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AUTHOR: S. L. Delyamure

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PART ONE. SYSTEMATICS
TREMATODA OF PINNIPEDIA AND CETACEA

GENUS Campula Cobbold, 1858

Synonym: Brachyclaudium Looss, 1899.

Historical Information

p. 32 The genus Campula was established by Cobbold almost one hundred years ago (1858) for the trematode species C. oblonga, parasites of the hepatic biliary pathways of dolphin (Phocaena phocaena). Before 1928, the genus Campula became sort of forgotten. Thereafter, many authors described new trematode species whose place was the genus Campula in the system, yet the investigators referred them to other genera. Thus, in 1885 Looss described trematodes from the liver of Delphinus delphis under the name Distomum palliatum, and a year later Poirier (1886) described two species: Distomum delphini and D. rochebruni from the same dolphin species. Stossich (1892), when classifying this group of trematodes, referred the species described by Cobbold to the genus Brachylaimus, and the species described by Looss and Poirier to the genus Cladocoelium. In 1899, Looss substantiated the gunus Brachicladium into which he transferred the species D. palliatum, D. delphini and D. rochebruni. Two years afterwards, however, he removed the species Brachicladium palliatum from the genus Brachicladium, and transferred it into the genus Campula. In 1928, Bittner and Sprehn reexamined the genus Campula, and transformed it into two species: Distomum delphini and D. rochebruni. From 1928 up to the present time, three more species of the genus Campula were described. Thus, in 1935 Ozaki described the species Campula folium, a parasite of the dolphin Neomeris phocaenoides (= Neophocaena phocaenoides), and in 1942 Yamaguti published a work in which two more species of the genus Campula occur: C. laevicaecum and C. Gondo. Thus, at present the genus Campula is represented by seven species.

Table for the species determination of the genus Campula[1]

1 (4). Testes non-branched.

2 (3). Suckers close together; testes placed anteriorly to the center of the body. Host: Delphinus delphis ... C. rochebruni (Poirier, 1886; Bittner and Sprehn, 1928).

3 (2). Suckers considerably remote from each other. Testes in the posterior third of the body length.
Host: Delphinus delphis ... C. Delphini (Poirier, 1886; Bittner and Sprehn, 1928).

4 (1). Testes branched.

5 (6). Intestinal trunks provided with anal openings. The bursa reaches the posterior edge of the ventral sucker. Host: Phocaena phocaena ... C. oblonga (Cobbold, 1858).

6 (5). The intestinal trunks lack anal openings.

7 (8). The bursa does not reach the posterior edge of the ventral sucker; no prepharyngeal pouch. Host: Delphinus delphis ... C. palliata (Looss, 1885).

8 (7). The bursa reaches the posterior edge of the ventral suckers. Prepharyngeal pouch present. Host: Neomeris phocaenoides ... C. folium (Ozaki, 1935).

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1. This table does not include C. gondo and C. laevicaecum because we lack the description of these species.

Campula oblonga (Cobbold, 1858)

Figure 2*

Synonyms: Distomum oblongus (Cobbold, 1858), (Braun, 1892); Distomum (Brachylaimus) oblongus (Cobbold, 1858; Stoss., 1892); Brachicladium oblongum (Cobbold, 1858; Looss, 1902); Distomum tenicolle Rud. (Olsson, 1893).

p. 33 Host: Phocaena phocaena L. - the porpoise.

Location within host: bile-ducts of liver.

Geographical distribution: North Atlantic Ocean (Europe and North America).

Literature: Skryabin, 1948, p. 133; Cobbold, 1858, p. 133; 1879, p. 419; Braun, 1892, p. 99; Stossich, 1892, pp. 16 - 17; Monticelli, 1893, p. 44; Stiles, 1895, p. 219; Looss, 1899, p. 558; 1902, p. 716; Braun, 1900, pp. 249 - 254; Price, 1932, pp. 7 - 9; Baylis, 1932, p. 396, 412; Schmidt - Ries, 1939a, pp. 89 - 92; Dawes, 1946, p. 389.

Campula delphini (Poirier, 1886; Bittner and Sprehn, 1929).

Figure 3*

Synonyms: Distomum delphini (Poirier, 18886); Cladocoelium delphini (Poirier, 1886; Stossich, 1892); Brachycladium delphini (Poirier, 1886; Looss, 1889).

Host: Delphinus delphis - white-sided dolphin.

Location within host: bile-ducts of liver.

Geographical distribution: The Atlantic (Europe).

Literature: Skryabin, 1948, p. 133; Poirier, 1886, pp. 34 - 36; Stossich, 1892, p. 10; Monticelli, 1893, p. 44 etc.; Stiles, 1895, p. 219; Looss, 1889, p. 558; Odhner, 1905, p. 348; Bittner and Sprehn, 1928; Baylis, 1932, p. 397, 409; Price, 1932, pp. 9 - 11; Dawes, 1946, p. 390.

Campula folium (Ozaki, 1935)

Figure 4*

Host: *Neomeris phocaenoides* (Cuvier = *Neophocaena phocaenoides*) - finless porpoise.
Location within host: Liver.
Geographical distribution: Japan.
Literature: Skryabin, 1948, p. 134; Ozaki, 1935, pp. 123 - 130.

Campula gondo (Yamaguti, 1942)
Host: *Globicephalus melas scammoni* Cope - black (Pacific Ocean) grind whale.
Location in the host: bile-ducts.
Geographic distribution: Pacific Ocean (Japan).
Literature: Yamaguti, 1942, PP. 402 - 404.

Campula palliata (Looss, 1885; Looss, 1901)

Figures 5, 6, 7*

Synonym: *Distomum palliatum* (Looss, 1885); *Brachycladium palliatum* (Looss, 1885; Looss, 1899); *Cladocoelium palliatum* (Looss, 1885; Stossich, 1892).
Host: *Delphinus delphis* L. - white-sided dolphin; D. delphis ponticus Barab. - the Azov-Black Sea white-sided dolphin.

Campula laevicaecum (Yamaguti, 1942)
Host: *Prodelphinus longirostris* Gray (= *Delphinus* longirostris)
Location in host: bile-ducts of the liver.
Geographic distribution: Pacific Ocean (Japan).
Literature: Yamaguti, 1942, pp. 399 - 402.

* Figures not included in original text.

CESTODA OF PINNIPEDIA AND CETACEA

p. 79 At the present time, forty-one species of cestodes are known which are parasitic in Pinnipedia and Cetacea. These species belong to four families: Tetrabothriidae (Braun, 1900); Diphyllobothriidae (Luhe, 1910); Phyllobothriidae (Braun, 1900); Pseudophyllidea (van Beneden, 1850); Tetraphyllidea (Schmarada, 1871); and Tetrarhynchidea (Poche, 1925).

Let us begin the systematic survey of Cestoda with Tetrabothriidae and Diphyllobothriidae. The representatives of these families are parasitic in pinnipeds and cetaceans only in the sexually mature state. At the end of this chapter a special section is devoted to the larval forms of Cestoda which are parasitic in Pinnipedia and Cetacea.

Table

for the determination of the cestode families whose representatives are parasitic in Pinnipedia and Cetacea in the sexually mature form[1]

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1. The table for the determination of the larval cestode forms is on page 206 of the original text.

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1 (2). Scolex provided with four suckers, sometimes sucker is missing, but it has a fleshy collar on the base. Sexual opening located unilaterally. Sacciform uterus ... Family Tetrabothriidae (Braun, 1900).

2 (1). Scolex provided with two longitudinal slits ("bothria"). The genital pores are located ventrally. The uterus is in the shape of a more or less twisted duct. The vitelline follicles are in the cortical paranchyma ... Family Diphyllobothriddae (Luhe, 1910).

Order Cyclophyllidea (Braun, 1900)

Family Tetrabothriidae (Braun, 1900)

Short historical outline of the study of tetrabothriids parasitic in pinnipeds and cetaceans.

Helminthologists are still not unanimous about the identifier of the family Tetrabothriidae. Thus, Meggitt (1924) and Southwell (1930) write that this family was set up by Linton in 1891. Nybelin (1922), Sprehn (1932), Joyeux and Baer (1936) and others consider that the author of the family Tetrabothriidae is Fuhrmann (1903), while K. I. Skryabin (1940) thinks that the author of this family is Braun (1900).

Having become acquainted with the corresponding literature sources, we found that the family of Tetrabothriidae was not established by Fuhrmann, since he himself (Fuhrmann,
p. 80 1933) considers that it was set up by Braun (1900). Unfortunately, we could not discover upon which sources Meggitt and Southwell relied when they considered Lipton the author of the family of Tetrabothriidae.

In regard to the position of the family of Tetrabothriidae in the system of cestodes, several discrepancies are also in existence. For instance, Nybelin (1922) thinks that this family should go into the system of the order of Pseudophyllidea (van Beneden, 1856) since in his opinion (which has some good reasons) the tetrabothriids are strongly differentiated pseudaphyllids. However, the majority of helminthologists does not accept the point of view of Nybelin, and considers the family Tetrabothriidae as a component member of the order of Cyclophyllidea. Without going into details of the essence of this question on the systematic position of tetrabothriids, which we intended to elucidate in another special work, we remark that the representatives of the family of Tetrabothriidae on the one hand, possess characteristics of the pseudophyllids, while on the other hand, they have traits of cyclophyllids, but they resemble the latter more. This general evaluation of the characteristics of the tetrabothriids is in agreement with the position of Academician K. I. Skryabin (1940) who segregates the family of Tetrabothriidae into an independent suborder called Tetrabothriata (Skrjabin 1940, Order Cyclophyllidea).

The tetrabothriids are a very homogenous family. According to different authors, it unites five to seven genera whose representatives are parasitic in cetaceans and pinnipeds but chiefly in birds. During the 136 years since the establishing of the genus Tetrabothrium (Rud., 1819), many species of tetrabothriids were described. In the overwhelming majority, these are very bad descriptions without illustrations. Many tetrabothriid species which were described as new are actually identical to older, already described species, but since the authors of the latter published a very superficial description, at present the literature includes real species and duplicate descriptions as independent species. Unfortunately, we did not have the facility to get into all the tetrabothriid families on the whole, since the majority of forms of this family are parasitic in birds, and to investigate their helminth fauna was not a part of our task. As to the tetrabothriids of marine mammals (Pinnipedia and Cetacea), we present a brief historical outline of their study as follows.

The first tetrabothriid of a cetacean was described by Diesing in 1850 under the name Tetrabothrium triangularis. The host of this tetrabothriid was the dolphin (Steno rostratus). At present, this species is under the designations: Tetrabothrium triangularis (Diesing, 1850); Prosthecocotyle triangularis (Diesing, 1850; Fuhrmann, 1899); and Strobilocephalus triangularis (Diesing, 1850; Baer, 1932).

In 1871, on material from the white-sided dolphin, Krefft described a tetrabothriid under the name Taenia forsteri. In 1892, this species was selected by Monticelli as a typical one for the genus Prosthecocotyle which he created. In 1903, the species *Taenia forsteri*, not without reason, was transferred by Fuhrmann into the genus *Tetrabothrium*. Johnston (1912) agreed with Fuhrmann on this question.

It should be mentioned that Fuhrmann (1898; 1899) considers the genus *Prosthecocotyle* (Monticelli, 1892), a fully justified member in the system of tetrabothriids. In the first work, he attributes five species from birds and one tetrabothriid (*P. forsteri*) from a cetacean (Delphinus sp.) to this genus. In the second work Fuhrmann already includes 15 species of tetrabothriids in the system of the genus *Prosthecocotyle*, thirteen of which are from birds and two (*P. forsteri* and *T. triangularis*) from cetaceans. However, in 1903 Fuhrmann abolished the genus *Prosthecocotyle*, and
p. 81 transferred to the genus *Tetrabothrium* all the species which he had earlier placed in the abolished genus. A number of scholars doubted the authenticity of the genus *Prosthecocotyle*, including Baylis (1926), who showed that this genus is identical to the genus *Tetrabothrium*. Having been specially interested in this question, we became convinced that the type species of this genus --- *Taenia forsteri* (Krefft, 1871) -- is one of the typical representatives of the genus *Tetrabothrium*.

In 1891, in a work of Jägerskjöld, Lönnberg described a cestode from the intestine of *Balaenoptera borealis* under the name *Diplobothrium affine*, which after a year Lönnberg himself tranferred to the *Tetrabothrium* genus. Subsequently, the pertinence of this species to the tetrabothriids was corroborated by Baylis (1926). In 1914, Leiper and Atkinson described (literally in a few words) a tetrabothriid from *B. borealis* under the designation *Oriana wilsoni* for which they created the new genus *Oriana*, however, they did not give to it any kind of diagnostic criteria. In 1915, the same authors supplemented the description of the species *Oriana* wilsoni somewhat, and gave a brief diagnosis of the Oriana genus, which is as follows: "Cyclophyllidea with large square discoid scolex, possessing four round suckers. Rostellum absent." From this diagnosis it is evident that the genus Oriana (Leiper and Atkinson, 1914), undoubtedly must be considered a synonym of the genus Tetrabothrium (Rudolphi, 1819). Baylis (1926) suggested that for the future the tetrabothriid which Leiper and Atkinson named Oriana wilsoni be called Tetrabothrium wilsoni (Leiper and Atkinson, 1914; Baylis, 1926).

Interesting and well outlined is the new tetrabothriid genus, Priapocephalus, which was established by Nybelin in 1922 for a cestode named Priapocephalus grandis (Nybelin, 1922), which is a parasite of the intestinal tract of cetaceans (Balaenoptera borealis and B. muculus). In 1928, Nybelin discovered the second species of this genus which he called P. minor (Nybelin, 1928). These species were put into many scholarly manuals and monographs as examples of a peculiar attachment of some cestodes to the intestinal walls of the host ("Manual of Zoology," edited by L. A. Zenkevich, volume 1, 1937; Principles of General Helminthology", by K. I. Skryabin and R. S. Schulz, and others 1940).

In 1922, Baylis established the new genus Anophryocephalus, and described a new species, A. anophrys, from Phoca hispida. But in 1926, when revising several species of tetrabothriids from Balaenopteridae, he arrived at the conclusion that the genera Prosthecoctyle (Monticelli, 1892), Diplobothrium (Beneden, 1889), and Oriana (Leiper and Atkinson, 1914), are identical to the genus Tetrabothrium (Rudolphi, 1819). Not ignoring this evident fact, several helminthologists continued to consider the genus Prosthecocotyle a real one, and describing new species, referred them to this genus. Thus, Guiart (1935) gave a superficial description of two cestodes under the designation Prosthecocotyle diplosomo and P. pachysoma Guiart, 1935, (the host is D. delphis). Both these species, as we have established, are identical to Tetrabothrium forsteri.

In the monograph of Meggitt (1924), four genera figure in the composition of the family Tetrabothriidae: Tetrabothrium (Rudolphi, 1819); Priapocephalus (Nybelin, 1922); Chaetophallus (Nybelin, 1916); and Anopryocephalus (Baylis, 1922). As parasites of pinnipeds and cetaceans, Meggitt mentions only four tetrabothriid species: Tetrabothrium forsteri (Krefft, 1873); T. triangularis (Diesing, 1850); Priapocephalus grandis (Nybelin, 1922); and Anophryocephalus anophrys (Baylis, 1922). The genus Prosthecocotyle (Monticelli, 1892), was considered by Meggitt as a synonym of the genus Tetrabothrium (Rudolphi, 1819). As to the genus Oriana (Leiper and Atkinson, 1914), in the monograph of Meggitt it is not included in the system of the p. 82 family Tetrabothriidae, however, but in the system of the family Phyllobothriidae.

In 1928, Nybelin (found in the intestine of Balaenoptera physalus which lives in the Norwegian shore area) described a new tetrabothriid to which he gave the name Tetrabothrius ruudi (Nybelin, 1928), while three years later Brightenti (1931) described a tetrabothriid from the duodenum of Phoca maculata (?) (Iceland) which he called Tetrabothrius albertinii (Brightenti, 1931).

As we found out, this species is identical to the Anophryocephalus anophrys (Baylis, 1922).

Fuhrmann (1933) refers five genera to the family of Tetrabothriidae: Anophryocephalus, (Baylis, 1922); Chaetophallus (Nybelin, 1916); Porotaenia (Szpotanska, 1917); Priapocephalus (Nybelin, 1922); and Tetrabothrium (Rud., 1819). Evidently he did not know of the work of Baer (1932) published one year earlier which included still two other genera in the system of the family Tetrabothriidae: Strobilocephalus (Baer, 1932), with the type S. triangularis (Diesing, 1951), and Trigonocotyle (Baer, 1932), with the type T. monticelli (Linton, 1923).

In the monograph of Joyeux and Baer (1936) the family Tetrabothriidae is represented with the above indicated seven genera. These authors gave a record of the helminths of pinnipeds and cetaceans which were the inhabitants of the waters of France. As parasites of cetaceans, Joyeux and Baer mention, among others, seven species of tetrabothriids: Priapocephalus grandis (Nybelin, 1922); P. minor (Nybelin, 1928); Strobylocephalus triangularis (Diesing, 1850); (Baer, 1932); Tetrabothrium affinis (Lonnberg, 1891; 1892); T. forsteri (Krefft, 1873; Johnston, 1912); T. ruudi (Nybelin, 1928); Trigonocotyle monticelli (Linton, 1923; Baer, 1932), while as parasites of pinnipeds they mention one species: Anophryocephalus anophrys (Baylis, 1922).

Sprehn (1932) mentions only one species among other species of tetrabothriids which is parasitic in marine mammals: T. forsteri. This author, by the way, also considers the genus Prosthecocotyle a synonym of the genus Tetrabothrium.

In 1952, the work of Krotov and Delamure appeared in which Trigonocotyle and Anophryocephalus figure as tetrabothriids from a sea lion and from the Okhotsk ringed seal (Phoca hispida). In a recent work, Delamure and Krotov (1955) gave these forms a more accurate definition. One of them was a new species of the Trigonocotyle genus, the other a new species of the Anophryocephalus genus.

After a thorough analysis of the data in the literature, comparison of the diagnostic characteristics of the genera and of the description of species as well as after investigation of our own material, we came to the conclusion that, in addition to the genera whose representatives are not recorded in pinnipeds and cetaceans (Chaetophallus, Porotaenia), the family Tetrabothriidae should unite five genera which are entirely or partly composed of species parasitic in Anophryocephalus, Priapocephalus, Strobilocephalusalus, Tetrabothrium, and Trigonocotyle. The genus Prosthecocotyle (Monticelli, 1892) and the genus Oriana (Leiper et Atkinson, 1914), are considered by us synonyms of the genus Tetrabothrium (Rudolphi, 1819) in agreement with the opinion of many authors (Luhe, 1899; Baylis, 1929; Joyeux and Baer, 1936, and others).

Diagnosis of the Family Tetrabothriidae (according to Joyeux and Baer, with additions). Scolex unarmed, without rostellum, with four suckers which are usually provided with "auricular" appendages placed at the anterior (frontal) edge of the suckers. In a few cases the scolex is cylindrical or pyramidal without suckers, but at its base it has a fleshy collar (genus Priapocephalus). The genital pores

p. 83 are arranged unilaterally. Almost always there is a very sinewy (powerful) genital atrium which is sometimes studded with spiculate formations. The bursa of the cirrus is small, it is usually united with the genital atrium with the aid of a powerful "cloacal canal." The vitellarium is located before the ovary. There may be a rudimentary uterine pore, or it may be lacking. The uterus is sacciform. The eggs are provided with thin, transparent shells. The adult forms are parasitic in cetaceans, pinnipeds, and especially in birds.

Type genus: Tetrabothrium (Rudolphi, 1908).

Table

of determination of the genera of the family Tetrabothriidae whose species are parasitic in pinnipeds and cetaceans.

1 (8). Scolex provided with four suckers.

2 (3). Scolex has a four-bladed apical organ. Suckers large, cup-shaped ... genus Tetrabothrium (Rudolphi, 1819).

3 (2). Scolex without an apical organ. Small, non-cupshaped suckers.

4 (7). Suckers arranged on the top of the scolex.

5 (6). Suckers with three small fleshy processes from which

one is more noticeable than the others ... genus *Trigonocotyle* (Baer, 1932).

6 (5). Suckers without processes ... genus *Anophryocephalus* (Baylis, 1922).

7 (4). Suckers arranged on the base of the scolex. Anterior portion of scolex fleshy ... genus *Strobilocephalus* (Baer, 1932).

8 (1). Scolex without sucker; its base is provided with a fleshy collar ... genus *Priapocephalus* (Nybelin, 1923).

GENUS *Tetrabothrium* (Rudolphi, 1819)

Synonyms: *Amphoterocotyle* (Diesing, 1853); *Eutetrabothrium* (Diesing, 1854); *Prosthecocotyle* (Monticelli, 1892); *Bothridiotaenia* (Lönnberg, 1896); *Diplobothrium* (Beneden, 1889); *Oriana* (Leiper and Atkinson, 1914).

Diagnosis (after Joyeux and Baer, 1936, with additions).

Tetrabothriidae. Scolex provided with an apical organ and with four suckers. Non-articulate, abbreviated neck. Distinct segmentation of the strobila. Wide proglottida: they have an almost square shape. Genital pores are located unilaterally. The bursa of the cirrus is almost spherical and small. It opens into a genital atrium by means of a narrow, fleshy canal.

Many types are parasitic in birds. A part of the species is parasitic in cetaceans.

Type species: *Tetrabothrium macrocephalum* (Rudolphi, 1819).

At present, five species of the genus *Tetrabothrium* are known which are parasitic in toothed and toothless whales. For the determination of these species we propose the following table.

Table

of determination of the species of the genus Tetrabothrium parasitic in cetaceans.

1 (6). Parasites of toothed whales.

2 (5). Body length more than 100 mm.

3 (4). Body length 200 to 390 mm, maximum width 0.2 mm. Adult strobila consits of 1414 to 1720 elements. Scolex 1.88 to 2.0 mm long, ... -4.8 mm wide. Bursa length 0.21 mm. Parasites of right whales (Balaenoptera borealis), blue whales and (illegible) T. affinis (Lonnberg, 1891, 1892).

p. 120 ... (from these) species, the first described Bothriocephalus schistochilus, a very much disseminated parasite of the bearded seal (Erignathus barbatus), the second described B. policalceolum from Phoca vitulina.

By the end of the 19th century a large number of investigations accumulated which were devoted to cestodes in general, including the bothriocephalids. This made it possible for a large group of authors and first of all for Lühe (1899), to make a revision of this group of helminths. Let us mention that, having found no kinship between the species which abided in the system of the genus Bothriocephalus (Rudolphi, 1808), (type species: Taenia punctata, Rudolphi, 1802), Lühe considered it necessary to segregate a part of them in an independent genus Dibothriocephalus (Luhe, 1899), with the type species D. latum (Luhe, 1758). In this genus Lühe included thirteen species:

1. Diphyllobothrium latum (Luhe, 1758).
2. D. cordatum (Leuckart, 1863) from man and dog (Greenland).
3. D. cristatus (Davaine, 1893), from man (France).
4. D. decipiens (Diesing, 1850), (= B. musculus Leuckart, 1848), from domestic cat and other felines of Europe and America.
5. D. dentriticus (Nitzsch, 1824), from sea gulls

of Europe.

6. D. ditremus (Creplin, 1825) from mergansers and grebes of Europe.
7. D. felis (Creplin, 1825), from the domestic cat.
8. D. fuscus (Krabbe, 1865), from dogs.
9. D. hians (Diesing, 1850), (= Bothriocephalus phocae foetidae, Creplin, 1825); B. tetrapertus (Siebold, 1848), from Phoca sp. (Europe).
10. D. maculatus (Leuckart, 1848) from the leopard seal.
11. D. schistochilus (Germanos, 1895) from the bearded seal (Spitsbergen).
12. D. variabilis (Krabbe, 1865) from crested seal (Europe).
13. D. polycalceolum (Ariola, 1896) from Phoca vitulina.

Thus species, from man, from different land and marine mammals and birds were put into the genus Dibothriocephalus.

In the sytem of the family Bothriocephalidae, Luhe included five subfamilies, including the subfamily Dibothriocephalinae (Luhe, 1899). The latter according to Luhe, 1899 should consist of six genera: Dibothriocephalus (Luhe, 1899) with type species D. latum, 1758); Duthiersia (Porrier, 1873) with type species D. fimbriata (Diesing, 1854). Scyphocephalus (Riggenback, 1898) with type species S. bisulcatus, (Riggenbach, 1898); Bothridium (Blainville, 1824), with type species B. pithinis, Blainville, 1828; Diplogonoporus (Lonnberg, 1892), with type species D. balaenopterae (Lonnberg, 1892); Pyramicocephalus (Monticelli, 1890) with type species P. antocephalus (Rudolphi, 1810).

The first half of the 20th century is characterized by an abundance of works in the study of diphyllobothriids. Many of them were devoted to the description of new species, or to the redescription of old ones, to the establishment of new hosts from among the pinnipeds and cetaceans or to other, similar questions. We do not wish to trouble the reader with a review of these detailed works which are of no importance in principle, especially as the below quoted historical data for the genera and species of diphyllobothriids fills this gap. Hence, we consider it necessary in the present a brief review of the history of investigations of diphyllobothriids to deal with works of a monographic nature which, to some extent, touch upon the main subjects of the diphyllobothriids classification.

One of these works is the publication of Luhe, who, in 1910, again subjected the system of cestodes to a revision. Without going into the fine details of this revision in every respect, I say that Luhe abolished the genus Dibothriocephalus (Luhe, 1899), he had earlier identified, since this genus proved to be a synonym of Diphyllobothrium (Cobbold, 1858). Moreover, after having thoroughly analyzed the
p. 121 accumulated material, Lühe considered it necessary to set up a new subfamily, Diphyllobothriianae, and a new family, Diphyllobothriidae, having included the latter together with three other families) in the Order Pseudaphyllidea.

Unfortunately, Lühe did not establish the full volume of the taxonomical units created by him, but limited himself to include only those forms which were recorded in Germany up to the year 1910. Evidently, this circumstance contributed considerably to the fact that subsequent research workers included different content in this outline of the system of Diphyllobothriidae other than the one which Lühe suggested.

Thus, in the monograph of Meggitt (1924), in the system of the family Diphyllobothriidae (Luhe, 1910), two subfamilies were shown: Diphyllobothriianae (Luhe, 1910) and Ligulinae (Monticelli and Crety, 1891). The subfamily Diphyllobothriinae, after Meggitt, unites six genera: Bothriidum (Blainville, 1824); Chlamydocephalus (Cohn, 1908); Diplogonoporus (Lonnberg, 1892); Diphyllobothrium (Cobbold, 1858); Pryamicocephalus (Monticelli, 1890) and Scyphocephalus (Riggenbach, 1898).

The diphyllobothriids parasites of pinnipeds and cetaceans are represented in Meggitt's work by three genera: Diphyllobothrium, Diplogonoporus, and Pyramicocephalus.

In the genus Diphyllobothrium, Meggitt mentions thirty-three species, and three Diphyllobothorium species, and twenty-four out of the thirty-three species figure as parasites of pinnipeds and cetaceans. For part of these species man and some carnivorous animals are indicated in the list of hosts. These are the following species:

1. *Diphyllobothrium antarcticum* (Baird, 1853).
2. *D. archeri* (Leiper et Atkinson, 1914).
3. *D. clavatum* (Railliet et Henry, 1912).
4. *D. coatsi* (Railliet et Henry, 1912).
5. *D. coniceps* (Linstow, 1905).
6. *D. cordatum* (Leuckart, 1863).
7. *D. elegans* (Krabbe, 1865).
8. *D. hians* (Diesing, 1850).
9. *D. lanceolatum* (Krabbe, 1865).
10. *D. lashleyi* (Leiper et Atkinson, 1914).
11. *D. latum* (L., 1758).
12. *D. macrocephalus* (Linstow, 1905).
13. *D. mobilis* (Rennie et Reid, 1912).
14. *D. perfoliatum* (Railliet et Henry, 1912).
15. *D. quadratum* (Linstow, 1891).
16. *D. resimum* (Railliet et Henry, 1912).
17. *D. rufum* (Leiper et Atkinson, 1914).
18. *D. romeri* Zschokke, 1903.
19. *D. schistochilus* (Germanos, 1895).
20. *D. scoticum* Rennie et Reid, 1912.
21. *D. scotti* (Shipley, 1907).
22. *D. stemmacephalum* (Cobbold, 1858).
23. *D. tectum* (Linstow, 1892).
24. *D. wilsoni* (Shipley, 1907).

The list of the genus Diplogonoporus in Meggitt's work includes seven species from which two (D. brauni, D. grandis) are noted as parasites in man, while marine mammals are recognized as hosts of the other five. These are the following species:

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Diplogonoporus balaenopterae Lönnberg, 1892.
2. *D. fasciatus* (Krabbe, 1865).
3. *D. septentrionalis* (Cholodkovsky, 1914).
4. *D. tetrapterus* (Siebold, 1848).
5. *D. variabilis* (Krabbe, 1865).

In the system of the genus Pyramicocephalus (Monticelli, 1890), Meggitt mentions only one species: Pyramicocephalus antocephalus (Rudolphi, 1810).

Thus, in Meggits's monograph (1924), thirty diphyllobothriid species are shown which are parasites of marine mammals. From these, twenty-six were recorded in pinnipeds, two in cetaceans, and two in pinnipeds, carnivores, and man[1].

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1. According to our data, Meggitt (1924) omitted only one species, Diphyllobothrium polycalceolum, which figures in the literature. In the second work of Meggitt published in the same year (1924a), the list of diphyllobothriids does not mention D. antarcticum, but, on the other hand, D. polycalceolum shows up in this list).

Meggitt's monograph was published at the time when the work of Baer (1924, 1925) appeared. This author, while investigating a diphyllobothriid from the Kafir fox (Octocyon megalotis) established in the system of Pseudophyllidea the new genus Luheella with the type species L. pretoriensis (Baer, 1924), and the new family Luheellidae (Baer, 1924). However, due to the investigation of Joyeux and Houdemer (1928) it was revealed that the genus Luheella is a synonym of the genus Diphyllobothrium, while the family Luheellidae is synonymous with the family Diphyllobothriidae.

An extensive research devoted to cestodes was published by Fuhrmann (1931) in whose opinion the Order Pseudaphyllidae (Beneden, 1850), should unite seven families from which three, that were earlier established by Lühe (1899) as subfamilies were promoted by Fuhrmann to the rank of independent families. He agreed with Lühe in regard to the subdivisions of the family of Diphyllobothriidae into two subfamilies: Diphyllobothriinae (Luhe, 1910), and Ligulinae (Monticelli, and Crety, 1891). In the first of these Fuhrmann included nine genera:

1. *Diphyllobothrium* Cobbold, 1858 (= *Dibothriocephalus* Lühe, 1899).
2. *Duthiersia* Perrier, 1873.
3. *Bothridium* Blainville, 1824 (= *Solenophorus* Creplin, 1839).
4. *Scyphocephalus* Riggenbach, 1898.
5. *Glandicephalus* Fuhrmann, 1921.
6. *Lüheella* Baer, 1924.
7. *Diplogonoporus* Lönnberg, 1892.
8. *Pyramicocephalus* Monticelli, 1890.
9. *Chlamydocephalus* Cohn, 1908.

However, after two years, Fuhrmann (1933) excluded the genus Bothridium from the family Diphyllobothriidae, but kept the remaining eight genera in it.

We notice that the genus Adenocephalus, established by Nybelin in 1931, did not enter into Fuhrmann's system. We also point out that in later years, in addition to other genera, in the system of diphyllobothriids two more were founded: Spirometra (Miller, 1937), and Hexagonoporus (Gubanov, 1952).

By the end of the first half of the 20th century, in correspondence with the development of the marine mammals

industry and with the increased interest in studying their parasites, forty diphyllobothriids species figured in world literature which were described in these animals. Thus, by
p. 123 this time, the diphyllobothriids in pinnipeds which are living in the Northern hemisphere were known under the following designations:

Adenocephalus septentrionalis Nybelin, 1931;
Clestobothrium glaciale Cholodkovsky, 1914;
Diphyllobothrium latum (L., 1758);
D. phocae -- foetidae Creplin, 1825;
D. hians (Diesing, 1850);
D. cordatum (Leuckart, 1863);
D. elegans (Krabbe, 1865);
D. lanceolatum (Krabbe, 1865);
D. schistochilus (Germanos, 1895);
D. macrocephalus (Linstow, 1895);
D. polycalceolum (Ariola, 1896);
D. romeri (Zschokke, 1903);
D. coniceps (Linstow, 1905);
Diplogonoporus tetrapterus (Siebold, 1848);
D. fasciatus (Krabbe, 1865);
D. septentrionalis Cholodkovsky, 1914;
Pyramicocephalus phocarum (Fabricius, 1789);
P. anthocephalus (Rudolphi, 1810);
Schistocephalus solidus (Müller, 1776).

In cetaceans of the Northern Hemisphere the following were recorded:

Diphyllobothrium stemmacephalum (Cobbold, 1858);
D. fuhrmanni Hsü, 1935;
Diplogonoporus balaenopterae Lönnberg, 1892.

Diplogonoporus grandis (Blanchard, 1894) was also recognized as a parasite of "marine mammals."

In pinnipeds of the Southern Hemisphere, the following diphyllobothriid species were recorded:

Adenocephalus pacificus Nybelin, 1931;
Diphyllobothrium antarcticum (Baird, 1853);
D. quadratum (Linstow, 1892);
D. tectus (Linstow, 1892);
D. scotti (Shipley, 1907);
D. wilsoni (Shipley, 1907);
D. coatsi (Rennie et Reid, 1912);
D. mobilis (Rennie et Reid, 1912);
D. scoticus (Rennie et Reid, 1912);
D. clavatum (Railliet et Henry, 1912);
D. resimum (Railliet et Henry, 1912);
D. perfoliatum (Railliet et Henry, 1912);
D. archeri (Leiper et Atkinson, 1914);
D. lashleyi (Leiper et Atkinson, 1914);
D. rufum (Leiper et Atkinson, 1914);
D. arctocephali Drummond, 1937;
D. arctocephalinum Johnston, 1937.

Naturally, not all these species were admitted by the investigators as actually existing species, about which we shall consider in more detail later on.

While getting acquainted with the history of research of diphyllobothriids, being parasitic in pinnipeds and cetaceans, we found that the overwhelming majority of works were devoted to the study of representatives of the extensive genus Diphyllobothrium. It goes without saying that investi-
p. 124 gations chiefly embracing this genus cannot be separated from investigations of the family as a whole, which also compelled us partly to reflect this in the present historical information.

To the genus Diphyllobothrium (Cobbold, 1858) (taken in a wide sense) the researchers referred seventy species whose bulk are parasites in pinnipeds. A large number of diphyllobothriid species known today is also recorded in cetaceans, man, terrestrial carnivorous mammals, fish-eating birds and even in snakes[1].

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1. Diphyllobothrium serpentis (Yamaguti, 1935), from the intestine of Naja naja (Taiwan).

According to the unanimous opinion of the majority of modern investigators, the diphyllobothriids and first of all the genus Diphyllobothrium is one of the most difficult groups of cestodes which until the present time existed in an unsatisfactory condition in the system of pseudophyllids. Many authors turned their attention to the "unwieldiness" of this genus and to the uncertain position of its many species, yet attempts at its revision were surely not many, which evidently is explained by the great difficulties usually attending such a work.

