in apposition, immediately in front of the ovary.

Host.—*Trematomus bernacchii.*

Parasite.—Most of the specimens appear comma-shaped, owing to the ventral bending of the anterior portion of the body. The worms taper considerably in front, having their greatest width at the level of the yolk-glands, where the body becomes thick and almost cylindrical. The posterior end is very bluntly rounded. The excretory pore lies at the base of a small dimple. There is no abdomen, nor does the skin appear to be striated, although on the ventral aspect irregular rugae are seen, apparently attributable to the bending of the specimen. The oral sucker (Pl. III, fig. 18, *a*) is about half the size of the ventral sucker (*b*). The suckers vary considerably in shape and in the thickness of the muscular wall in different specimens. This is due to varying amounts of contraction. A characteristic feature of the oral aperture is a fleshy lip extending around the dorsal but absent from the ventral rim.

The pharynx is small and globular. The main gut-branches (*g*) are greatly dilated. They extend to the posterior end of the body, where they are almost contiguous.

The yolk-glands (*y*, *y'*) consist of two half-moon-shaped solid masses lying in apposition, one anterior to the other. The ovary (*ov.*) is smooth and oval, with the posterior aspect somewhat indented by the yolk-gland. The testes (*t*, *t'*) are compact rounded bodies lying slightly diagonally to one another, immediately in front of the ovary. The eggs as seen within the uterus (*ut*) measure 0·04 mm. by 0·02 mm., and are brownish in colour.

LEPOCREADIINAE.

Lepodora, Odhner, 1905.

15. *Lepodora garrardi*, Leip. and Atk. (Pl. III, fig. 20.)

Lepodora garrardi, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 224.

Flat fleshy forms 3 mm. by 0·9 mm. Colour brownish, due to numerous yolk-glands. Skin covered with delicate spines. Ventral sucker 0·27 mm., oral sucker 0·37 mm. Stout pyriform pharynx, 0·2 mm. Eggs few but large. Testes tandem. Gut-branches wide and extending to the posterior end of the body.

Host.—Two specimens from the intestine of *Trematomus bernacchii*.

Parasite.—Flat fleshy forms, 3 mm. by 0·9 mm., of a brownish colour, apparently due to the large and numerous yolk-glands, which extend from the level of the bifurcation of the gut to the posterior end of the body, and inwards also to unite across the body. Delicate spines occur on the skin. The ventral sucker (Pl. III, fig. 20, *b*), 0·27 mm. in diameter, is slightly smaller than the oral sucker (*a*), and lies at the junction of the anterior and middle third of the body. The oral sucker, 0·37 mm. in diameter, opens subterminally. There is a prepharynx and a stoutly developed pyriform muscular pharynx, 0·2 mm., succeeded by a slender oesophagus. The two gut-branches (*g*) are of wide lumen and reach to within 0·1 mm. of the excretory opening. The genital orifice (*gp*) lies immediately in front of the ventral sucker and is unusually obvious. The cirrus is short and fleshy. The globular testes (*t*, *t'*) lie tandem, and immediately in front of them, and slightly to one side of the middle line, is a large

smooth ovary (*or*) 0·22 mm. The eggs are few in number but of very considerable size, and have a brown shell measuring 0·1 mm. by 0·03 mm. while still within the body.

ALLOCREADIINAE.

Podocotyle, Dujardin, 1845.

16. *Podocotyle pennelli*, Leip. and Atk. (Pl. III, fig. 19).

Podocotyle pennelli, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 224.

Small forms tapering from the large pouting ventral sucker. The armed cirrus extends to the posterior level of the ventral sucker. Yolk-glands large and discrete. Testes smooth, tandem. Eggs large, with a flat knob-like protrusion at one pole.

Host.—About six members of this species were obtained from *Trematomus bernacchii*.

Parasite.—The specimens vary in length from 2·4 mm. to 2·8 mm. The greatest transverse diameter of the body is in the region of the large fleshy ventral sucker, from which the body tapers markedly in both directions. The skin is smooth. The position of the ventral sucker (Pl. III, fig. 19, *b*) varies; the posterior portion of the body may elongate so that the sucker appears to be situated in the anterior third, in other cases the sucker is almost in the centre. The oral sucker (*a*) is a spherical muscular organ, 0·18 mm. by 0·15 mm., succeeded immediately by a round pharynx of half its diameter. The gut-branches (*g*) do not extend quite to the hind end of the body, but end on a level with the posterior limit of the testes. The genital pore (*gp*) opens midway between the oral and ventral suckers, always considerably to the left of the middle line. The armed cirrus is slightly extended, and can be traced backwards as a sausage-shaped mass to a level just short of the posterior rim of the ventral sucker. The yolk-glands (*y*, *y'*) are discrete and extensive, ranging from the level of the genital pore to the posterior extremity. The testes (*t*, *t'*) are smooth oval bodies which vary markedly in size in different specimens. They lie one in front of the other in the intercaecal region behind the ventral sucker; in front of them and slightly to the right is a large ovary (*or*), which may be pear-shaped or very slightly lobate. The eggs are large, 0·06 mm. by 0·04 mm. Each has a distinct knob-like protrusion of the shell-substance at one pole.

Allocreadium, Looss, 1900.

17. *Allocreadium fowleri*, Leip. and Atk. (Pl. III, fig. 21.)

Allocreadium fowleri, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 224.

Immature forms 0·74 mm. in length, 0·4 mm. broad. Skin smooth. Cylindrical excretory vesicle with fine black pigment-granules. Large ventral sucker 0·36 mm. Three small round bodies, 0·1 mm. in diameter, represent the genital glands.

Host.—*Trematomus bernacchii*.

Parasite.—A few microscopic Trematodes of a deep red colour occurred with

the other Trematodes from this fish. None were sexually mature. The largest specimen measures only 0·74 mm. in length. The greatest breadth is 0·4 mm., in the region of the ventral sucker (Fig. 21, *b*), whence the worm becomes bluntly pointed both anteriorly and posteriorly. The skin is smooth. The ventral sucker occupies almost the entire width of the worm, measuring 0·36 mm. transversely by 0·26 mm. antero-posteriorly. Its muscular wall, as seen in optical section, is 0·1 mm. thick. The oral sucker (*a*) is about one-quarter the size of the ventral sucker. A muscular pharynx succeeds the oral sucker, and the alimentary canal then immediately divides into two dilated main gut-branches, which terminate blindly a short way behind the ventral sucker (*g*). The testes lie one in front of the other, somewhat diagonally, and the ovary is found on one side of the testes. These three bodies are smooth and round, measuring about 0·1 mm. in diameter. The extent of the yolk-glands cannot be determined. No eggs were present in any of the specimens. Details of the cirrus and other structures could not be made out from the material available. The excretory vesicle (*ex*) is cylindrical and in some specimens is rendered conspicuous by the presence of fine black pigment-granules.

MONOSTOMOIDEA.

Ogmogaster, Jägerskiöld, 1891.

18. *Ogmogaster plicatus* (Creplin). (Pl. III, fig. 16. Text-figs. 5 and 6.)

Monostomum plicatum, Creplin, 1829.

Hosts. The specimens of this Monostome were obtained from both Weddell's Seal (*Leptonychotes weddelli*) and the Crab-eating Seal (*Lobodon carcinophagus*). Some occurred loosely attached to the coats of the small intestine, others upon the contents of the intestine.

Parasite.—In colour the worms were nearly always a light pink, like that of some corals and shells. The colour always disappeared on fixation, when they became isabelline to brown. The parasite is in shape exactly like the half of a hemp-seed split longitudinally.

The size of the specimens varies considerably—those obtained from the Crab-eating Seal being generally the largest. The average length is 5–6 mm., none being above 8 mm.; they are, therefore, slightly smaller on the whole than those from *Balaenoptera acutorostrata* and *B. musculus*,* described by Jägerskiöld. The greatest transverse diameter varies from 4·5 mm. to 5·5 mm. The ventral aspect is hollowed and cupped, the dorsal convex from end to end and from side to side. The worm is narrower at the cephalic end than at the caudal end; its greatest diameter being at the equatorial line. The ventral surface is raised into a succession of longitudinal rugae (Pl. III, fig. 16, *r*), averaging in number fourteen to fifteen, as ascertained from cross-

* The Common Rorqual.—S.F.H.

section. The number varies at different levels. Pl. III, fig. 16, shows the manner of ending in the front region. In no specimen was the cirrus protruded as in the original description given by Creplin. The dorsal surface is smooth and without spines or hooks. The anterior extremity of the worm is surmounted by the oral sucker (text-fig. 5, *e*). The wavy margin of the worm separates the oral sucker as by a short intervening lip (text-fig. 5, *a'*) from the corrugated ventral surface on which, at a deeper level, is the common genital pore (Pl. III, fig. 16, *gp*). Just within this can be seen two important structures, a large ringed vaginal aperture (text-fig. 5, *d*) and a smaller ringed cirrus (text-fig. 5, *c*).

This parasite was previously obtained by Dr. Creplin from *Balaenoptera acutorostrata*, in 1829, in Arctic waters, and again by L. A. Jägerskiöld from *B. acutorostrata* and *B. musculus*, in 1891, on the northern shores of Norway. The seals are,

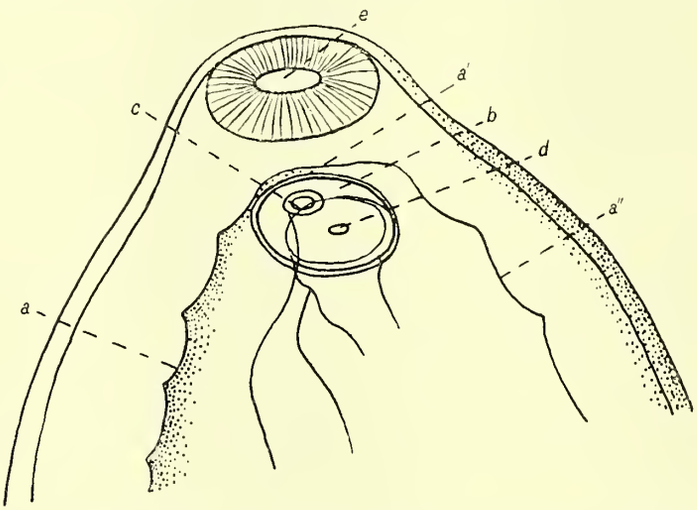

Fig. 5.—*Ogmogaster plicatus* (Creplin.): Ventral view of the anterior end, showing: *a*, *a'*, *a''*, the ventral folds of the margin of the body; *b*, the genital sinus; *c*, the aperture of the male, and *d*, that of the female genital duct; *e*, the oral sucker.

therefore, new hosts, and are both confined to the Antarctic region. Whales, believed to be of the same species, occur, however, in both Arctic and Antarctic seas, and are known to have similar parasites in each region.

Internal Anatomy.

Digestive Tract.—At the cephalic end is the oral sucker, measuring 0·5 mm., with an internal aperture measuring 0·25 mm. The sucker opens immediately into the oesophagus, and this soon divides into the two gut-branches, which run a tortuous course down either side of the worm to end at a short distance from the caudal extremity.

Only a very few points can be added to the excellent and exhaustive description given by L. A. Jägerskiöld.

Genital Organs.—The genital opening is in the middle line on the ventral

surface, behind the oral sucker, from which it is separated by a lip. It is at a deeper level than the sucker. It consists of a thick ring surrounding the cirrus-opening and the wider vaginal opening (text-fig. 5, *b*). The yolk-glands (Pl. III, fig. 16, *y*) vary greatly in number, from ten to eighteen occurring on either side. The variation in the size and shape of the ovary (Fig. 16, *or*) is also marked, as will be seen from text-figure 6 (a, b, c, d, e, f, g). The shell-gland is a thin structure immediately in front of the ovary, and is composed of large cells with a small nucleus.

The posterior ending of the rugae seems to be in a small punctate opening.