The first attempt at subdividing the "swelling" genus Diphyllobothrium was undertaken by Faust, Campbell, and Kellogg (1929). These investigators studied a few representatives of the genus Diphyllobothrium on original material, and through necessity subdivided it into two subgenera: Diphyllobothrium (Cobbold, 1858; Faust, Campbell and Kellogg, 1929, in a strict sense), and Spirometra (Faust, Campbell and Kellogg, 1929). In the opinion of the authors, the subgenus Diphyllobothrium should unite those species of the Diphyllobothrium which are characterized by "rosette" shaped uterus and by eggs which have round, obtundent poles. For the type species of this subgenus, the authors quote Diphyllobothrium stemmacephalus (Cobbold, 1858). They also point out that the representatives of the subgenus Diphyllobothrium select only fishes as supplemental hosts.

As to the subgenus Spirometra, in the opinion of Faust et al, this subgenus should unite those species of the genus Diphyllobothrium which have an uterus spirally stretched out into a columella with eggs which have more or less tapering poles. For the type of species of the subgenus Spirometra the authors selected Diphyllobothrium decipiens (Diesing, 1850). As Faust, Campbell, and Kellogg write, the representatives of the subgenus Spirometra do not use fish as supplemental host, but prefer amphibia, reptiles, birds, and mammals. This was the first attempt to break up the genus Diphyllobothrium. The second attempt was made by Müller (1936, 1937). First Müller, 1936 showed that the subgenus Spirometra, established by Faust, Campbell and Kellogg, should be raised to the rank of an independent genus. Then, he proposed (1937) to subdivide the genus Diphyllobothrium into three genera, and characterized them in the following form.

The first genus (unnamed) should include, in the author's opinion, Diphyllobothrium latum and the species resembling it. The latter should meet the following characteristics. The scolex is small and spatual-shaped (spoonlike). The neck is long and thin. The uterus has rosette shape. The cirrus and bagina open into a common sinus. The uterine pore is separated. The bursa of the cirrus is simple. The seminal vesicle is separated and
p. 125 placed dorsad from the bursa; egg with round poles; the coracidia float slowly. The intermediate hosts are representatives of the genus Diaptomus; supplemental hosts are fishes.

The second genus is Spirometra (Müller, 1937) (type species S. erinocei). Müller includes in this genus those species which were united in the subgenus Spirometra (Faust, Campbell and Kellogg, 1929). All these should possess the following characteristics. Scolex small, spoonshaped; neck long and thin; the anterior part of the uterus in the shape of a tightly wound spiral. Cirrus and vagina open separately;

the bursa of the cirrus is complex and includes the seminal vesicle; the poles of eggs are tapering; the coracidia swim rapidly and are provided with hooks; intermediate hosts are the representatives of the genus Cyclops; additional hosts are frogs, snakes or mammals.

The third genus (unnamed) should include species from pinnipeds. They have the following characteristics: Scolex relatively large, heart-shaped, with bothria (slits) reaching over the anterior segments; neck lacking; strobila widens directly behind the scolex; the uterus is rosette shaped; the cirrus is as in D. latum; the seminal vesicle is separated from the bursa, and is located dorsad; the poles of eggs are round; the developmental cycle is unknown in a large part.

The advantageous feature of the suggested systems (Faust, Campbell and Kellogg, 1929; Muller, 1937) is that in their desire to subdivide up the genus Diphyllobothrium, the authors were guided not only by the findings of morphology, but also tried to involve in the solution of the question several biological characteristics of the species assembled in this genus. There is no doubt that classifications of the diphyllobothriids based only upon morphological characteristics of the species, without consideration of the sometimes very complicated inter-relations of these species with the surrounding evironment. In other words, without consideration of their ecological characteristics, will be always unsatisfactory and artificial. Unfortunately, knowledge of the biology, and of the anatomy of the majority of diphyllobothriids, especially of the diphyllobothriids which parasitize in pinnipeds and cetaceans, is very deficient. The biology of these species is judged on the basis of sporadic and not entirely accurate observations, or, more often, on the basis of analogy with biological species parasitizing in man and in terrestrial carnivores. It was not accidental that, when he divided the genus Diphyllobothrium into three independent genera, Müller abstained from distributing the species, which were united by the genus Diphyllobothrium, among the genera which he created, evidently considering that subsequent authors should do this work in the future. Such a position, strange at the first glance, is explained by the circumstance that the majority of the diphyllobothriid species are very poorly studied, and for this reason it cannot be established to which of the three genera of Müller they should be ascribed.

In 1947, in a work under the title "Lühe's Diphyllobothrium," Wardle, Leod and Stewart made a further questionable attempt at revising the genus Diphyllobothrium. The substance of this revision should be dealt with in more detail.

From the large diversity of species referred to the genus Diphyllobothrium, the mentioned authors --- on the basis of the examination of some original material from pinnipeds of the Atlantic and Pacific Oceans (Canadian shoreline, Alaska seacoast) separated four types of diphllobothriids each of which was characterized by them in detail. The first type, in the opinion of the mentioned authors, approximates the description of Diplogonorporus fasciatus (Krabbe, 1865). The second is similar to the description of Diphyllobothrium lanceolatum (Krabbe, 1865). The third
p. 126 resembles Krabbea grandis (Blanchard, 1894), found in man (Japan). The fourth corresponds with the description of diphyllobothriids from marine fur seals St. Paul Island (species not indicated). The authors gave taxonomical information on the listed four types of diphyllobothriids, and remarked that all of them go into a single "generic group" which, just as many other generic groups of pseudophyllids, are very variable in such details as shape of scolex, relative thickness of the cuticle, of the subcuticle, cortex, parenchymal muscular zone and medulla,

number and arrangements of the testes on the cross section, monogonadic or diplogonadic character of sexual organs, distribution of the uterine loops, depending upon the degree of abridgement of the helminth and the development of the gonads." Wardle, Leod and Stewart called this "generic group" Cordiocephalus, and, to our surprise, they selected the type species of the genus Pyramicocephalus, i.e., P. phocarum (Fabricius, 1780) to be the type species of this new genus. Finally, the genus Diphyllobothrium (in the sense of Lühe) was broken up by the indicated authors, while the species which were introduced into this genus, were distributed by them among the genera: Diphyllobothrium (Cobbold, 1858); Diplogonoporus (Lonnberg, 1892); Glandicephalus (Fuhrmann, 1921); Adenocephalus (Nybelin, 1931); Dibothriocephlus (Luhe, 1899); Cordiocephalus (Wardle, Leod and Stewart, 1947). To each of the indicated genera, Wardle and his corworkers gave a corresponding diagnosis, they composed a table for the determination of these genera, and also of the species which formerly belonged to the genus Diphyllobothrium. As a result, the system of the broken up and remodelled genus Diphyllobothrium looks as follows:[1]

1. In spite of the existing rules of scientific nomenclature, in the work of Wardle, et al, all synonyms figure without generic designations. In regard to some types of synonyms, we could not establish which of the generic names these authors had in mind (considering that species were often taken over from one genus into another, and for this reason it was necessary to transform the entire synonymics into such a shape in which it is presented in their work).

a- Род I. *Adenocephalus* Nybelin, 1931.
b- Вид 1. *A. pacificus* Nybelin, 1931.

Род II. *Glandicephalus* Fuhrmann, 1921.
Вид 1. *G. antarcticum* Baird, 1853 (= *antarcticum* Diesing, 1863; *antarcticum* Zschokke, 1903; *antarcticus* Shipley, 1907; *ant arcticus* Railliet et Henry, 1912).
Вид 2. *G. wilsoni* Shipley, 1907.

Род III. *Diphyllobothrium* Cobbold, 1858.
Вид 1. *D. stemmacephalum* Cobbold, 1858.
Вид 2. *D. fuhrmanni* Hsü, 1935 (= *stemmacephalum* Yamaguti, 1935).

Род IV. *Diplogonoporus* Lönnberg, 1892.
Вид 1. *D. balaenopterae* Lönnberg, 1892.

Род V. *Cordicephalus* Wardle, Leod and Stewart, 1947.

Legend:

a. Genus

b. Species

Synonyms: <u>Diplogonorporus</u> (Lonnberg, 1892) partial; <u>Krabbea</u> (Blanchard, 1844); <u>Dibothriocpehalus</u> (Luhe, 1898) partial; <u>Diphyllobothrium</u> (Luhe, 1910) partial.

Вид 1. *C. phocarum* Fabricius, 1780 (= *phocarum* Fabricius, 1780; *phocae* Müller, 1780; *phocae foetidae* Creplin, 1825; *tetrapterus* Siebold, 1848; *hians* Diesing, 1860; *cordatus* Leuckart, 1863; *elegans* Krabbe, 1865; *lanceolatus* Krabbe, 1865; *variabilis* Krabbe, 1865; *schistochilus* Germanos, 1895; *polycalceolum* Ariola, 1896; *romeri* Zschokke, 1903; *macrocephalus* Linstow, 1905; *coniceps* Linstow, 1905.

Species 1.

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a- Вид 2. *C. tectus* Linstow, 1892 (= *scoticum* Rennie et Reid, 1912; *perfoliatum* Railliet et Henry, 1912; *clavatum* Railliet et Henry, 1912; *lashleyi* (Leiper et Atkinson, 1914).

Вид 3. *C. arctocephalinum* Johnston, 1937 (= *arctocephali* Drummond, 1937; *septentrionalis* Nybelin, 1931; *glacialis* Cholodkovsky, 1914; *grandis* Blanchard, 1884).

Вид 4. *C. quadratus* Linstow, 1892 (= *resimum* Railliet et Henry, 1912; *coatsi* Rennie et Reid, 1912).

b- Род VI. *Spirometra* Müller, 1937.

Вид 1. *S. bresslauei* Baer, 1927.
» 2. *S. decipiens* Gedoelst, 1911.
» 3. *S. erinacei* Faust, Campbell and Kellogg, 1929.
» 4. *S. felis* Soutwell, 1928.
» 5. *S. gracile* Baer, 1927.
» 6. *S. houghtoni* Faust, 1929.
» 7. *S. mansoni* Joyeux, 1927.
» 8. *S. mansonoides* Müller, 1935.
» 9. *S. reptans* Joyeux and Houdemer, 1928.
» 10. *S. serpentis* Yamaguti, 1935.
» 11. *S. urichi* Cameron, 1936.
» 12. *S. okumurai* Faust, 1929.
» 13. *S. pretoriensis* Baer, 1924.
» 14. *S. raillieti* Ratz, 1913 (= *erinacei europaei* Brumpt, 1936).
» 15. *S. ranarum* Meggitt, 1924.
» 16. *S. reptans* Meggitt, 1924.
» 17. *S. tangalangi* Mac Callum, 1921.

Род VII. *Dibothriocephalus* Lühe, 1899.

Legend:

a - Species

b - Genus

Parasites of mammals

Species

Вид 1. *D. latum* Linnaeus, 1758.
» 2. *D. larvei* Vergeer, 1942.
» 3. *D. theileri* Baer, 1925.
» 4. *D. trinitatus* Cameron, 1936.

Parasites of birds

Species

Вид 5. *D. canadensis* Cooper, 1921.
» 6. *D. cordiceps* Leidy, 1871.
» 7. *D. dentriticus* Nitzsch, 1824.
» 8. *D. oblongatus* Thomas, 1946.

Among the doubtful species Wardle and coworkers indicate:

В числе сомнительных видов Варда с соавторами указывают: *americanus* Hall et Wigdor, 1918; *fuscus* Krabbe, 1865; *nenzi* Petrow, 1938; *parvus* Stephens, 1908; *similis* Krabbe, 1865; *skrjabini* Plotnikov, 1932; *strictus* Talysin, 1932; *taenioides* Leon, 1930; *tungussicus* Podjapolskaja et Gnedina, 1932; *ditremus* Creplin, 1825; *exile* Linton, 1892; *fissiceps* Creplin, 1829.

The quoted system has a number of substanital shortcomings.

1. Wardle, Leod and Steward three together actually existing species into synonyms very freely, without any evidence. We categorically object to this, because we consider that species cannot be brought into synonyms without demonstrating that they are such; for, with regard to a large number of actually existing (text discontinues) confusion and muddle .....

NEMATODES OF PINNIPEDS AND CETACEANS

p. 218 At the present time (1952) in pinnipeds and cetaceans, sixty-five species of nematodes are recorded from the orders: Ascaridida (Skrjabin et Schulz, 1940); Rhabditida (Chitwood, 1933); and Spirurida (Chitwood, 1933).

The Order Ascaridida is represented by the family Anisakidae (Skrjabin et Karochin, 1945); the order Rhabditida by families Anclostomatidae (Looss, 1905), Dictyocaulidae (Skrjabin, 1941), Filaroididae (Schulz, 1951), and Pseudaliidae (Railliet, 1916); the Order Spirurida by families Crassicaudidae (Skrjabin et Andreeva, 1934), Filariidae (Cobbold, 1864), and Setarridae (Skrjabin et Shikhobalova, 1945). Thus, the nematodes of pinnipeds and cetaceans are included in the system of eight families.

For the determination of these families we compiled the following table.

Table

of determination of nematode families whose representatives parasitize in pinnipeds and cetaceans.

1 (8). The caudal or posterior end --- in all cases of the male has a more or less developed copulatory bursa with ribs.

2 (5). The bursa is well developed.

3 (4). There is a well developed chitinous buccal capsule. The buccal opening is provided with ventral cutting organs -- teeth or plates. Parasites of the digestive canal ... Ancylostomatidae (Looss, 1905).

4 (3). No chitinous buccal capsule. The oral opening is not provided with teeth or plates. Spicules of porous structure, with alae. The dorsal rib of the bursa consists of two crura. Parasites of the respiratory and circulatory system of

mammals .... Family Dictyocaulidae (Skrjabin, 1941).

5 (2). Bursa poorly developed, rudimentary, sometimes represented only by a system of sessile papillae.

6 (7). Mouth encircled by six, sometimes poorly perceptible teeth. Parasites of organs of the respiratory and circulatory system of terrestrial carnivorous mammals, less frequently of rodents, insectivora, primates, and pinnipeds ..... Family Filaroididae (Skyjabin, 1951).

7 (6). Mouth lacks lips, and it is encircled with barely perceptible papillae. The distal ends of the partially developed lateral ribs are provided with papillae. Parasites of organs of respiration, of the circulatory system, and of the organs of hearing of toothed cetaceans and less often of the cranial cavities of small terrestrial carnivorous mamals ... Family Pseudaliidae (Railliet, 1916).

8 (1). Bursa absent.

9 (12). Parasites of the urogenital system or of the digestive canal.

10 (11). Mouth lacks lips or has two simple lateral lips. The anterior segment of the intestine does not form a cecal appendix. Esophagus double. The body of the female near the end is girdled with a constriction. Parasites of the urogenital system of cetaceans ... family Crassicaudidae (Skrjabin et Andreeva, 1934).

p. 219 11 (10). Mouth usually encircled with three large teeth; rarely there are six teeth. The anterior segment of the intestine forms a cecal appendix. The girdling constriction near the end of the female is lacking. Parasites of the digestive canal of vertebrates ... family Anisakidae (Skrjabin et Karochin, 1945).

12 (9). Parasites of closed cavities or of tissues.

13 (14). The head lacks perioral bas-reliefs, chitinous peribuccal ring and epaulet-shaped formations. Mouth simple, more often entirely devoid of lips, rarely with two to four lips poorly defined. Parasites of terrestrial vertebrates

and very rarely of marine mammals ... family Filariidae (Cobbold, 1864).

14 (13). The head end is armed with perioral bas-reliefs which have the nature either of a chitinous peri-buccal ring, or of epaulet-shaped formations, or of denticles. Parasites of terrestrial vertebrates and very rarely of marine mammals ... family Setariidae (Skrjabin et Schikhobalova, 1945).

Order Ascaridida (Skrjabin et Schultz, 1940)
Family Anisakidae (Skrjabin et Karochin, 1945).

Synonyms: Acanthocheilinae (Wülker, 1929); Heterocheilidae (Railliet et Henry, 1915, partial).

Subfamily Anisakinae (Railliet et Henry, 1912).

Synonyms: Acanthocheilinae (Wülker, 1930); Heterocheilinae (Railliet et Henry, 1915, partial).

The subfamily Anisakinae, as this was indicated by Skrjabin, Shikhobalova, and Mozgov (1951), includes twenty-three genera at the present time.

In pinnipeds and cetaceans five genera are parasitic. For their determination we propose the following table.

Table
for determination of the genera of the subfamily Anisakinae whose representatives are parasitic in pinnipeds and cetaceans.

1 (6). Gastric appendix and intermediate lips absent.

2 (3). Intestinal apophysis absent. Each lip bears a set of small denticles. Excretory orifice at the base of the latero-ventral lips ... Genus Anisakis (Dujardin, 1845).

3 (2). There is an intestinal apophysis.

4 (5). The excretory orifice is placed on the level of the neural ring. Spicules are uneven. There is an auxiliary organ --- in all cases ... Genus Pseudoterranova (Mosgovoy, 1950).

5 (4). The excretory orifice is placed between the latero-ventral lips. Spicules even or almost even. Accessory piece very often absent ... Genus Terranova (Leiper et Atkinson, 1914).

6 (1). If there is a gastric appendix, then the intermediate lips are missing, and vice versa, or else one or the other is present.

7 (10). Lips are provided with denticles.

8 (9). No gastric appendix. There are intermediate lips ... Genus Porrocaecum (Railliet et Henry, 1912).

9 (8). There is a gastric appendix. No intermediate lip ... Genus Phocascaris (Höst, 1932).

10 (7). Lips do not have denticles. Gastric appendix and intermediate teeth present. Spicules of even size ... Genus Contracaecum (Railliet et Henry, 1912).

p. 220 Genus Anisakis (Dujardin, 1845)

Synonyms: Peritracheilus (Diesing, 1851); Conocephalus (Diesing, 1861); Nec Thunb, 1812.

Table

of determination of the subgenera of Genus Anisakis

(According to Mozgovoy, 1953)

1 (2). Stomach very often entirely U-shaped, less frequently straight; its length exceeds its width four times or more. Length of spicule 1.5 mm. Vulva on the midportion of the body or slightly anteriorly or posteriorly placed to it ... Subgenus Anisakis (Dujardin, 1845; Mozgovoy, 1951).

2 (1). Short and straight stomach; its length is equal or almost equal to its width. The spicules do not exceed 0.67 mm in length. The vulva in the anterior fourth or third of the body ...

Subgenus Skrjabinisakis (Mozgovoy, 1951).

Subgenus Anisakis (Dujardin, 1845; Mozgovoy, 1951)

For the determination of different species included in the subgenus Anisakis, we propose the following table.

Table

for species determination of the Subgenus Anisakis[1].

1 (9). Postanal papillae six or more pairs.

2 (14). Parasites of cetaceans.

3 (8). Length of the larger spicule exceeds the length of the smaller not more than one-half times.

4 (7). The tail of the male lacks lateral widenings of the cuticle.

5 (6). Postanal papillae seven pairs. Spicules 1.85 and 1.23 mm long. The pulp of lips has the shape of a truncated cone. Parasites of dolphins of the genus Prodelphinus ... A. Dussumierii (Beneden, 1870).

6 (5). Eight-ten pairs of postanal papillae. Spicules 2.46 and 2.17 mm in length. Parasites of dolphins of the genus Sotalia ... A. alexandri (Hsü et Hoeppli, 1933).

7 (4). The tail of the male has lateral widenings of the cuticle. Six pairs of postanal papillae, one to two pairs of adanal papillae. Parasites of baleen and toothed cetaceans .... A. simplex (Rudolphi, 1809).

8 (3). Spicules markedly uneven: one 3 mm long, the other 0.9 mm. Six to ten pairs of postanal papillae. Unpaired postanal papillae are absent. Parasites of dolphin species ... A. typica (Diesing, 1860).

9 (1). Not more than 5 pairs of postanal papillae.

10 (11). One pair of postanal papillae. Spicules 2.25 and 1.45 mm long. Parasites of sperm whales ... A. catadontis (Baylis, 1922).

11 (10). Four to five pairs of postanal papillae.

12 (13). Four pairs of postanal papillae. They are located

on a surface demarcated by grooves. Spicules 3.1 to 3.7 and 2.2 to 2.5 mm long. Vulva posteriorly to the middle of the body. Parasites of sperm whales ... A. ivanizkii (Mozgovoy, 1949).

13 (12). Five pairs of postanal papillae. No postanal area limited by grooves. Spicules 1.93 and 1.49 mm long. Vulva in the center of the body. Parasites of white whales ... A. kukenthalii (Cobb, 1889).

14 (2) Parasites of pinnipeds.

15 (18). Six to eight pairs of postanal papillae.

p. 221 16 (17). Lips with numerous denticles. Spicules of 2 mm length; stomach of the female 2 mm in length. Parasites of the walrus ... A. rosmari (Baylis, 1916).

17 (16). Lips with three large teeth. Spicules 1.55 and 1.4 mm in length. Stomach of the female 0.4 to 0.9 mm long. Parasites of the sea lion ... A. tridentata (Kreis, 1938).

18 (15). Eleven pairs of postanal papillae, sixty pairs of preanal papillae. Spicules identical in size, 2 mm long. Parasites of the pinniped genera Halichoerus and Mirouga ... A. similis (Baird, 1853).

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1. The table does not include the species A. insignis, and A. patagonica, whose description is insufficient, or the species A. tursionis whose description is unknown to us.

Anisakis (Anisakis) dussumierii (Beneden, 1870; Baylis, 1920.

Synonyms: Ascaris dussumierii (Beneden, 1870); A. simplex (Dujardin, 1845) nec A. simplex (Rudolphi, 1809).

Hosts: Physeter catodon l. - sperm whale; Prodelphinus longirostris Gray (= Delphinus dussumierii) - prodolphin.

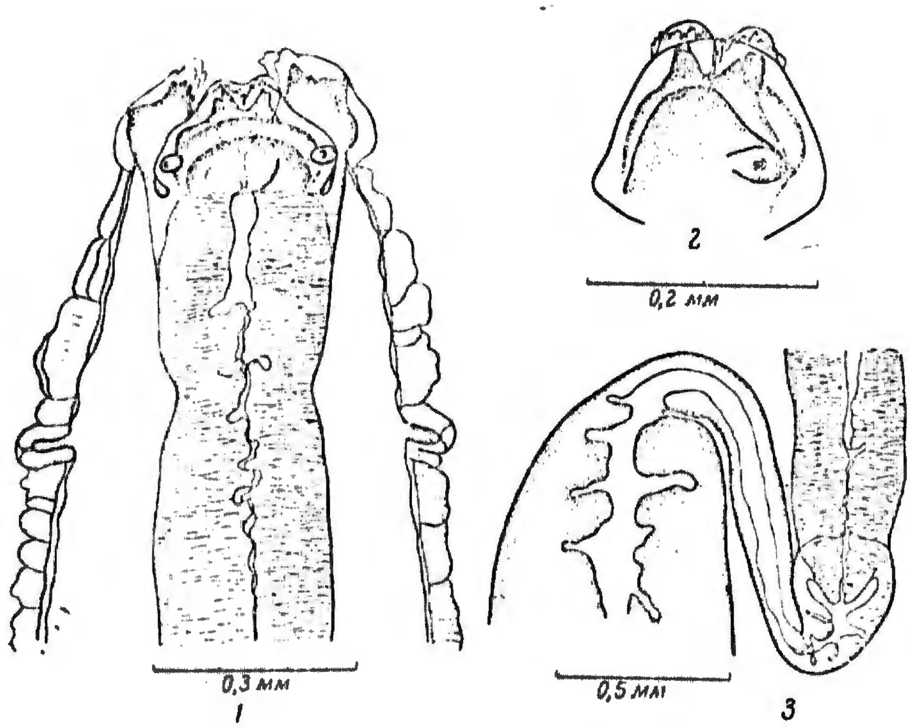

Figure 133.
1. Dorsal view of the head end; 2. Latero-ventral lip; 3. Anterior part of the digestive canal (after Mozgovoy, 1951 (3), after Mozgovoy, 1953, (1 - 2).

Location within host: stomach; large intestine.

Geographical distribution: Pacific Ocean (Japan). In the USSR, in the Bering Sea (Commander Islands).

Literature: Mozgovoy, 1949, p. 26; Mozgovoy, 1951, p. 14; Skryabin, Shikhobalova, Mozgovoy, 1951, p. 466; Mozgovoy, 1953, p. 11; Dujardin, 1845, p. 220; Cobbold, 1879, p. 362; Stossich, 1896, p. 17; Stiles et Hassall, 1899, p. 161 etc.; Baylis, 1920, p. 260; Baylis, 1923, p. 216; Baylis, 1932, p. 401, 409; Yorke and Maplestone, 1926,

p. 272; Yamaguti, 1941, p. 424 to 425.

p. 222

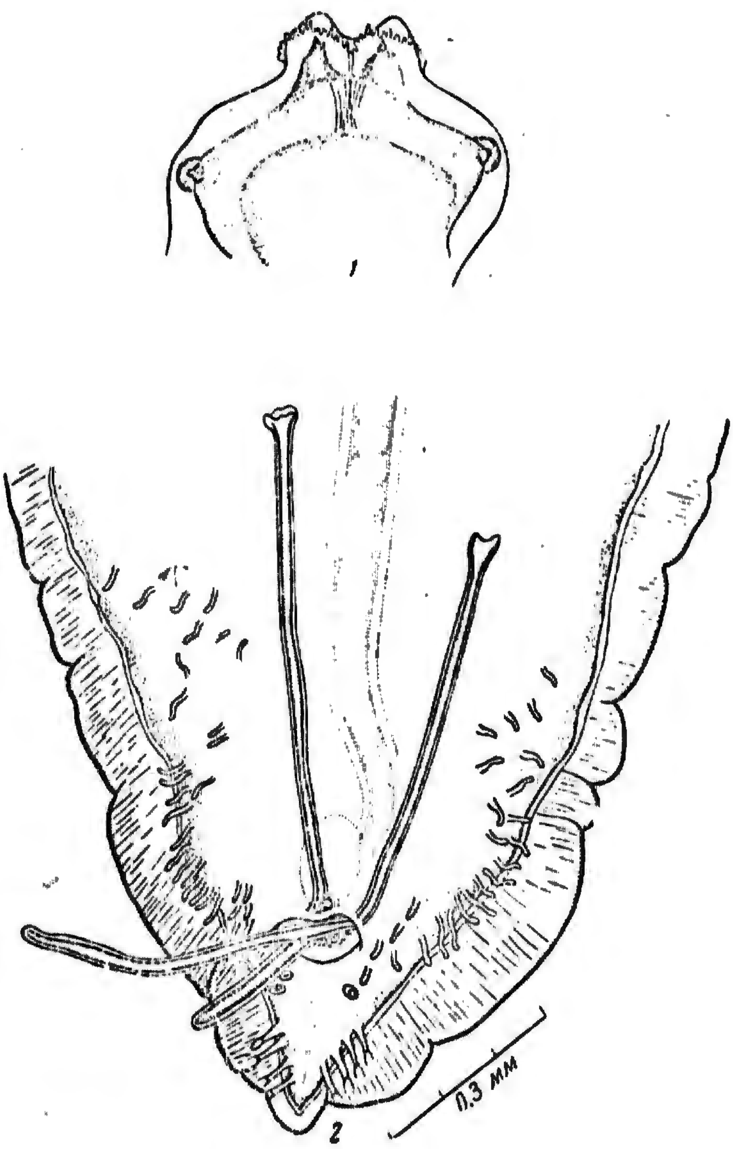

Figure 134.

Anisakis (Anisakis)dussumierii (Beneden, 1870) Baylis, 1920.

1. Dorsal lip; 2. Caudal end of the male, ventral view (After Mozgovoy, 1951).

Anisakis (Anisakis) alexandri (Hsü et Hoeppli, 1933).
(Figure 135)

Host: Sotalia sinensis (Flower).

Location in the host: Stomach.

Geographic distribution: Pacific Ocean (China).

Literature: Mozgovoy, 1953, p. 14; Skryabin, Shikhobalova, Mozgovoy, 1951, p. 468; Hsü et Hoeppli, 1933, p. 165 to 167.

p. 223 Anisakis (Anisakis) catodontis (Baylis, 1929).
(Figure 136)

Host: Physeter catodon L., - sperm whale.

Location in host: Stomach.

Geographic distribution: Atlantic Ocean (Saldanha Bay, South Africa).

Literature: Mozgovoy, 1953, p. 15; Skryabin, Shikhobalova, Mozgovoy, 1951, p. 468; Baylis, 1929, p. 544; Freund, 1932, p. 39.

Anisakis (Anisakis) insignis (Diesing, 1851; Baylis, 1920).

Synonym: Peritracheilus insignis (Diesing, 1851).

Host: Inia geoffroyensis Blainville, the South American dolphin.

Location in host: Stomach.

Geographic distribution: Peru.

The description of the species is not quoted because of the inaccessibility of Diesing's work. According to Baylis, 1923 (from Mozgovoy, 1953), the body dimensions are as follows: length of body of the male 50.0 to 90.0 mm, of the female ... 100.0 to 140.0 mm. The largest width of the male is 1.0 mm, and of the female ... 1.6 to 2.0 mm.

Literature: Skrjabin, Shikhobalova, Mozgovoy, 1951, p. 468; Diesing, 1851, p. 210; Diesing, 1855, p. 181; Jagerskiöld, 1893, p. 7; Jagerskiöld, 1894, p. 543; Stiles et Hassall, 1899, p. 107, 138; Baylis, 1920, p. 260;

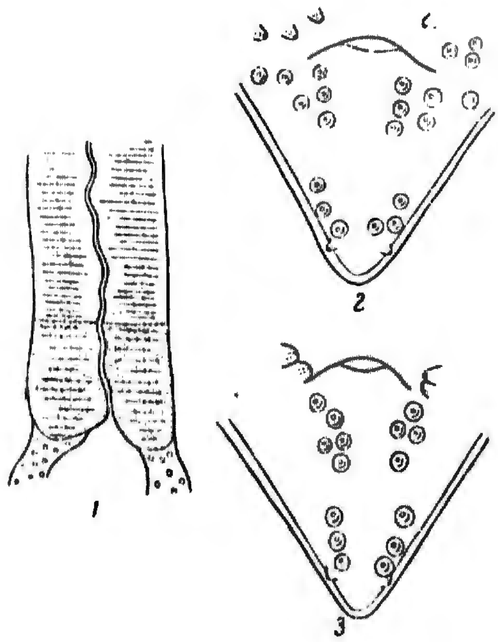

Figure 135.
Anisakis (anisakis) alexandrii

(Hsü et Hoeppli, 1933)
1. Stomach; 2, 3. Caudal end of male seen ventrally (after Hsü et Hoeppli, 1933, from Mozgovoy, 1953).

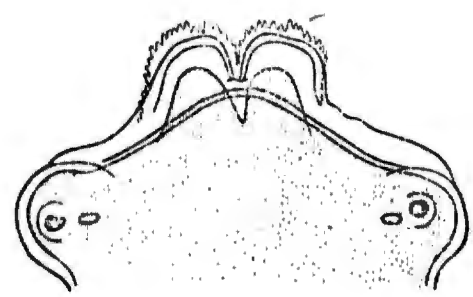

Figure 136.
Anisakis (Anisakis) catodontis

(Baylis, 1929).
Dorsal lip (after Baylis, 1929, from Mozgovoy, 1953).

Baylis, 1923, p. 216; Yorke and Maplestone, 1926, p. 273; Kreis, 1945, p. 562 to 567.

p. 224 Anisakis (Anisakis) ivanizkii (Mozgovoy, 1949). (Figures 137, 138, 139, 140).

Host: Physeter catodon L., - sperm whale.

Location in host: Stomach.

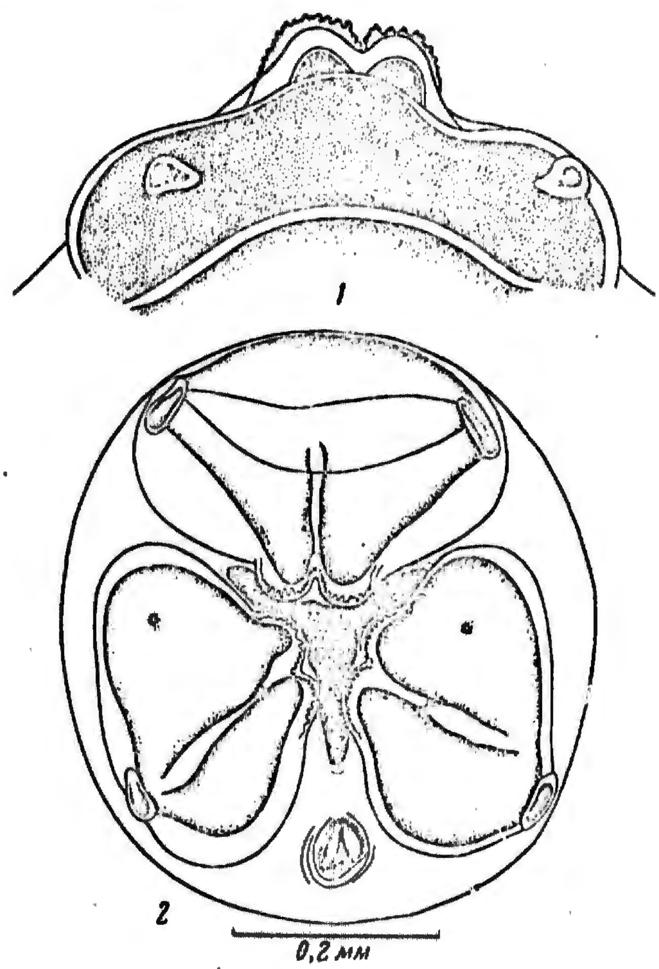

Figure 137

1. Dorsal lip; 2. Apical view of head end (after Mozgovoy, 1949).

Geographical distribution: USSR ... Pacific Ocean (Commander Islands).

Literature: Mozgovoy, 1949, p. 31 to 36; Mozgovoy, 1951, p. 15; Skryabin, Shikhobalova, and Mozgovoy, 1951, p. 468; Mozgovoy, 1953, p. 17.

Anisakis (Anisakis) kükenthalii (Cobb, 1889; Baylis, 1920. (Figures 141, 142).

Synonym: Ascaris kukenthalii (Cobb, 1889).

Host: Delphinapterus leukas Pall - white dolphin.

Location in host: Stomach.

p. 226 Geography of distribution: Northern Arctic Ocean (Norway, West Spitsbergen), North Sea (England), In the USSR ... Sea of Okhotsk (Nikolayevsk, Anivsk Bay).

Material: A. A. Krotov and we (1952) examined material from a white dolphin caught in the Anivsk Bay.

Literature: Mozgovoy, 1949, p. 36 to 40; Mozgovoy, 1951, p. 14, Skrjabin, Shikhobalova, Mozgovoy, 1951, p. 468; Krotov and Delamure, 1952, p. 280 etc.; Cobb, 1889, p. 149 to 150; Stossich, 1896, p. 33; Stiles and Hassall, 1899, p. 144 etc.; Baylis, 1920, p. 260; Baylis, 1923, p. 216; Baylis, 1932, p. 402.

p. 225

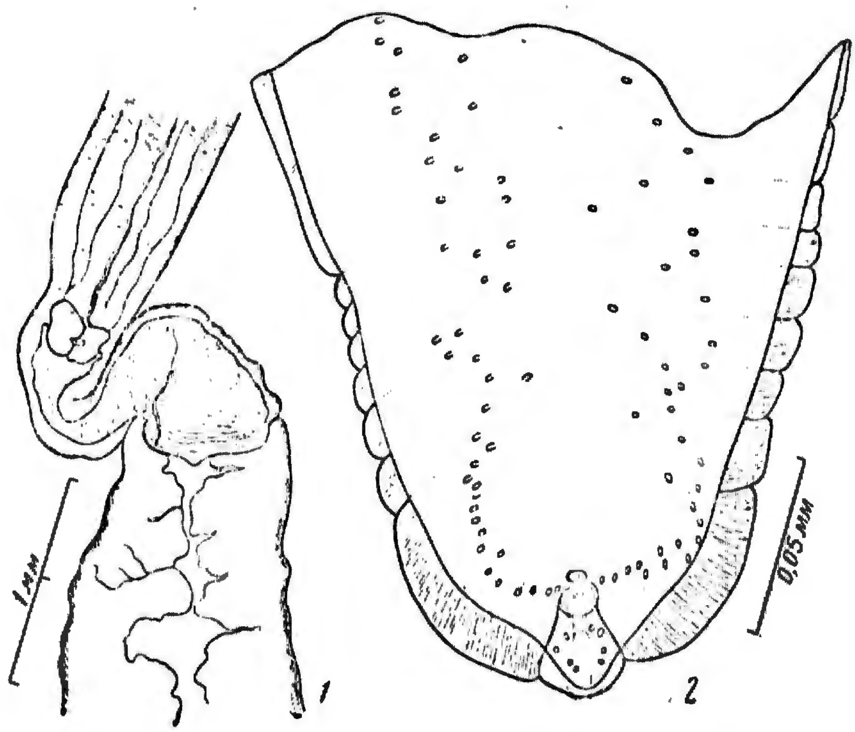

Figure 138.

Anisakis (Anisakis) ivanizkii (Mozgovoy, 1949:
1. Anterior portion of the digestive canal;
2. Caudal end of a male, ventral view (after Mozgovoy, 1949).

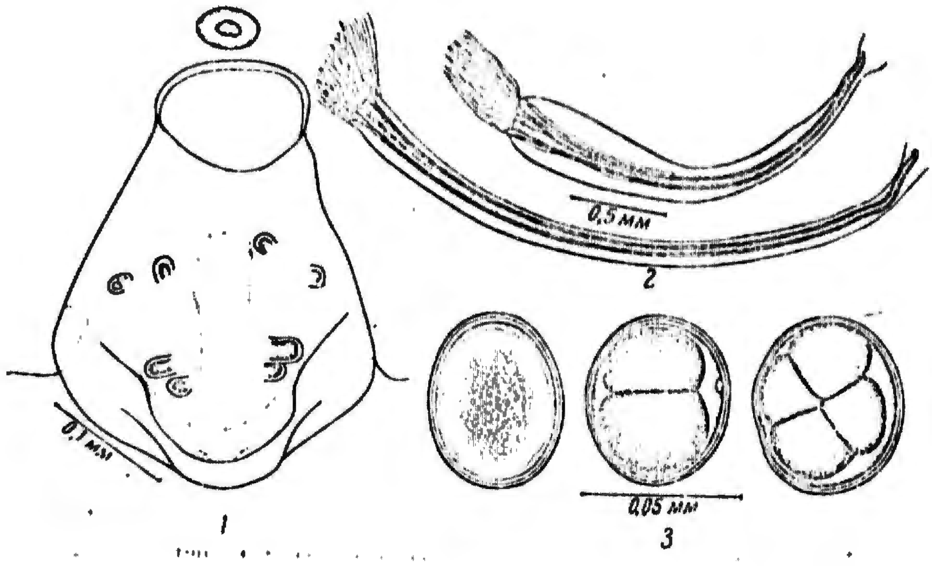

Figure 139.

Anisakis (Anisakis) ivanizkii (Mozgovoy, 1949).
1. Postanal area of the male; 2. Spicules;
3. Eggs (after Mozgovoy, 1949).

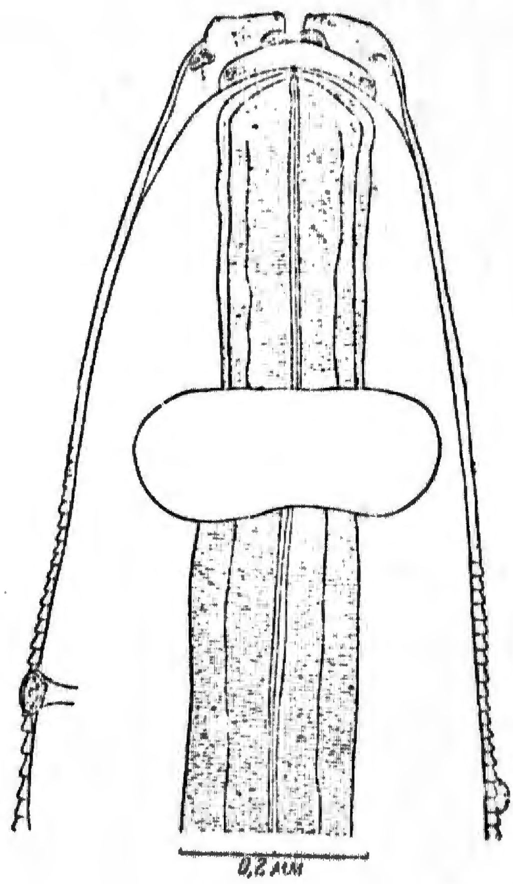

Figure 140.
Anisakis (Anisakis) ivanizkii (Mozgòvoy, 1949).
Dorsal view of the anterior end of the body.
(After Mozgovoy, 1949).

Anisakis (Anisakis) patgonica (Linstow, 1880; Baylis, 1920).
(Figure 143)

Synonym: Ascaris patagonica (Linstow, 1880).

Host: Otaria byronia Blainv.

Location in host: Stomach.

Geographic distribution: Patagonia.

Literature: Mozgovoy, 1953, p. 25; Skryabin, Shikhobalova, Mozgovoy, 1951, p. 463; Linstow, 1880, p. 41 to 42; Stiles et Hassall, 1899, p. 375; Baylis, 1920, p. 253 to 262; Baylis, 1923, p. 10; Yorke and Maplestone, 1926, p. 273; Baylis, 1937, p. 129; Kreis, 1940, p. 185 to 186.

p. 227

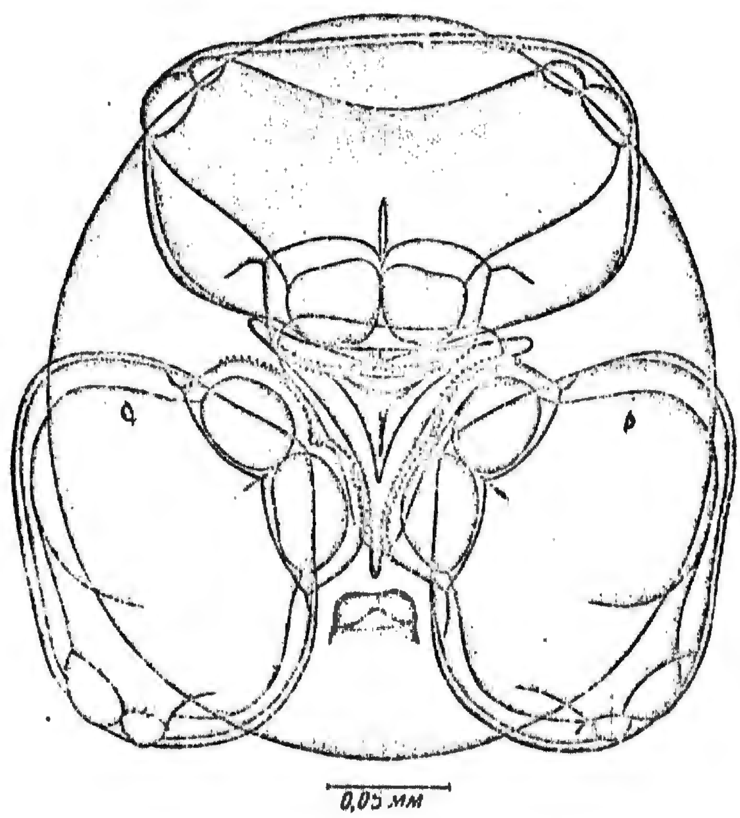

Figure 141.

Anisakis (Anisakis) kükenthalii (Cobb, 1889; Baylis, 1920).

Apical view of the head end (after Mozgovoy, 1949).

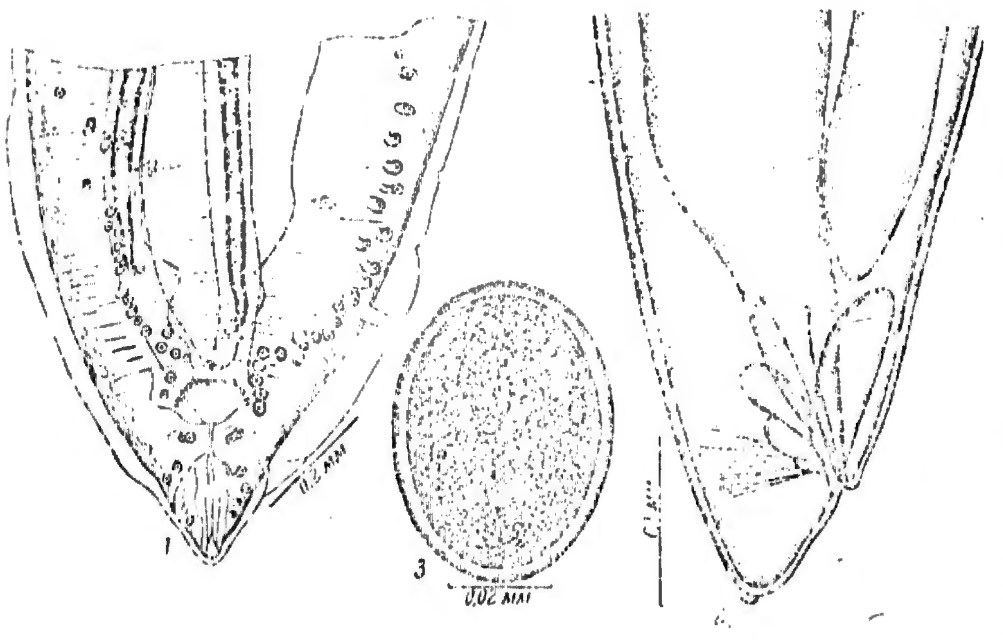

Figure 142.
Anisakis (Anisakis) kükenthalii (Cobb, 1899; Baylis, 1920).
1. Caudal end of the male; 2. Caudal end of the female; 3. Egg (after Mozgovoy, 1949).

p. 228

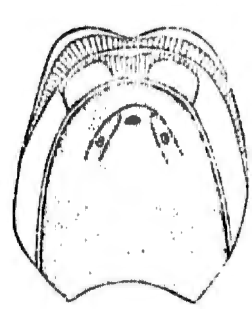

Figure 143.
Anisakis (Anisakis) patagonica (Linstow, 1880; Baylis, 1920).
Dorsal lip (after Linstow, 1880, from Mozgovoy, 1953).

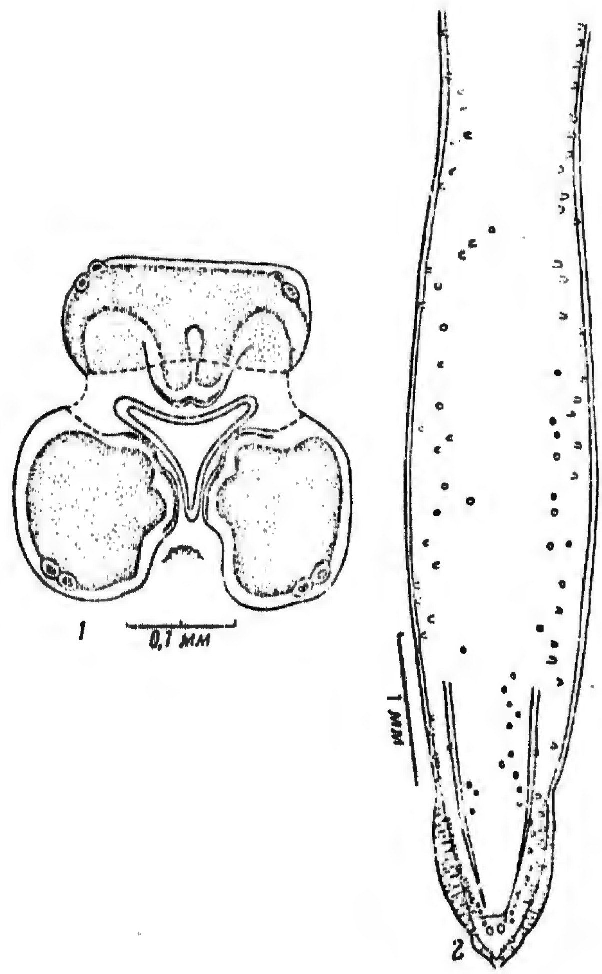

Figure 144.
Anisakis (Anisakis) rosmari (Baylis, 1916; Baylis, 1920).
1. Head end in apical view; 2. Caudal end of the male (after Baylis, 1916, from Mozgovoy, 1953).

p. 229 Anisakis (Anisakis) rosmari (Baylis, 1910, 1920). (Figure 144).

Synonyms: Ascaris bicolor (Baird, 1868 nec Rudolphi, 1793); Ascaris rosmari (Baylis, 1916); Anisakis alata (Hsü, 1933).

Host: Odobaenus rosmarus L. - the walrus.

Location in host: Stomach.

Geographic distribution: (Evidently, the North Atlantic Arctic area).

Literature: Mozgovoy, 1953, p. 26; Skryabin, Shikhobalova, Mozgovoy, 1951, p. 468; Baylis, 1916a, p. 373 to 376; Baylis, 1916, p. 411 to 419; Baylis, 1920, p.256; Yorke and Maplestone, 1929, p. 276; Hsü, 1933, p. 59 to 62; Baylis, 1937, p. 128; Lister, 1940, p. 401.

Anisakis (Anisakis) similis (Baird, 1853; Baylis, 1920). (Figure 145).

Synonyms: Ascaris similis (Baird, 1853).

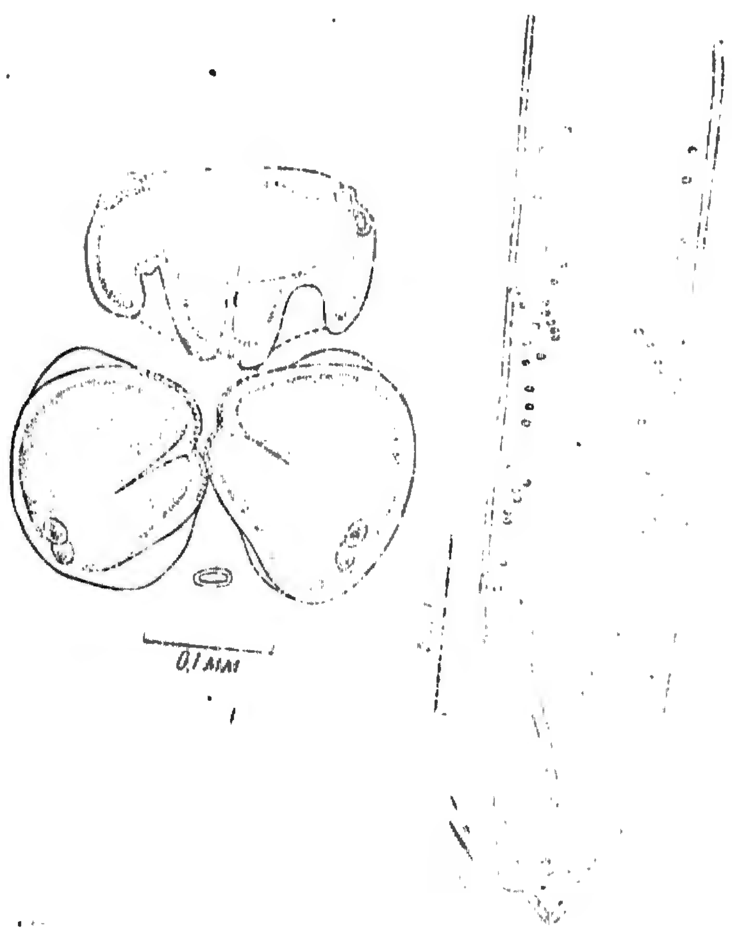

Figure 145.
Anisakis (Anisakis) similis (Baird, 1853; Baylis, 1920).

1. Apical view of head end; 2. Caudal end of the male (after Baylis, 1916, from Mozgovoy, 1953).

Host: Halichoerus grypus Fabr. - the grey seal; Mirounga leonina L. - the southern sea elephant.

Location: Stomach.

p. 230 Geographic distribution: Atlantic Ocean (England, Falkland Islands, South Georgia of the Antarctics), North Sea, Switzerland (Basel zoological garden), Pacific Ocean (Australia).

Literature: Mozgovoy, 1953, p. 27; Skryabin, Shikhobalova, Mozgovoy, 1951, p. 468; Baird, 1853, p. 19; Stiles et Hassall, 1899, p. 146 to 147; Sweet, 1909, p. 482; Baylis, 1923, p. 10; Yorke et Maplestone, 1926, p. 273; Baylis, 1929, p. 543; Wülker, 1930, p. 1 to 16; Baylis, 1937, p. 128; Baylis, 1939, p. 491,; Lyster, 1940, p. 401 to 403; Kreis, 1940, p. 185 to 186.

Anisakis (Anisakis) simplex (Rudolphi, 1809; Baylis, 1920). (Figures 146, 147).

Synonyms: Ascaris simplex (Rudolphi, 1809), nec A. simplex (Dujardin, 1845); Ascaris angulivalvis (Creplin, 1851); Anisakis salaris(Gmelin, 1790; Yamaguti, 1935).

Host: Eumetopias jubatus Schr. - sea lion; Mesoplodon bidens Sow. - "belt-tooth;" Hyperoodon ampullatus Forst. (H. rostratus) - high-brow bottle-nose whale; Delphinapterus

p. 231 leucas Pall. - white whale; Monodon monoceros, L. - narwhale; delphis L. - white-sided dolphin; Lagenorhynchus albirostris Gray - white-nose dolphin; L. cruciger Gray (= L. obscurus) - brown dolphin; Orca orca L. - "Kosatka"; Phocaena phocaena L. - porpoise; Balaenoptera musculus L. - blue whale; B. acutorostrata Lac. - small whale; Physeter catodon L. - sperm whale.

p. 230

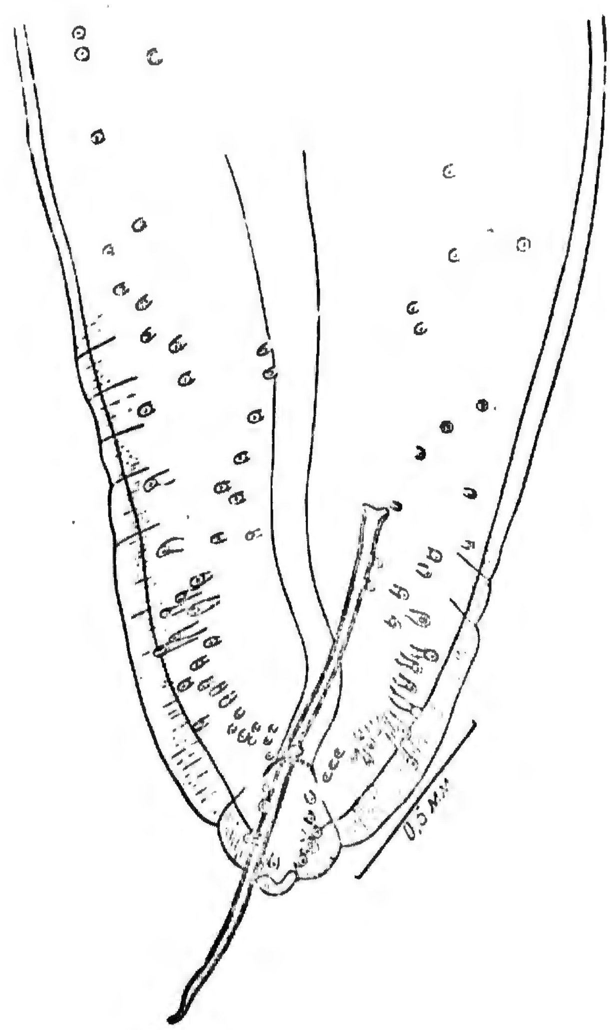

Figure 146.
Anisakis (Anisakis) simplex (Rudolphi, 1809; Baylis, 1920).
Caudal end of the male (after Mozgovoy, 1953).

p. 231

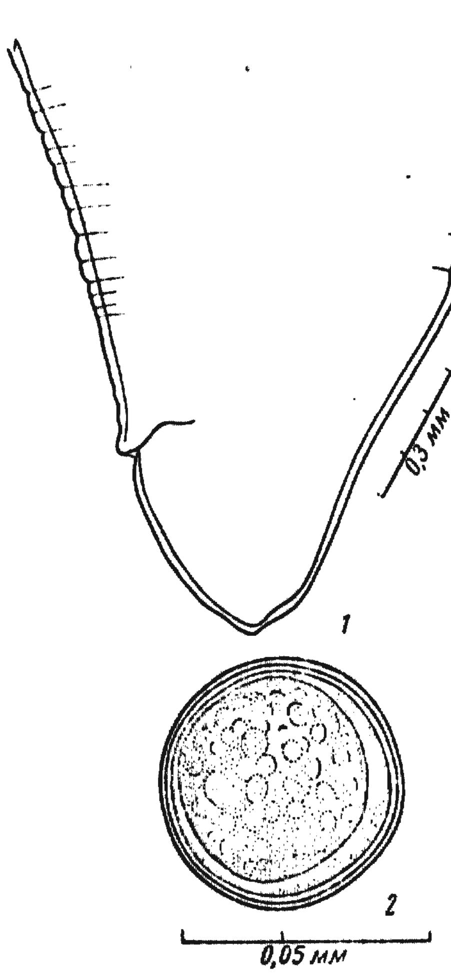

Figure 147.

Anisakis (Anisakis) simplex (Rudolphi, 1809; Baylis, 1920).

1. Caudal end of a female; 2. Egg (after Mozgovoy, 1953).

Location in host: esophagus, stomach, intestine.

Geographic distribution: North Sea (Denmark, England, Germany), Pacific Ocean (Japan, New Zealand). In the USSR Pacific Ocean (the gulfs of Morzhev, Kronotskiy, and Olyutorskiy).

Literature: Mozgovoy, 1953, p. 29; Mozgovoy, 1949, p. 26; Mozgovoy, 1951, p. 15; Skryabin, Shikhobalova, Mozgovoy, 1951, p. 468; Rudolphi, 1809, p. 179 to 180; Dujardin, 1845, p. 220; Creplin, 1851, p. 158; Diesing, 1851, p. 155; Diesing, 1861, p. 656; van Beneden, 1870, p. 411; Jägerskiöld, 1891, p. 131; p. 132; Jägerskiöld, 1893, p. 27; Jägerskiöld, 1894, p. 474; Stossich, 1896, p. 17; Stiles et Hassall, 1899, p. 120; Baylis, 1920, p. 260; Baylis, 1923, p. 216; Baylis, 1932, p. 402; Yamaguti, 1935a, p. 338 to 339; Scmidt-Ries, 1939, p. 100; Fujita, 1940, p. 379; Punt, 1941, p. 51 to 53; Yamaguti, 1941, p. 423 to 424; Johnston et Mawson, 1941, p. 433; Johnston et Mawson, 1945, p. 133; Baylis, 1945, p. 119 to 121.

p. 232 Anisakis (Anisakis) tridentata (Kreiss, 1938). (Figure 148).

Host: Eumetopias jubatus Schreb. - sea lion.

Location in host: Stomach.

Geographic distribution: Switzerland (Basel zoological garden).

Literature: Mozgovoy, 1953, p. 32; Skryabin, Shikhobalova, Mozgovoy, 1951, p. 468; Kreiss, 1938, p. 297 to 301.

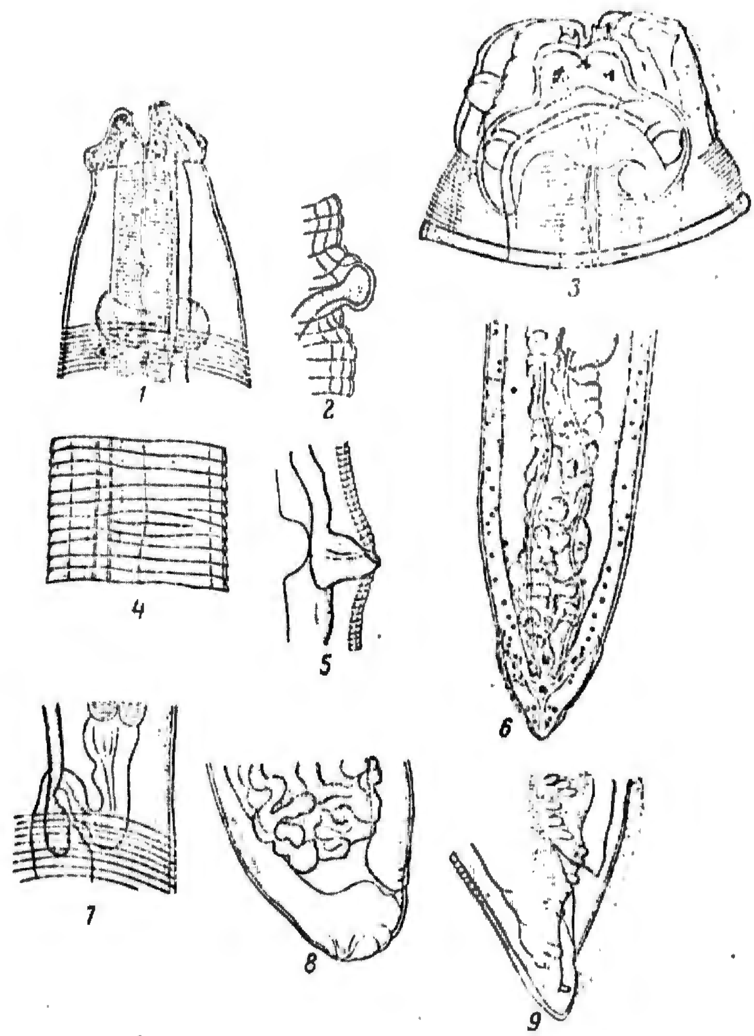

Figure 148.

Anisakis (Anisakis) tridentata (Kreiss, 1938).
1. Anterior end of the body of the female; 2. Cervical papilla; 3. Head end of the female; 4. Striation of the cuticle of a female; 5. Vulva; 6. Caudal end of a male, ventral view; 7. Stomach of a male; 8. Caudal end of a female; 9. Caudal end of a female, lateral view (after Kreiss, 1938, from Mozgovoy, 1953).

Anisakis (Anisakis) typica (Diesing, 1860; Baylis, 1920).

Synonyms:

p. 233 Hosts: Delphinus delphis L. - white-sided dolphin; Globicephalus melas (Traill), - grind whale; Phocaena phocaena L. - porpoise; Lagenorhynchus cruciger (Orb. et Gervain) (= L. obscurus) - brown dolphin.

Location in hosts: stomach.

Geographic distribution: North Sea (Germany), Atlantic Ocean (the northern gulf of Saldania -- Southeast Africa).

Literature: Mozgovoy, 1953, p. 34; Skryabin, Shikhobalova, Mozgovoy, 1951, p. 469; Diesing, 1861, p. 669; Jägerskiöld, 1894, p. 450 to 453; Stiles et Hassall, 1899, p.127 etc.; Stossich, 1902, p. 66; Shipley, 1905, p. 98; Baylis, 1920, p. 260; Baylis, 1923, p. 216; Yorke et Maplestone, 1926, p. 273; Baylis, 1929, p. 543; Baylis, 1932, p. 402; Freund, 1932, p. 54 to 55; Sprehn, 1932 (quoted after Schmidt-Ries, 1939a); Schmidt-Ries, 1939a, p. 100; Lyster, 1940, p. 401 to 403.

Subgenus Skrjabinisakis (Mozgovoy, 1952).

Table

for determination of the species of subgenus Skrjabinisakis.

1 (4). More than two pairs of postanal papillae. Parasites of the sperm whale.

2 (3). Four pairs of postanal papillae. Postanal denticles are absent. The males are 70 to 90 mm in length, the females 80 to 112 mm ... A. physeteris (Baylis, 1923).

3 (2). Six pairs of postanal papillae. There are three transverse sets of postanal denticles. Males 90 to 113 mm long, females 98 to 158 mm ... A. skrjabin (Mozgovoy, 1949).

4 (1). One to two pairs of postanal papillae. Sixty pairs of preanal papillae. Vulva in the anterior third of body. Males 20 mm long, females 50 mm. Parasites of the

seal ... A. schupakovi (Mozgovoy, 1951).

Anisakis (Skrjabinisakis) skrjabini (Mosgovoy, 1949).
(Figures 149, 150).

Host: Physeter catodon L. - sperm whale; Hyperoodon ampullatus (Forst) - the highbrow bottle-nose whale.

Location in host: Stomach, small intestine.

Geographic distribution: Pacific Ocean (rivers of the Commander Islands), the Sea of Okhotsk, Antarctics.

Material: We ex mined nine specimens of this species of sperm whale caught by the "Slava" whaling flottila in the Antarctics (27 December 1947). This species was found in the Antarctics for the first time.

Anisakis (Skrjabinisakis) physeteris (Baylis, 1923).
(Figure 151).

Host: Physeter catodon L. - the sperm whale.

Location in host: Stomach.

Geographic distribution: Atlantic Ocean -- the Gulf of Caldania (Southwest Africa), South Georgia, Indian Ocean Durban (Southeast Africa).

Literature: Mozgovoy, 1953, p. 39; Skryabin, Shikhobalova, Mozgovoy, 1951, p. 469; Baylis, 1923, p. 211 to 218; Baylis, 1929, p. 543; Freund, 1932, p. 39; Scheffer, 1939, p. 67 to 69.

Anisakis (Skrjabinisakis) schupakovi (Mosgovoy, 1951).

Synonym: Anisakis sp. Schupakovi, 1936.

Host: Phoca caspica Gmelin - the Caspian seal.

Location in host: Intestine.

p. 235 Geographic distribution: USSR ... The Caspian Sea (Chechen' Island).

The new species A. (S.) schupakovi was proposed by Mozgovoy for forms which were described by I. T. Shchupakov (1936) as Anisakis sp. from the Caspian seal.

Shchupakov (1936) and Mozgovoy (1951) do not introduce pictures of this species. In view of this, we reproduce here the description of this species according to Shchupakov (from Mozgovoy, 1953).

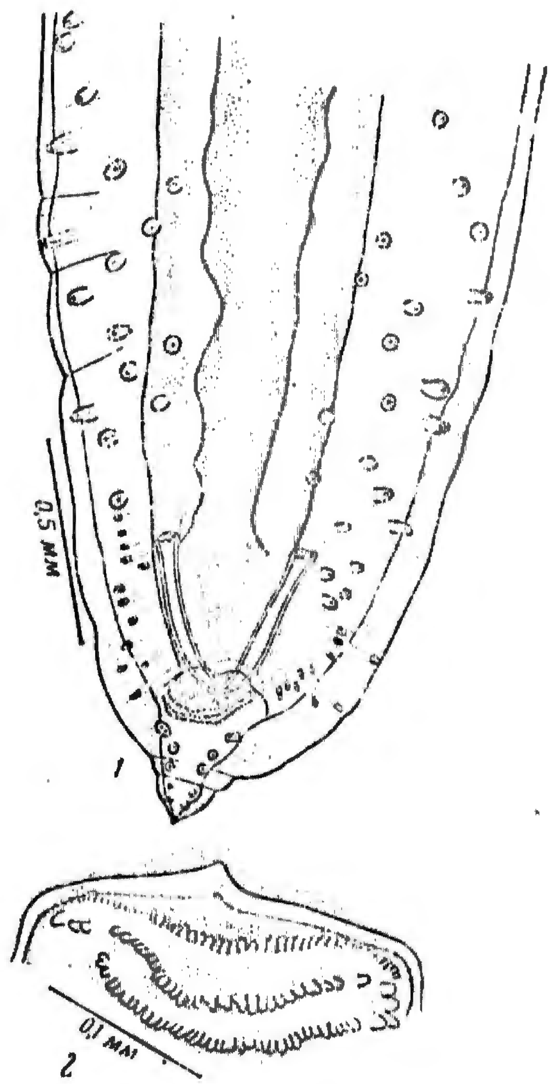

Figure 150.

Anisakis (Skrjabinisakis) skrjabini (Mosgovoy, 1949).

1. Ventral view of the caudal end of a male;
2. Postanal area of a male (denticles)
(After Mozgovoy, 1949).

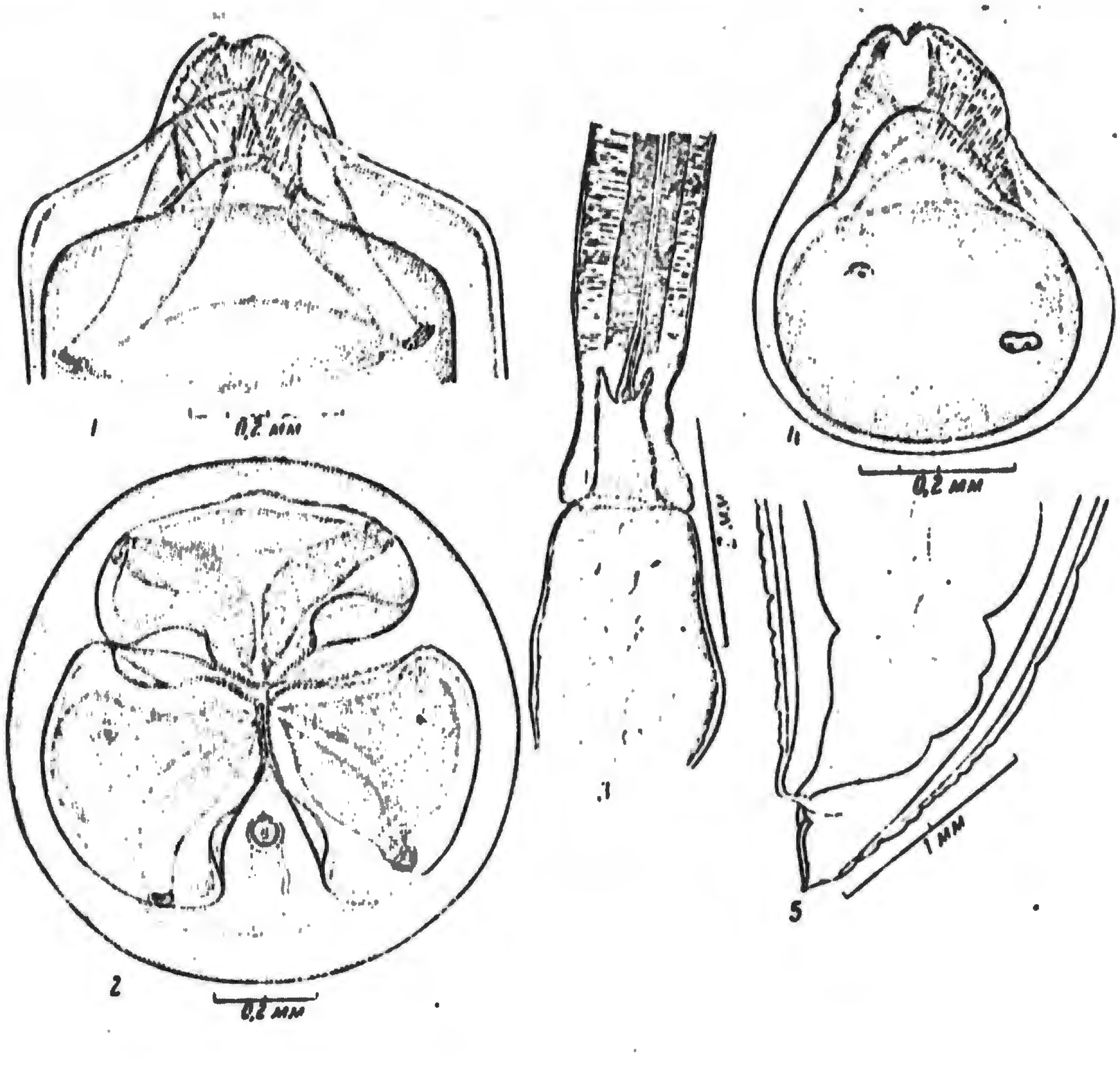

Figure 149.