The occurrence of this parasite may serve to throw some light on the much discussed question of the specific identity of whales found in widely separated localities.

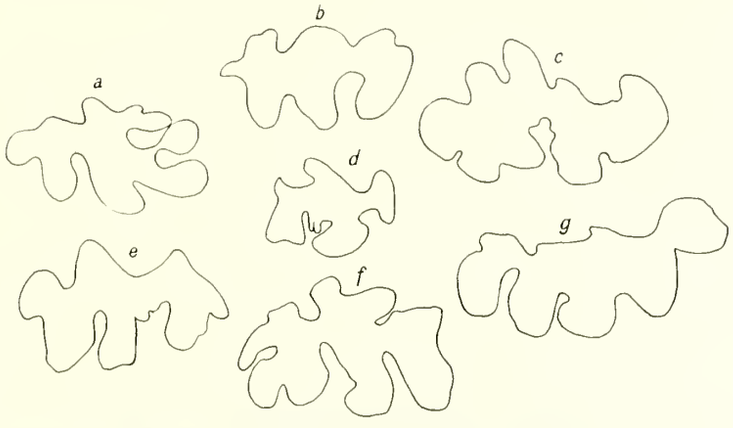

Fig. 6.—*Ogmogaster plicatus:* The ovary, outlined from seven specimens, to show variation in contour.

The occurrence of *Crassicauda crassicauda* in a Northern Rorqual, as described by Creplin, and in a specimen of a Humpback (*Megaptera*) caught off New Zealand, also has some bearing upon this matter.

CESTODA.

Order PSEUDOPHYLLIDEA.

Fam. BOTHRIOCEPHALIDAE.

Dibothriocephalus, Lühe, 1899.

19. *Dibothriocephalus mobilis*, Rennie and Reid, 1912.

This minute Cestode occurred in large quantities in the stomach and in the upper part of the small intestine of all the specimens of Weddell's Seal examined.

The average length, including the head, is 1·6 mm. There is no neck, and segmentation begins immediately behind the head. The segments increase in breadth about the middle, and diminish, tending to become more elongate, towards the tail-end.

The segments number from five to six; the broadest measuring 0·58 mm. transversely, and 0·22 mm. from before backwards. None show genital glands.

The genital pores are placed in the middle line, nearer the head-end of each segment.

The head is peculiar. It is relatively large, measuring 0·58 mm. in length, and in its broadest part 0·34 mm. in width. On either side there is a large sucker, guarded by peculiar lips, and having a small opening. The sucker is 0·39 mm. long, and 0·18 mm. across in its broadest part.

The worms are so immature that we are unable to give a specific diagnosis. We place these forms, with some hesitation, under *D. mobilis*, Rennie and Reid.

20. *Dibothriocephalus coatsi*, Rennie and Reid, 1912. (Pl. V, figs. 37, 38.)

Host.—These small Cestodes were collected from the small intestine of Weddell's Seal. They come from a slightly lower level than the preceding form. The infection was in most cases an exceedingly heavy one, the whole of the inner surface of the intestine being a felted mass of these minute worms. The intestine itself did not show any macroscopic changes resulting from their presence.

External Characters.—The worms are from 1 cm. to 1·5 cm. long, varying in colour from dirty grey to brown. The head is narrow and is bluntly pointed at its apex. There is only a very short neck, and the segments then become clearly defined at once. These, with the exception of the first two, become elongated on passing backwards.

Head.—The dorsal and ventral surfaces of the blunt, elongated head are grooved by shallow, gaping slits or suckers, 0·75 mm. long; these suckers do not extend on to the top of the head. The head measures 1·1 mm. in length and 0·36 mm. across in its broadest part, which is, roughly, just below the upper third.

Segments.—The fourteenth segment (Pl. V, fig. 38) is narrow above, widens in front of the middle, and tapers again to the hind end. The segments do not overlap each other in any way. In a stained specimen there is an outer, clear and unstained portion at the periphery of the whole segment. The genital pores (*c*) are in the middle line, much nearer the cephalic than the caudal end of the segment. The cloacal opening measures 0·1 mm. in its greatest length, and 0·06 mm. in its greatest breadth. The cirrus was not extruded in any segment, and therefore was not measured. The uterine opening (*d*) is nearly circular, its diameter measuring 0·05 mm. in any direction. It is placed immediately behind the cirrus-opening. The ovary, uterus (*e*) and female organs are grouped for a short space behind this. The limits of the uterus are circumscribed and do not extend far down the segment. This organ is simple and not branched, and usually contains from eight to ten eggs, which first appear in the sixth to the eighth segments, and measure 0·06 mm. in length. The testes number about ninety. They are very distinct and are of a regularly rounded shape. They are not arranged in any characteristic manner, but are scattered generally throughout the segments, being fewest at the anterior border.

The segment described measures 1·04 mm. from before backwards, 0·44 mm. in its broadest side to side measurement, and 0·34 mm. in width at the caudal end. The surfaces of the segments are not folded. Two excretory canals run down either side of the segment; the inner pair run down practically alongside the female organs, while the outer pair are separated from the others by a considerable interval. The testes are distributed between and outside these canals.

21. *Dibothriocephalus lashleyi*, Leip. and Atk. (Pl. V, figs. 40, 41.)

Dibothriocephalus lashleyi, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 224.

3 to 4 cm. in length. Young segments quadrate. Mature segments 3 to 4 times as long as broad. Head 1·2 mm. long and 0·77 mm. broad. Suckers situated laterally, almost circular, and not extending far down the head. Eggs first appear at the 14th segment, and measure 0·06 mm. in diameter. The testes extend inwards in each segment in single series of three.

Host.—Weddell's Seal (*Leptonychotes weddelli*). This Cestode, like the previous one, occurs in the upper part of the small intestine in large numbers.

External Characters.—The colour varies; the head and some part of the anterior end are white, but where the segments begin to elongate the colour becomes pearly grey. This Cestode is larger than the preceding and measures 3 cm. to 4 cm. in length. The surface is folded, but this is probably due to contraction. The anterior segments are quadrate and shortened antero-posteriorly, broader from side to side than from before backwards. The hinder segments are enormously elongated and their length is three to four times as great as their breadth. The head is somewhat conical, ending in a point, and is less markedly clubbed than in the preceding species.

Head (Pl. V, fig. 40).—The head is relatively small, measuring 1·2 mm. in its greatest length, while its greatest breadth is 0·77 mm. The central portion, between the two suckers, terminates as a nipple-shaped projection. No rostellum and no hooks are present. The suckers are placed on either side, not on the dorsal and ventral surfaces. They are almost circular and do not run down the head for any considerable distance. They measure 0·24 mm. antero-posteriorly and 0·17 mm. from side to side. They are depressions, and have not the fold found in the following species (text-fig. 11). The head is continuous with the neck, which is short, the worm rapidly becoming segmented.

Segments (Fig. 41).—In the strobila examined the eggs first appear at the fourteenth segment. The anterior of the segments which are mature are broader from side to side than from before backwards. The posterior are greatly elongated. The former measure 1·4 mm. from side to side and 0·6 mm. from before backwards. The latter measure 1·8 mm. from before backwards, 0·92 mm. from side to side at the cephalic end, and 0·58 mm. at the caudal end.

The genital pore is in the middle line and is a simple opening; it is placed nearer the cephalic than the caudal border of the segment. It consists of the cloacal opening

(Fig. 41, *c*), which is 0·13 mm. in its longest diameter, and 0·07 mm. in its broadest. The cirrus was not extruded in any segment, and therefore could not be measured.

The small uterine opening (*d*) is behind and slightly to one side of the cloacal opening. Its longest diameter is 0·05 mm. and its greatest breadth 0·03 mm. Behind the genital opening the ovarian and other female organs are always grouped very regularly and in a very characteristic manner. The uterus is small and simple, and only contains a few eggs, which measure 0·06 mm.

The testes are very numerous and are grouped in a definite manner, which is characteristic. They tend to be roughly in paired columns, and there is always, running toward the caudal end of the female organs, a definite row of three or more testes marked off by their direction from the remainder.

The excretory canals are continuous throughout the segments, and a single one runs down on either side, just outside the junction of the middle and outer thirds. The testes are distributed on their outer side as plentifully as on their inner side. The musculature is not well marked.

22. *Dibothriocephalus archeri*, Leip. and Atk. (Text-fig. 7.)

Dibothriocephalus archeri, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 224.

6 to 12 cm. in length. Large square head, 2·04 mm. broad. Lips of the suckers folded inwards. The eggs first appear in the 57th segment and measure 0·07 mm. Testes scattered diffusely.

Host.—Weddell's Seal (*Leptonychotes weddelli*); collected in fair quantities from the upper part of the small intestine.

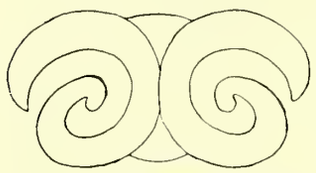

Fig. 7.—*Dibothriocephalus archeri:* Optical transverse section of the head, showing the inward folding of the walls of the suckers.

External Characters.—The colour of the worms is a dirty white, and in length they measure from 6 cm. to 12 cm. They are flattened dorso-ventrally, and attain their greatest breadth as the caudal end of the worm is reached. The anterior segments are more quadrilateral than the posterior, which tend to become broadened from side to side and shortened from before backwards. The genital pores are in the median line, and at about the middle of the segment.

Head.—The head is relatively large, and is somewhat square, its greatest breadth (2·04 mm.) being in the anterior part. Its length is 2 mm.

The central portion, between the two suckers, terminates in a slight cone suggesting a rostellum. There is no true rostellum, and no hooks are present. The suckers run down the head for 1·25 mm. of its length. The central, interior, portion of the head seems to be a rod of more solid structure between the two suckers. On looking at the head from the front, the two suckers are seen to be cup-shaped and folded (text-fig. 7); the outer lapel of the suckers running out from the head for some distance. The suckers, at their anterior end, measure 1·02 mm. from side to side,

and 0·86 mm. dorso-ventrally. They are placed on either side of the worm, and not on its dorsal and ventral surfaces. The apex of the head measures 1·56 mm. from side to side and 0·92 mm. from above downwards.

Segments.—That described is the ninety-seventh segment. The segments are quadrate, their hinder and lateral portions slightly overhanging the following segment by a short nipple-shaped projection on either side. They are broader from side to side than from before backwards, with the exception of the first few segments. There is a long neck. In a stained specimen the outer portion of each segment stains diffusely with haematoxylin. Measurements: from side to side, 1·5 mm.; from before backwards, 1 mm.

The genital pore is surrounded by a slight mound, which includes the aperture for the cirrus and the vaginal opening. The mound usually has an elongation towards the vaginal pore. The opening is placed about mid-way in the segment. The cirrus is extended in nearly all the segments that are mature. It ends in a clubbed, roughened portion having five lobes, but no hooks, and measures 0·12 mm. in length. The opening is almost circular and measures 0·02 mm. The vaginal opening is very small, relatively, measuring 0·04 mm. in its greatest breadth and 0·06 mm. in its greatest length. From it a well-marked vagina leads slantingly backwards to the uterus. The female organs are collected just behind the opening, forming a dark staining mass. The uterus is small and is confined to this space. The eggs begin to appear at the fifty-seventh segment, and measure 0·07 mm. The testes are numerous and are scattered throughout the tissue of the segment; there are few on the outer side of the excretory canals. There is no definite arrangement as in the preceding Cestode. The single pair of excretory canals are wide. They lie just outside the junction of the outer and middle thirds of the segment. The ventral surface of the segment seems to bear definite transverse rugae. These may have been caused by contraction, but are more probably a permanent feature. The longitudinal muscular fibres are well marked, but the circular are less distinct. The shape of the genital opening is very distinctive; as is the shape of the extremity of the cirrus.

Diphyllobothrium, Cobbold, 1859.