Anisakis (Skrjabinisakis) skrjabini Mosgovoy, 1949.

1. Dorsal lip; 2. Apical view of the head end; 3. Anterior part of the digestive canal; 4. Latero-ventral lip; 5. Caudal end of the female. (After Mozgovoy, 1949).

p. 235 Description of the Species (after Shchupakov, 1936, from Mozgovoy, 1949). Nematodes of medium size. Cuticle transversely striated. Mouth armed with three teeth. Intermediate lips are missing. Along the internal margin of the lip, a set of small denticles run through. The dorsal lip is provided with a notch on the anterior end. The latero-ventral lips have two papillae each. The esophagus is one seventh to one ninth of the body length. The stomach is short, not too sharply demarcated from the intestine.

p. 236 Male. Body length 20.0 mm. The length of the esophagus is 2.5 to 3.0 mm. The cloacal orifice is located at 0.15 mm distance from the tip of the tail. There are no caudal wings. Accessory piece is absent. About 60 (in fact, pairs of) preanal papillae. These papillae are placed in two non-parallel lines. Occasionally a four line arrangement is noted. The gap between the papillae is small at the cloaca, and it gradually increases anteriorly from the cloaca. One to two pairs of postanal papillae. The author could not succeed in finding their exact number. The spicules are of different length, arciform. The length of the larger spicula is 0.67 mm, the length of the smaller is 0.12 mm.

Female. The body length is 50.0 mm. Immediately behind the lateral lips there are two rather large protuberances with sharply separated, granular content. The esophagus is 5.5 mm long, the stomach length is about 1.0 mm. The vulva is located in the anterior third of the body. The eggs are round. The embryo is at the two to four blastomers stage.

Literature: Shchupakov, 1936, p. 136 to 143; Mozgovoy, 1951, p. 15 to 16; Skryabin, Schikhobalova, Mozgovoy, 1951, p. 469; Mozgovoy, 1953.

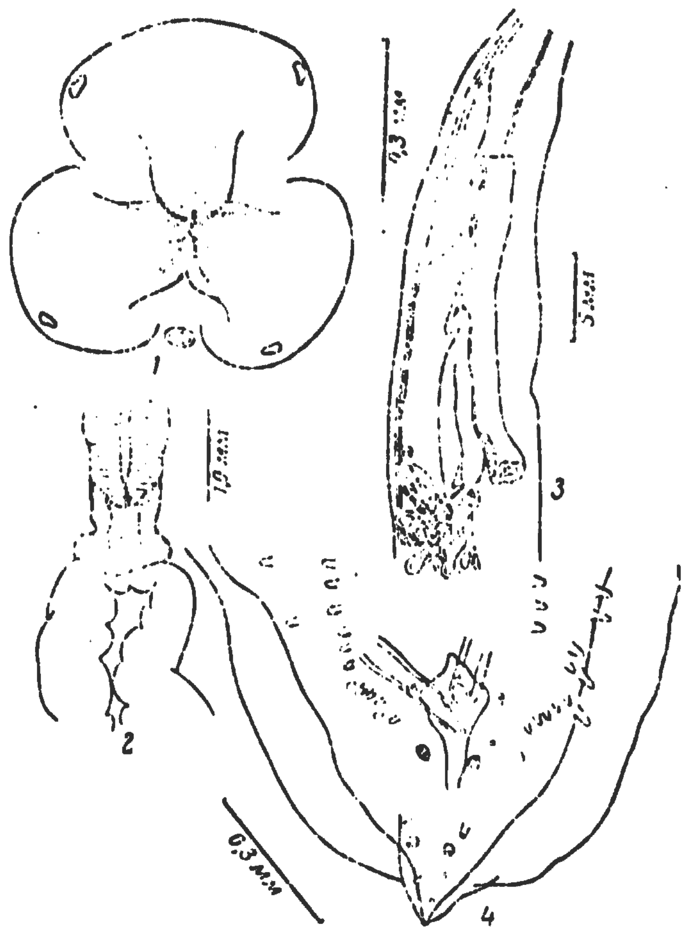

Figure 151.
Anisakis (Skrjabinisakis) physeteris
(Baylis, 1923).
1. Apical view of the head end; 2. Stomach;
3. Topography of the female sexual organs;
4. Caudal end of the male (after Baylis,
1923, from Mozgovoy, 1953).

p. 237 Species of the genus Anisakis, whose subgeneric relation was not established.[1]

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1. Here reference should be made to Anisakis cogians

(Johnson et Mawson, 1939), from Kogia breviceps (Australia).

Anisakis tursionis (Cruz, 1946).

Host: Tursiops tursio Fabricius (= T. truncatus), the aphaline.

Location in host: ?

Geographic distribution: Indian Ocean.

Larval form of Anisakis, found in Liocassis.

Anisakis sp. (Dollfus, 1948).

Host: Orca orca l. - kosatka.

Location in host: Stomach.

Geographic distribution: ?

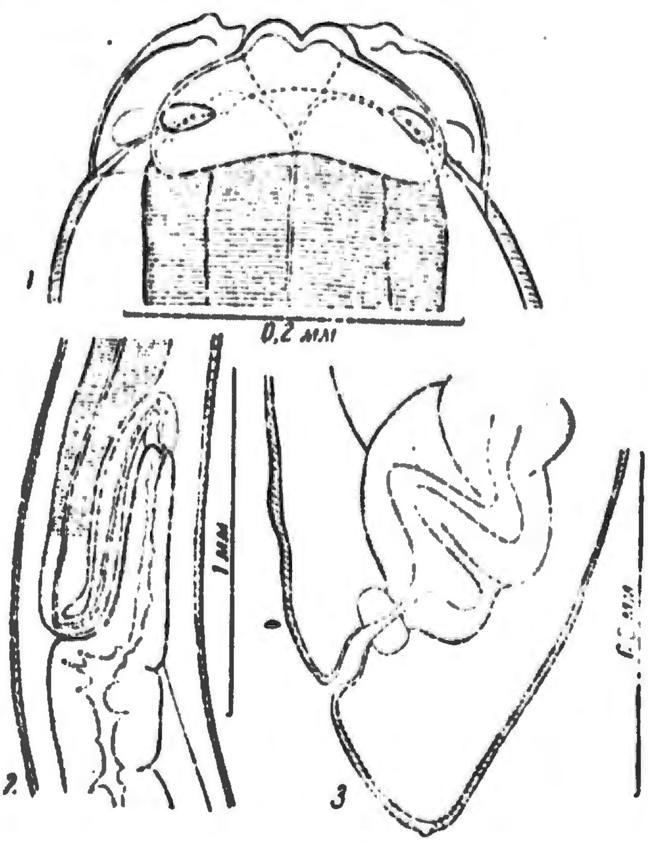

Figure 152.

Anisakis sp., (Dollfus, 1948):

1. Dorsal view of the head end; 2. anterior part of the body at the stomach level; 3. caudal end of the female, lateral view (After Dollfus, 1948).

Description (After Dollfus, 1948). Length about 30 mm, width at the center of the body 0.79 to 0.85 mm. In an anterior direction the body is much more narrowed than rearward (the width at the level of the neural ring is 0.312
p. 238 mm), but at the very end it is markedly tapering (the width is 0.235 mm at the level of the anus). The cuticle is transversely striated at 0.247 mm intervals: the striation is not absolutely regular. The cervical papillae are slightly asymmetric, since the right stands out at 0.458 mm, and the left at 0.423 mm from the head end. The neural ring is at 0.953 to 1.112 mm distance from the anterior end of the body.

The mouth is armed with three teeth with dentate crests. The dorsal lip is 0.168 mm in width at its bottom, the width of the ventro-lateral lips is 0.131 mm. The dentate crests are slightly divided into two blades. The dorsal lip bears two large twin papillae, while the ventro-lateral lips have only one such papilla. The esophagus is stretched out over a distance of 3.6 mm, and then it turns up anteriorly, again returns sharply~~, and uni~~tes with the intestine. The anterior portion of the intestine is narrower than the following further parts. The boundary between the muscular and the glandular parts (= Stomach) of the esophagus is not distinctly marked, but even so it can be determined that the muscular part ends 0.22 to 0.25 mm before (anteriorly to) the turn. The anus stands out 0.115 mm from the rear end which bears a round, terminal slightly raised papilla. The genital apparatus is in a rudimentary state. This specimen is evidently a non-mature female. The vulval orifice was not found.

Literature: Dollfus, 1948, p. 305 to 308.

<u>Genus Contracaecum</u> (Railliet et Henry, 1912).

Synonyms:

Синонимы: *Kathleena* Leiper et Atkinson, 1914; *Ceratascaris* Cobb, 192[illegible]; *Iheringascaris* Pereira, 1935; *Thynnascaris* Dollfus, 1933; *Amplicaecum* Walton, 192[illegible]

The genus Contracaecum includes three subgenera: Ornitocaecum (Mosgovoy, 1951), Erschovicaecum (Mosgovoy, 1951), and Contracaecum (Railliet et Henry, 1912; Mosgovoy, 1951).

In addition to species from fishes and birds, the latter subgenus includes species from mammals, including pinnipeds and cetaceans.

Subgenus Contracaecum (Railliet et Henry, 1912; Mosgovoy, 1951).

From the sixty-one species which belong to the subgenus Contracaseum, seven parasitize in pinnipeds and cetaceans. For the determination of these species we propose the following table.

Table

for species determination of the subgenus Contracaecum which are parasites of pinnipeds and cetaceans.

1 (6). The head lips are smaller than the intermediate ones.

2 (5). All papillae on the lips are single. Parasites of pinnipeds of the Southern hemisphere.

3 (4). Thirty-eight pairs of caudal papillae. Vulva inthe anterior fourth of the body. The length of the ovum 0.052 - 0.055 mm. Males 16 to 19 mm long, females 17 to 28 mm. Parasites of southern marine fur seals...
C. Corderoi (Lent et Freitas, 1948).

4 (3). Caudal papillae not less than fifty pairs. Vulva in the middle fourth of the body. Egg length 0.07 to 0.08 mm. Males 25 to 30 mm in length, females 30 to 40 mm. Parasites of sea leopards and of the seals of Weddel ...
C. stenocephalum (Railliet et Henry, 1907).

5 (2). Twin papillae on the lips. Parasites of many species of pinnipeds of the Northern and Southern Hemispheres. Neural ring anteriorly to the cervical papillae. Sixty-fiv to seventy-eight pairs of caudal papillae. Vulva on the

boundary of the first and second third of the body. Males 35 to 40 mm in length, females 50 to 52 mm ... C. osculatum (Rud., 1802).

6 (1). The head and intermediate lips are equal, or the first are larger than the latter.

p. 239 7 (10). Parasites of pinnipeds.

8 (9). Parasites of pinnipeds of the Antarctic (sea leopards, Weddel seals, Ross seals). Forty pairs of caudal papillae. Cloaca surrounded with lateral wings. Spicules four to five mm long. Vulva located at the level of the anterior fifth part of the body... C. radiatum (Linstow, 1907).

9 (8). Parasites of pinnipeds of the tropical and subtropical seas (parasites of West Indian seals). 33 pairs of caudal papillae. The cloaca is not surrounded with lateral wings. Spicules 12 mm long. Vulva near the anterior third of the body. Males 45 mm long, females 62 mm ... C. turgidum (Chapin, 1925).

10 (7). Parasites of cetaceans of South Asia. Nineteen pairs of caudal papillae. Spicules 2.37 mm in length. Males and females 30 to 40 mm in length ... C. lobulatum (Schneider, 1866).

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1. This table does not include C. rectangulum, which description according to Linstow is not available.

Contracaecum (Contracaecum) corderoi (Lent et Freitas, 1948).
(Figure 153).

Host: Arctocephalus australis Zimm. - southern fur seal.

Location in host: Stomach.

Geographic distribution: Atlantic Ocean (Uruguay).

Literature: Mozgovoy, 1953, p. 75; Lent et Freitas, 1948, p. 43 to 45.

Contracaecum (Contracaecum) lobulatum (Schneider,1866; Baylis et Daubney, 1923).
(Figure 154).

Synonyms: Ascaris delphini (Rudolphi, 1819); A. lobulata (Schneider, 1866).

Host: Platanista gangetica Lebeck. - river dolphin.

Location in host: Stomach, small and large intestine.

Geographic distribution: Indian Ocean (Ceylon, Burma).

Literature: Mozgovoy, 1953, p. 91; Skryabin, Shikhobalova, Mozgovoy, 1951, p. 481;

Литература: Мозговой, 1953, стр. 91; Скрябин, Шихобалова, Мозговой, 1951, стр. 481; Rudolphi, 1819, p. 54, 296; Dujardin, 1845, p. 221; Schneider, 1866, p. 44, 193; van Beneden, 1870, p. 359; Krabbe, 1878, p. 47; Cobbold, 1879, p. 426; Stossich, 1896, p. 63; Stiles et Hassall, 1899, p. 159, 162 [illegible]; Baylis, 1920, p. 262; Linstow, 1907, p. 37; Baylis and Daubney, 1923, p. 557; Baylis, 1932, p. 402; Baylis, 1936, p. 87-88.

Contracaecum (Contracaecum) osculatum (Rud., 1802; Baylis, 1920).

In 1950, on the basis of examinations of an original material from the Baykal seal and ringed seal obtained near Murmansk, A. A. Mozgovoy and K. M. Ryzhikov broke the species C. osculatum into two subspecies: Contracaecum (C.) osculatum osculatum, and Contracaecum (C.) osculatum baicalensis. For the determination of these subspecies, the following table can be used.

Table

for subspecies determination of the species Contracaecum osculatum.

1 (2). The length of the stomach somewhat exceeds its width. Five to seven pairs of postanal papillae. Parasites of many species of pinnipeds of the Northern and Southern hemispheres ... C. osculatum osculatum (Rud., 1802; Mosgovoy et Ryjikov, 1950).

2 (1). Length of the stomach less than its width.

Figure 153.

Contracaecum (Contracaecum) corderoi

(Lent et Freitas, 1948).

1. Initial part of sexual apparatus of female; 2, 4. Head end ventral view; 3. The same, dorsal view; 5. The same, apical view; 6. Papilla; 7. Egg; 8. Distal end of spicule; 9. Proximal end of spicule; 10. Cross section of spicule; 11. Caudal end of male, ventral view; 12. The same, lateral view; (After Lent et Freitas, 1948, from Mozgovoy, 1953).

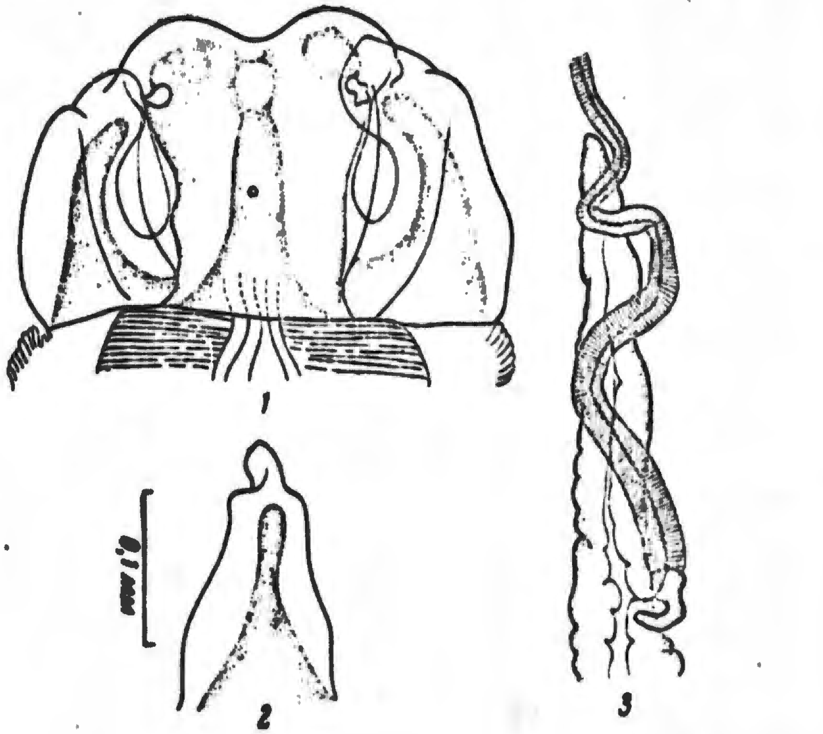

Figure 154.

<u>Contracaecum (Contracaecum) lobulatum</u>
(Schneider, 1866; Baylis et Daubney, 1923).
1. Head end, dorsal view; 2. Intermediate lip; 3. Anterior part of digestive canal (After Baylis et Daubney, 1923, from Mozgovoy, 1953).

p. 239 Eight to nine pairs of postanal papillae. Parasites of the Baykal seal ... C. osculatum baicalensis (Mosgovoy et Ryjikov, 1950).

Here are the descriptions of these subspecies.

Contracaecum (C.) osculatum osculatum (Rudolphi, 1802; Mosgovoy et Ryjikov, 1950).

(Figures 155, 156, 157).

Synonyms:

Синонимы: *Ascaris osculatum* Rudolphi, 1802; *Kathleena osculata* (Rudolphi, 1802) Leiper et Atkinson, 1915; *Contracaecum antarcticum* Johnston, 1938; *C. ogmorhini* Johnston et Mawson, 1941; *C. gypsophocae* Johnston et Mawson, 1941; *Phocascaris hydrurgae* Johnston et Mawson, 1941

p. 241 Hosts: Arctocephalus doriferus (= A. forsteri, Crystophora tasmanica, Gipsophoca tasmanica, Neophoca tasmanica, Neophoca cinerea); Arctocephalus australis Zimm. southern fur seal; Eumetopias jubatus Schreb. - sea lion; Otaria byronia Bl., - southern sea lion; Odobaenus rosmarus L. - walrus; Pagophoca groenlandica (Erx.) - hard seal; Phoca hispida Schreb. - ringed seal; Ph. hispida oschotensis Jord et Cl. - Okhotsk ringed seal; Phoca vitulina L. - common seal; Halichoerus grypus Fabr. - gray seal; Erignathus barbatus Erx. - bearded seal; Lobodon carcinophagus Jag. et Puch. - crab-eating seal; Hydrurga leptonyx Bl. - sea leopard; Leptonychotes weddelli Less. - Weddel's seal; Monachus monachus Herm. - (=M. albiventer) - West Indian seal; Cystophora criastata (Erx.) - crested seal; Mirounga leonina L. - sea elephant.

In the USSR waters it is found in the following hosts: Phoca hispida, Pagophoca groenlandica, and Erignathus barbatus.

Location in host: small intestine, stomach.

Geographic distribution: Greenland, Spitsbergen, England, North America, Canada, Bering Sea, Ceylon, Egypt, Antarctics. In the USSR: White Sea, Novaya Semlya (Russian Harbor), Guker's Island, Pacific Bay, Franz Joseph Land, Karks Gates, Loginov Island, Novosibirsk Islands (Kotel'niy Island).

Material: This subspecies was studied by us on specimens from the Greenland seal (personal collection), and from the bearded seal (collection of S. S. Surkov). Moreover, jointly with A. I. Krotov (1952), material from the Okhotsk ringed seal was examined.

Literature: Vagin, 1930, p. 55; Mozgovoy, et Ryzhikov, 1950, p. 997 to 999; Mozgovoy, 1951, p. 16 to 18; Skryabin, Shikhobalova, Mozgovoy, 1953, p. 120;

Литература: Вагин, 1930, стр. 55; Мозговой и Рыжиков, 1950, стр. 997—999; Мозговой, 1951, стр. 16—18; Скрябин, Шихобалова, Мозговой, 1951, стр. 483; Кротов и Делямуре, 1952, стр. 285 и др.; Мозговой, 1953, стр. 120; Dujardin, 1945, p. 164; Schneider, 1866, p. 44; Krabbe, 1878, p. 45; Linstow, 1880, p. 44—45; Jägerskiöld, 1894, p. 457—463; Linstow, 1895, p. 528—531; Linstow, 1905, p. 182—183; Railliet et Henry, 1907, p. 2—7; Leiper et Atkinson, 1914, p. 222; Baylis, 1920, p. 256—261; Baylis, 1922, p. 425; Yorke et Maplestone, 1926, p. 282; Walton, 1927, p. 51; Baylis, 1939, p. 492; Johnston, 1937, p. 12; Baylis, 1939, p. 492; Lyster, 1940, p. 398—399; Johnston et Mawson, 1945, p. 85.

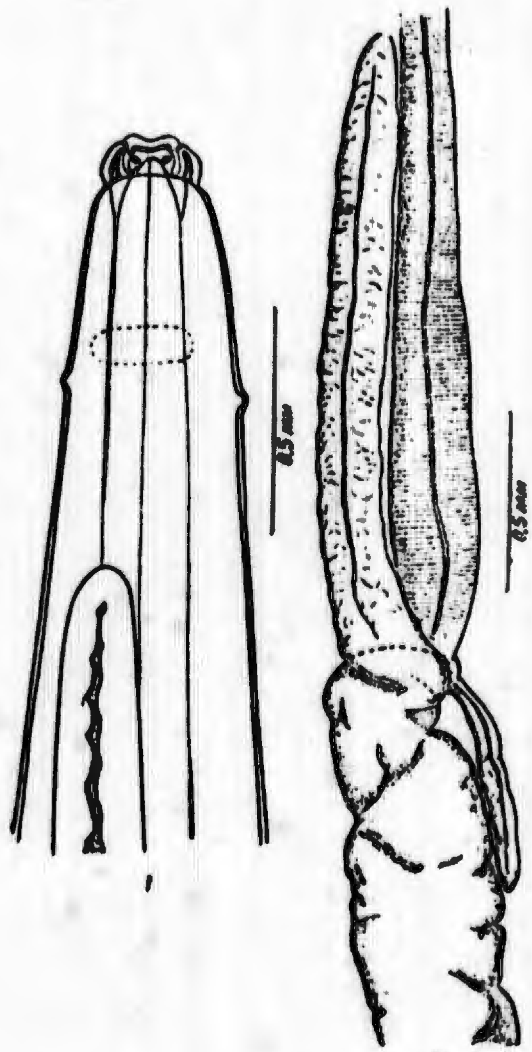

Figure 155.

Contracaecum (Contracaecum) osculatum osculatum

(Rudolphi, 1802; Mosgovoy et Ryjikov, 1950).
1. Anterior end of body; 2. Anterior portion of digestive canal (original).

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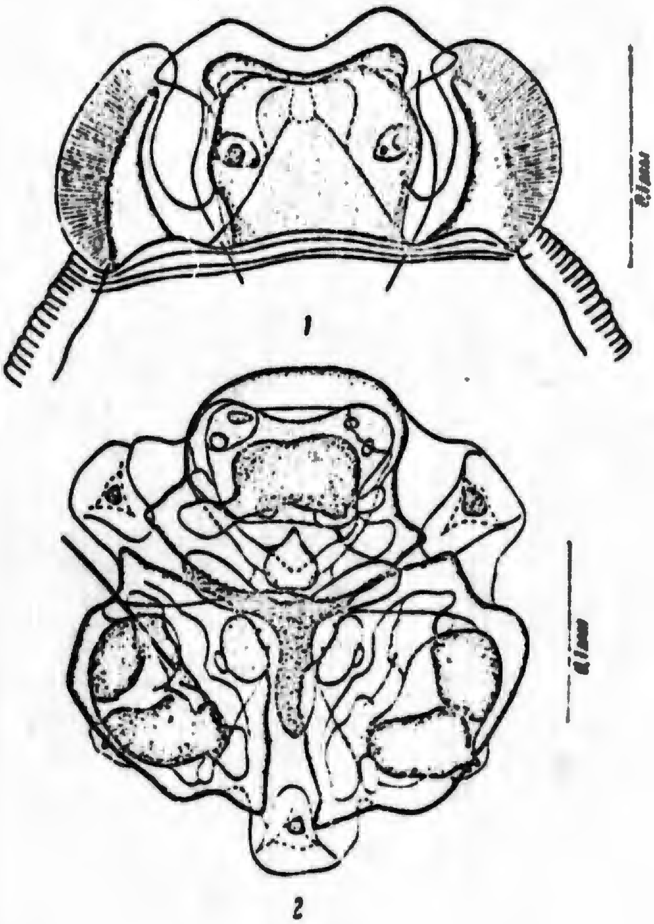


Figure 156.
<u>Contracaecum (Contracaecum)</u>
<u>osculatum osculatum</u>
(Rudolphi, 1802; Mosgovoy,
et Rhjikov, 1950).
1. Dorsal view of head end;
2. Apical view; the same
(original).

Figure 157.
<u>Contracaecum (Contracaecum)</u>
<u>osculatum osculatum</u>
(Rudolphi, 1802).
Mosgovoy et Ryjikov, 1950.
Ventral view of the caudal
end of the male
(original).

p. 243 **Contracaecum (Contraceacum) Osculatum baicalensis** (Mosgovoy et Ryjikov, 1950)

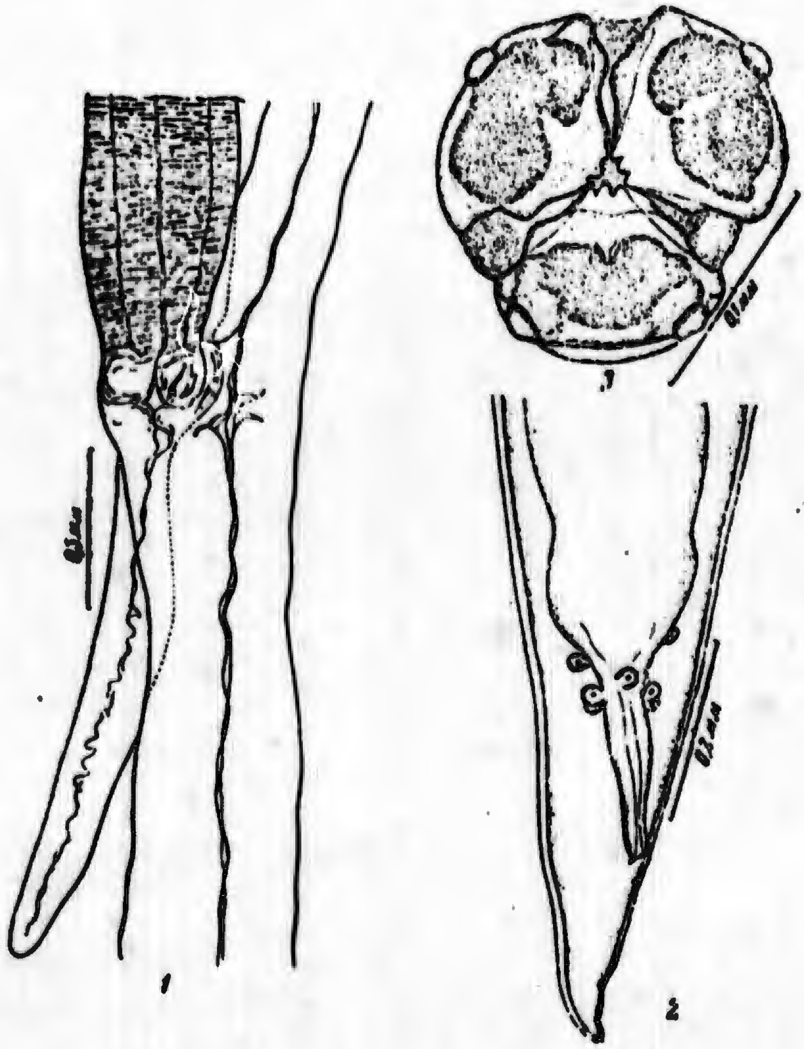


Figure 158

Contracaecum (Contracaecum) osculatum baicalensis (Mosgovoy et Ryjiikov, 1950).

1. Anterior end of the digestive tract; 2. Caudal end of the larva in lateral view; 3. Apical view of the head end of the larva. (After Mozgovoy and Ryzhikov, 1951 (1), after Sudarikov and Ryshikov, 1951, (2, 3).

Host: Phoca sibirica (Gmelin), - Baykal seal.

Location in host: Stomach, small and large intestine.

Geographic distribution: USSR (Lake Baykal).

Below are the data on the developmental cycle of Contracaecum osculatum baicalensis.

p. 244 V. E. Sudarikov and K. M. Ryzhikov were interested in the problem of the biology of C. osculatum baicalensis. These authors, after investigating the helminth fauna of the Baykal seal and of several fishes in the Lake Baykal arrived at the conclusion that the larvae of the nematode genus Contracaecum which parasitize in the body of the yellow-blade pigfish (Cottocomephorus grewingki) are the larvae of Contracaecum osculatum baicalensis, a parasite of the digestive tract of the Baykal seal, Phoca sibirica. In favor of this assumption of Sudarikov and Ryzhikov are many convincing facts.

1. The yellow-blade pigfish is rather markedly infested with larvae of Contracaecum at the places where the seal can be found.

2. From all fish species which are food for seals only the yellow-blade pigfish is the carrier of Contracaecum larvae.

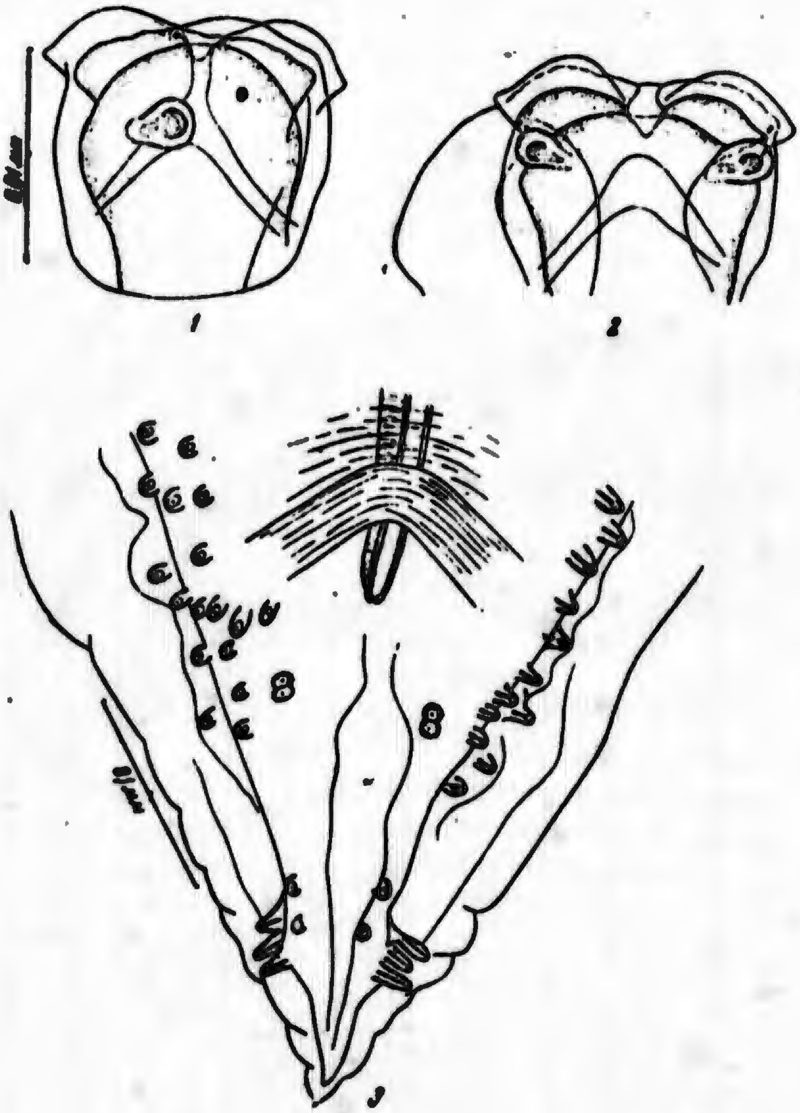


Figure 159.

<u>Contracaecum (Contracaecum) osculatum baicalensis</u> (Mosgovoy et Ryjikov, 1950).

1. Latero-ventral lip; 2. Dorsal lip; 3. Caudal end of the male, ventral view (after Mozgovoy and Ryzhikov, 1951).

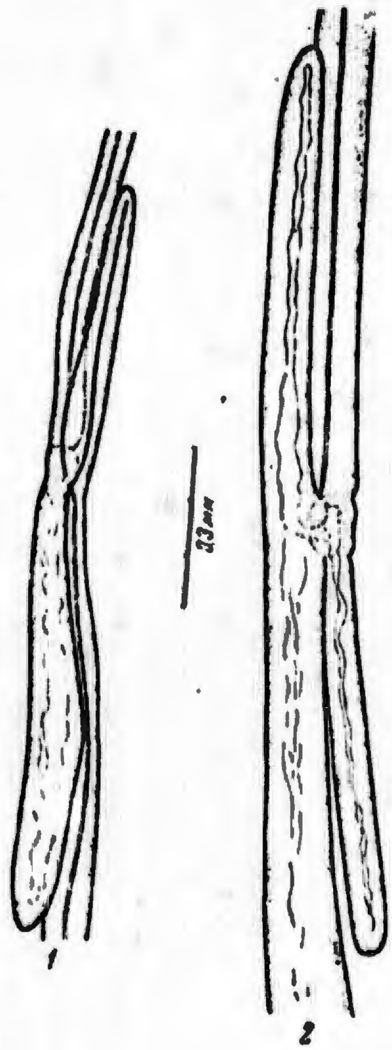


Figure 160.

<u>Contracaecum (Contracaecum) osculatum</u> baicalensis (Mosgovoy et Ryjikov, 1950). Anterior segment of the digestive tract of the larva:

1. From the body cavity of the yellow-blade pigfish; 2. From the stomach of the Baykal seal (after Sudarikov and Ryzhikov, 1951).