23. *Diphyllobothrium perfoliatum*, Railliet and Henry, 1912. (Text-fig. 8.)

Host.—Weddell's Seal (*Leptonychotes weddelli*); small intestine. The parasite occurs in a well-marked tuft at the beginning of the small intestine. The majority of the individuals have their heads beneath the first two or three valvulae conniventes. The Report of the French Antarctic Expedition under Dr. Charcot, 1909, describes the same arrangement of the worms at the ileocaecal valve.

External Appearance.—The worms measure, on the average, 14 cm. in length, but there is a certain amount of variation in size. The head and some portion of the

segments are of a pearly white colour, varying to yellowish white at the hinder end. The segments, except those near the neck, show marked imbrication, and on the ventral surface, at the hinder border of each, there is a marked V-shaped indentation.

Head.—The head (text-fig. 8) is club-shaped, broadening near its apex and then narrowing. It measures 1·35 mm. transversely, and 1 mm. in a dorso-ventral direction. The suckers are simple slit-like depressions which extend on to the summit of the head, where they are separated by a fairly broad ridge. One lies on the dorsal, the other on the ventral surface of the head. The lips of the suckers are narrow, with the result that there is no folding.

The lips approximate as they proceed down the head. The suckers have an extreme breadth of 0·58 mm. in front, and are 0·05 mm. broad at the thin end. The length from the front of the head to the end of the sucker is 1 mm. There is no rostellum, and there are no hooks. The head tapers to join the neck, which extends to about 0·7 cm., after which the first segments appear.

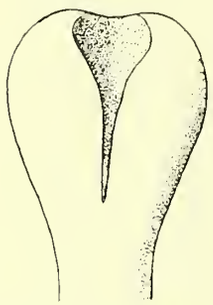

Fig. 8. — *Diphyllobothrium perfoliatum*, Railliet and Henry: The head, showing the shallow lips of the sucker.

Segments.—The segments are relatively wide, and vary in breadth from 3 mm. near the head-end to 5 mm. near the tail. They are exceedingly short, and markedly imbricated.

The genital pores are in the middle line and are placed on a slight projection. The surface of the segment is folded around them to make a depression. The cirrus-sac is large, the cirrus itself simple and unarmed, and measuring 0·3 mm. in length and 0·1 mm. in breadth; it is anterior to the vagina, which is a narrow straight tube, 0·35 mm. long and 0·04 mm. broad.

The uterus is convoluted and occupies the central and lateral portions of the segment. The testes are numerous and occupy the imbricated portion of the segment as well as the central portion; some of them tend to be aggregated into small groups. Later the segments become full of eggs at the expense of the other contents.

Well-marked bands of longitudinal muscular fibres are continued down the ventral and dorsal aspects of the central portions of the segments. The circular fibres are not so well marked. A single wide excretory canal runs down either side of the segment, near its outer part.

24. *Diphyllobothrium rufum*, Leip. and Atk.

Diphyllobothrium rufum, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 224.

3 to 6 cm. in length. The head, which is characteristically pigmented brick-red around the base of the suckers, measures 1·64 × 1·44 mm. The suckers are dorsal and ventral. The segments overlap markedly, as in *D. perfoliatum*. The eggs measure 0·025 mm.

Host.—Weddell's Seal (*Leptonychotes weddelli*); small intestine.

The worms are confined as a definite tuft to the first few valvulae conniventes as

in *D. perfoliatum*. They were found by Mr. D. G. Lillie, in a seal killed near Coulman Island, Lat. 74° S. approximately, and a similar set was seen at Hut Point in Lat. 77° 45′ S.

External Appearance.—The worms are from 3 cm. to 6 cm. long, the average length being about 5 cm. The strobila is shaped like an Indian club, being narrow in front, broadest behind the middle, and tapering slightly to the hinder end. The colour is a yellowish white. The head, around the suckers, contains a very characteristic scarlet pigment.

Head.—The head measures 1·64 mm. from before backwards, and 1·44 mm. from side to side in its broadest part. Anteriorly there are two deep suckers lying ventrally and dorsally. The sucker measures 0·52 mm. internally, 1 mm. externally, and 1·45 mm. from before backwards. Its hinder part is surrounded by a free edge. A bright scarlet pigment-band on the outer side of the fold surrounding the sucker is very characteristic. It only encroaches partially on the inner side and measures 0·11 mm. at its broadest part.

Segments.—The segments immediately succeed the head without the interposition of a neck. They vary in size, measuring 2 mm. transversely at the head-end, 5 mm. at the broadest portion, and 3 mm. at the tail-end. The segment described is from near the head-end of the worm. The dorso-ventral measurement is 2·14 mm. The segment consists of a central portion, measuring 0·32 mm. from before backwards, and two lateral portions. There is marked imbrication of the segments, as in *D. perfoliatum*. The genital openings are central and are placed partly on the anterior surface of the overlapping edge. The cirrus is fairly large, measuring 0·41 mm. in length and 0·11 mm. in breadth; it is anterior to the vagina, which is a slender tube measuring 0·24 mm. in length and 0·02 mm. in width. The testes are numerous and extend out into the lateral portions of the segment. The uterus is also extensive, the eggs, which measure 0·025 mm., being present in the later segments to near the periphery. Two winding excretory canals run down either side of the segment close to the junction of the central and lateral portions. The musculature is not so well marked as in *D. perfoliatum*. The longitudinal bands are small and are not continuous over a large number of segments. The fibres are small and insignificant. The circular fibres are better marked.

25. *Plerocercoid larva*, sp. inc. (Pl. V, figs. 39, 42.)

A few larvae, apparently of Bothriocephalid Tapeworms, were found encysted under the mucous coat of the pyloric processes of the gut of *Trematomus bernacchii*. It is impossible to associate them with any particular species, but there is every probability that they are the young stages of one or other of the species of *Dibothriocephalus* or *Diphyllobothrium* found in the Seals.

Order TETRAPHYLLIDEA.

Fam. PHYLLOBOTHRIIDAE.

Anthobothrium, Van Beneden, 1850.

26. *Anthobothrium wyatti*, Leip. and Atk.

Anthobothrium wyatti, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 225.

Scolices small, unsegmented. Four large auricular appendages, each occupied by two tandem suckers. A brightly pigmented band crosses the neck in the living state.

Attached to the wall of the rectum of the fish *Trematomus bernacchii* were a large number of small Cestode scolices characterised in the living state by the presence of a bright red ring of pigmentation in the neck. There are four auricular discs, each carrying a pair of round suckers. The rostellum also is occupied by a muscular sucker.

These parasites bear some resemblance to the forms figured by Van Beneden in 1861 as typical of his genus *Anthobothrium*, and they are accordingly referred to that genus. The scolex measures 1·18 mm. in length by 0·53 mm. in breadth. There is no indication of segmentation. The auricles measure 0·3 mm. by 0·18 mm. The suckers on each side lie one in front of the other; the anterior measuring 0·1 mm. in diameter, the posterior being slightly larger, viz., 0·12 mm.

Oriana, Leip. and Atk.

Oriana, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 226.

A Tetraphyllid with large quadrate discoidal head carrying four round suckers. Rostellum absent.

27. *Oriana wilsoni*, Leip. and Atk. (Pl. V, figs. 32, 33, 34.)

Oriana wilsoni, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 225.

Segments all immature. Strobila 13 cm. long. Head discoidal, 3 mm. in diameter, quadrate in outline, 4 round suckers present terminally. Neck very slender. Testes arranged in two definite groups of 7–8 and 17–18. Near to *Diplobothrium*.

Host.—These Cestodes were obtained by Mr. D. G. Lillie from the intestine of a Rorqual (*Balaenoptera borealis*, Lesson), caught off the Bay of Islands, New Zealand (Stat. 149).

External Appearance.—The worms vary very greatly in size and length and in the number and shape of their segments. None contain eggs. The length of the unsegmented part, or neck, varies also very greatly, sometimes being as much as 3 cm. The description is of an average specimen and will hold for the majority obtained.

Head.—The length of the strobila is 13 cm. to 14 cm. The head is discoidal, anteriorly flattened and square-sided, varying from 2·8 mm. to 3·2 mm. in diameter. The neck is exceedingly narrow and is attached to the head much as is the stem to the bowl of a champagne-glass. The four suckers, which almost completely occupy the anterior surface of the head, are nearly circular. They have a diameter, outside, of 1·35 mm. and, inside, of 0·76 mm. They are fairly deep and are embedded for some distance in the substance of the head. There is no rostellum and there are no hooks.

The margins both of the head and of the orifices of the suckers are rounded (Pl. V, figs. 32, 33).

Segments.—The segments figured (Fig. 34) are about the 221st and 222nd. The shape of the hinder segments usually varies considerably, but in general conformation the remaining segments are the same. A typical segment measures 1·35 mm. transversely, but is only 0·47 mm. long. The genital pore opens marginally near the anterior border of the segment. There is a slender, elongate, unarmed and sometimes pyriform cirrus, measuring 0·14 mm. The vas deferens makes its way as a straight uncoiled tube to the centre of the segment, where it ends in a slight dilatation. Caudad, but in close proximity to this, is a narrower tube, the vagina, which runs to the middle of the segment, ending in a small punctate mass which possibly represents the shell-gland. The testes are rounded and are arranged very definitely in two sets, divided by the vas deferens and vagina. The set on the side of the pore usually numbers seven to eight, and that on the opposite side 17 or 18. The total number of testes is 24 to 25, of which the majority (from 17 to 18) occupy that side of the segment distant from the cirrus. They are situated internally to the excretory canals. The segments do not overlap in any way, and their lateral borders are rounded. A fair number of chalk-bodies are present. Even in the most caudal segments there are no eggs, and the uterus is not fully developed.

The infection of the Rorqual was evidently a recent and a very heavy one.

This species has been made the type of a new genus *Oriana* near to *Diplobothrium*, a preoccupied genus, in the family Phyllobothriidae.

Order CYCLOPHYLLIDEA.

Fam. TETRABOTHRIIDAE.

Tetrabothrius, Rud., 1819.

28. *Tetrabothrius heteroclitus*, Dies.

Host.—Great Grey Shearwater (*Puffinus cinereus*); small intestine.

External Characters.—These Cestodes are exceedingly long and slender and are from 10 cm. to 13 cm. long. The segments are fairly uniform in shape, but towards the caudal end they become broader from side to side and decrease comparatively in depth. They are broader in front than behind and each overlaps the succeeding segment for a short portion. Their hinder ends are carried out as sharp points beyond the margins of the succeeding segments. The worms were in a tangled mass in the intestine, and were thus exceedingly difficult to separate.

Head.—The head is shaped like a truncated cone bluntly rounded off. From the sides hang the four suckers with well-developed auricular appendages. The lips of the suckers are broad and folded inwards. The cavities widen posteriorly. The suckers do not appear on the anterior surface of the head.

The head, which is succeeded by a fairly long and simple neck, measures 0·37 mm.

in length. The apex is 0·24 mm. across, while the lower and broadest part is 0·45 mm. There is no rostellum and there are no hooks. The neck is broadest at its junction with the head and gradually narrows to the first segment.

Segments.—The following information regarding the segments is derived from stained specimens, from near the head-end and near the tail-end of the worms.

Maturity is late. The general size and shape of the segments, which are broader than long, does not vary much. Antero-posteriorly they measure 0·32 mm., the cephalad border being 0·5 mm. in width and the caudad border 0·62 mm. The staining of the segments is diffuse. The genital openings are on the side and are unilateral: they vary considerably in formation in various parts of the worm. Thus in immature portions there is no projecting ring, while in those which are more mature there is a well-marked ring outside the border of the segment, while at a deeper level there is a second ring containing the openings of the cirrus and vagina. The cirrus is simple, rounded and unarmed. The straight vas deferens which runs from it ends in a slight dilatation. The vagina is below the cirrus-opening. The small and rounded testes are arranged in a circular manner around the dilated end of the vas deferens, and this is a characteristic feature of the species; they number from twenty-two to twenty-four. In the more mature segments they are displaced to one side by the uterus. In front of them, and some distance from the anterior border, are the ovary and yolk-gland. These are of no great size, but can easily be differentiated by their staining. A single excretory canal runs down each side, externally to the testes. The canal is narrow and is internal to the genital atrium.