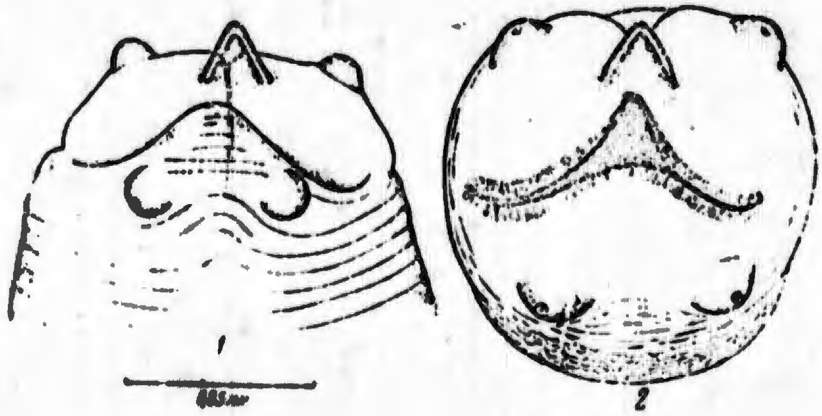


Figure 161.

Head end of the larva of Contracaecum (Contracaecum) osculatum baicalensis from the body cavity of the yellow-blade pigfish.

1. Dorsal view; 2. Subapical view (After Sudarikov and Ryzhikov, 1951).

p. 246

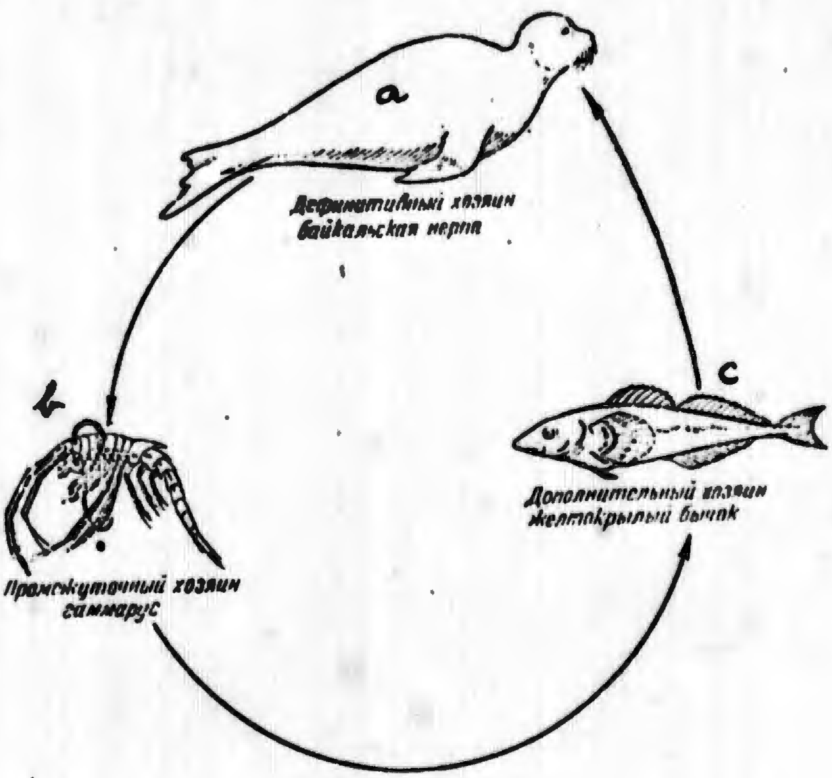


Figure 162.

Biological cycles of the nematode Contracaecum (Contracaecum) osculatum baicalensis

a. Definitive host: Baykal seal;

b. Intermediate host: Gammarus?;

c. Additional host: Yellow-blade pigfish;

(After Sudarikov and Ryzhikov, 1951).

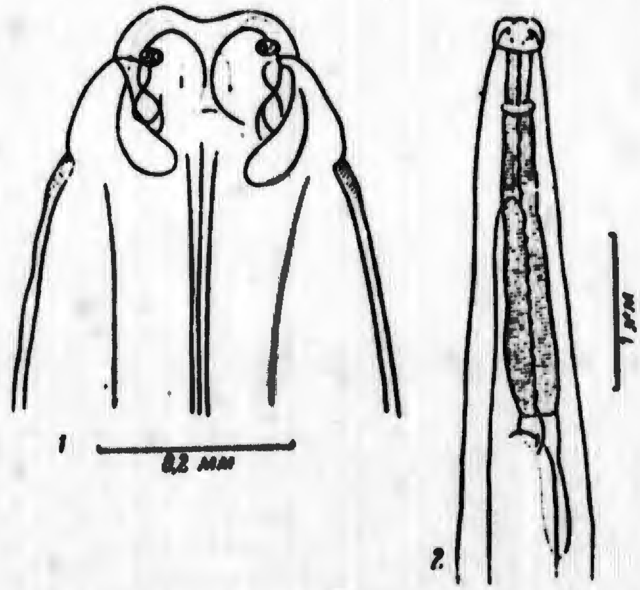


Figure 163.
Contracaecum (Contracaecum) radiatum (Linstow, 1907; Baylis, 1920).
1. Dorsal view of head end; 2. Anterior end of body (After Baylis, 1937 from Mozgovoy, 1953).

p. 247 3. The larvae of Contracaecum from the yellow-blade pigfish cannot be larvae of Contracaecum species from fish, since in the fishes of the Baykal Lake nematodes of the Contracaecum genus do not parasitize in the adult stage.

4. Comparison of the anatomical and morphological characteristics of the larvae of Contracaecum from the yellow-blade pigfish and immature Contracaecum osculatum from the stomach of the Baykal seal confirm their pertinance to a single species.

Sudarikov and Ryzhikov consider the whole biological cycle of development of the Contracaecum osculatum baicalensis in the following form: the definitive host is the Baykal seal, Phoca sibirica; the most probable intermediate host is the fresh-water shrimp "Yur," Macrohectopus branickii; additonal host is the yellow-blade pigfish, Cottecomephorus grewingkii. The outline borrowed from the work of Sudarikov and Ryzhikov illustrates the ideas of these authors about the biological cycle of Contracaecum osculatum baicalensis, parasitic in the Baykal seal.

Literature: Mozgovoy and Ryzhikov, 1950, p. 997 to 999; Mozgovoy, 1951, p. 18 to 21; Sudarikov and Ryzhikov, 1951, p. 59 to 66; Mozgovoy, 1953, p. 125.

Contracaecum (Contracaecum) radiatum (Linstow, 1907; Baylis, 1920).
(Figures 163, 164).

Synonyms:

Синонимы: *Ascaris radiata* Linstow, 1907; *A. falcigera* Railliet et Henry, 1907; *Kathleena radiata* (Linstow, 1907) Leiper et Atkinson, 1914

Hosts: Leptonychtes weddelli Less. - Weddel's seal; Hydrurga leptonyx Bl. - sea leopard; Ommatophoca rossi Gray - Ross's seal; Diomedea exulans, - Albatross.

Location in host: Intestine.

Geographic distribution: Antarctics.

Literature: Layman and Mudreeova, 1926, p. 45; Mozgovoy, 1953, p. 145; Skrayabin, Shikhobalova, Mozgovoy, 1951, p. 484;

Литература: Лейман и Мудреннова, 1926, стр. 45; Мозговой, 1953, стр. 145; Скрябин, Шихобалова, Мозговой, 1951, стр. 484; Linstow, 1892, p. 8—9; Linstow, 1907 (цит. по Baylis, 1937); Railliet et Henry, 1907, p. 2—7; Leiper and Atkinson, 1914, p. 222; Gedoelst, 1916, p. 18; Baylis, 1920, p. 262; Yorke and Maplestone, 1926, p. 282; Baylis, 1937, p. 126—127; Johnston, 1937б, p. 15; Johnston et Mawson, 1945, p. 85, 122, 125.

Contracaecum (Contracaecum) rectangulum (Linstow, 1907; Baylis, 1920).

Synonyms:

Синонимы: *Ascaris rectangula* Linstow, 1907; *Kathleena rectangula* (Linstow, 1907), Leiper et Atkinson, 1914

Host: Hydrurga leptonyx Bl. - sea leopard; Leptonychotes weddelli Less. - Weddel's seal; Lobodon carcinophagus Yag. et Puch. - crab-eating seal; Palmer archipelago (?).

Location in host: stomach.

Geographic distribution: Southern Atlantic (Sandwich Islands), Antarctics.

We are unable to give a description of the species because of the inaccessibility of Linstow's work. A. A. Mozgovoy (1953) gives the following characteristic of this species according to the drawing of Linstow. Head end armed with three lips. The dorsal lip consists of two parts: a wider laterally expanded part and a narrower part with a notch in the middle of its anterior segment. Intermediate lips are present according to the findings of Baylis (1920), Leiper and Atkinson, Layman and Mudreeova. There are
p. 249 esophageal and intestinal processes, where the first considerably exceeds the other. The caudal end of the male is evidently armed with five pairs of postanal papillae from which one pair is doubled, while three pairs of the latter papillae are located near the end of the tail on a special cuticular surface (platform).

Literature: Layman and Mudreeova, 1926,p. 41 to 45; Mozgovoy, 1953, p. 147; Skryabin, Shikhobalova, Mozgovoy, 1951, p. 484;

Linstow, 1907a, p. 402, 408; Leiper et Atkinson, 1914, p. 222; Yorke and Maplestone, 1926, p. 282; Baylis, 1929, p. 547; Baylis, 1937, p. 121—131; Johnston, 1937б, p. 10—11.

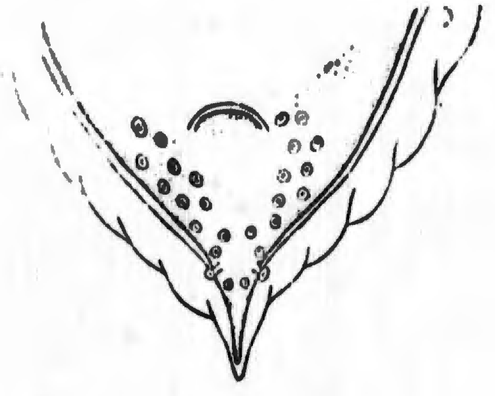


Figure 164.
<u>Contracaecum (Contracaecum) radiatum</u>
(Linstow, 1907; Baylis, 1920).
Caudal end of the male; ventral view
(After Linstow, 1907, from Mozgovoy,
1953).

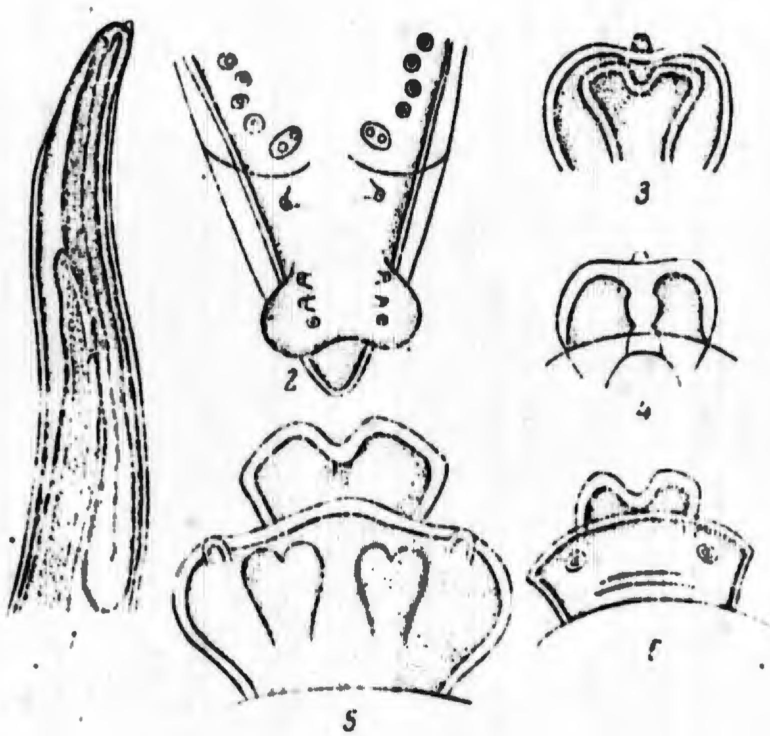


Figure 165.

<u>Contracaecum (Contracaecum) rectangulum</u>
(Linstow, 1907; Baylis, 1920).
1. Anterior end of the body; 2. Caudal end of the male, in ventral view; 3, 4. Lateral lip; 5, 6. Dorsal lip
(After Linstow, 1906, from Mozgovoy, 1953).

Contracaecum (Contracaecum) stenocephalum
(Railliet et Henry, 1907); (Layman et Mudrezova, 1926).

Synonym: Ascaris stenocephala (Railliet et Henry, 1907).

Host: Hydrurga leptonyx Bl. - sea leopard; Leptonychtes weddelli Less. - Weddel's seal.

Location in host: Stomach.

Geographic distribution: Antarctics.

Literature: Mozgovoy, 1953, p. 161; Skryabin, Shikhobalova, Mozgovoy, 1951, p. 485;

Railliet et Henry, 1907, p. 2--10; Gedoelst, 1916, p. 17—18; Yorke et Maplestone, 1926, p. 282; Johnston, 1937б, p. 13; Baylis, 1937, p. 121—131.

Contraceacum (Contracaecum) turgidum
(Chapin, 1925).

Host: Monachus schauinslandii Math.

Location in host: Stomach.

Geographic distribution: Pacific Ocean (the islands of Hawaii and Laysan).

Literature: Mozgovoy, 1953, p. 166; Skryabin, Shikhobalova, Mozgovoy, 1951, p. 485; Chapin, 1925, p. 1 to 3; Baylis, 1937, p. 127.

Genus Phocascaris (Höst, 1932)

At present the genus Phocascaris consists of two species for whose determination we propose the following table.

Table
of species determination of the genus Phocascaris (Höst, 1932).

1 (2). Lips with rounded edges. Spicules armed with wings. Intestinal process brief. Vulva on the boundary line of the first fifth part of the body. Among the postanal papillae one pair is doubled. Parasites of Phoca hispida ... Phocascaris netsiki (Lyster, 1940).

2 (1). Quadrate lips. Spicules without wings.

Intestinal process long. Vulva on the boundary line of the first third of the body. All postanal papillae are single. Parasites of Pagophoca groenlandica ... Phocascaris phocae (Höst, 1932).

Phocascaris phocae (Höst, 1932).

Host: Pagophoca groenlandica Erx. - White Sea (Greenland) seal, or hard seal.

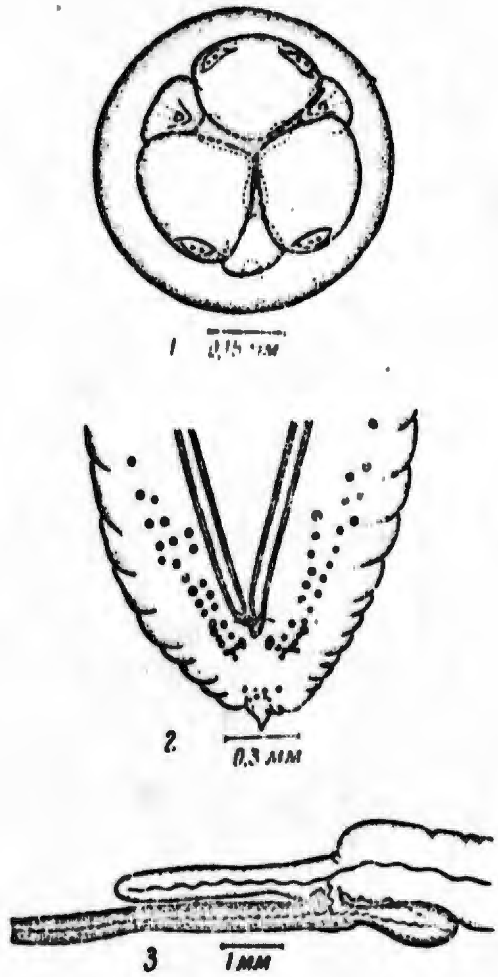
Location in host: Stomach, duodenum and small intestine.

Geographic distribution: White Sea (different points).

p. 251 Material: A large number of different sizes of specimens which we gathered from thirty-seven adults during the period from 1 to 27 March, 1951.

Description of species (according to personal investigations). Males smaller than the females. The body tapers at both ends, more with tapering pronounced toward the anterior end. The cuticle on the head and caudal ends is tranversely striated at 0.0030 to 0.0038 mm intervals. At the caudal end, the cuticle has a fine and longitudinal striation at slightly shorter intervals, due to which it acquires a reticulated shape. In addition to the fine striation, the cuticle has a coarser striation at 0.0115 to 0.0230 mm intervals. The head is armed with three lips with whose aid the helminths are very strongly attached to the wall of the intestinal tract, so that they are torn when pulled by their caudal end, but they do not release their lips from the tissues of the host. The dorsal lip is wider than the lateral ventral lips. It bears two large
p. 252 submedian papillae, each a latero-ventral, one larger submedian and one small lateral. At the touching (osculating) edges, the lips are provided with thickened plates which protrude from the side of the oral orifice each of which

p. 250



166. Contracaecum (Contracaecum) turgidum Chapin, 1925:

1. Apical view of head; 2. Ventral view of caudal end of the male; 3. Anterior segment of the digestive canal (After Chapin, 1925; from Mozgovoy, 1953).

Figure 167.

Phocascaris phocae (Höst, 1932). 1. Anterior end of the body in ventral view; 2. Anterior end of the digestive canal (original).

p. 252 bears a delicate corrugation which has a denticular edge of cuticular fold. Each lip on the side, which is turned toward the oral orifice, has three narrow identical labial grooves. Two marginal grooves separate the projections of the above indicated labial platelets, while a middle one divides the segment of lips between these platelets into two protuberances which are also directed toward the side of the oral orifice. There is no intermendiate lip. The slit-shaped excretory orifice is located between the latero-ventral lips. The neural ring is situated at a distance of 0.471 to 0.592 mm from the head end. Behind it and laterally are located the cervical papillae of a height of 0.015 to 0.018 mm. The esophagus is muscular, more or less curved. The stomach is glandular, reduced. Backwards from it a blind process goes out which is located ventrad from the intestine. In its turn, starting from the intestine, going forward, dorsad from the esophagus, the large intestinal process is which tapers toward the end.

p. 251

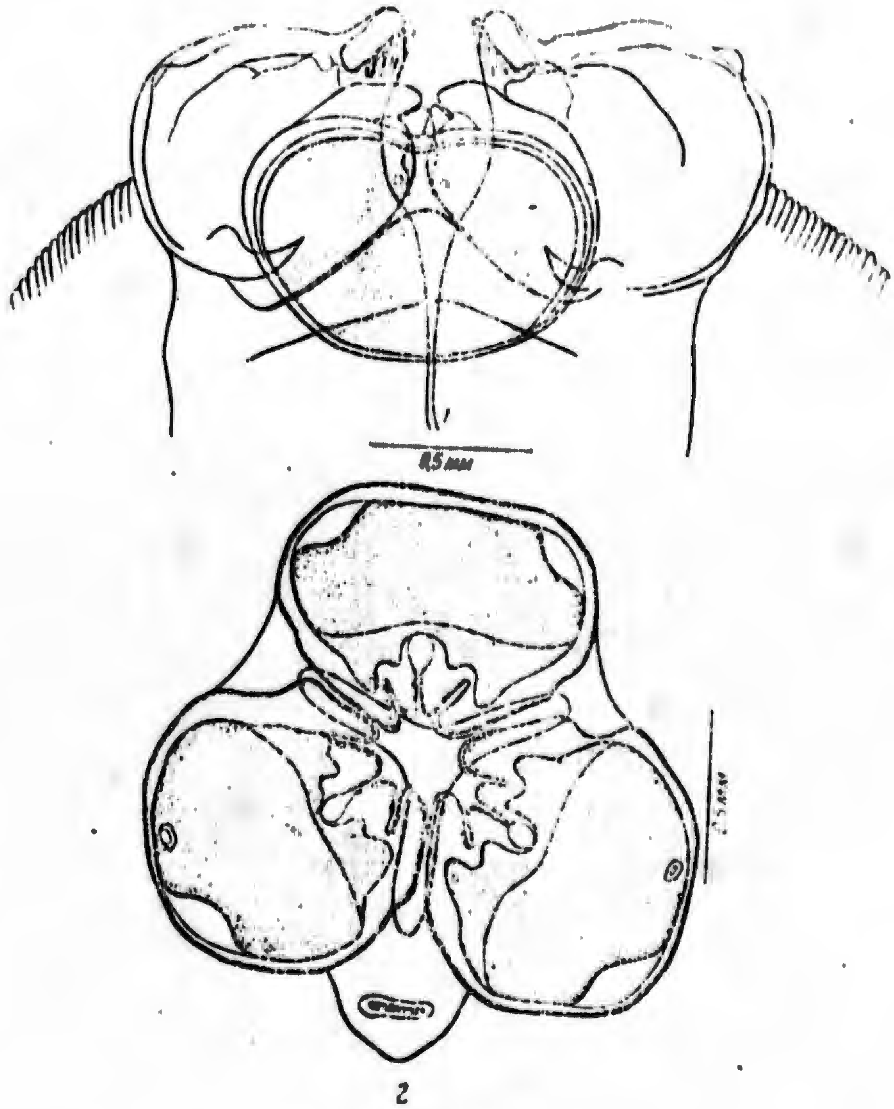


Figure 168.
Phocascaris phocae (Höst, 1932)
1. Dorsal view of the head end;
2. The same in apical view (original).

p. 252 Male. B·dy length 42.0 to 49.4 mm, maximum width, 0.980 to 1.357 mm. The body width at the level of the lips is 0.264 to 0.339 mm; at the end of the esophagus it is 0.660 to 1.075 mm; at the level of preanal papillae most remote from the cloaca it is 0.697 to 0.867 mm; at the level of the claca it is 0.301 to 0.452 mm. The cervical papillae are arranged at a distance of 0.584 to 0.697 mm from the head end. The esophagus is 3.583 to 4.337 mm; with a width of 0.183 to 0. 264 mm at the base of the lips, and 0.452 to 0.509 mm at the stomach. The stomach process is 0.810 to 1.225 mm long, with a width of 0.150 to 0.188 mm. The intestinal process is 2.451 to 3.772 mm long, with a maximum width of 0.188 to 0.264 mm. The caudal end is conical, tapering, provided with small lateral wings, slightly curved on the ventral side. The orifice of the cloaca is of semilunar shape, located at a distance of 0.301 to 0.320 mm from the tail tip. The spicules are elongated thin, and slightly uneven. The proximal ends of them have a club-shaped widening to which two band-shaped retractors are fastened. The length of the right spicules over their entire length is 0.056 to 0.088 mm. An accessory piece is absent. The caudal papillae are very numerous: -- there are 54 to 58 preanal pairs and 11 to 12 postanal pairs. The preanal papillae have a height of 0.023 to 0.030 mm, near the cloaca they are located in two irregular sets on each side of the body, while further away, along the direction to the head end, they are in a single line. The preanal papillae nearest to the cloaca are located from it at a distance of 2.471 to 4.046 mm. Among the postanal papillae, one pair is doubled, located near the cloaca are also 5 to 8 pairs of single papillae. Near the tail tip, three pairs of small papillae are present or absent. All caudal papillae are short, conical, stalk-like or warty in shape, but not flat.

Female. The body length is 57.2 to 87.4 mm; its maximum width is 1.81 to 2.10 mm. The body width is 0.320 to 0.452 mm at the level of the lips; 1.075 to 1.263 mm at the esophageal end; 1.244 to 1.433 mm at the level of the vulva; 0.396 to 0.509 mm at the anus. The cervical papillae are located at a distance of 0.792 to 1.037 mm from the head end. The esophagus is 4.715 to 5.280 mm long, with a width of 0.264 to 0.301 mm at the base of the lips, while

at the stomach it is 0.452 to 0.565 mm. The gastric process is 1.320 to 1.697 mm long, while the intestinal process is 3.583 to 4.432 mm. The anus is located at a distance of 0.509 to 0.775 mm from the tail tip. The vulva is at a distance of 15.08 to 19.12 mm from the head end. Behind the vulva runs the vagina which is 2.018 to 3.093 mm
p. 253 long, and it widens as it comes nearer to the uterus. According to the data of Höst, the unpaired part of the uterus is 4.0 mm long and 0.3 mm wide. It can be divided into two parallel branches of 0.18 mm width, which also run backwards. At a distance of 5.0 mm backwards from the site of bifurcation, the two uterine branches make a turn and run forward. Before their termination they come in touch with each other for some length, then again they separate and form a spindle-shaped widening (Seminal reservoir). The oviducts, with multiple flexures, form numerous loops with the ovaries. These loops have the shape of a skein. The eggs are oval, with a fine covering shell. At the moment of egg laying, the embryo is not segmented.

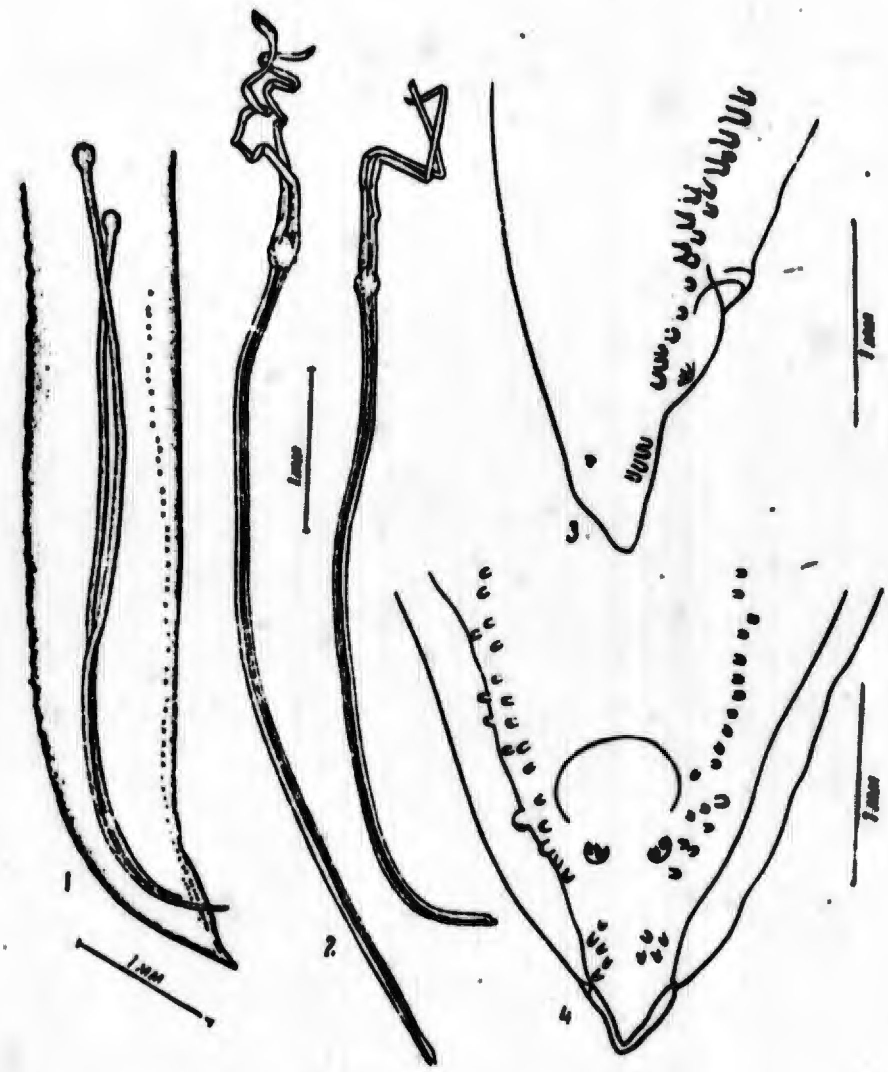


Figure 169.
Phocascaris phocae (Höst, 1932)
1. Lateral view of the rear end of the male body; 2. Spicules; 3. Caudal end of the male in lateral view; 4. The same in ventral view (original).

Notes On The Biology And Ecology Of Phocascaris Phocae.

The species Phocascaris phocae was described by Höst in 1932 after specimens from the stomach of the Greenland seal (Pagonphoca groenlandica) removed from the White Sea. Evidently, the author did not have specimens of
p.254 Phocascaris phocae which are parasitic in the small intestine of the same beast; for only the stomach was recognized by Höst as the site of location of this species.

During an expedition on an icebreaker (1951) we had an opportunity to conduct autopsy on forty-eight Greenland seals in the White Sea. As a result, it was possible not only to collect a very large number of nematodes of this species (from 37 beasts) and to establish that they invade both the stomach and the intestines, but also to elucidate one of the interesting ecological characteristics of the helminths. During the time of the autopsies of seals on the ice, it was noticed, and as a result of subsequent laboratory processing of the material it was once and for all established, that all individual Phocascaris phocae -- usually invading the stomach with several hundred specimens -- have comparatively small and almost identifal sizes of the body. On the contrary, individuals of Phocascaris phocae, which invade the duodenum and small intestines usually by a few dozens, have bodies which are large and unequal in size.

First it seemed to us that we have to deal with two different species of nematodes one of which had its habitat in the stomach,while the other has it in the intestine. However, after careful examination of the collected material, we became convinced that we have to do with one and the same species in which under the effect of different conditions (in the stomach and in the intestine) and evddently mostly under the influence of a different intensity of invasion, the variability of body length as well as of other signs was manifested in different ways.

Where at comparatively small surface a few hundred nematodes were residing (stomach), the body length of the males was 32.0 to 38.5 mm, while the body length of the females was 42.1 to 51.3 mm. But where on a comparatively large surface (small intestine) only 2 to 3 dozens of them were residing, the body length of the males was 42.0 to 49.4 mm, while the length of the females was 57.2 to 87.4 mm.

Thus, we found an inverse proportion between the body sizes of Phocasearis phocae and the number of specimens of the given species, invading one or another part of the seal's intestinal tract.

It should be mentioned that the here described phenomenon has been already noted also in regard to the tapeworm (Diphllobothrium latum) used for experimental infestation of dogs (E. N. Pavlovskiy and V. G. Gnezdilov, 1949). It is also known with regard to the cestode Ctenotaenia citelli, parasite of the gopher (Kirschenblatt, 1947) and with regard to the polystome (Polystomum intergerinum) parasitizing in the frog (Miretskiy, 1949). As to the nematodes of pinnipeds, the here described phenomenon was the first one found by us.

Literature: Skryabin, Shikhobalova, Mozgovoy, 1951, p. 516; Mozgovoy, 1953, p. 302; Host, p. 335 to 340,1932; Kirschenblatt, 1947, p. 115 to 118; Pavlovskiy and Gne dilov, 1949, p. 755 to 759; Miretskiy, 1949, p. 25 to 27.

Pnocascaris netsiki (Lyster, 1940)

Host: Phoca hispida Screb. - ringed seal.

Location in host: intestine.

Geographic distribution: North Arctic Ocean (North Canada).

Literature: Mozgovoy, 1953, p. 307; Skryabin, Shikhobalova, Mozgovoy, 1951, p. 516; Lyster, 1940, p. 399 to 401.

p. 255

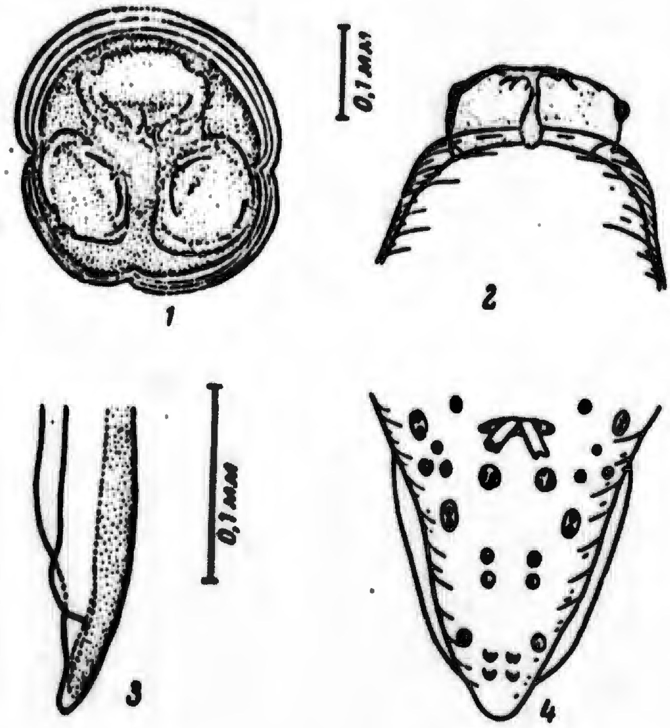


Figure 170.

Phocascaris netsiki (Lyster, 1940).

1. Apical view of the head end; 2. The same in ventral view; 3. Spicule; 4. Ventral view of the tail end of a male (After Linstow, 1940, from Mozgovoy, 1953).

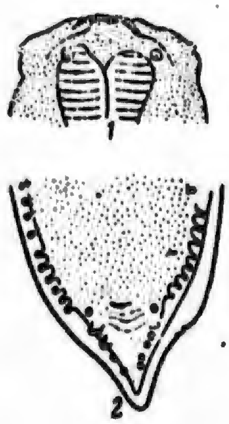


Figure 171.
Pseudoterranova kogiae (Johnston et Mawson, 1939). 1. Dorsal view of the anterior end; 2. Ventral view of the caudal end of a male (After Johnston and Mawson, 1939, from Mozgovoy, 1953).

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GENUS Porrocaecum (Railliet et Henry, (1912).

According to K. I. Skryabin, N. P. Shikhobalova and A. A. Mozgovoy, 1951, the genus Porrocaecum cnn be divided into two subgenera: Porrocaecum (Railliet et Henry, 1912; Karokhin, 1946), and Laymanicaecum (Mosgovoy, 1951).

The single species of the Porrocaecum genus which was found in pinnipeds is the Porrocaecum sulcatum, which belongs to the subgenus Porrocaecum (Railliet et Henry, 1912); Karokhin, 1946).

Subgenus Porrocaecum (Railliet et Henry, 1912; Karokhin, 1946).
Porrocaecum (Porrocaecum) sulcatum (Rudolphi, 1819; Baylis, 1923[1]).

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1. Corroboration of the parasitizing of this species in

southern fur seals is needed.

Synonym: Ascaris sulcata (Rudolphi, 1819).

Hosts: Arctocephalus australis Zimm. - The southern fur seal; Chelonia mydas (L); Thalassochelus coretta (= T. corticata), T. sp., sea turtles.

Location in host: Stomach.

Geographic distribution: In the southern fur seals, it was recorded in the South Atlantic (Brazil).

Literature: Karokhin, 1946, p. 138; Mozgovoy, 1953, p. 379; Skryabin, Shikhobalova, Mozgovoy, 1951, p. 524; Rudolphi, 1819 (quoted after Mozgovoy, 1953);

Dujardin, 1845, p. 174; Schneider, 1886, p. 43; Baylis, 1923, p. 3—4; Yorke and Maplestone, 1926, p. 280—281; Freitas et Lent, 1946, p. 235—238; Lent et Freitas, 1948, p. 37.