29. *Tetrabothrius cylindraceus* (Rud.), 1819. (Pl. IV, fig. 31.)

Host.—McCormick's Skua (*Megalestris maccormicki*); intestine. These birds feed largely on blubber, and on the excrement of seals. They also feed on fish. Although a large number of birds were examined only a very few Cestodes were obtained.

External Appearance.—This is a fairly slender worm. The longest specimen is 8 cm. long, and the segments are at first uniform in size, but gradually lengthen towards the caudal end. The colour is a dirty brown. Unfortunately, all the specimens had lost the scolex.

Description of Segment.—The segments drawn (Pl. IV, fig. 31) are from fairly near the anterior end of the fragment. They are quadrate, and measure 0·64 mm. from side to side, and 0·47 mm. longitudinally. Each segment is slightly narrower at the cephalic end than at the caudal border. In a stained specimen the outer portions remain unstained.

In the middle, occupying the more cephalic portion of the segment, is a deeply-staining mass composed of the testes (Fig. 31, *t*). These are numerous—fifteen to thirty—and are generally arranged in a horse-shoe shape, with the concavity caudad. The ovary and yolk-gland (*yg*) are in front of these, fairly large, and immediately behind the cephalic border.

The genital atrium is very large and has a fleshy wall. The pores are single and on the same side throughout the strobila. The massive atrium occupies nearly the whole border of the segment. The outer measurement of the atrium is 0·23 mm., while its cavity is 0·15 mm. across. The cirrus (*sp*) is usually extruded and hooked backwards in nearly every segment. It measures 0·05 mm., and its surface is roughened by ridges. The broad vagina crosses the segment, and, after turning once upon itself, runs towards the centre. Two excretory canals run down either side, immediately internally to the genital atrium, throughout the segments. The outer canal is small, the inner nearly twice as wide.

30. *Tetrabothrius priestleyi*, Leip. and Atk. (Pl. IV, fig. 28.)

Tetrabothrius priestleyi, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 225.

Strobila 10 cm. long, excessively slender, with large tulip-like head. Testes 17–20. Near to *T. pelecani*, Fuhrmann.

Host.—A Frigate bird (*Fregata aquila* or *F. ariel*), shot at South Trinidad (Stat. 36); intestine.

External Appearance.—The worms measure from 10 to 11 cm. in length, and for the greater part are exceedingly slender. The segments become enlarged only towards the caudal end. They are pearly white in the anterior thin part, changing to yellowish-white posteriorly. The worms were removed from the intestine in a tangled mass, and owing to their long slender necks were difficult to separate from one another.

Head.—The head is comparatively large, and is armed with four suckers placed on the sides and not showing on the top of the head. The suckers are narrow in front and expand to their greatest width behind. The head is 0·55 mm. long, and attains 0·44 mm. in breadth at its broadest part. Each sucker is 0·42 mm. long and 0·22 mm. wide at its broadest part. The head-region is well-defined. There is a slight constriction behind the suckers, and this is succeeded by a fairly long neck, before the segments make their appearance.

Segments.—The segments figured (Pl. IV, fig. 28) are from about the middle of the worm. Maturity is late. The segments stain diffusely with haematoxylin. They are broader than long, measuring 0·6 mm. by 0·3 mm. Their shape does not vary much, but they become thicker and broader toward the posterior end. The genital atria are unilateral, large and rounded, measuring 0·14 mm. They open laterally. The cirrus is rounded and unarmed, measuring 0·1 mm. in length and 0·06 mm. in its greatest breadth. A short vagina lies behind it. The testes are relatively large and form about seventeen to twenty groups. They are confined to the central part of the segment. In some of them the bulk is increased markedly, and stained nuclei are found only round the periphery. The yolk-gland is placed in front of them, in the middle of the cephalic border. It is large, circular, and stains deeply, measuring 0·04 mm. across. A single excretory canal runs down either side, externally to the testes. The canal is broad and runs internally to the genital atrium. A most

characteristic feature in a stained specimen of this worm is a series of about fifteen strong bands of muscular fibres which run down the ventral aspect of the worm. They are continuous from segment to segment.

Apart from the number of the testes, this form appears to be similar to that recorded by Fuhrmann in 1908 under the name *Tetrabothrius pelecani* (Rud., 1819), a binomial abbreviation for *Taenia pelecani aquilae* Rud. The names *Taenia heterosoma* and *T. sulae fuscae* had previously been given by Baird (as *nomina nuda*) to specimens in the British Museum, which both Monticelli and Fuhrmann, on re-examination, have pronounced to be identical with *T. pelecani* (Rud.)*

31. *Tetrabothrius nelsoni*, Leip. and Atk. (Pl. IV, fig. 25.)

Tetrabothrius nelsoni, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 226.

Fragments only. Head absent. Testes 6 to 8, aggregated at the side of the segment remote from the cirrus.

Host.—Sooty Albatros or Hutton's Albatros (*Phoebetria palpebrata*); intestine.

External Appearance.—Only fragments of the strobila were obtained. The anterior portions are white, the more mature segments grey and almost transparent.

Segments.—The figure represents the posterior end of a fragment, where the segments measure 2 mm. transversely and 0·4 mm. in length. The hinder lateral borders of each segment overlap the succeeding segment considerably. The staining is diffuse. The genital cloaca (Pl. IV, fig. 25, *a*) is large and thick-walled; it is always on the same side of the strobila and opens directly on the side. The cirrus (*c*) measures 0·32 mm. × 0·20 mm. From it there proceeds across the segment a very slightly coiled vas deferens (*b*). The vagina (*v*) runs an erratic course just behind the vas deferens to almost the middle of the segment, where it turns backwards to end in a large dilatation which varies considerably in the different segments. The contents give a chromatin staining and appear to be spermatozoa. Immediately in front of this is a large ovarian mass measuring 0·15 mm. in its greatest diameter. The testes (*t*), which number from six to eight, are large, measuring 0·09 mm., and they are aggregated together in a small area on the side of the segment remote from the genital opening. Two narrow excretory canals run down either side; they are external to the testes and internal to the genital openings. The musculature is poorly marked.

32. *Tetrabothrius creani*, Leip. and Atk. (Pl. IV, figs. 26, 27.)

Tetrabothrius creani, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 225.

Strobila 4·5 cm. Head 0·84 mm. broad, carrying four suckers but no rostellum. Testes numerous. Yolk-gland large. Cirrus 0·06 mm.

Host.—This Cestode was obtained from the small intestine of *Estrelata trinitatis* and *E. arminjoniana*. These two Petrels in all probability are only one species, the

* See Fuhrmann, "Die Cestoden der Vögel," *Zool. Jahrb.* Suppl. x, 1909, p. 34, note 5.

variation in colours being due to age. The birds were taken at South Trinidad (Stat. 36).

External Characters.—The worm is of a dirty white colour. The head is followed by a short neck. The strobila measures from 4·5 cm. to 5 cm. Each segment slightly overlaps its successor. About the middle of the body the segments are almost as long as they are broad, but towards the posterior end the breadth considerably exceeds the length.

Head.—The head (Pl. IV, fig. 26) carries four suckers, which occupy ear-shaped projections on its sides. They are not visible from the top, as in the two other species obtained from this bird. The head measures 0·84 mm. from side to side, and 0·92 mm. antero-posteriorly. Each sucker is longer than it is broad and measures 0·94 mm. longitudinally and 0·62 mm. transversely. There is no rostellum and there are no hooks.

Segments.— The segments described (Pl. IV, fig. 27) are from about the middle of the worm. Each is slightly wedge-shaped, being narrower in front than behind, the hinder margin overlapping considerably. They measure 0·62 mm. antero-posteriorly, 0·6 mm. from side to side in front, and 0·82 mm. from side to side behind.

The genital pores are marginal and unilateral. They measure 0·14 mm. in length and are somewhat rounded. The cirrus is well developed, unarmed, and measures 0·06 mm. in length. The outer portion of each segment in a stained specimen remains clear and unstained. The testes and the female organs are confined to the space internal to this. The testes are numerous, numbering 35–50 or more, and are of medium size. The yolk-gland is relatively large and is placed in front of the testes, at the anterior border of each segment. The uterus is a simple sac containing the eggs. Eggs are found only in the latter segments. Two well-marked excretory canals run down either side, externally to the testes and just internally to the cirrus-opening.

33. *Tetrabothrius catherinae*, Leip. and Atk. (Pl. IV, figs. 29, 30. Text-fig. 9.)

Tetrabothrius catherinae, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 225.

Stouter than the preceding species. Head comparatively small. Suckers mostly on the top of the head. The segments overlap their successors by one-third. Testes 30 to 45, bunched in the middle of the segment. Genital organs very characteristic. Cloaca divided into outer and inner portions. There is a large pyriform seminal vesicle internally to the cirrus.

Host.—Trinidad Petrel (*Estrelata trinitatis*); small intestine.

External Characters.—The colour is white. The worm is stouter and thicker than the preceding Cestode. The segments are broad from side to side, and short from before backwards; and this shape is uniform throughout. There is a comparatively small head, no neck being present, and the segments immediately follow it. These gradually increase in breadth until the worm ends caudally. The genital pores are unilateral and open nearer the ventral than the dorsal aspect.

Head.—The head (Pl. IV, fig. 29) is comparatively small, and is without hooks or rostellum. There are four suckers, which are placed mostly on the top of the head.

and do not extend for any great distance down the sides. They are not deep and have no overhanging border.

The head measures 0·9 mm. in breadth and 0·9 mm. in an antero-posterior direction. The outside measurement of a sucker in its broadest part is 0·42 mm., and in its longest axis 0·62 mm. The greatest inside measurements are 0·2 mm. by 0·34 mm. There is no neck, the head being immediately followed by the segments.

Segments.—The segments described (Fig. 30) are those from the head-end of the worm, and later, segments cut in serial sections from nearer the caudal end. Each segment measures 1·14 mm. from side to side and 0·42 mm. antero-posteriorly. The hinder border of the preceding segment overlaps it for over a third of its ventral surface, and it in turn overlaps the following segment. The musculature is exceedingly well developed. There is a clear outer space in a stained specimen and a more deeply staining interior containing the generative organs. The testes are numerous, 30 to 45, and are found internally to the excretory canals. They are bunched more closely together in the middle of the segment and are there difficult to count. A small ovary and yolk-gland are placed in front of them near the anterior border of the segment. The genital openings are peculiar. They are unilateral and open on the side of the segment, but more on the ventral than on the dorsal aspect. There is a small punctate opening or depression showing signs of striation (text-fig. 9, *cc*). Internally to this there is a well-marked ring (*ic*) containing the male and female openings, and behind that a very large cirrus (*s*) and cirrus-sac (*sb*). The outer opening has an internal measurement of 0·02 mm. and an external diameter of 0·04 mm. The inner ring has an internal aperture of 0·04 mm. and an external opening of 0·06 mm. The cirrus measures 0·16 mm., and is unarmed.

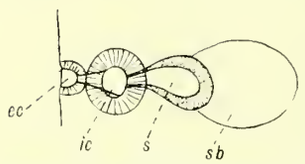

Fig. 9.—*Tetrabothrius catherinae:* the terminal organs of the genital apparatus. *cc*, muscular external portion of cloaca; *ic*, internal portion; *s*, cirrus; *sb*, cirrus-sac.

In sections of more mature segments the whole of the interior is taken up by a mass of eggs in a sac-like uterus, which is simple and undivided. Well-marked broad bands of muscular fibres are present. Two excretory canals run down either side of the segments. The outer and smaller lies very near the edge. The inner, a far wider canal, runs down at a short distance from it internally.

34. *Tetrabothrius aichesoni*, Leip. and Atk. (Text-fig. 10).

Tetrabothrius aichesoni, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 225.

Strobila 3 cm., more slender than in the preceding species. Segments more uniform, only overlapping slightly. Testes arranged in three distinct sets, very numerous, far in excess of those of the previous forms.

Host.—Trinidad Petrel (*Œstrelata trinitatis*); intestine.

External Characters.—This Cestode is of a dirty white colour, and measures 3 cm. to 3·5 cm. in length. It is a more slender worm than the preceding, and the segments

are more uniform in size and shape. The head is succeeded by a very short neck, and segmentation begins almost at once. The segments are uniform nearly the whole way down the body. The genital pores are single and unilateral.

Head.—The head is large. It expands from its narrow junction with the neck to its bulbous end. It has four large suckers, which are deeply hollowed. They open above on its upper surface, and run for some distance along its sides (text-fig. 10). There is a free border formed by the flap making the edge of the sucker. The head measures 0·92 mm. from side to side and 1 mm. from before backwards. It is roughly square when looked at from in front. Each sucker has an outside measurement of 0·44 mm. and an inside measurement of 0·24 mm.

Segments.—Unlike the last Cestode, the uniformity of the shape and size of the segments is marked. They measure 0·49 mm. from before backwards, and 0·76 mm. from side to side. The borders are rounded, and they slightly overlap one another. In a stained specimen the outer portion of the segments remains unstained. The genital openings are unilateral and occur at the sides, rather upon the ventral surface. The opening measures 0·04 mm. and is rounded. The cirrus-sac measures 0·14 mm. and is also rounded. The vagina is fairly wide. The testes, which number 30 to 40, are small and rounded; they are confined definitely to the space between the excretory canals on either side. They are also generally arranged in three distinct sets—the number in the middle set being far in excess of that in either of the other two. In front of these and near the cephalic end of the segment are the deeply-staining yolk-gland and ovary. The ovary is 0·06 mm. across and is rounded. The uterus is a simple sac, and the eggs occur late in the hinder segments. Two excretory canals run down either side, internally to the cirrus but externally to the testes, and are continuous throughout the segments.

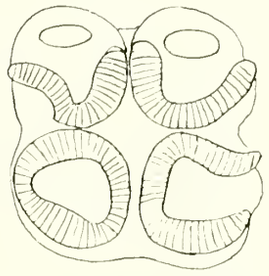

Fig. 10.—*Tetrabothrius aichesoni*: view of the anterior extremity of the scolex.

The main differences from the previous Cestode are in the genital openings, the number, distribution and arrangement of the testes, the shape of the head and suckers, and the uniformity of the segments in shape and size.

35. *Tetrabothrius wrighti*, Leip. and Atk. (Pl. IV, fig. 22.)

Tetrabothrius wrighti, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 225.

Strobila 2·2 mm. long, none of the segments containing eggs. Head 0·4 mm. in length. Testes constantly twelve. Auricular appendages of suckers well developed.

Host.—A few of these minute Cestodes were obtained from the gut of the Adélie Penguin (*Pygoscelis adeliae*), a species which is usually peculiarly free from parasites of any kind.

Head.—The short neck is surmounted by a large head with four suckers and a peculiar rounded armature. There is no rostellum, nor do hooks occur. The head

measures 0·4 mm. in length. The suckers attain their greatest breadth, 0·2 mm., posteriorly. They have overhanging edges and ear-like prolongations.

Segments.—The neck is followed by twenty segments. The segments gradually increase in length from behind the head without diminishing in transverse measurement. The last segment has a breadth of 0·3 mm., and a length of 0·15 mm. The internal organs begin to develop at the eleventh segment. The genital pores are marginal and on the same side. There is a large thick-walled cloaca. The cirrus is large and muscular. The vagina leads into a wide straight tube. The testes are few in number (twelve in each segment); their staining qualities markedly diminish in the last segments. The ovary is situated in the middle line, and near the anterior border of the segment. In front of this is a small, deeply-staining yolk-gland. The cirrus-pouches are external to the excretory canals and are situated marginally, in the middle third of each segment.

In all the material obtained from Adélie Penguins the strobila had the extraordinarily small size above noted. The number of testes is constantly twelve, and the auricular appendages are well developed.

Three species of *Tetrabothrius* have been found hitherto in Penguins, viz., *T. joubini*, Raill., *T. eudyptidis*, Lönnberg, and *T. lutzi*, Parona. *T. wrighti* seems to correspond in many points to the description given by Fuhrmann for *T. monticellii*. The limited number of testes is especially remarked upon by Fuhrmann as peculiar to this species. *T. joubini* is reported, however, to have only five to eight testes. The type-material of that species is said to be immature and poorly preserved.

Fam. DILEPINIDAE.

Anomotaenia, Cohn, 1900.

36. *Anomotaenia zederi* (Baird). (Pl. IV, figs. 23, 24. Text-fig. 11.)

Taenia zederi, Baird, 1853.
Tetrabothrius zederi, Monticelli.
Prosthecocotyle zederi, Fuhrmann.

Host.—Emperor Penguin (*Aptenodytes forsteri*); intestine.

External Appearance.—The worms measure 4 to 5 cm. in length. The head bears a rostellum and four suckers, and is pointed, while caudad from the suckers there is a well-marked pyriform swelling which subsides after a course of 0·7 cm. to join the segments (Pl. IV, fig. 23).

Head.—The head (text-fig. 11) is pointed, and there is a well-marked rostellum (*r*) measuring 0·24 mm. by 0·15 mm. transversely. The rostellum is retractile within a well-marked groove on the surface of the head. Its centre, distally, is marked by a small opening, and communicates with a hollow interior which forms a blind sucker situated within the rostellum. There are two series of well-marked hooks (*h*), nine in each series. The hooks measure 0·09 mm. from end to end; 0·04 mm. from the tip there is a well-marked guard. They are 0·01 mm. thick. The four

other suckers (*s*) on the head are circular, and have an external measurement of 0·24 mm. and an internal diameter of 0·1 mm. Their surface is fleshy, and they are unarmed. The head is succeeded by a large globular neck measuring 0·7 cm. in length and 0·5 cm. transversely. In the interior two wide wavy excretory canals run toward the segments.

Segments.—The segments are very peculiar. There is a central portion, rounded dorsally and cupped ventrally. From the outer borders of each segment there is a well-marked lapel or apron which crosses from either side toward the centre. It is divided by a deep cleft in the middle line from its neighbour of the opposite side. The edge is crenated and suggests the machicolations on ramparts. Only in the latter segments were there any genitalia developed. The testes number 30 to 40, and are confined definitely to the dorsal portion of the segment. They are large and show a crenated outline. Two wide excretory canals run down either side, at the junction of the lapels with the segments. No eggs were present in any of the segments. The longitudinal muscular bands are very marked. The genital pore is peculiar and opens on the border of the lapel ventrally; the pores probably alternate. The anatomy of the segments is exceedingly difficult to make out.

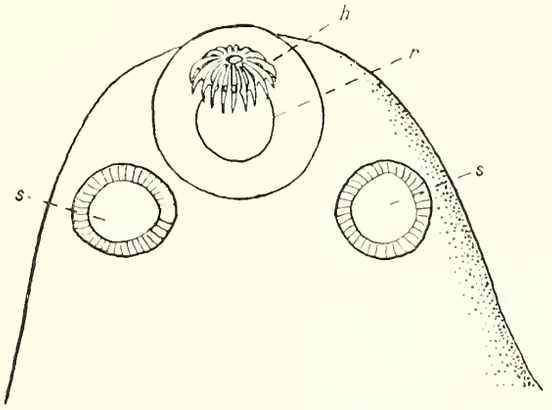

Fig. 11.—*Anomotaenia zederi* (Baird): anterior portion of scolex. *h*, hooks; *r*, rostellum; *s*, suckers.

Encysted in the Emperor Penguin, and completely closed off, occur forms consisting of only the head and neck (Pl. IV, fig. 23). Other cysts occur (Fig. 24) in which several individuals are present and the cyst is connected with the gut of the host. These worms consist of a head and a varying number of flat immature segments, the beginning of the genital apertures being visible on the sides. There also occur more mature forms in the cysts showing the peculiar conformation of the segments. In detail the heads and necks of the three forms are identical. An almost analogous case is mentioned by Railliet and Henry. These parasites were obtained by the French Antarctic Expedition from *Pygoscelis papua*, and the authors ascribe the mature form to *Anomotaenia zederi*.

Order TRYPANORHYNCHA.

Fam. TETRARHYNCHIDAE.

Tetrarhynchus, Rud., 1809.

37. *Tetrarhynchus* sp. (larva). (Pl. V, fig. 35.)

This interesting little *Tetrarhynchus* was collected together with some larval Nematodes, encysted in the wall of the caecum of a Barracouta (*Lepidopus caudatus*) at

the Bay of Islands, New Zealand. The specimens are minute, pearly white and almost spherical bodies, measuring, on the average, 1·02 mm. long. The greatest breadth is 0·96 mm.

On the outer aspect of the anterior half of the body are four large fleshy suckers surrounding a depression from which four rostella emerge. The borders of the suckers project beyond the body at their posterior limits. The muscular fibres of the suckers give the walls an appearance of coarse striation.

The rostella are long and slender, slightly bulbous at their distal ends, and well armed with series of backwardly curved hooks. They measure 0·45 mm. in length, 0·06 mm. in breadth at their distal ends, and 0·04 mm. at their proximal ends. In vertical series the hooks number eleven rows, and in horizontal series eight rows.

From the posterior end of each hook-bearing rostellum, a cylindrical portion, possibly muscular, proceeds backwards and is surrounded by a short kidney-shaped sac. These sacs are 0·37 mm. long and 0·14 mm. broad.

Into the posterior half of the body a broad but short "abdomen" or tail is countersunk, and the tail shows a slight median depression. There are always a large number of chalk-bodies contained in the interior. The surface of the body is smooth and the whole cyst appears to be enclosed in a delicate transparent capsule probably secreted by the host.

Abothros, Welch, 1876.

38. *Abothros carcharias*, Welch, 1876. (Pl. V, fig. 36.)

This worm, a larval form, was obtained from the stomach of a small shark (*Carcharias* sp.) caught in 1910 at the Island of S. Trinidad (Stat. 37). It consists of a clubbed anterior portion, and a longer and more slender tail "telescoped" into the fore-body somewhat after the manner of the "abdomen" of *Heniurus*. The total length is 21 mm., the anterior portion measures 7·3 mm., and the tail-end is 13·7 mm. long. The tail-end is in part protrusible.

The body is surmounted anteriorly by four slender rostella armed with hooks. The length of the rostellum is 0·7 mm.; the breadth, which is uniform, being 0·12 mm. The vertical number of hooks is twenty-seven, and the horizontal number is eight in each row. The hooks are sharply down-curved, sharp-pointed, and with a broad base; they measure 0·03 mm. from tip to base. There is a striking diminution in the size of the hooks of the proximal rows. There is a well-marked sac for each rostellum. To each are attached long bundles of muscular fibres which run back, to become inserted into the line of attachment of the abdominal portion of the body. The excretory canals run down into the tail-portion. The skin is smooth and unarmed. In the interior of the bulbous anterior end there are a large number of granules of brown pigment.

Somewhat similar forms have been described by Welch from the stomach of a shark (*Carcharias* sp.) and by Rennie and Reid from the muscles of the Bonito.

Owing to the absence of suckers, Welch created a separate genus *Abothros* for his specimen. Our material does not appear to differ from his species *A. carcharias*. Welch merely states that the number of hooks on each rostellum is about 200.

SUMMARY AND CONCLUSIONS.