GENUS Pseudoterranova (Mosgovoy, 1950).

Pseudotoerranova kogiae (Johnston et Mawson, 1939; (Figure 171).

Synonym: Porrocaecum kogiae (Johnson et Mawson, 1939).

Host: Kogia breviceps Bl. - the dwarf sperm whalte

Location in host: Stomach.

Geographic distribution: South Australia.

Literature: Mozgovoy, 1950, p. 263 to 269; Mozgovoy, 1953, p. 401; Johnston et Mawson, 1939, p. 266; Johnston et Mawson, 1945, p. 111.

GENUS Terranova (Leiper et Atkinson, 1914).

Mozgovoy, 1951, subdivided the genus Terranova into two subgenera: Terranova (Leiper et Atkinson, 1914) Karokhin, 1946) and Sauronema (Mosgovoy, 1951). The parasites of marine mammals belong to the subgenus Terranova.

Subgenus Terranova (Leiper et Atkinson, 1914; Karokhin, 1946).

Terranova (Terranova) decipiens (Krabbe, 1878) Baylis, 1961.

Synonyms:

Ascaris decipiens Krabbe, 1878; A. bulbosa Cobb., 1889; A. simplex Linstow, 1888, nec Rudolphi, 1800; Porrocaecum decipiens (Krabbe, 1878) Baylis, 1920

Hosts: Eumetopias jubatus Schr. - sea lion; Arctocephalus doriferus (= ? A. gasella, A. hookeri), - southern fur seal; Callorihinus ursinus L. - fur seal; C. ursinus curilensis Jord. et Clarc. - Kurili fur seal; Odobaenus rosmarus L. - walrus; Phoca hispida Schr. -
p. 257 ringed seal; Phoca hispida botnica Gm. (= Ph. annelata), - Baltic seal; Ph. hispida ochotensis Pall., - ringed seal of the Okhotsk Sea; Phoca vitulina L. - common seal; Pagophoca groenlandica Erx. - hard seal; Erignathus barbatus Erx. - bearded seal; Halichoerus grypus Fabric - gray seal; Mirounga angustirostris (= Macrorhynus angustrirostris), - sea elephant; L. leonina L. - sea elephant; Leptonychotes weddelli Less. - Weddel's seal; Ommatophoca rossi Gray - Ross's seal; Monachus monachus Herm. - (= M. albiventer, Pelagius monachus) - West Indian seal; Balaenoptera acutorostrata Lacep. - small rorqual; B. musculus L. - blue rorqual; Monodon monoceros L. - narwhal; ? Phocaena phocaena L. - phocena.

Location in host: stomach and intestine.

Geographic distribution: North Arctic Ocean (shores of Scandinavia, North America, Alaska), Hudson Bay (North America); Atlantic and Pacific Oceans; Antarctics. In the USSR: North Arctic Ocean (Wrangel Island), White Sea, Bering Sea (Commander Islands), the Sea of Okhotsk (the Island of Seals).

Material: We examined this species on specimens from the hard seal (personnal collection), and from the bearded

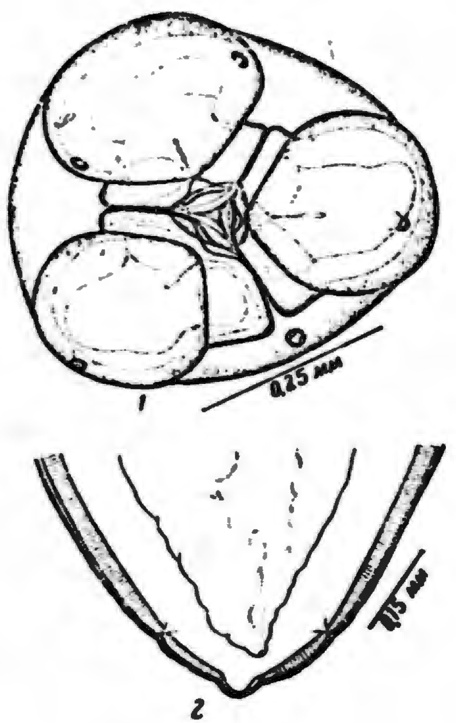

Figure 172.

<u>Terranova (Terranova) decipiens</u>
(Krabbe, 1878, Baylis 1916).
1. Apical view of head end; ventral view of caudal end of a female (after Mozgovoy, 1951, (1), 1953 (2).

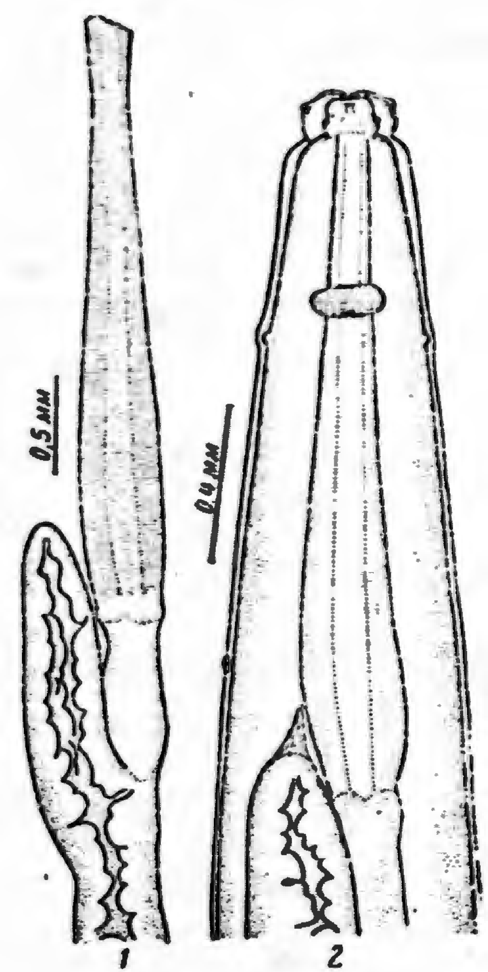

Figure 173.

<u>Terranova (Terranova) decipiens</u>
(Krabbe, 1873, Baylis, 1916).
1. Anterior segment of the digestive canal; 2. Anterior end of the body (after Mozgovoy, 1951).

p. 258 seal (collection of S. S. Surkov and V. Saprasov), as well as from the Okhotsk ringed seal and the Kurili fur seal (together with A. I. Krotov, 1952).

Literature: Levashov, 1921, p. 91; Skryabin, 1923, p. 40; Laiman, 1937, p. 359 to 362; Afana'yev, 1941, p. 111 to 115; Karokhin, 1946, p. 148; Mozgovoy, 1951, p. 21; Skryabin, Shikhobalova, Mozgovoy, 1951, p. 537; Krotov and Delamure, 1952, p. 281 etc etc.; :eodu. 1891 (quoted after Walton, 1927); Krabbe, 1878, p. 45 to 47; Linstow, 1886, b, p. 1 to 19; Cobb, 1888, p. 59 to 64; Jägerskiöld, 1894, 467 to 474; Stossich, 1896, p. 20; Linstow, 1896 (quoted after Schmidt Ries, 1939);

Jägerskiöld, 1898, p. 791—798; Linstow, 1898, p. 9; Stiles et Hassall, 1899, p. 109—120; Linstow, 1900, p. 119—124; Stossich, 1902, p. 62; Railliet et Henry, 1907, p. 1—3; Baylis, 1916, p. 365—368; Gedoelst, 1916, p. 20; Baylis, 1920b, p. 411—420; Baylis, 1920, p. 261; Yorke and Maplestone, 1926, p. 280; Walton, 1927, p. 61—62; Baylis, 1929, p. 545—546; Freund, 1933, p. 77; Kahl, 1936, p. 177—181; Baylis, 1937, p. 127—128; Johnston, 1937b, p. 8—11; Schmidt-Ries, 1939a, p. 99—101; Lyster, 1940, p. 395—405; Johnston et Mawson, 1943, p. 238; Johnston et Mawson, 1943a, p. 32—33; Baylis, 1944, p. 119—121; Johnston et Mawson, 1945, p. 111.

Immature and Larval forms of Anisakidae.

In our material, larvae of Anisakidae were found. We think it necessary to indicate their hosts, location in host, and geographic distribution.

1. Anisakidae gen. sp.

Host: *Eumetopias jubatus* Schreb. - sea lion.

Location in host: segment of large intestine.

Geographic distribution: Pacific Ocean.

Literature: Krotov and Delamure, 1952, p. 284.

2. Anisakidae gen. sp.

Host: *Callorhynus ursinus* L. - fur seal.

Location in host: stomach, small and large segments of intestine.

Geographic distribution: Pacific Ocean.

Literature: Krotov and Delamure, 1952, p. 281.

3. Anisakidae gen. sp.

Host: Physeter catodon L. - sperm whale.

Location in host: stomach, intestine.

Geographic distribution: Pacific Ocean.

4. Anisakidae gen. sp.

Host: Pagophoca groenlandica Fabric. - Greenland seal.

Location in host: stomach.

Geographic distribution: White Sea.

Order RHABDITIDA (Chitwood, 1933)

Family ANCYLOSTOMATIDAE (Looss, 1905)

At present, in addition to the subfamily Ancylostomatinae, this family also includes the subfamilies Strongylocanthinae (Yorke et Maplestone, 1926), and Bunostomatinae (Looss, 1905).

p. 259 The subfamily Bunostomatinae includes many genera, including the genus Uncinaria two species of which parasitize in pinnipeds.

Subfamily Bunostomatinae (Looss, 1905).

Genus Uncinaria (Froelich, 1789).

Uncinaria hamiltoni (Baylis, 1935).

Synonym: Dochmius (Dujardin, 1845); Dochmoides (Cameron, 1924).

Hosts: Otaria byronia Bl. - southern sea lion; Mirounga leonina L. (= Macrorhynus leonina), - southern sea elephant.

Location in host: intestines.

Geographic distribution: Falkland Islands.

Description of species (after Baylis, 1933). Subventral teeth very well developed. On the subdorsal angles of the anterior edge of the oral capsule two formations are placed which have the shape of small, backward curved teeth. The oral orifice is usually elongated in the dorso-ventral direction, the edge of the cuticular membrane which borders it is overlapping the dorsal end. The esophagus is bulb-shaped. The position of cervical papillae varies considerably. They are located at a distance of 0.47 to 1.1 mm, while the excretory orifice is at a distance of 0.6 to 1.1 mm from the anterior end of the body. The neural ring is slightly anterior to the excretory opening.

Male. The body is 8.5 to 12.0 mm long, and 0.4 to 0.46 mm wide at its maximum. The oral capsule is 0.28 to 0.30 mm long. The rear end of the esophagus protrudes from the anterior end of the body at a distance of 1.50 to 1.55 mm. The bursa is of the usual construction. The main branches of the dorsal rib are tricuspidate, which the outer terminal branch is the longest. The spicules are fine, transversely striated and tapering. Their length is 1.0 mm. The accessory piece is widened from behind, forming a wide groove for the spicules. The length of the accessory piece is 0.125 to 0.137 mm.

Female. The body is 12.5 to 17.5 mm long, and 0.52 to 0.60 mm wide, maximum. The length of the oral capsule is 0.32 to 0.38 mm. The rear end of the esophagus is at at distance of 1.6 to 1.9 mm from the anterior end of the body. The tail of the female is 0.16 to 0.25 mm, the shape and length of its terminal end varies considerably. There is one pair of papillae 5.1 to 7.0 mm from the rear end of the body. The lips of the vulva are usually very prominent. Sometimes, the vulva is curved inward, forming a depression in the body wall. The egg is 0.135 to 0.138 mm long and 0.085 to 0.093 mm wide. They are of oval form, with a relatively thick shell, and reach the larval stage in the uterus.

Literature: Skryabin, Shikhobalova, Schultz, Boyev, Popova, Delamure, 1952, p. 150; Baylis, 1933, p. 308 to 316; Johnston et Mawson, 1945, p. 138.

Uncinaria lucasi (Stiles, 1901)

Synonym: Uncinaria sp. Stiles et Hassall, 1899 (? Uncinaria stemmacephala; in Afanas' yev, 1941).

Hosts: Callorhinum ursinus alascanus Jord. et Clark.- Pribylov or Alascan fur seal.

Location in host: Small intestine.

Geographic distribution: Bering Sea (Pribylov Island). In the USSR ... not recorded.

p. 260 Historical Information

The first time this species was described by Stiles and Hassall in 1899 under the name Uncinaria sp. In 1901 Stiles designated this uncinaria as U. lucasi Stiles, 1901. Baylis (1903) turned attention to the imperfect description of this species, and in 1947 he re-described it according to original material which he collected from marine fur seals of Pribylov Island. (Stiles and Hassall, who first described this species, had at their disposal material from this host and from the same place).

Alluding to foreign authors (Stiles and Hassall, 1899 etc.), V. P. Afanas'yev (1941) points out that the species Uncinaria stemmacephala was found in Alaskan seals. This statement evidently refers to the Uncinaria sp. Stiles and Hassall, 1899, which is now called U. lucasi. At the same time it is not excluded that U. stemmacephala can be a parasite of seals, but the indications available on this point require confirmation.

Description of the species (after Baylis, 1947). The cuticle is finely and weakly striated transversely at intervals of about 0.004 to 0.006 mm. The oral capsule, in

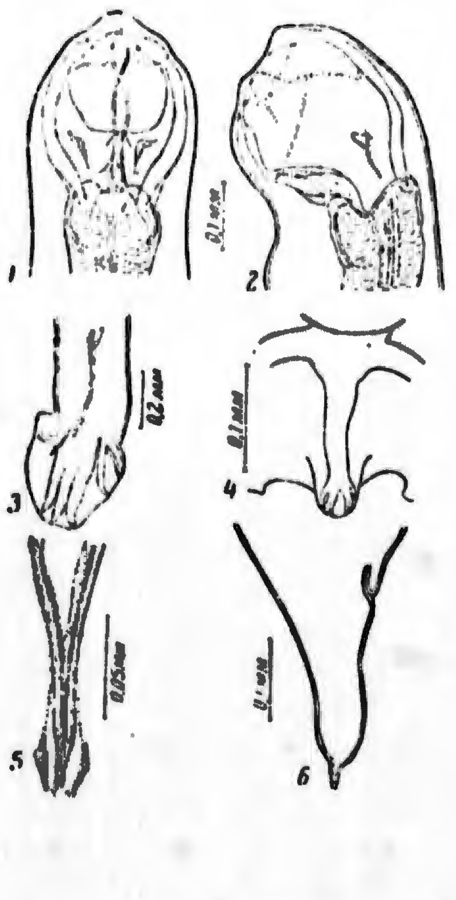

Figure 174.

Uncinaria lucasi (Stiles, 1901).

1. Dorsal view of the head end of a female; 2. Lateral view of the same; 3. Lateral view of the caudal end of a male; 4. Dorsal view of the dorsal rib; 5. Terminal end of the spicules; 6. Caudal end of a female in lateral view (after Baylis, 1947).

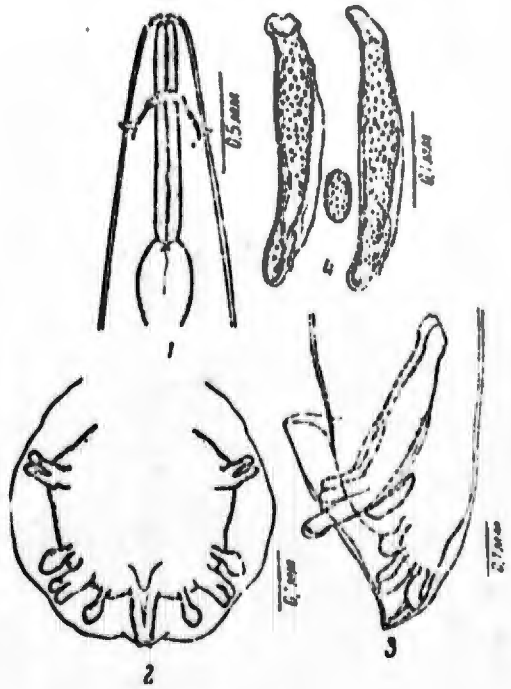

Figure 175

Otostrogylus circumlitus (Railliet, 1899; Bruyn, 1933).

1. Anterior end of the body; 2. Ventral view of the bursa; 3. Lateral view of the same; 4. Spicules and accessory piece. (after Skryabin, 1933).

p. 261 comparison with the oral capsule of U. hamiltoni, is smaller and of slightly different shape. There are not enough ringed (annular) thickenings in its wall which are usually present in the U. hamiltoni. The subventral teeth are smaller than in U. hamiltoni. On the subdorsal angles of the edge of the oral capsule there are no dentiform formations. Near the subventral angles of the mouth, at the boundary of its membtanous edges, there are paired cuticular supporting formations which have the shape of paired larger triangular teeth. The angular orifice is elongated dorso-ventrally. The esophagus is finger-shaped. The walls of its anterior end (at the transition into the oral capsule) contain a collar-shaped cuticular band which probably serves for the fastening of several muscular fibers. The cervical papillae are placed at 0.57 to 0.62 mm distance from the anterior end, and the very poorly defined excretory orifice at a distance of 0.60 to 0.67 mm. The neural ring is poorly defined, but evidently it is located approximately at the same level as the cervical papillae.

Male. The body length is 7.4 to 9.7 mm, maximum width 0.30 to 0.38 mm. The oral capsule is 0.21 to 0.24 mm long. The esophagus is 1.1 to 1.2 mm long. The bursa is smaller than in U. hamiltoni. All the lateral ribs are identical in length. The terminal branches of thedorsal rib are as in U. hamiltoni, but its main branches are shorter in comparison to the main shaft. The spicules are 0.50 to 0.56 mm long. They have transversely striated wings which seem to merge near the distal ends, but the finely tapered ends of the spicules are free. The accessory piece is widened in its rear half where there is a groove for the spicules. The length of the accessory piece is 0.08 to 0.09 mm.

Female. The body length is 12.4 to 15.0 mm, maximum width 0.42 to 0.50 mm. The oral capsule is 0.24 to 0.28 mm long. The length of the esophagus is 1.25 to 1.40 mm. The tail (including the brief terminal process) has 0.21 to 0.25 mm in length or sometimes slightly more than this. At the middle of the tail there is usually a slight constriction, while at a distance of 0.06 to 0.08 mm from the tip there are two weakly perceptible papillae. The vulva is located 5.2 to 6.3 mm from the rear end. Its lips form a protruding papillae. The total length of the opposite directed ovijectors is about 1.0 mm. The egg is 0.12 to 0.14 x 0.08 to 0.088 mm. The eggs are provided with a thick shell (0.004 to 0.005 mm) and at the moment of laying they contain rolled-up larvae.

Literature: Skryabin, Shikhobalova, Schultz, Boyev, Popova, Delamure, 1952, p. 154; Stiles et Hassall, 1899, p. 99; Stiles, 1901, p. 523 (quoted by Baylis, 1947); Baylis, 1947, p. 160 to 162.

Family Dictyocaulidae (Skrjabin, 1941).
Subfamily Dictyocaulinae (Skrjabin, 1933).

At present the subfamily Dictyocaulinae unites three genera: Dictyocaulus (Railliet et Henry, 1907); Bronchonema (Monnig, 1932); Otostrongylus (Bruyn , 1933).

The following genus is represented by one species which is parasitic in seals.

Genus Otostrongylus (Bruyn, 1933).

Synonyms: Kutassicaulus (Skrjabin, 1933); Kutastrongylus (Skrjabin, 1933).

Historical Information

In 1899, Railliet, while studying the helminthological specimen from Phoca vitulina, caught in the shoreline of France, described a nematode under the name Strongylus circumlitus (Railliet, 1899).

p. 262 Yorke and Milestone (1926) did not mention this species and therewith ignore the first scientific description of a pulmonary nematode of pinnipeds.[1]

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1. In the work of Eschricht (1841, p. 345) it was shown that Kroyer in 1841 found nematodes in the lungs of Ph. vitulina caught in the shorelines of Europe, but did not describe them, and did not give them a name (Dougherty and Herman, 1947).

In 1933, Bruyn found the same species in the lungs and blood vessels of Phoca vitulina caught in the shorelines of the Netherlands. Having studied the species S. circumlitus in detail, Bruyn arrived at the conclusion that it should be put into the special genus Otostrongylus (Fam. Metastrongulidae).

In the same 1933 year, Academician K. P. Skryabin, not knowing of Bruyn's work, which was prepared for publication, founded a new genus, Kutassicaulus, for the nematodes K. andreewoi (Skrjabin, 1933), a parasite of the lungs and blood vessels of the liver in the seal Ph. hispida (Ph. hispida ochotensis) and Ph. foetida (at present Ph. hispida pomororum). K. I. Skryabin refers the genus Kutassicaulus, which is established, to the subfamily Dictyocaulinae (Skrjabin, 1933).

In 1935, Schuurmans-Stekhoven, relying upon the fact that Bruyn's work was printed a few months before the work of K. I. Skryabin, took the genus Kutassicaulus (Skrjabin, 1933) for a synonym of the genus Otostrongylus (Bruyn, 1933) which subsequent authors accepted in agreement.

Having examined a large original material caught by V.G. Bobrova from the Okhotsk ringed seal, and having compared the data which we obtained with the data of K.I. Skryabin (1933) and Bruyn (1933), we established that the species Otostrongylus andreewoi (Skrjabin, 1933) is a synonym of the species Otostrongylus circumlitus (Bruyn, 1933).

Otostrongylus circumlitus (Railliet, 1899; Bruyn, 1933)

Synonyms: Strongylus circumlitus (Railliet, 1899); Kutassicaulus andreewoi (Skrjabin, 1933).

Hosts: Phoca vitulina L., (= Ph. foetida) - the common seal; Phoca hispida pomororum (Smirn.) - the pomor seal; Phoca hispida ochotensis (Pall), - the Okhotsk seal.

Location in host: Lungs (bronchi), right half of heart, pulmonary artery, hepatic blood vessels.

Geographic distribution: North Sea (shoreline of France and the Netherlands). IN the USSR: The White Sea and the Sea of Okhotsk.

Material: Several dozen specimens from the lungs and from the right half of the heart of the Okhotsk ringed seal were furnished to us by A. I. Krotov. The material was collected by V. G. Bobrov, a coworker of the Sakhalin Branch of the USSR Academy of Sciences.

Description of species (after the own investigations of the specimens from the lungs of the Okhotsk ringed seal). Comparatively long thread-shaped nematodes of dirty white color. Their body is equally constricted toward the front and rear ends. The cuticle does not have transverse or longitudinal striations. The mouth lacks lips, and it is armed with 18 papillae, six of which are large and 12 are fine. Each of the papillae is provided with one bristle directed forward.

The large papillae of 0.015 to 0.019 mm height are placed along an internal circle; two of them are internal dorsal, two are internal ventral and two are internal lateral. The fine papillae are 0.003 to 0.007 mm in height (size without the bristles); they are located along an external circle, one pair for each large papilla.

p. 263 The oral capsule is small, funnel-shaped, slightly chitinized. Its internal wall is provided with one concentric series of very fine teeth. There are four cervical papillae: two subventral and two subdorsal. Individuals parasitizing in the respiratory system possess a thicker cuticle and somewhat larger size than individuals parasitizing in the circulatory system of the same host.

Male. The body length is 53.0 to 72.0 mm. Maximum width of the body is 0.528 to 0.697 mm. The width of the body at the level of the esophageal end is 0.471 to 0.509 mm, while before the bursa it is 0.264 to 0.339 mm. The width of the oral capsule is 0.057 to 0.065 mm with a depth of 0.037 to 0.057 mm. Its funnel shaped stricture passes over into the esophageal lumen. The neural ring is located at a distance of 0.358 to 0.377 mm from the anterior end, while the excretory aperture is at a distance of 0.565 mm. The esophagus is 1.037 to 1.225 mm long, and its maximum width is 0.132 to 0.134. It is cylindrical, slightly narrowing in the region of the neural ring, it has a well outlined transverse striation.

The tail is provided with a well developed, almost round saucer-shaped (patellate) bursa which has no lobes. The bursa is 0.414 to 0.565 mm long, and 0.433 to 0.490 mm wide. It is supported by nine well developed ribs of which two are ventral, two are sublateral, two lateral, two subdorsal and one is dorsal, which was formed as a result of the fusion of two ribs. The ventral ribs are 0.145 to 0.161 mm long, with a width of 0.049 to 0.053 mm at the base. They are located anteriorly from the level of the cloaca, and considerably far away from the lateral ribs. Beginning from the middle, each ventral rib is divided into two closely situated branches. The lateral ribs fo off from a wide common, base. The external rib lateral is 0.107 to 0.138 mm in length, with a clavate bulge at its distal end which has a width of 0.030 to 0.046 mm. The lateral rib is 0.142 to 0.188 mm in length, and it is divided in the middle into two branches whose points are borne by one barely noticeable papilla. The external dorsal ribs are 0.122 to 0.145 mm in length, and 0.023 to 0.026 mm wide at the base, separated from the nearby situated ribs. Their distal ends are swollen in the form of clubs. The dorsal rib is powerful, 0.153 to 0.172 mm long, with a width of 0.042 to 0.046 mm (ventrally) and 0.65 mm (laterally) at the base. It consists of two dorsal ribs which are fused at their tips, while in specimens from the blood-circulatory system of the seal the dorsal rib has a thin median bar whose tip fuses with common tip of the dorsal rib.

At the examination of the bursa from the dorsal side, it could be very distinctly seen that all bursal ribs take their origin from a single common flattened base which has the shape of the Roman numeral V, whose slightly narrowed and rounded base forms the dorsal rib. Thus, in this position of the nematode it is clearly visible that the dorsal rib actually consists of two ribs which are fused with their points, which was first observed by K.I. Skryabin (1933) who thinks that the described species has not one but two dorsal ribs. It should be also stated that the external edge of the above mentioned common costal basis is bordered by a transparent thickened tissue whose dorsal surface is welded together with the walls of the bursa.

The spicules are typical for dictyocaulids. They are 0.490 to 0.546 mm long, with a 0.069 to 0.075 mm maximum width. They are brown and spongy. They have two wings,

one of which is stretched along the ventral surface, and the other on the dorsal surface. The dorsal wing of the spicule forms a fine outgrowth in the rear third of its length, which is edged with a transparent membrane,
p. 266 passing over the body of the spicule. The distal end of the spicule is finger-shaped and truncated. Muscle (retractor) is fastened to the rugged proximal end.

The accessory piece is 0.113 to 0.115 mm long, and 0.023 to 0.034 mm wide, just as the spicules also. It is covered with warty projections, but here they are considerably small in size.

Female. The body length is 81.0 to 97.0 mm. Maximum width is 1.037 to 1.320 mm. The body width is 0.641 to 0.697 mm at the esophageal end, while it is 0.433 mm at the anal level. The oral capsule is 0.081 to 0.092 mm deep, and 0.094 mm wide. The excretory aperture is at a distance of 0.565 mm, and the neural ring is at a distance of 0.546 mm from the anterior end. The esophagus is 1.093 to 1.131 mm long, and its maximum width is 0.132 to 0.150 mm. The site of the vulva was not found. The tail is tapered conically. Its tip ends in a very small three-pronged papilla. The cuticle of the tail slightly lags behind (stands off) and acquires a fine transverse striation which is especially well noticeable on the small cuticular wings that surround the anus. They are located at a distance of 0.245 to 0.358 mm from the tail tip. The uterus is 0.320 mm, filled with eggs which have thin membranous transparent shells and larvae at all stages of development. The shaped larvae are spirally rolled up; they fill up the ultimate segments of the uteri. The length of unhatched eggs is 0.065 mm, their width 0.057 mm. At the first stages of segmentation, the eggs are 0.088 to 0.096 mm long, and 0.053 to 0.057 mm wide. The length of the larva is 0.268 to 0.326 mm, and its width 0.019 to 0.023 mm.

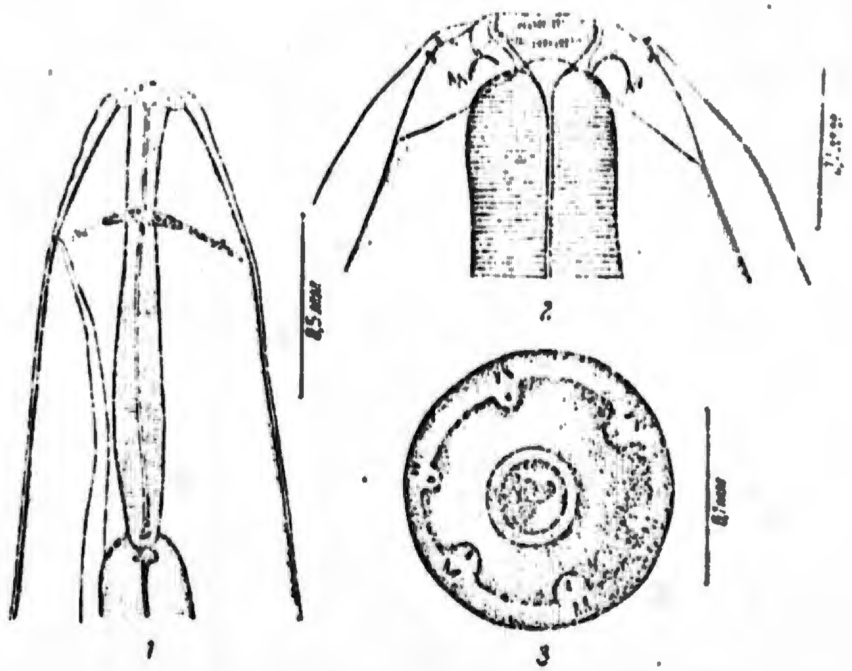

Figure 176.

Otostrongylus circumlitus (Railliet,1899; Bruyn, 1933).

1. Anterior end of the body; 2. Head end; 3. Apical view of the same (original).

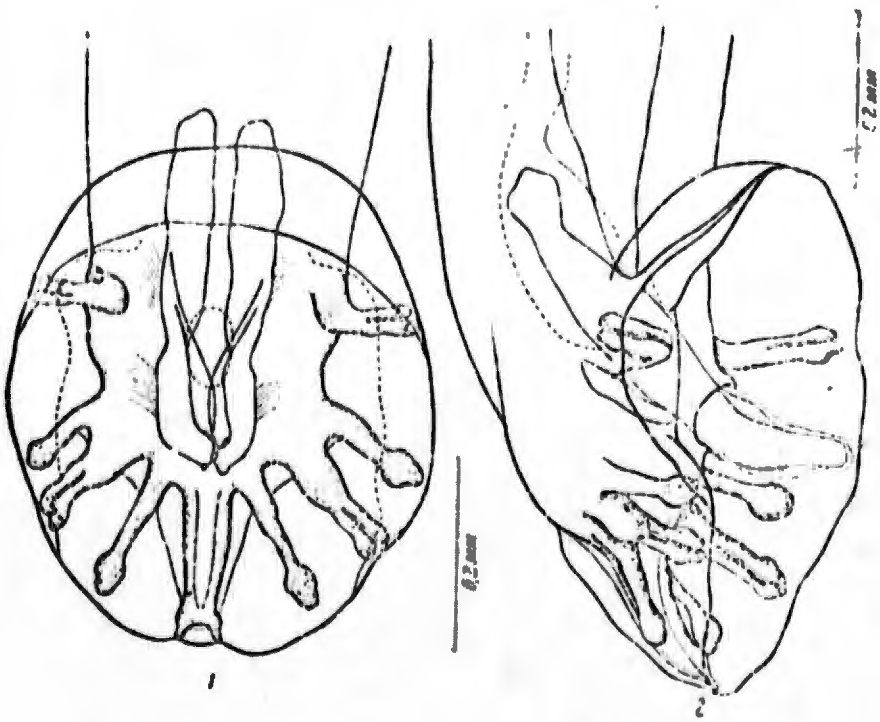

Figure 177.

Otostrongylus circumlitus (Railliet, 1899; Bruyn, 1933).

1. Ventral view of bursa; 2. Latero-ventral view of the same (original).

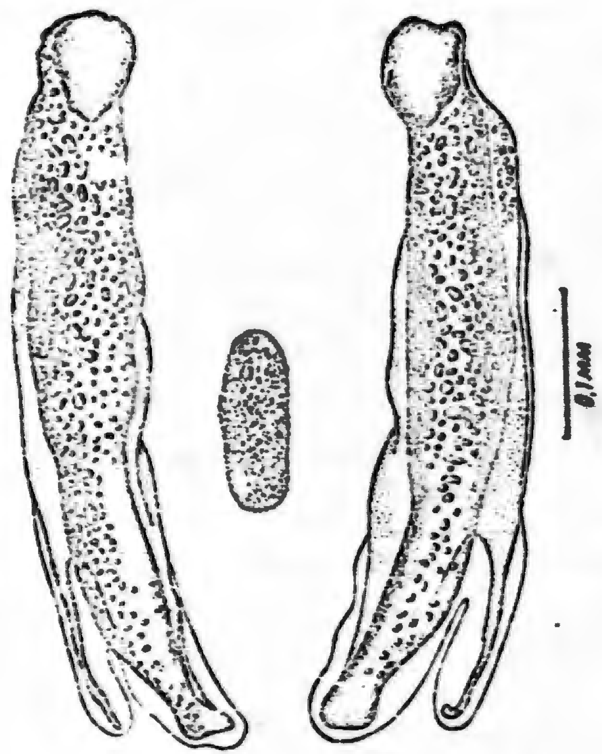

Figure 178.
Otostrongylus circumlitus (Railliet, 1899; Bruyn, 1933).
Spicules and accessory piece (original).

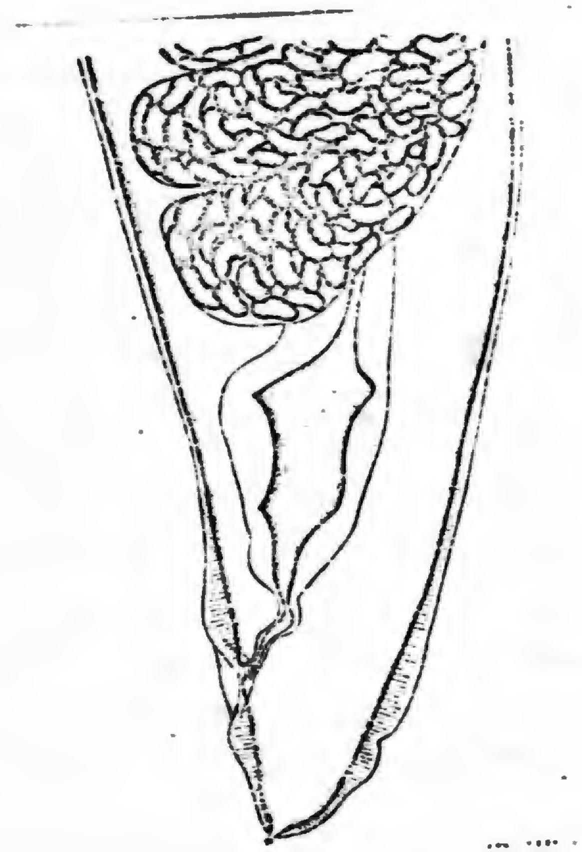

Figure 179.
Otostrongylus circumlitus (Railliet, 1899; Bruyn, 1933).
Lateral view of the female tail end (original).