We now summarise the species that have been collected by the various Antarctic Expeditions up to the present time. The species described as new in the corresponding Reports are indicated by an asterisk.

Ross's Antarctic Expedition, 1841–4. 2 species (both new).

CESTODA :

**Dibothriocephalus antarcticus* (Baird), 1853.
**Taenia zederi*, Baird, 1853.

National Antarctic Expedition, 1901–4 ("Discovery"). 4 species (3 new, 1 previously known).

CESTODA : —

Dibothriocephalus antarcticus (Baird), 1853.
* ,, *scotti*, Shipley, 1907.
* ,, *wilsoni*, Shipley, 1907.

NEMATODA : —

**Leptosomatum australe*.

Scottish National Antarctic Expedition ("Scotia"). 17 species (8 new, 5 previously known, 4 doubtful).

CESTODA :

**Dibothriocephalus scoticus*, Rennie and Reid, 1912.
* ,, *coatsi*, Rennie and Reid, 1912.
,, *antarcticus* (Baird), 1853.
* ,, *mobilis*, Rennie and Reid, 1912.
* ,, *pygoscelis*, Rennie and Reid, 1912.
Anchistrocephalus microcephalus (Rud.), 1819.
Hymenolepis sp. ?
Phyllobothrium sp. ?
Tetrarhynchus sp. ?

NEMATODA : —

(parasitic) : —

**Ascaris radiata*, v. Linst., 1906.
* ,, *rectangula*, v. Linst., 1906.
,, *osculata*, Rud. 1802.
,, *diomedeae*, v. Linst., 1888.
,, sp. ?
**Monorygma dentatum*, v. Linst., 1906.

(free living) : —

Thoracostoma setosum, v. Linst., 1896.

ACANTHOCEPHALA : —

**Echinorhynchus antarcticus*, Rennie, 1906.

Expédition Antarctique Française ("Pourquoi Pas?"). 18 species (4 doubtful, 8 new, 6 previously known).

CESTODA :—

**Diphyllobothrium resimum*, Railliet and Henry, 1912.
,, *wilsoni* (Shipley), 1907.
* ,, *perfoliatum*, Railliet and Henry, 1912.
* ,, *clavatum*, Railliet and Henry, 1912.
,, *antarcticum* (Baird), 1853.
,, sp.?
Anomotaenia zederi, Baird, 1853.
**Tetrabothrius joubini*, Railliet and Henry, 1912.
**Choanotaenia dominicana*, Railliet and Henry, 1912.
Tetrabothrius heteroclitus, Dies., 1850.
,, sp. (?)
? ,, sp.
? ,, sp.

NEMATODA :—

Ascaris decipiens, Krabbe, 1878.
,, *osculata*, Rud., 1802.
* ,, *falcigera*, Railliet and Henry, 1907 (=*A. radiata*, v. Linst., 1906).
* ,, *stenocephala*, Railliet and Henry, 1907 (=*A. rectangula*, v. Linst., 1906).

ACANTHOCEPHALA :—

**Corynosoma sipho*, Railliet and Henry, 1907 (=*C. antarcticus*, Rennie, 1906).

British Antarctic Expedition ("Terra Nova") 1910–13.

A. 9 Forms previously recorded from the Antarctic Zone, represented in the collection.

NEMATODA :—

Leptosomatum setosum, v. Linst., 1906.
Ascaris osculata, Rud. [*Kathleena*] . . . (Hosts, *Hydrurga leptonyx*, *Lobodon carcinophagus* and (larvae) *Trematomus bernacchii*).
,, *radiata*, v. Linst. [*Kathleena*] . . (Host, *Leptonychotes weddelli*).
,, *rectangula*, v. Linst. [*Kathleena*] . (,, ,, ,,).

ACANTHOCEPHALA:

Echinorhynchus hamanni, v. Linst. [*Corynosoma*]. (Hosts, *Leptonychotes weddelli*, *Lobodon carcinophagus*, *Hydrurga leptonyx*).

CESTODA :—

Taenia zederi, Baird [*Anomotaenia*] . . . (Host, *Aptenodytes forsteri*).
Dibothriocephalus mobilis, Rennie and Reid, 1912. (,, *Leptonychotes weddelli*).
Dibothriocephalus coatsi, Rennie and Reid, 1912. (,, ,, ,,).
Diphyllobothrium perfoliatum, Railliet and Henry, 1912. (,, ,, ,,).

B. 3 Forms previously recorded from the Arctic Regions, now found in the Antarctic Zone.

NEMATODA :—

Filaria crassicauda, Creplin [*Crassicauda*] . (Host, *Megaptera*).

ACANTHOCEPHALA :—

Echinorhynchus turbinella (Dies.) Porta. [*Pomporhynchus*]. (,, ,,).

TREMATODA :—

Monostomum plicatum, Creplin [*Ogmogaster*] . (Hosts, *Leptonychotes weddelli*, *Lobodon carcinophagus*).

C. 1 Form previously recorded elsewhere and now found within the Antarctic Circle.

CESTODA :—

Tetrabothrius cylindraceus (Rud.), 1819 . (Host, *Megalestris maccormicki*).

D. New species,† collected in the Antarctic Zone.

NEMATODA :—

**Kathleena scotti* . . . . . (Host, *Diomedea melanophrys*).

ACANTHOCEPHALA :—

**Echinorhynchus campbelli* . . . . . (Host, *Trematomus bernacchii*).
* ,, *rennicki* . . . . . (,, ,, ,,).
* ,, *debenhami* . . . . . (,, ,, ,,).

TREMATODA :—

**Hemiurus oatesi* . . . . . (Host, *Trematomus bernacchii*).
**Aponurus bowersi* . . . . . (,, ,, ,,).
**Lepodora garrardi* . . . . . (,, ,, ,,).
**Podocotyle pennelli* . . . . . (,, ,, ,,).
**Allocreadium fowleri* . . . . . (,, ,, ,,).

CESTODA :—

**Dibothriocephalus lashleyi* . . . . . (Host, *Leptonychotes weddelli*).
* ,, *archeri* . . . . . (,, ,, ,,).
**Diphyllobothrium rufum* . . . . . (,, ,, ,,).
**Oriana wilsoni* . . . . . (,, *Balaenoptera borealis*).
**Tetrabothrius wrighti* . . . . . (,, *Pygoscelis adeliae*).
**Anthobothrium wyatti* . . . . . (,, *Trematomus bernacchii*).

E. Forms collected in Tropical and Temperate Zones during the voyage of the "Terra Nova."

(1) Previously recorded :—

CESTODA :—

Abothros carcharias, Welch., 1876 . . . (Host, *Carcharias* sp.).
Tetrabothrius heteroclitus, Dies., 1850 . . (,, *Puffinus cinereus*).

(2) New species.

CESTODA :—

**Tetrabothrius evansi* . . . . . (Hosts, Trinidad Petrels, *Œstrelata trinitatis* and *Œ. arminjoniana*).
* ,, *aitchesoni* . . . . . (Host, *Œ. trinitatis*).
* ,, *catherinae* . . . . . (,, ,,).
* ,, *priestleyi* . . . . . (,, Frigate Bird, *Fregata aquila* or *F. ariel*).
* ,, *nelsoni* . . . . . (,, Sooty Albatros, *Phoebetria palpebrata*).

(3) Undetermined.

CESTODA :—

Tetrarhynchus (larva). . . . . (Host, *Lepidopus caudatus*).

F. New Genera.

NEMATODA :—

(1) *Crassicauda* . . . . . Genotype, *Filaria crassicauda*, Creplin, 1829.
(2) *Terranova* . . . . . ,, *Terranova antarctica*, Leip. and Atk., 1914.
(3) *Kathleena* . . . . . Genotype, *Ascaris osculata*, Rud., 1802.

CESTODA :—

(4) *Oriana* . . . . . Genotype, *Oriana wilsoni*, Leip. and Atk., 1914.

G. In *Trematomus bernacchii* caught in icehole-traps were found the developmental stages of *Corynosoma hamanni*, *Dibothriocephalus* spp. and Ascarids, which attain maturity in the Antarctic Seals.

† Diagnoses of these new species have already been published in the Proceedings of the Zoological Society, 1914, pp. 222–226.

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PLATE I.

Figs. 1, 4, 7.—*Terranova antarctica.*
,, 2, 5, 8.—*Kathleena scotti.*
,, 3, 6, 9.—*Leptosomatum setosum.*

Fig. 1.—*Terranova antarctica*, Leiper and Atkinson ; ex *Mustelus antarcticus*. Anterior portion showing *a*, simple œsophagus, and *b*, caecal prolongation of the intestine.

Fig. 2.—*Kathleena scotti*, Leiper and Atkinson ; ex *Diomedea melanophrys*. Anterior portion showing *a*, œsophagus, with *b*, posterior appendage, and *c*, the caecal prolongation of the intestine.

Fig. 3.—*Leptosomatum setosum*, v. Linst. Anterior end, showing *a*, cephalic armature ; *b*, œsophagus ; *c*, ocelli ; *d*, nerve-ring.

Fig. 4.—*Terranova antarctica*. Posterior end of female. *a*, anus.

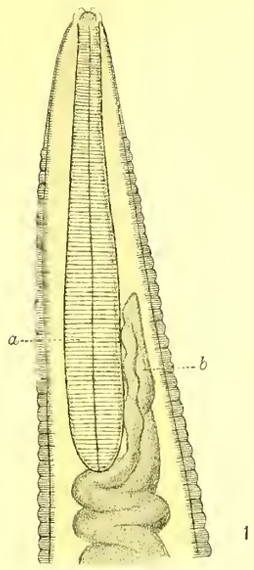
Fig. 5.—*Kathleena scotti*. Posterior extremity of male, showing *sp.*, spicules. The papillae are illustrated in text-fig. 1.

Fig. 6.—*Leptosomatum setosum*. Posterior end of male showing four papillae, *p.*, and the peculiar spicules, *sp.*, accessory piece, *ap.*, and sucker, *s*.

Fig. 7.—*Terranova antarctica*. Anterior end, showing outline of the lips. Interlabia are absent.

Fig. 8.—*Kathleena scotti*. Anterior end, showing the lips, *a*, *a'*, *a''*, from the ventral aspect. There is a large interlabium, *b*, separating the two ventral lips, *a*, *a''*. The other two are not visible in this position.

Fig. 9.—*Leptosomatum setosum*. Head, showing *a*, cephalic armature in optical section, and *b*, cuticular spines.



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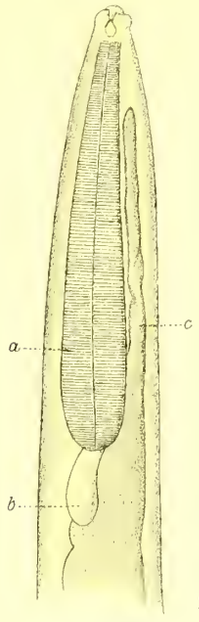

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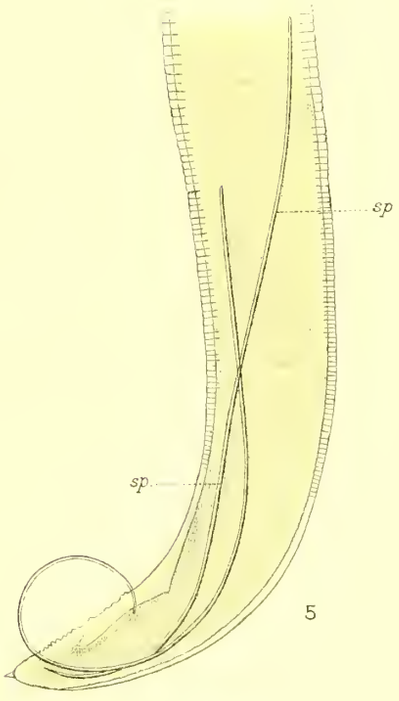

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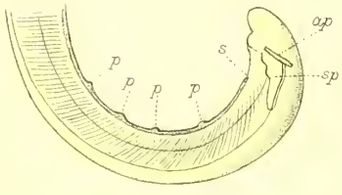

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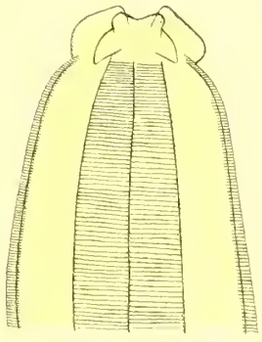
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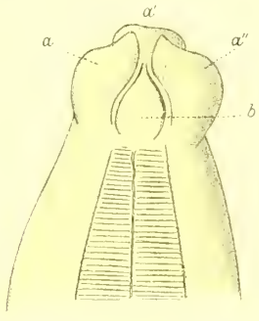

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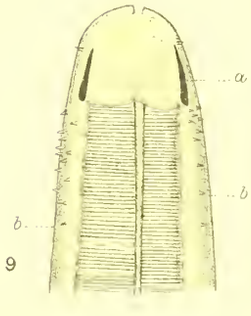

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PLATE II.