Literature: Skryabin, 1933, p. 359 to 363; Skryabin, Shikhobalova, Schulz, Popova, Boyev, Delamure, p. 614, 1952; Railliet, 1899, p. 128 to 130; Bruyn, 1933, p. 142 to 153.

Family Filaroididae (Schulz, 1951).

Synonym: Filariopsidae (Chandler,1931 in part).

Subfamily Filaroidinae (Skrjabin, 1933).

At present the subfamily Filaroidinae consists of four genera: Filaroides (Beneden, 1858); Anafilaroides (Gerichter, 1948); Metathelazia (Skinker, 1931); Parafilaroides (Dougherty, 1946). The latter genus consists of species which are parasitic in pinnipeds.

GENUS Parafilaroides (Dougherty, 1946).

Table

of species determination of the genus Parafilaroides.

1 (4). Parasites of Eumetopias jubatus (Steller's sea lion).

2 (3). Body length of male up to 3 mm, of female 4.5 to 5.2 mm ... Parafilaroides prolificus (Dougherty et Herman, 1947).

3 (2). Body length of female 9 mm (males not known) Parafilaroides prolificus (Dougherty et Herman, 1947).

4 (1). Parasites of Phoca vitulina and Zalophus californianus.

5 (6). Body length of male 15 to 18 mm, of female 22, 23 mm. Length of spicules 0.042 to 0.047 mm. Parasites of Phoca vitulina ... Parafilaroides gymnurus (Railliet, 1899), Dougherty, 1946.

6 (5). Body length of male 6, 7 mm, of female 16 to 21 mm. Length of spicules 0.035 mm. Parasites of Zalophus californianus ... Parafilaroides decorus Dougherty et Herman, 1947.

p. 267 <u>Parafilaroides gymnurus</u> (Railliet, 1899) Dougherty, 1946.

Synonyms:

Синонимы: *Pseudalius gymnurus* Railliet, 1899; *Halocercus gymnurus* (Railliet, 1899) Baylis et Daubney, 1925; *H. (Prohalocercus) gymnurus* (Railliet, 1899) Baylis et Daubney, 1925 in Skrjabin, 1942; *Filaroides gymnurus* (Railliet, 1899) Dougherty, 1943

Host: <u>Phoca vitulina</u>, L., the common seal.

Location in host: Lungs.

Geographic distribution: Europe.

Description of species (after Baylis and Daubney, 1925).

Male. The body length is 15 to 18 mm, with a maximum width of 0.12 mm. The bursa, ribs and papillae are absent, as it is assumed. The spicules are 0.042 to 0.047 mm (? 0.42 to 0.47 mm) long, slightly curved, constricted at the base, widened and thickened dorsally.

Female. Body length 22, 23 mm, with a maximum width of 0.17 mm.

Literature: Skryabin, 1942, p. 42; Delamure, 1946, p. 113; Skryabin, Shikhobalova, Schulz, Popova, Boyev, Delamure, 1952, p. 726;

Railliet 1899, p. 129; Baylis et Daubney, 1925, p. 213; Yorke et Maplestone, 1926, p. 171; Freund, 1933, p. 73—74; Baylis, 1932, p. 413; Dougherty, 1943a, p. 72; Dougherty, 1944, p. 93; Dougherty, 1946, p. 20.

<u>Parfilaroides decorus</u> (Dougherty et Herman, 1947).

Synonyms:

Синонимы: *Halocercus* sp. Herman, 1942; *Filaroides* sp. Dougherty, 1943; *Parafilaroides* sp. Dougherty, 1946.

Host: <u>Zalophus californianus</u>, sea lion.

Location in host: Lungs.

Geographic distribution: California.

Description of species (after Dougherty and Herman 1947). Longer and thinner worms than <u>P. nanus</u> and <u>P. prolificus</u>. There are twin subventral glands. Their length is 0.170 to 0.215 mm. The neural ring is at a distance of 0.062. to 0.078 from the head end.

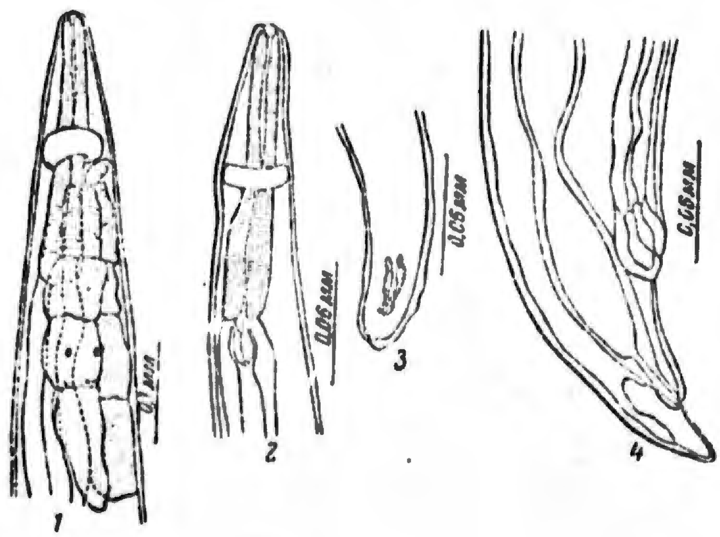

Figure 180.
Parafilaroides decorus Dougherty and Herman, 1947:
1, 2. Anterior end of body; 3. Tail
end of the male; 4. Tail end of the female
(After Dougherty and Herman, 1947).

p. 268 Male. Body length 6, 7 mm, with a maximum width of 0.092 mm. The length of the esophagus is 0.120 to 0.125 mm, with a maximum width of 0.012 mm. The bursa is entirely missing. The rear end bears two subterminal papillae. The spicules are fine, delicate, equal. The length of the spicules is 0.035 mm. There is an accessory piece. Its length is 0.010 mm (a more accurate structure of the accessory piece was not determined).

Female. Body length 16 to 21 mm. Maximum width of the body is 0.165 mm. The esophagus is 0.155 to 0.170 mm long, with a maximum width of 0.021 mm. The anus is at a distance of 0.018 to 0.023 mm distance from the caudal end. The vulva is located in front of the anus. The distance from anus to vulva equals 0.047 to 0.059 mm. The length of the vagina proper is 0.027 to 0.033 mm, while the length of the uterine vagina is 0.155 to 0.290 mm. The terminal segments of the uteri are filled with a large number of tightly packed larvae.

Literature: Skryabin, Shikhobalova, Schulz, Popova, Boyev, Delamure, 1952, p. 726; Dougherty et Herman, 1947, p. 79 to 81.

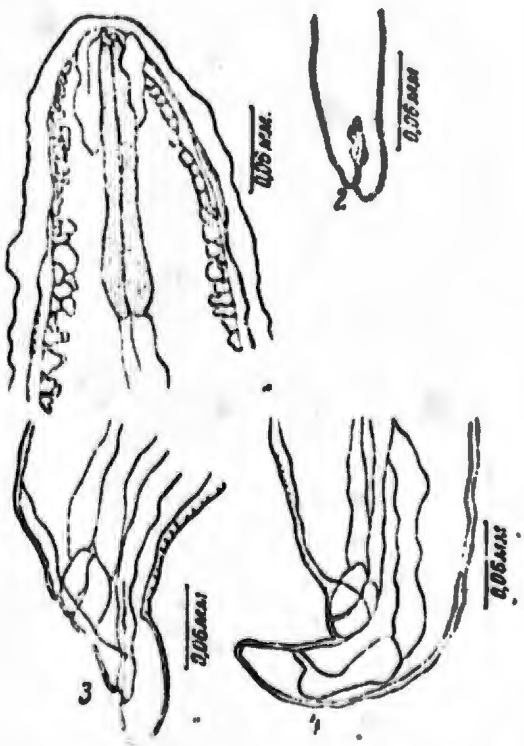

Figure 181.

Parafilaroides nanus Dougherty et Herman, 1947.
1. Head end of the female; 2. Caudal end of the male, in lateral view; 3. Lateral view of the caudal end of the female: 4. The same (curved ventrad).
(After Dougherty and Herman, 1947).

Parafilaroides nanus Dougherty et Herman, 1947

Synonym: Filaroides sp. Dougherty, 1943; Parafilaroides sp., Dougherty, 1946.

Host: Eumetopias jubatus Schr., sea lion.

Location in host: Lungs.

Geographic distribution: California.

p. 269 Description of species (after Dougherty and Herman, 1947). Very small nematodes (in comparison with P. decorus). The cuticle is hardly perceptible. The anterior end is wide. Under the microscope, the irregular line of hypodermal cells is visible. Subventral glands are absent. The neural ring is not distinctly expressed.

Male. Body length 2.8 mm, with a maximum width of 0.105 mm (the anterior end is defective for this reason the esophagus was not measured). Spicules are somewhat more delicate than in P. decorus. Their length is 0.039 mm. The distal ends of the spicules are possibly fused together. The accessory piece is about 0.010 mm long.

Female. The body length is 4.5 to 5.2 mm. Maximum width of the body 0.215 mm. The esophagus is 0.185 to 0.195 mm long, and 0.035 mm in maximum width. The anus is at a distance of 0.040 mm from the rear end. The vulva is 0.055 to 0.060 mm anterior to the anus. The true vagina is 0.040 to 0.045 mm long, and the uterine vagina is 0.340 mm. The uteri are filled with a relatively small number of larvae.

Literature: Skryabin, Shikhobalova, Schulz, Popova, Boyev, Delamure, 1952, p. 726; Dougherty et Herman, 1947, p. 79 to 81.

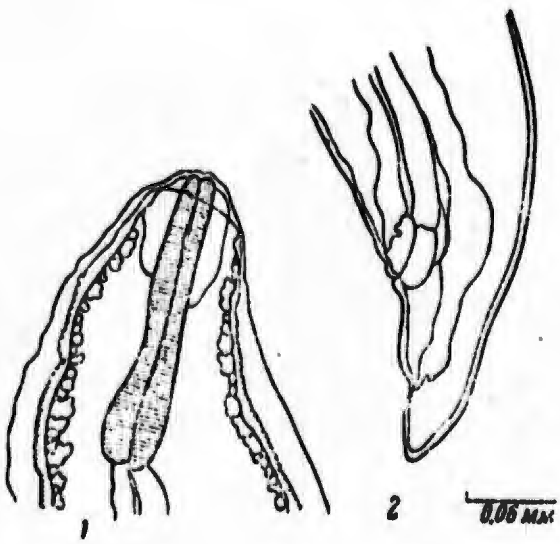

Figure 182.
Parafilaroides prolificus Dougherty et Herman, 1947.
1. Head end of the female; lateral view of the caudal end of the female.
(After Dougherty and Herman, 1948).

p. 270 Parafilaroides prolificus Dougherty et Herman, 1947.

Synonyms: Filaroides sp. Dougherty, 1943; Parafilaroides sp. Dougherty, 1946.

Host: Eumetopias jubatus Schr., sea lion.

Location in host: Lungs.

Geographic distribution: California.

Description of species (after Cougherty and Herman, 1947). Nematodes resembling P. nanus but almost double the length.

Male. Unknown.

Female. Body length 9mm, with a maximum width of 0.240 mm. Esophagus 0.195 mm, and its maximum width is 0.038 mm. The anus is 0.045 mm from the posterior end of the body. In front of the anus, at a distance of 0.065 mm is the vulva. The true vagina is 0.040 mm long. The uterine vagina is 0.255 mm long. The uteri are filled with many larvae, but they are not as many and not arranged as in P. decorus.

Literature: Skryabin, Shikhobalova, Schulz, Popova, Boyev, Delamure, 1952, p. 726; Dougherty et Herman, 1947, p. 79 to 81.

Dougherty and Herman also indicate another undetermined species which they call Parafilaroides sp.

Parafilaroides sp.

Host: Eumetopias jubatus Schr., the bearded seal.

Location in host: Lung parenchyma.

Geographic distribution: California.

Literature: Dougherty and Herman, 1947, p. 81 to 82.

Family Pseudaliidae (Railliet, 1916).

We gave a detailed historical synopsis and a critical analysis of the phylogenesis and classification of adult pseudaliids as well as a historical information as to the genera and species of this family in the "Determinant Of Parasitic Nematodes" (vol. 3, 1953, by K. I. Skryabin, N. P. Shikhobalova, R. S. Schulz, T. I. Popova, S. N. Boyev, S. L. Delamure).

Table

for determination of subfamilies of the family of

Pseudaliidae.

1 (2). The bursa consists of two isolated small, kidney-shaped or bean-shaped lateral lobes which are supported by short, nipple-shaped ribs. Parasites of the lungs of dolphins and of the frontal sinuses of dogfish ... Subfamily Skrjabingylinae (Skrjabin, 1933).

2 (1). The bursa has another construction.

3 (8). The bursa consists of three lobes, where the dorsal lobe is poorly defined. Not all ribs are short and nipple-shaped.

4 (7). A pair of preanal papillae is absent.

5 (6). The lateral ribs are prominent. The dorsal and ventral ribs are not pronounced. Parasites in the lungs and blood circulatory system of dolphins... Subfamily Pseudaliinae (Railliet,et Henry, 1909).

6 (5). The lateral and dorsal ribs are equally well developed. Parasites in the organs of hearing, lungs and circulatory system of dolphinoids ... Subfamily Stenurinae (Skrjabin, 1942).

7 (4). A pair of preanal papillae is present. Parasites in the lungs of sables ... Subfamily Sobolevingylinae (Romanov, 1952).

8 (3). The bursa is not subdivided into lobes; all ribs are short and tuberculate. Parasites in the lungs of dolphins and bottle-nose whales ... Subfamily Halocercinae (Delamure, 1952).

Subfamily Pseudaliinae (Railliet et Henry, 1909).

GENUS Pseudalius (Dujardin, 1845).

Synonyms: Pharurus (Leuckart, 1848, partly); Prosthecosacter (Diesing, 1854, partly).

Pseudalius inflexus (Rudolphi, 1809; Schneider, 1866).

Synonyms:

Синонимы: *Strongylus inflexus* Rudolphi, 1809; *S. inflexus major* Raspail, 1829 *S. major* Raspail, 1829; *Pseudalius filum* Dujardin, 1845; *Prosthecosacter inflexus* Diesing, 1851; ? *P. convolutus* Cobbold, 1864; *Pseudalius inflexus* Schneider, 1866; ? *Posthecosacter convolutus* Cobbold, 1879 (nec *Stenurus inflexu*. Dujardin, 1845)

p. 271 Host: PHocaena phocaena L. (= Ph. communis), the porpoise.

Location in host: Bronchi, blood circulatory vessels and heart.

Geographic distribution: North Atlantic, shores of Europe, Asiatic shoreline of the Pacific Ocean. It was not found in the USSR.

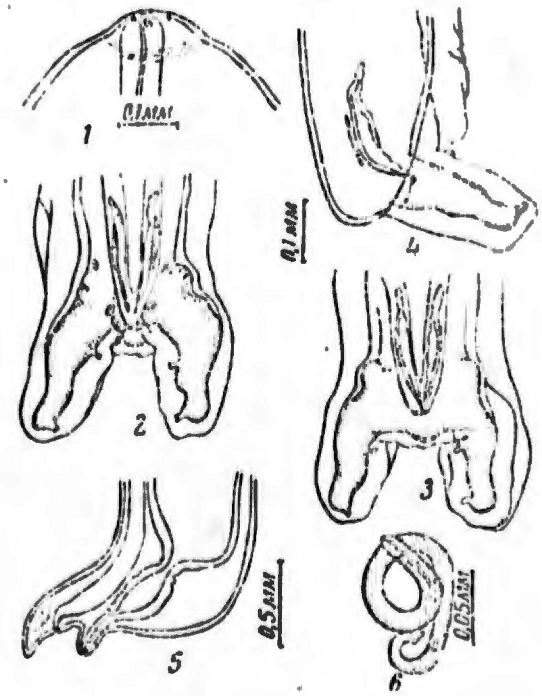

Figure 183.
Pseudalius inflexus (Rudolphi, 1809;
Schneider, 1866).
1. Anterior end; 2. Ventral view of the posterior of the male; 3. Dorsal view of the same; 4. Lateral view of the same; posterior of the female; 6. Larva (After Baylis and Daubney, 1925).

Description of the species (after Baylis and Daubney, 1925). The body is comparatively thick in the front, becoming narrower toward the posterior end. Very small (.02 mm) round mouth. The oral capsule is absent. The esophagus is only slightly widened in its rear portion, 0.73 to 0.80 mm in length and 0.15 mm its maximum width. The males are smaller than the females.

Male. Body length 120 to 140 mm, maximum width 1.2 mm. The rear end of the male is provided with a clearly defined genital conus which has a serrated rear edge. At some distance from the lateral lobes, the cuticle of the body is swollen. The spicules are 0.24 to 0.26 mm long, with an insufficiently chitinized appendicular part; they are in a clearly noticeable spicular sheath.

Female. The body length is 120 to 160 mm , maximum width is 1.4 mm. The tail is 0.25 mm long, it has a tubular vulvar process. The length of the vagina and of the whole trunk of the uteri is 0.75 mm. Each uterus is stretched forward, and it reaches the middle of the body, while the oviduct goes in the opposite direction. Viviparous. The larvae are 0.35 to 0.38 mm long, with a small head eminence and a slopingly truncate tail.

p. 272 Literature: Skryabin, 1942, p. 42; Skryabin, Shikhobalova, Schulz, Popova, Boyev, Delamure, 1952, p. 760;

, Rudolphi, 1809, p. 227; Kuhn, 1829a, p. 152; Kuhn, 1829 [illegible], p. 139; Kuhn, 1829b, p. 363; Raspail, 1829, p. 250, 251; Dujardin, 18[illegible], p. 1[illegible]; Diesing, 1851, p. 323; Molin, 1861, p. 174—176; van Beneden, 1861, p. 275—277; Schneider, 1866, p. 173—174; Cobbold, 1879, p. 424; Linstow, 1880, p. 40; 1888a, p. 17; Scott, 1908, p. 89—90; Baylis and Daubney, 1925, p. 204, Yorke and Maplestone, 1926, p. 168; Freund, 1933; p. 168; Baylis, 1932, p. 403 [illegible], Schmidt-Ries, 1939, p. 101—102; Dougherty, 1943, p. 20.

Subfamily Halocercinae (Delamure, 1952).

Brief historical information

For the creation of the outlined troup of the most primitive psudallids, Delamure proposed in 1952 to subdivide the family of Pseudaliidae (Railliet et Henry, 1909), into two subfamilies: Pseudaliinae (Railliet et Henry, 1909) (with the genus Psudalius, Dujardin, 1845) and Halocercinae (Delamure, 1952) (with the genera Halocercus, Baylis et Daubney, 1925), and Delamurella

(Gubanov, 1952).

Table

for determination of genera of the subfamily Halocercinae.

1 (2). There are prebursal alae. Parasites of the lungs of cetaceans of the family Ziphidae .... Genus Delamurella (Gubanov, 1952).

2 (1). No prebursal alae. Parasite of the lungs of cetaceans of the family Delphinidae ... Genus Halocercus (Baylis and Dougherty, 1925).

GENUS Halocercus (Baylis et Daubney, 1925).

Table

of subgenera determination of the genus Halocercus.

1 (4). Rudimentary bursa, clearly demarcated from the cuticle of the body.

2 (3). The bursal ribs are in the shape of papillae, not differentiated by branching ... Halocercus (Baylis et Daubney, 1925; Skrjabin, 1942).

3 (2). The bursal ribs are clearly differentiated by branching ... Posthalocercus (Delamure; Skrjabin, 1942).

4 (1). Bursa completely absent, or not clearly demarcated from the cuticle of the body. The bursal ribs are without differentiation by branching ... Prohalocercus (Skrjabin, 1942).

Subgenus Halocercus (Baylis et Daubney, 1925; Skrjabin, 1942).

Table

for species determination of the subgenus Halocercus.

1 (2). Each ventral rib is provided with one papilla; males 50 to 65 mm long, females 60 to 90 mm. Esophagus 0.6 mm long; spicules 0.73 to 0.76 mm. Parasites of Delphinus delphis. ... H. (H.) delphini (Baylis et Daubney 1925).

2 (1). Each ventral rib is provided with two papillae. Males 30 to 35 mm long, females 42 to 52 mm. Parasites of Sotalia guianensis ... H (H.) brasiliensis (Lins., 1933).

4 (3). Ventral ribs with three papillae. Spicules 0.65 mm long. Parasites of Lagenorhynchus albirostris ... H (H.) lagenorhynchi (Baylis et Daubney, 1925).

p. 273 Halocercus (H.) delphini (Baylis et Daubney, 1925).

Host: Delphinus delphis L., White-sided dolphin.

Location in host: Bronchi.

Geographic distribution: Atlantic Ocean (British Isles).

Description of species (after Baylis and Daubney, 1925). Small mouth, with small cuticular invagination. Head and cervical papillae, and excretory pores are not noted. The esophagus is cylindrical, about 0.6 mm long, and 0.013 mm at maximum width. The neural ring is located 0.16 to 0.18 mm from the anterior end of the body.

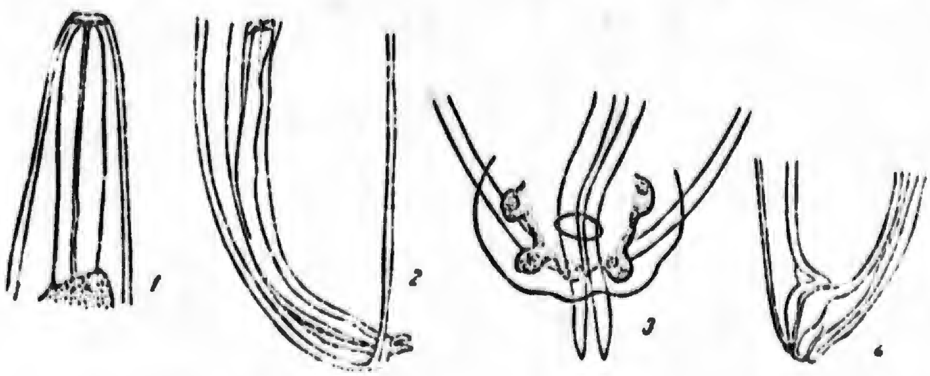

Figure 184.

Halocercus (Halocercus) delphini (Baylis et Daubney, 1925).

1. Anterior end; 2. Lateral view of the posterior end of the male; 3. Ventral view of the same; 4. Posterior end of the female. (After Baylis and Daubney, 1925).

Male. Body length 50 to 65 mm, with a maximum width of 0.43 mm. The bursa is disk-shaped, with an edge which is slightly notched between ribs. The ventral ribs are supported at the ends by one sessile papilla. The lateral and dorsal ribs have two termianl papillae each. The spicules are 0.73 to 0.76 mm long. The testis extends anteriorly, and turns up backwards at the esophagus.

Female. The body length is 60 to 90 mm. The maximum width of the body is 0.50 mm. The tube-shaped genital organs stretches forward to the boundary line of the anterior and the middle part of the body. The total length of the vagina and the trunk uterus is about 0.12 mm. The larvae are 0.260 to 0.285 mm in length.

Literature: Skryabin, 1942, p. 41; Delamure, 1946, p. 113; Skryabin, Shikhobalova, Schulz, Popova, Boyev, Delamure, 1952, p. 764;

Halocercus (H.) brasiliensis (Almeida, 1933).

Host: Sotalia guianensis (v. Beneden) (= S. brasiliensis).

Location in host: Lungs.

Geographic distribution: Atlantic Ocean (Brazil, near Rio de Janeiro).

Description of species (after Almeida, 1933). Body of yellowish white color, relatively thick, with constriction in front at both poles. The posterior end of the male is more or less blunt, provided with a rudimentary genital bursa. The posterior end of the female is truncated.
p. 275 The head papillae are weakly developed. The oral aperture is small. The cervical papillae were not found. The neural ring is at a distance of 0.12 to 0.15 mm from the anterior end. In the anterior part of the body of the

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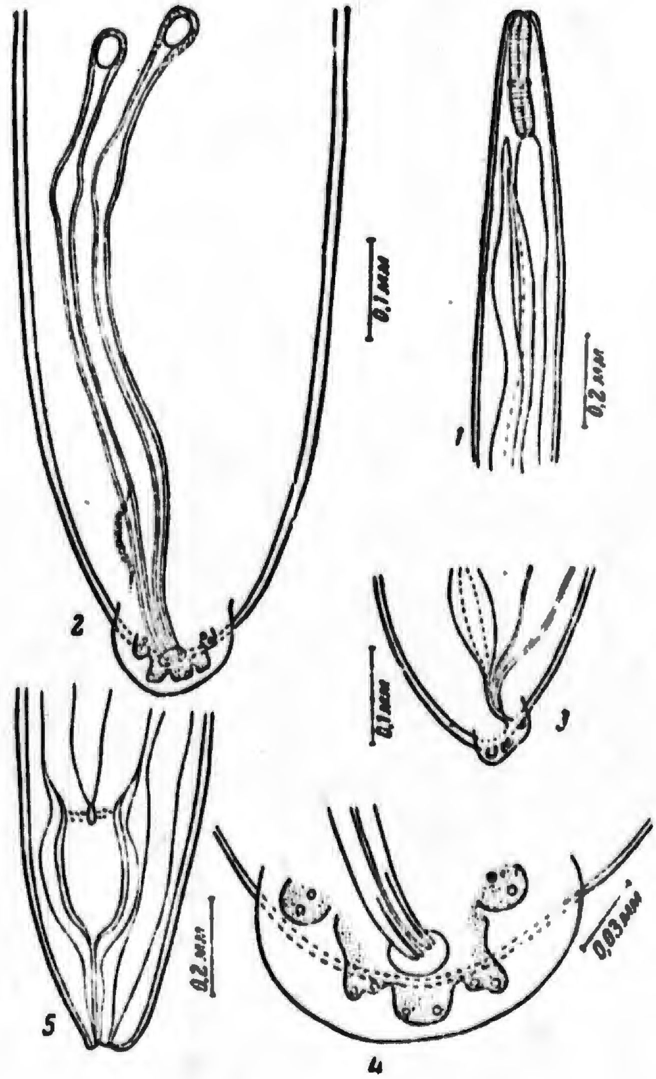

Figure 185.

Halocercus (Halocercus) brasiliensis (Almeida, 1933).

1. Anterior end of the body; 2. Ventral view of the posterior end of a male; 3. Lateral view of the same; 4. Ventral view of the bursa; 5. Posterior end of the female (after Almeida, 1933).

parasite there are two larger unicellular glands located by the sides of the esophagus, as if encircling it. These glands open into the excretory orifice which is located at the level of the esophageal end. The indicated glands are not identical: one has thelength of 0.84 to 0.88 mm, the other's length is 1.0 to 1.1 mm.

Male. The body length is 30.0 to 35.0 mm with the maximum width of 0.39 to 0.42 mm. The esophagus is cylindrical and short. The esophageal length is 0.22 to 0.24 mm, and its maximum width is 0.028 to 0.037 mm. The tail is blunt, provided with a weakly developed disk-shaped genital bursa, which is not subdivided into lobes. The bursal ribs are rudimentary, and swollen. Each thick ventral rib bears two sessile papillae of different size. Each lateral rib bears two papillae, moreover, the larger papilla is located on the larger projection of the rib. The dorsal rib is large, with two equal papillae, placed near its lateral edge. The spicules are 0.60 to 0.70 mm long, more or less equal, thin, clearly subdivided, located in a sell defined sheath. The distal ends of the spicules are divided into two distinctly expressed straight-line branches. The median part of the spicules is tube-shaped. The body of each spicule develops a widening 0.15 to 0.18 mm from the median end. In an extended condition the auxiliary organ is thread-shaped, but due to its mobility it can assume different forms. The length of the auxiliary organ is 0.10 to 0.12 mm, with a maximum width of 0.08 to 0.10 mm. The opening of the cloaca is very large. It is located subterminally, somewhat lower than the level of the ventral lobes of the bursa.

Female. The body length is 45.0 to 52.0 mm, with a maximum width of 0.47 to 0.60 mm. The esophagus is cylindrical, short, with a length of 0.24 to 0.28 mm, and a maximum width of 0.037 to 0.050 mm. The rear end is truncated. The vulva is located at a distance of 0.070 to 0.096 (?) mm from the posterior end and at a distance of 0.040 to 0.056 mm from the anus. The openings of the vulva is surrounded with a delicate musculature without cuticular bulgings. The anus is located at a distance of 0.03 to 0.04 mm from the rear end. The vagina is brief, located parallel with the intestine,. The length of the vagina is about 0.21 to 0.28 mm. The ovijector is large, wide, with thick walls. At the examination of the female from the abdominal side, the ovijector has a piriform or heart-shaped form. The length of the ovijector is 0.23 to 0.32 mm. The top part of the ovijector forms two symmetrically located extensions which pass over into the uteri.

At a certain level the uteri stretch out parallel, and then, just before the oviducts they form loops.

The length of the vagina with the ovijectors is 0.44 to 0.60 mm. Viviparous. The uteri and the ovijector are filled with larvae whose length is 0.21 to 0.28 mm.

Literature: Delamure, 1946, p. 113; Sk[illegible]bin, Shikhobalova, Schulz, Popova, Boyev, Delamure, 1952, p. 766; Lins de Almeida, 1933, p. 955 to 958; Lins de Almeida, 1933a, p. 156 to 159; Dougherty, 1943, p. 21; Dougherty, 1944, p.93.

Halocercus (H.) lagenorhynchi (Baylis,et Daubney, 1925).

Host: Lagenorhynchus albirostris (gray) - the white nosed dolphin; Tursiopis tursio (Fabr.) (T. turncatus), the aphaline.

Location in host: Lungs (bronchi).

p. 276 Geographic distribution: Atlantic Ocean (Europe), shoreline of Australia.

This species was described by Baylis and Daubney based on poorly preserved damaged specimens, affixed to the pulmonary tissue of a dolphin.

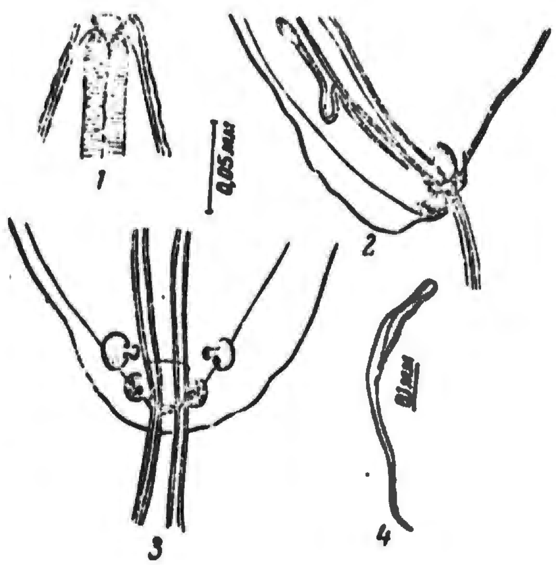

Figure 186.

Halocercus (Halocercus) lagenorhynchi (Baylis and Daubney, 1925).
1. Anterior end of the female;
2. Posterior end of the male, lateral view; 3. Ventral view of the same;
4. Spicule (After Baylis and Daubney, 1925).

Description of species (after Baylis and Daubney, 1925). Greatest length of the fragment is 93 mm. Maximum width of the male about 0.34 mm, of the female, 0.40 mm. The rear end is conical and fine. The head is usually retracted so that the mouth is located in the depth of a cuticular infundibulum. The cervical papillae of the head and the excretory pore are not noticed. The esophagus is cylindrical and very short (about 0.2 mm in length).

The neural ring is evidently located about the anterior third of the esophagus. On the tail of the male, the cuticle is swollen. The membranous part of the bursa cannot be distinguished from the rest of the cuticle. The structure of the bursal ribs corresponds to the type. The ending of the central ribs are pedunculate. The outer ends of the lateral ribs are bifurcate. The spicules are about 0.65 mm long. The auxiliary organ of the spicules is comparatively well developed: in the center it bears a double plication. The length of this auxiliary organ is about 0.1 mm (without the plication). The vulva is at a distance of 0.088 mm from the rear end. The length of the vagina and of the total uterine trunk is 0.63 mm.

Literature: Delamure, 1946, p. 113; Skryabin, Shikhobalova, Schulz, Popova, Boyev, Delamure, 1952, p. 766; Baylis et Daubney, 1925, p. 211–212; Yorke et Maplestone, 1926, p. 171; Freund, 1933, p. 53; Baylis, 1932, p. 401–411; Lins de Almeida, 1933a, p. 154–155, 159, Johnston et Mawson, 1941, p. 429; Dougherty, 1943, p. 20.

<u>Halocercus (H.) pingi</u> (Wu, 1929).

Host: <u>Neomeris phocaenoides</u> Cuv., apodal porpoise.

Location in host: Lungs.

p. 277 Geographic distribution: Pacific Ocean (China).

Description of species (after data in the literature).

Male. Body length 150 to 183 mm, maximum width 0.40 to 0.65 mm. Length of the esophagus 0.19 to 0.22 mm, maximum width 0.035 to 0.036 mm. The bursa is presented with five rudimentary ribs without differentiation by branching. Spicules 0.77 to 0.82 mm long. There is an auxiliary organ.

Female. The body length is 225 to 364 mm. The length of the esophagus is 0.19 to 0.22 mm, with maximum width of 0.035 to 0.039 mm. The vulva is located at a distance of

0.07 to 0.10 mm from the tail end. The length of the vagina is 0.65 to 0.87 mm.

Literature: Skryabin, 1942, p. 42; Delamure, 1946, p. 113; Skryabin, Shikhobalova, Schulz, Popova, Boyev, Delamure, 1952, p. 766; Wu, 1929, p. 276; Lins de Almeida, 1933a, p. 156; Lins de Almeida, 1933, p. 955 to 958; Dougherty, 1943, p. 21.

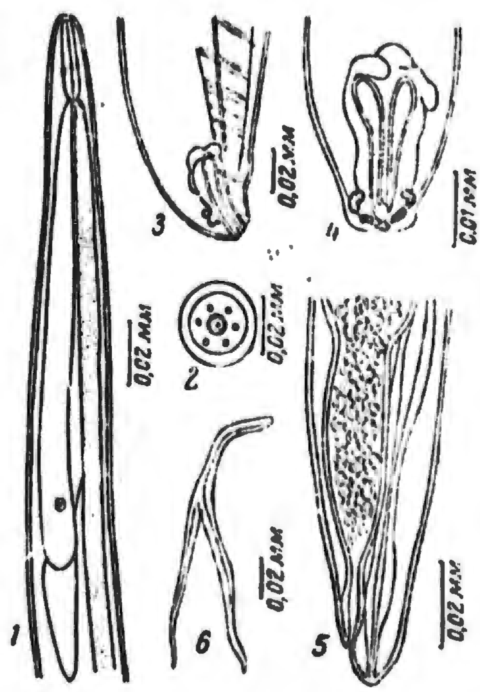

Figure 187.

Halocercus (Halocercus) pingi (Wu, 1929).

1. Anterior end of the body; 2. Apical view of the anterior end; 3. Lateral view of the male posterior end. 4. Ventral view of the same; 5. Lateral view of the female posterior end; 6. Spicules. (After Wu, 1929).

Subgenus Prohalocercus (Skrjabin, 1942).

Table

for species determination of the subgenus Prohalocercus.