Fig. 10.—*Pomporhynchus turbinella*, Dies., complete male; ex *Balaenoptera borealis*: *a*, rostellum; *b*, head, bearing large hooks; *c*, neck; *d*, *d'*, testes: *e*, prostatic glands; *f*, cirrus; *g*, bursal sac; *g'*, sac partially protruded.

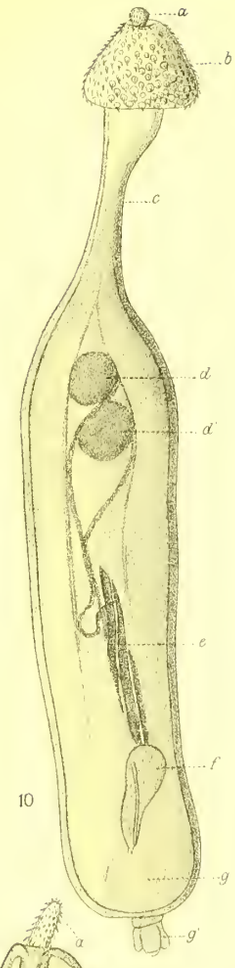
Fig. 11.—*Corynosoma hamanni*, v. Linst., male; ex *Leptonychotes weddelli*: *a–g*, as in Fig. 10; *h*, *h'*, spines on skin of body.

Fig. 12.—*Corynosoma hamanni*, v. Linst.; larval stage; ex *Trematomus bernacchii*: *a–g*, as in Fig. 10. Enlarged 43 diameters.

Fig. 13.—*Echinorhynchus campbelli*, Leiper and Atkinson, male; ex *Trematomus bernacchii*: *a–g*, as in Fig. 10.; *l*, *l'*, lemnisci.

Fig. 14.—*Echinorhynchus debenhami*, Leiper and Atkinson, male; ex *Trematomus bernacchii*: *a–g*, as in Fig. 10; *l*, *l'*, lemnisci.

Fig. 15.—*Echinorhynchus rennicki*, Leiper and Atkinson, male; ex *Trematomus bernacchii*: *a–g*, as in Fig. 10; *l*, *l'*, lemnisci.



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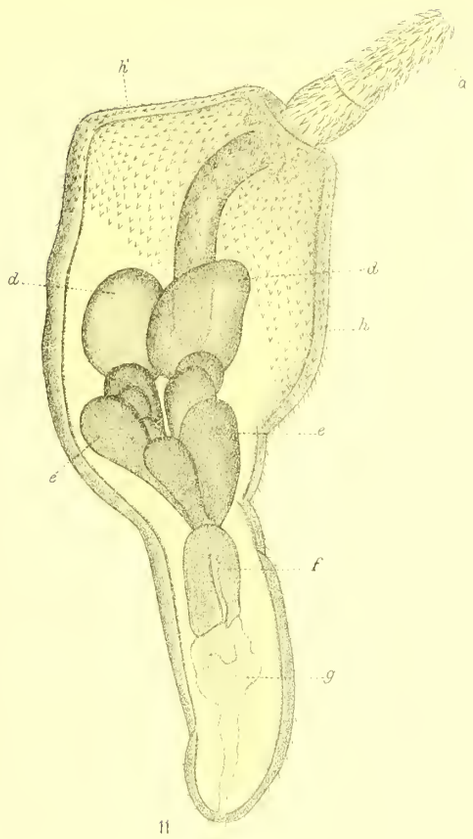

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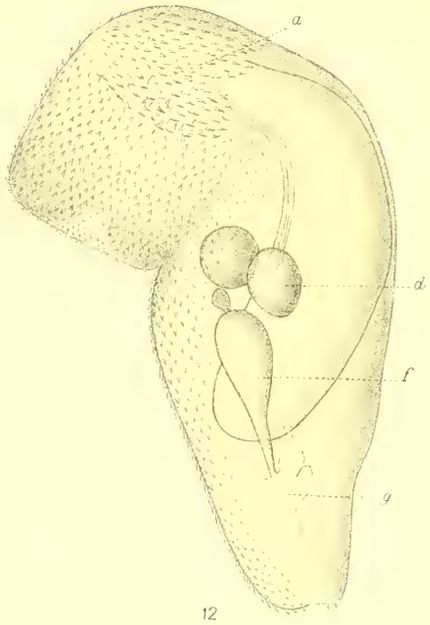

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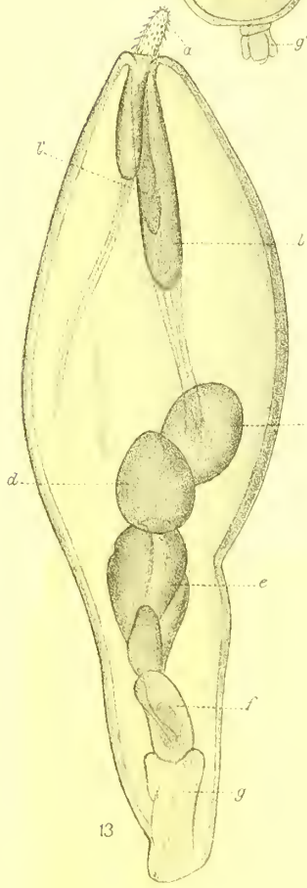

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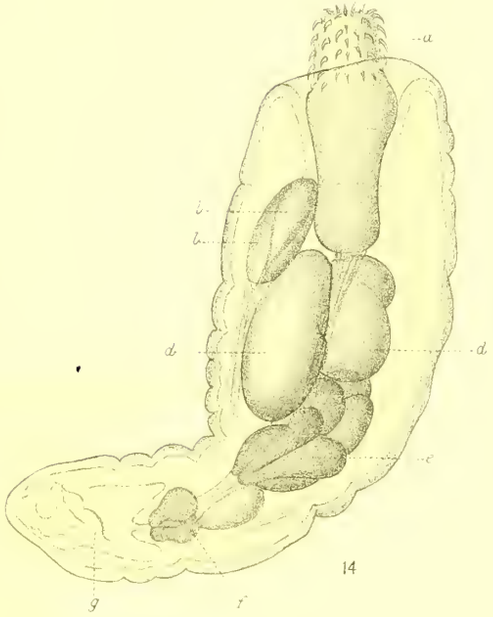

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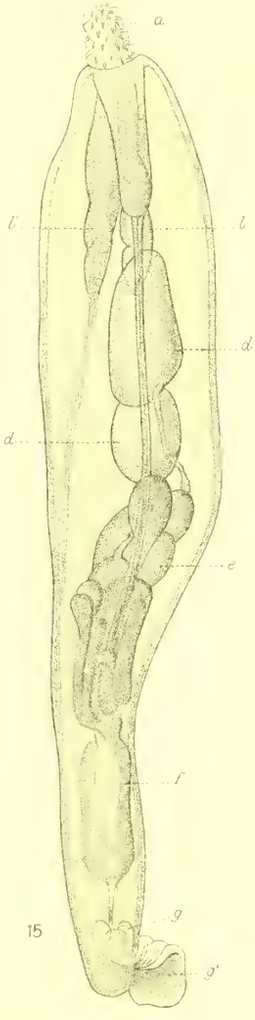

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PLATE III.

Fig. 16.—*Ogmogaster plicatus* (Creplin); ex *Leptonychotes weddelli*. Ventral view; *a*, oral sucker; *b*, wavy margin of body; *gp*, genital pore; *ov*, ovary; *r*, rugae; *t*, *t'*, testes; *ut*, uterus; *y*, yolk-glands.

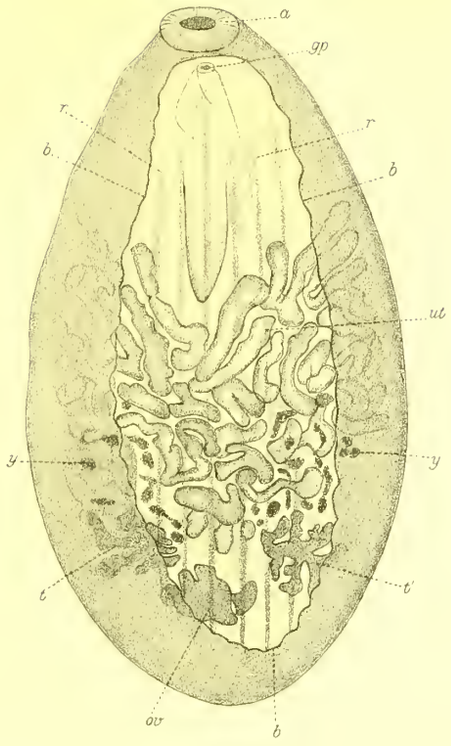
Fig. 17.—*Hemiurus oatesi*, Leiper and Atkinson; ex *Trematomus bernacchii*. *a*, oral sucker; *b*, ventral sucker; *c*, cirrus; *d*, abdomen; *ex*, excretory vesicle; *g*, branch of gut; *gp*, genital pore; *ov*, ovary; *ph*, pharynx; *sv*, seminal vesicle; *t*, *t'*, testes; *ut*, uterus; *y*, *y'*, yolk-glands.

Fig. 18.—*Aponurus bowersi*, Leiper and Atkinson; ex *Trematomus bernacchii*. Lettering as in Fig. 17.

Fig. 19.—*Podocotyle pennelli*, Leiper and Atkinson; ex *Trematomus bernacchii*. Lettering as in Fig. 17.

Fig. 20.—*Lepodora garrardi*, Leiper and Atkinson; ex *Trematomus bernacchii*. Lettering as in Fig. 17.

Fig. 21.—*Allocreadium fowleri*, Leiper and Atkinson; ex *Trematomus bernacchii*. Immature form. Lettering as in Fig. 17.



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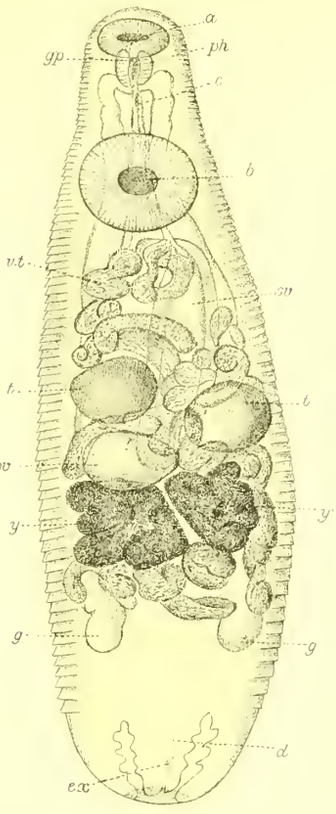

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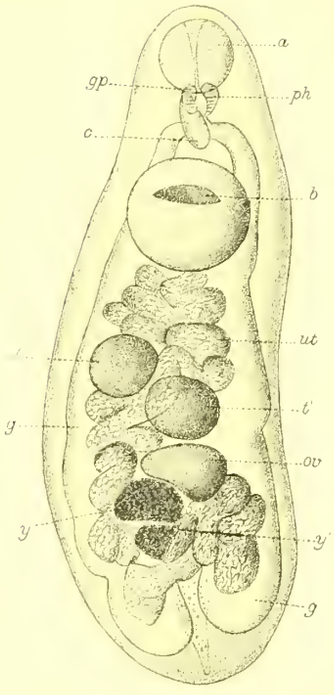

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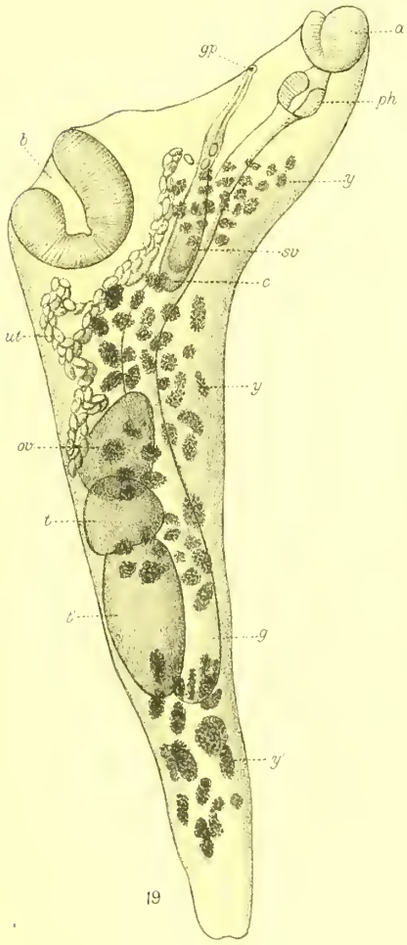

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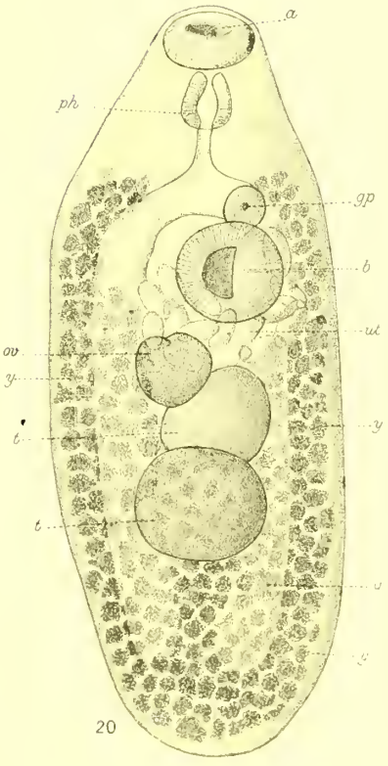

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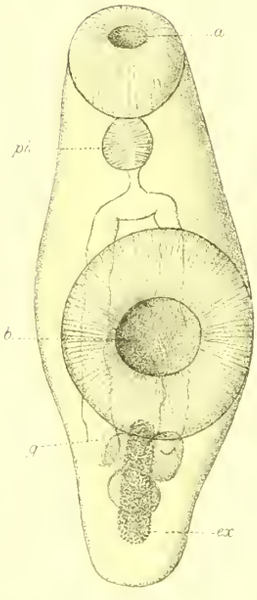

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PLATE IV.

Fig. 22.—*Tetrabothrius wrighti*, Leiper and Atkinson; ex *Pygoscelis adeliae*. Complete but immature strobila, showing characteristic suckers, and the arrangement of the testes in the segments.

Fig. 23.—*Anomotaenia zederi*, ex *Aptenodytes forsteri*. Immature form from cyst.

Fig. 24.—*A. zederi*. Cyst dissected out from intestinal wall and showing long neck and opening into lumen of the gut of the host.

Fig. 25.—*Tetrabothrius nelsoni*, Leiper and Atkinson; ex *Phoebetria palpebrata*. Segment, showing *a*, genital atrium; *b*, vas deferens; *c*, cirrus; *t*, testes; *v*, vagina; *vs*, vesicula seminalis.

Fig. 26.—*Tetrabothrius creani*, Leiper and Atkinson; ex *Œstrelata trinitatis*; head, showing suckers.

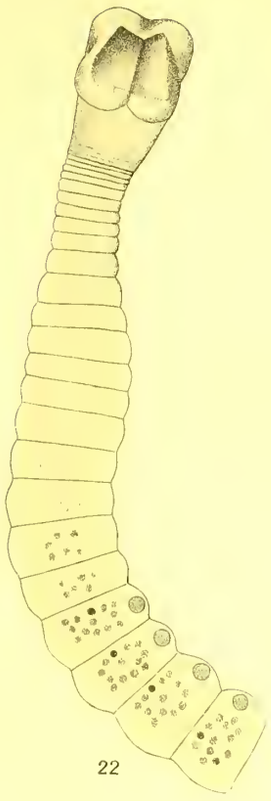
Fig. 27.—*T. creani*. Segments.

Fig. 28.—*Tetrabothrius priestleyi*, Leiper and Atkinson; ex Frigate Bird (*Fregata aquila* or *F. ariel*). Immature segments; *c*, cloaca; *sp*, cirrus; *t*, testes.

Fig. 29.—*Tetrabothrius catherinae*, Leiper and Atkinson; ex *Œstrelata trinitatis*; scolex.

Fig. 30.—*T. catherinae*. Segments; *c*, cloaca; *sp*, cirrus; *t*, testes.

Fig. 31.—*Tetrabothrius cylindraceus*, ex *Megalestris maccormicki*. Segments, showing horse-shoe arrangement of testes; *c*, cloaca; *sp*, cirrus; *t*, testes; *yg*, yolk-gland.



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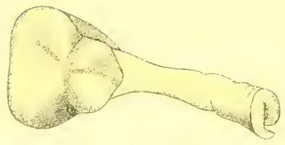

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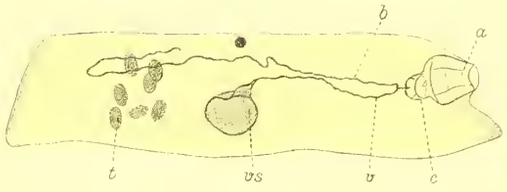

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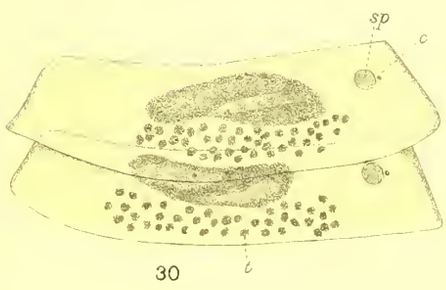

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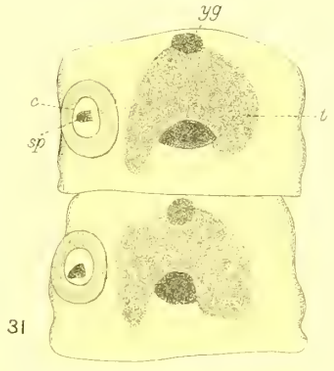

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PLATE V.

Fig. 32.—*Oriana wilsoni*, Leiper and Atkinson ; ex *Balaenoptera borealis*. Head, anterior surface, showing four round suckers ; no rostellum.

Fig. 33.—*O. wilsoni*. Head seen laterally, showing mode of attachment of slender neck.

Fig. 34.—*O. wilsoni*. Segments.

Fig. 35.—*Tetrarhynchus* sp., ex *Lepidopus caudatus*. Larva removed from cyst.

Fig. 36.—*Abothros carcharias*, Welch, ex *Carcharias*, sp. Complete specimen ; only three of the four rostella are shown.

Fig. 37.—*Dibothriocephalus coatsi*, ex *Leptonychotes weddelli*. Complete strobila.

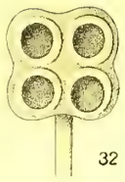
Fig. 38.—*D. coatsi*. Mature segment ; *c*, cloaca ; *d*, uterine pore ; *e*, uterus, containing eggs ; *t*, testes.

Fig. 39.—Plerocercoid larva, ex *Trematomus bernacchii*.

Fig. 40.—*Dibothriocephalus lashleyi*, Leiper and Atkinson ; ex *Leptonychotes weddelli*. Head.

Fig. 41.—*D. lashleyi*. Segments ; lettering as in Fig. 38.

Fig. 42.—Plerocercoid larva, ex *Trematomus bernacchii*.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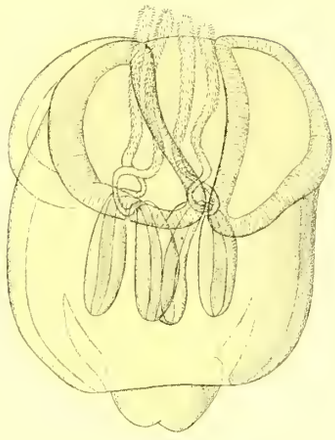
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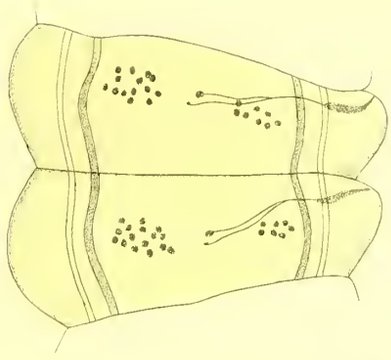
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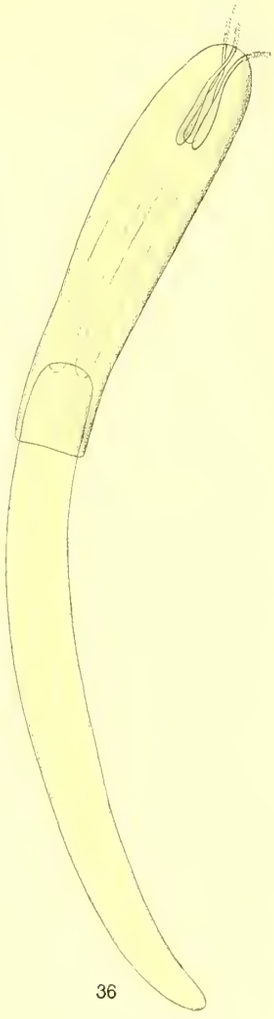
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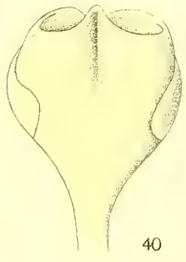
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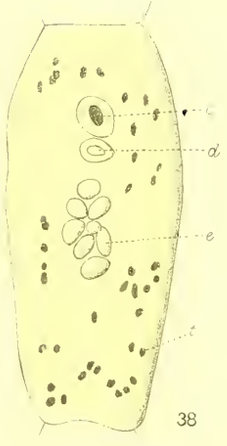

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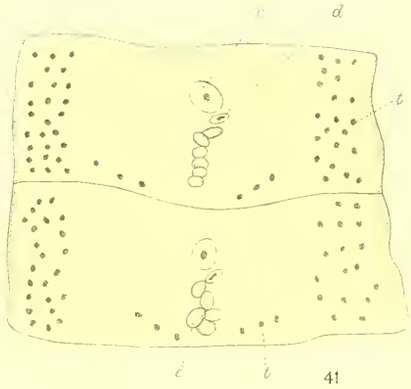

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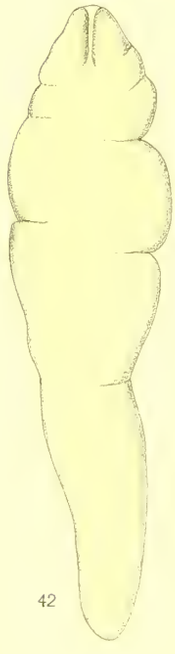
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