1 (2). Each spicule has a proximal capitulum behind which a slight constriction follows. The length of the spicules is 0.150 to 0.205 mm. Parasites of Phocaena phocaena ... Halocercus (P.) invaginatus (Quekett, 1841).

2 (1). Spicules without proximal capitulum, widened at the end of the first third of their length. The length of the spicule is 0.125 to 0.145 mm. Parasites of Phocaenoides dalli ... Halocercus (P) kirbyi (Dougherty, 1943).

Halocercus (Prohalocercus) invaginatus (Quekett, 1841; Dougherty, 1943).

Synonyms:

Host: Phocaena phocaena - the porpoise.

Location in host: Lungs (small cysts scattered in the parenchyma).

Geographic distribution: Pacific coast of California (San Francisco and Washington Bays), the Baltic Sea, Atlantic Ocean (presumably at the British Isles). It was not found in the USSR.

Description of species (after Dougherty, 1944).

Male. The body length is 8.0 to 17.0 mm, maximum width (without the cuticle) 0.170 mm. The cuticle is strongly and p. 279 unevenly swollen all over its surface. The oral aperture is provided with six small teeth.

The esophagus is very short. The length of the esophagus is 0.105 to 0.140 mm with a maximum width of 0.010 to 0.017 mm.

The neural ring is located in the second third of the esophageal length from the anterior end. The excretory pore

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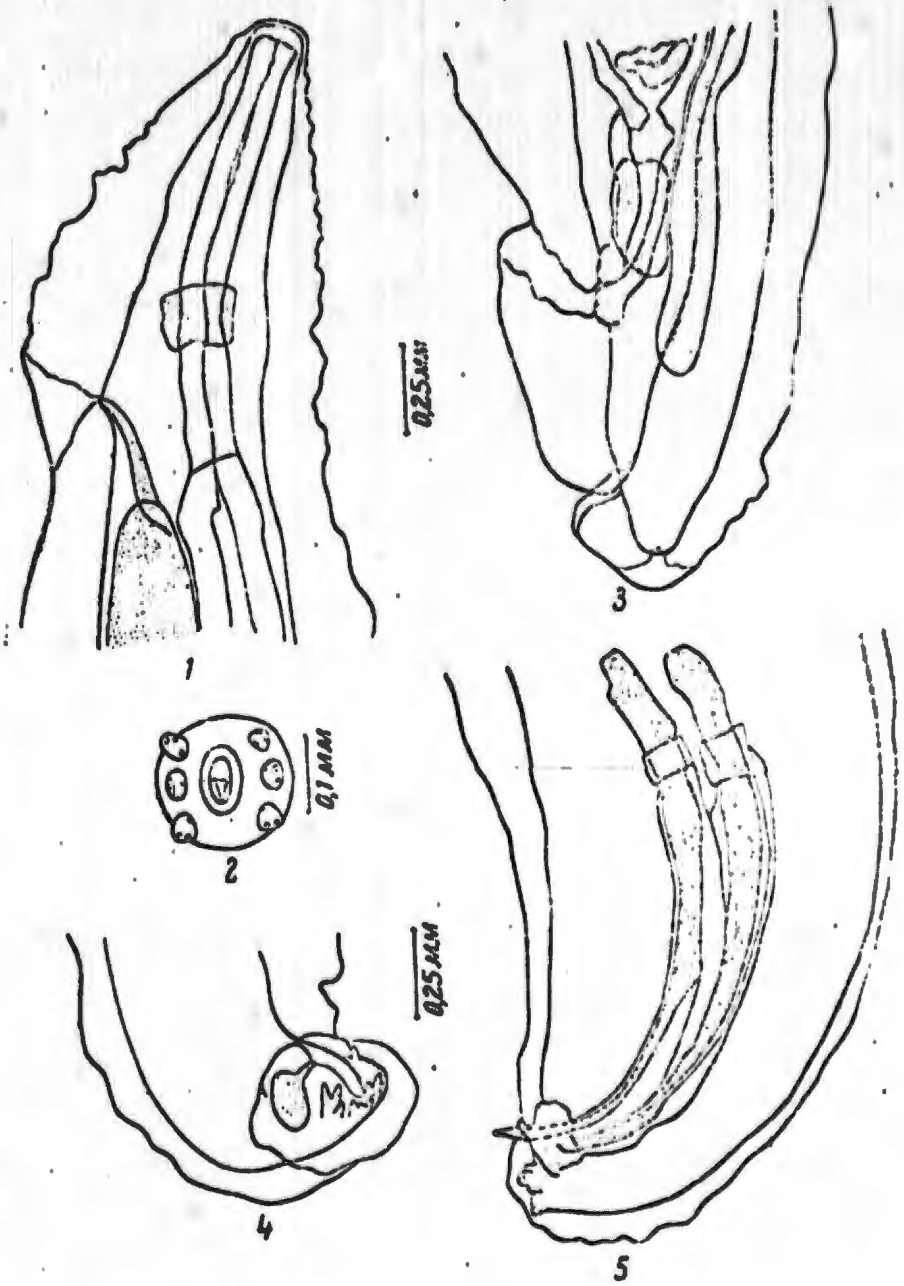

Figure 188.

<u>Halocercus (Prohalcercus) invaginatus</u>

(Quekett, 1841; Dougherty, 1943).

1. Anterior end of the female body;
2. Apical view of the head end;
3. Lateral view of the posterior end of the female; 4. Latero-ventral view of the bursa;
5. Posterior end of the male, lateral view.

(After Dougherty, 1943).

opens at the level of the rear end of the esophagus.

The rear end of the male is curved on the abdominal side of the body. The cuticle of the female's bursa is not clearly distinguished from the cuticle of the body. The ventral ribs are provided with one papilla at the wide base. Each of the lateral ribs carries three papillae two of which are thin, finger-shaped, while one is short and blunt.

The dorsal rib has two blunt papillae. The spicules are very short, curved, with distinct "case". Each spicule has a proximal capitulum, then a slight stricture and a curved platelet. The length of the spicules is 0.150 to 0.205 mm. The auxiliary organ is slightly chitinized, its length is 0.025 to 0.045 mm.

Female. The body length is 17.0 to 31.0 mm with a maximum width (without the cuticle) of 0.170 mm. The cuticle is strongly and unevenly swollen all over the body surface. The oral opening is provided with six teeth. The esophagus is short; its length is 0.120 to 0.165 mm with a maximum width of 0.010 to 0.019 mm. The vulva is encircled by lips. It is 0.031 to 0.063 mm from the anus, and 0.048 to 0.088 mm from the posterior end. The total length of the vagina proper and the ovijector is 0.150 to 0.225 mm. The ejector is 0.031 to 0.075 mm long. Reservoir with one series of larvae.

Literature: Delamure, 1946, p. 112; Skryabin, Shikhobalova, Schulz, Popova, Boyev, Delamure, 1952, p. 766;

, Quekett, 1841, .p. 151—152; 1844, p. 44—50; Siebold, 1842, p. 348; Diesing, 1851, II, .p. 281; Schneider, 1866, .p. 74; Baylis and Daubney, 1925, p. 213, 215; Yorke and Maplestone, 1926, p. 171; Freund, 1933, .p. 47; Baylis, 1932, .p. 413; Lins de Almeida, 1933a, p. 155, 159; Schmidt-Ries, 1939a, p. 103; Dougherty, 1943, p. 19—20; Dougherty, 1944, p. 87—88.

Halocercus (Prohalocercus) kirbyi (Dougherty, 1944).

Host: Phocaenoides dalli True., white winged porpoise.

Location in host: Lungs (nodular consolidations or small cavities on the lung surface).

Geographic distribution: Pacific oceanic shoreline of California (San Francisco Bay).

Description of species (after Dougherty, 1944).

Male. The body length of the male is 30.0 mm to 40.0 with a maximum width of 0.125 mm. The oral aperture is provided with six teeth. Short esophagus, with a length of 0.17 to 0.21 mm, with a maximum width of 0.017to 0.021 mm. The neural ring is located at a distance of somewhat more than a third of the esophageal length from the anterior end. No excretory aperture was found.

The rear end of the body is provided with a simple, hardly noticeable bursa which bears ribs. The ventral rib is wide; on this wide basis one pedunculate papilla arises. The lateral rib bears three papillae: one of the is short and blunt, two are long, more or less tapering, and almost even in size. The dorsal rib bears two blunt papillae. The spicules are very short, 0.125 to 0.145 mm long, curved, trough-shaped. At the middle of each spicule their wing is very markedly widened on both sides from the mid-line. There was no auxiliary organ found.

p. 281 Female. The body length is 52.0 to 88.0 mm, with a maximum width of 0.150 mm. The length of the esophagus is 0.17 to 0.21 mm with a maximum width of 0.016 to 0.021 mm. There were no excretory openings found. The vulva is surrounded with lips. It is located 0.021 to 0.038 mm from the anus, and 0.036 to 0.069 mm from the posterior end. The total length of the vagina proper and the ovi-ject is 0.305 to 0.615 mm. The vagina proper is 0.010 mm long. The ejector is 0.090 to 0.180 mm long. The reservoir is filled with larvae arranged in one line.

Literature: Dougherty, 1943, p. 21; Dougherty, 1944, p. 90 to 92.

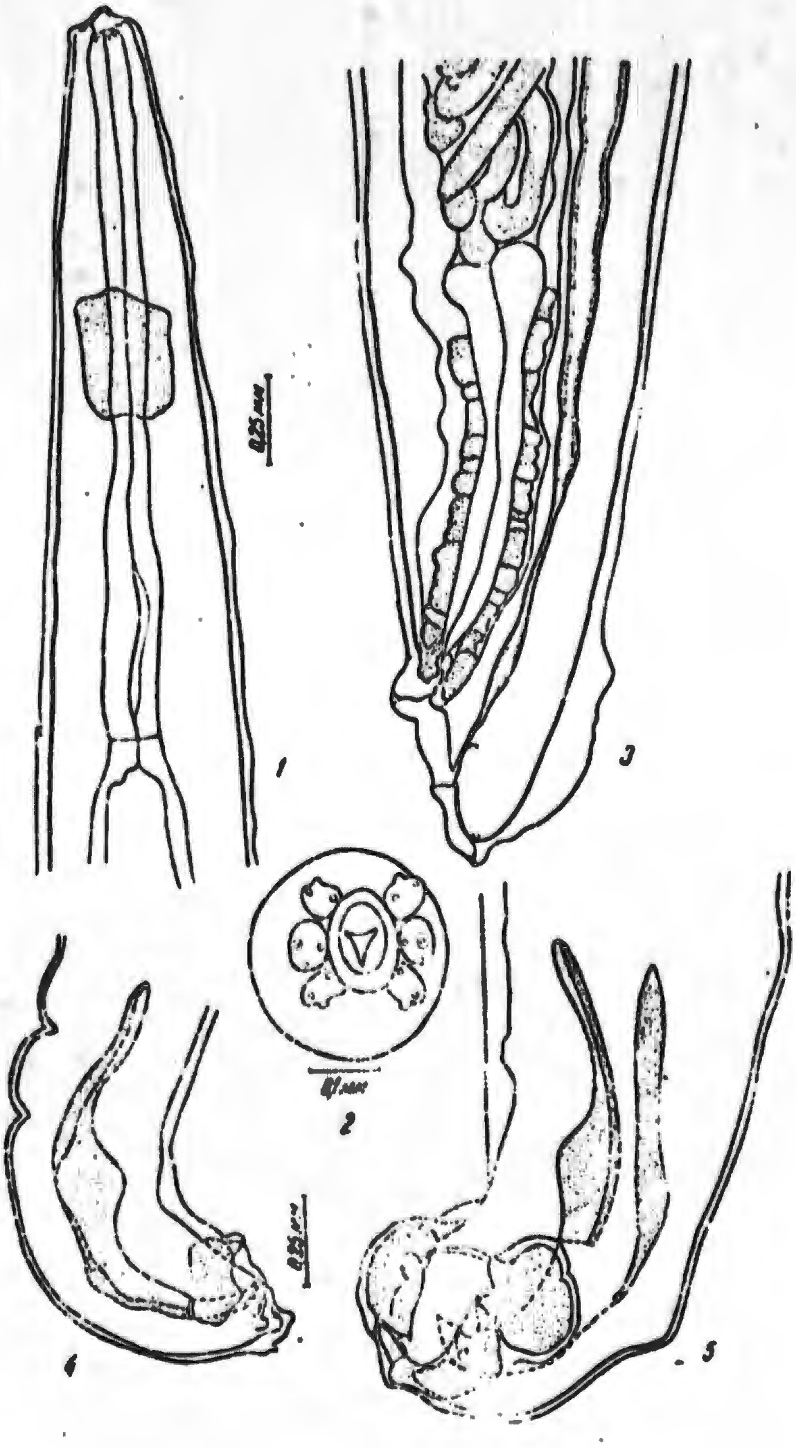

Figure 189.

Halocercus (Prohalocercus) kirbyi (Dougherty, 1944).
1. Anterior end of the body; 2. Apical view of the head end; 3. Posterior end of the female in lateral view; 4. Posterior end of the male in lateral view; 5. Lateral view of the same (after Dougherty, 1944).

Subgenus Posthalocercus (Delamure in Skrjabin, 1942).

Table

for species determaination of the subgenus Posthalocercus.

1 (4). Before the bursa, ventrally, there is no strong prominence.

2 (3). Ventral ribs disk-shaped. Auxiliary organ 0.072 to 0.080 mm long. Parasites of *Phocaena phocaena relicta* ... *Halocercus (Post.) taurica* (Delamure, 1942).

3 (2). The ventral ribs are shaped as protuberances. Auxiliary organ 0.043 to 0.051 mm long. Parasites of *Phocaena phocaena relicta* ... *Halocercus (Post.) ponticus* (Delamure, 1946).

4 (1). Before the bursa, ventrad, there is a strong prominence. The auxiliary organ forms five to seven curves over its length. Males 61 to 108 mm length, females 193 to 293 mm. Parasites of *Delphinus delphi ponticus* ... *Halocercus (Post.) kleinenbergi* (Delamure, 1951).

Halocercus (Posthalocercus) taurica (Delamure in Skrjabin, 1942).

Host: *Phocaena phocaena relicta* Abel - Azovian dolphin, or "pykhtun" (= puff-up).

Location in host: Lungs.

Geographic distribution: USSR (Sea of Azov, and the Black Sea).

Description of species (after Delamure, 1946). Thread shaped, fine nematodes. The anterior part of the body intrudes into the lung tissue, but it is not closed into a capsule from the tissues of the host. The posterior part of the body is located in bronchi of 1 to 1.5 mm diameter. The mouth has no capsule; the oral cavity is very weakly developed. The esophagus has cylindrical shape.

The male reaches 23.0 to 27.5 mm in length with a maximum width of 0.126 to 0.180 mm. The anterior end of the

body is 0.020 to 0.024 mm in the apical view. The width of the body in the area of the esophageal end is 0.168. to 0.188 mm, its width 0.016 to 0.020 mm. The tail end of the body is curved on the abdominal side, and is provided with a copulatory bursa. The bursa has an oval form, and it is not differentiated into lobes. The length of the bursa is 0.044 to 0.048 mm, it s width 0.068 to 0.072 mm. The cloaca is located 0.024 to 0.025 mm from the posterior end. The bursa is provided with a pair of buds of central ribs, with a pair of buds of lateral ribs, and with the rudiment of a dorsal rib. The ventral rib is disc shaped. On the internal surface of each ventral rib one papilla is located. The length of the base of the disk-shaped ventral ribs is 0.028 to 0.036 mm, its height is 0.016 to 0.020 mm. The rudiments of the lateral ribs and of the dorsal rib are of much smaller size. The rudiment of the lateral rib, which is 0.012 to 0.013 mm long and 0.011 to 0.012 mm in height, is provided with three papillae. Two of the outside papillae have a button shape and are equal in size. The top one corresponds to the antero-lateral rib, while the lower to the postero-lateral rib. The middle papillae has the shape of a finger. It corresponds to the medio-lateral rib. The rudiment of the dorsal rib is located subdorsad. Its width is 0.014 to 0.016 mm, height 0.004 mm.
p. 283 Along the edges of the rudiment two papillae are located. The size, considerably curved, and widened in their first third. The proximal ends of the spicules are blunt, the distal ones are pointed. The length of the spicules is 0.176 to 0.204 mm, the maximum width is 0.016 to 0.020 mm. The auxiliary organ is powerful, has the form of a sabre. It is well chitinized, somewhat widened at its proximal end, and narrowed at the distal end. In a ventral position of the nematode it is evident that the auxiliary organ is wide, boat-shaped, split into two at its proximal end, while

rounded at the distal end. The length of the auxiliary organ is 0.072 to 0.080 mm, its maximum width 0.003 to 0.004 mm.

The female reaches a length of 33.9 to 46.8 mm with a maximum width of 0.175 to 0.273 mm. In the area of the rear end of the esophagus, the body width is 0.072 to 0.112 mm. The length of the esophagus is 0.168 to 0.195 mm, its width 0.016 to 0.020 mm. The tail is conical, with a blunt tip. Up to the level of the vulva the dorsal and ventral walls of the body run parallel, but further on that ventral segment of the body which connects the area of the anus and of the bulba is tapered (bevelled) with regard to the axis of the body under an acute angle. The vulva and the anus are located ventrally. The anus is not surrounded with projecting lips; it is located 0.036 to 0.056 mm from the dorsal wall of the body, and 0.024 to 0.028 from the posterior end. The vulva is surrounded by two protruding lips without appendices. The length of the base of both lips equals 0.024 to 0.039 mm, their height is 0.012 to 0.016 mm. The vulva is located in front of the anus 0.062 to 0.136 mm from the caudal end and 0.060 to 0.112 mm from the dorsal wall of the body. The vaginal length is 0.196 to 0.292 mm, its width 0.020 to 0.048 mm. In the uteri, the spirally rolled up larvae have 0,148 to 0.152 mm length, 0.014 to 0.016 mm width, and the length of the eggs is 0.044 to 0.048 mm, and their width 0.028 to 0.036 mm.

Viviparous.

Literature: Skryabin, 1942, p. 41, 46; Delamure, 1945, p. 104; Delamure, 1946, p. 107 to 109; Skryabin, Shikhobalova, Schulz, Popova, Boyev, Delamure, 1952, p. 766; Dougherty, 1944, p. 92 to 93.

Halocercus (Posthalocercus) kleinenbergi (Delamure, 1951).

Host: Delphinus delphis ponticus Barabasch - the Black Sea white-sided dolphin.

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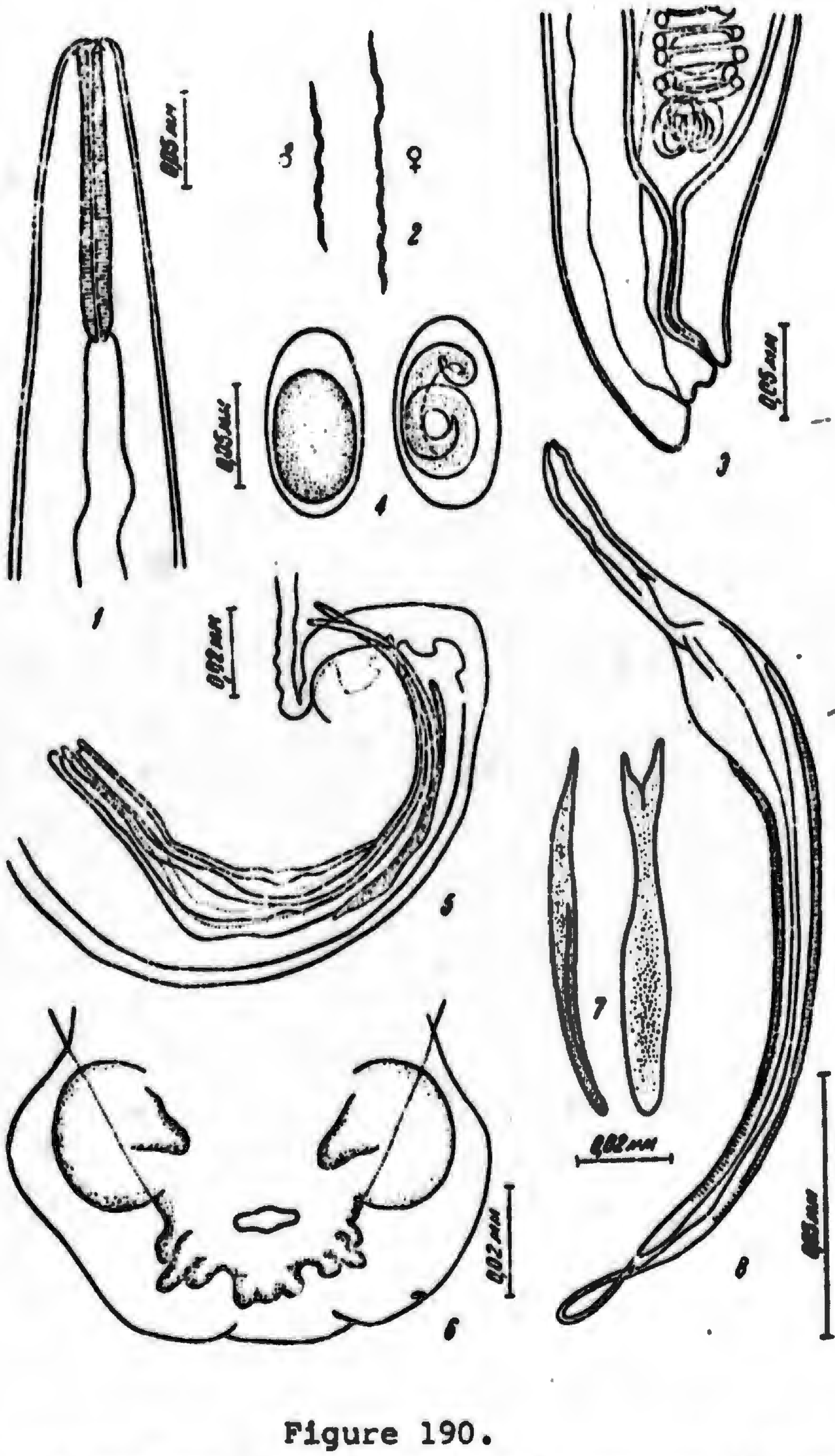

Figure 190.

Halocercus (Posthalocercus) taurica (Delamure, 1942). 1. Anterior end of the body; 2. Male and female; 3. Lateral view of the caudal end of the female; 4. Egg; 5. Lateral view of the caudal end of the male; 6. Ventral view of the bursa; 7. Lateral and ventral view of the auxiliary organ; 8. Spicule (after Delamure, 1946).

Location in host: Lungs.

Geographic distribution: USSR (Black Sea).

Material: 233 specimens of males and females from dolphins caught by Yalta dolphin hunters on 2 August, 1948 (incomplete helminothlogical dissections No. 295 to 310).

Description of species (after Delamure, 1951). Large thread-shaped nematodes. The anterior end is tapering: it is embedded in a small bolld-carrying lacuna, or vessel, whose diameter coincides with the diameter of the parasite's body.

The middle portion of the body is in the lung parenchyma and by its length it forms loops, which appear as curves, and sometimes even as nodes (knots). The caudal end of the body is in the lumen of a bronchiolus or of a small bronchus. It drinks blood. The esophagus is cylindrical. The oral capsule is very weakly developed. The females are twice as long as the males.

The male reaches a length of 61.9 to 108.1 mm with a maximum width of the body of 0.336 to 0.493 mm. The width of the body in the area of the esophageal end is 0.117 to 0.156 mm, at the beginning of the spicules, 0.255 to 0.391 mm, and at the level of the cloaca 0.091 to 0.146 mm. The esophagus is 0.149 to 0.205 mm long, with a maximum width of 0.022 to 0.030 mm.

p. 285 The width of the oral capsule is 0.007 to 0.011 mm. The caudal end is reverted toward the abdominal surface of the body and it is provideded with a copulatory bursa with rudimentary ribs; the bursa is not differentiated by lobes. In front of the bursa across the body a strong prominence rises. The length of the base of this prominence, at a lateral position of the nematode, is 0.076 to 0.102 mm, and its height is 0.029 to 0.038 mm. The size of this elevation, at a ventral position of the nematode, is 0.074 to 0.083 x 0.114 to 0.136 mm. The cloaca is 0.026 to 0.036 mm from the

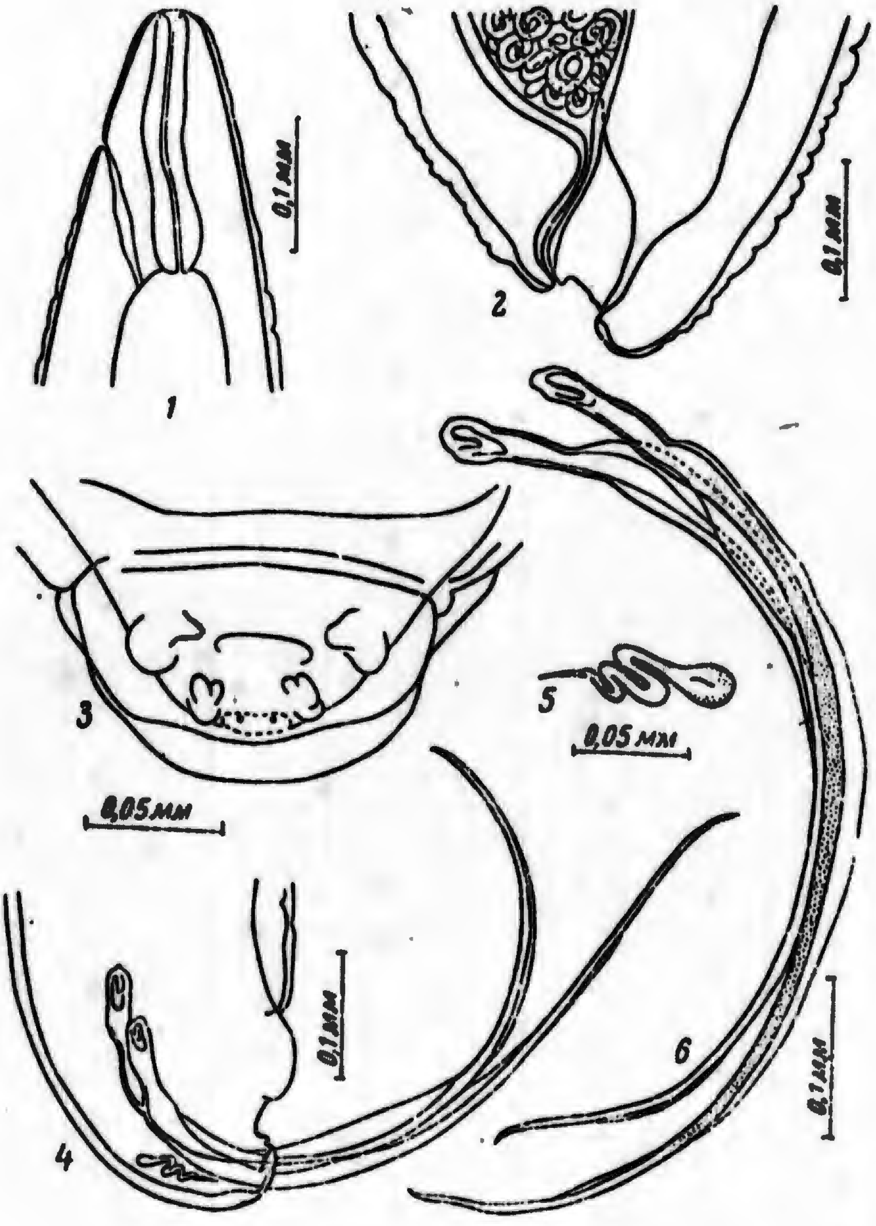

Figure 191.
Halocercus (Posthalocercus) kleinenbergi
(Delamure, 1951).
1. Anterior end of the body; 2. Lateral view of the caudal end of a female; 3. Ventral view of the bursa; 4. Lateral view of the caudal end of the male; 5. Auxiliary organ; 6. Spicules (after Delamure, 1951).

rear end of the body. The bursa has an oval shape. It is provided with a pair of rudimentary bentral ribs, a pair of rudimentary lateral ribs, and one bud of a dorsal rib. The length of the bursa is 0.058 to 0.079 mm, itsswidth is 0.105 to 0.144 mm. The rudiments of the ventral ribs have a wide base on which a cone shaped papilla arises. The height of the rudiment of the ventral rib is 0.022 to 0.026 mm, at a ventral position of the nematode, and 0.026 to 0.034 mm in a lateral position of the worm. The length of the papilla of the ventral rib is 0.011 to 0.015 mm in the ventral position of the nematode and 0.007 to 0.011 mm at its lateral position. The width of the base of the ventral bud is 0.015 to 0.019 mm. The buds of the lateral ribs carry each two nodular papillae of different size. The height of the buds of the lateral ribs is 0.015 to 0.019 mm in a ventral position of the nematode, and 0.022 to 0.026 mm at its lateral position. The maximum width of the rudiment of the lateral rib is 0.011 to 0.015 mm. The height of the larger papilla of the lateral rib rudiment is 0.007 to 0.011 mm, and the height of the small one is 0.003 to 0.007 mm. The distance between the outside edges of the lateral rib rudiments is 0.043 to 0.060 mm. The bud of the dorsal rib is located subterminally, it is poorly defined, and provided with two barely noticeable papillae which are far away from each other. The height of the dorsal rib's bud is 0.007 to 0.011 mm, the length of the base is 0.015 to 0.019 mm, the height of the papillae is 0.002 mm. The spicules are curved, wing-shaped and equal in size. The distal ends of the spicule are pointed, the proximal ends are blunt, and trough-shaped in form. The length of the spicule is 0.748 to 0.850 mm, with a maximum width of 0.020 to 0.026 mm. The auxiliary organ is well chitinized, sinuous, over its entire length it forms 5 to 7 curves. The proximal end of auxiliary organ is wide, the distal end is pointed. The length of the auxiliary organ is 0.171 to 0.205 mm, its maximum width is 0.011 to 0.015 mm.

The female is 193.0 to 293.0 mm long, with a maximum width of the body at 0.493 to 0.612 mm. In the area of the esophagus, the body is 0.169 to 0.239 mm, at the level of the vulva it is 0.140 to 0.190 mm; at the level of the anus it is 0.070 to 0.095 mm. The esophagus is 0.163 to 0.204 mm in length, with a maximum width of 0.026 to 0.038 mm. The width of the oral capsule is 0.011 to 0.015 mm. The excretory opening is located 0.118 to 0.121 mm from the anterior end. The caudal end of the body is conical. The vulva and the anus are located ventrally. The vulva is surrounded by two small lips. The upper one hangs over the side of the cloaca. The length of the base is the eminence formed by the lips, 0.028 to 0.053 mm. The vulva is located in front of the anus at a distance of 0.076 to 0.087 mm from the caudal end at a distance of 0.045 to 0.064 mm from the anus. Two long uteri form numerous curves in the body. The greatest width of one uterus is evident 5 to 6 mm from the caudal end, and is 0.221 to 0.255 mm, while at the beginning of the vagina the width is 0.144 to 0.187 mm. The vagina consists of a widened proximal and a tubular-shaped distal segment. The length of the vagina is 0.612 to 0.663 mm. The length of the widened segment of the vagina is 0.510 to 0.646 mm, with a maximum width of 0.190 to 0.250 mm. The length of the tubular shaped segment of the vagina is 0.119 to 0.153 mm. The thickness of the walls of the vagina is 0.0111 to 0.0150 mm. The uteri in their upper segments are filled with eggs at all stages of development. The lower segments of the uteri, as in the vagina, are filled with formed, spirally rolled-up larvae.
p. 286 The length of the eggs is 0.053 to 0.060 mm, and their width 0.038 to 0.041 mm. The length of the larvae is 0.159 to 0.171 mm, and their width 0.011 to 0.015 mm.

Viviparous.

Literature: Delamure, 1951, p. 93 to 97; Delamure, 1951a, p. 103; Skryabin, Shikhobalova, Schulz, Popova, Boyev, Delamure, 1952, p. 768.

Halocercus (Posthalocercus) ponticus (Delamure, 1946).

Host: Phocaena phocaena relicta Abel - the Azov-Black Sea porpoise, the "pykhtun" or "azovka."

Location in host: Lungs.

Geographic distribution: USSR (Black Sea and the Sea of Azov, Kerchenskiy Strait).

Description of species (after Delamure, 1946). Fine thread-shaped nematodes which are parasitic in the lungs of Phocaena phocaena relicta where, by concentration of several specimens, they form numerous tubercles. Each tubercle of nematodes and the purulent mass which surrounds it is sort of isolated from the undamaged parts of the lung by an elastic capsule which is formed by the tissues of the host. The anterior end of the body is pointed. The caudal end of the body in the male is somewhat curved on the abdominal side. The esophagus is cylindrical in shape. The oral capsule is very weakly developed. The females are more than twice as long as the males.

The male reaches 27.10 to 30.50 mm inlength, with a maximum width of the body at 0.217 to 0.351 mm. The body width in the area of the esophageal end is 0.118 to 0.197 mm, and at the start of the spicule it is 0.169 to 0.197 mm. The anterior end of the body in an apical view is 0.015 to 0.016 mm. The esophagus is 0.154 to 0.185 mm long, with a maximum width of 0.016 to 0.021 mm. The caudal end is curved on the abdominal side of the body and is provided with a copulatory bursa which is not differentiated by lobes; the bursa has rudimentary ribs. The bursa has an oval shape. The bursal length is 0.035 to 0.043 mm, its width is 0.050 to 0.063 mm. The cloaca is located at a distance of 0.102 to 0.118 mm from the dorsal wall of the body. The bursa is provided with a pair of rudiments of ventral ribs, a pair of rudimentary lateral ribs, and with one rudimentary dorsal rib. The rudiments of the ventral ribs of a height of 0.004 to 0.005 mm each carry a very tiny papilla. The rudiments of the lateral ribs have short, wide base on which3tuberculate papillae arise for each rib. The papillae of the lateral ribs evidently correspond to the anterior lateral, mid-lateral and posterior lateral ribs. The height of the rudiment of the lateral rib is 0.010 to 0.013 mm, the width of the base 0.008 to 0.009 mm. The distance between the buds of the lateral ribs is 0.030 to 0.034 mm. The buds of the dorsal rib is located subterminally, is very weakly manifested, and is provided with two papillae, which are far away from each other. The height of the dorsal bud is 0.005 to 0.006 mm, the width of the base is 0.012 to 0.014 mm. The spicules are wing-shaped, equal in size, slightly curved, and widened in their first third. The distal ends of the spicules are pointed, while the proximal ends are blunt, trough-shaped, and porous. The spicules are 0.189 to 0.209 mm in length, with a maximum width of 0.019 to 0.020 mm. The length of theproximal crest of the spicule is 0.031 to 0.047 mm. The auxiliary organ is well chitinized, boat-shaped in form. The proximal end of the auxiliary organ is wider than the distal. The length of the auxiliary organ is 0.043 to 0.051 mm. Its width, when the nematode is in the lateral position, is 0.008 to 0.010 mm, and when it is in the ventral position it is 0.012 to 0.016 mm.

The female has a length of 55.7 to 64.9 mm, with a maximum width of the body at 0.351 to 0.409 mm. The esophagus is 0.181 to 0.233 mm long, with a maximum width of 0.022 to 0.023 mm.

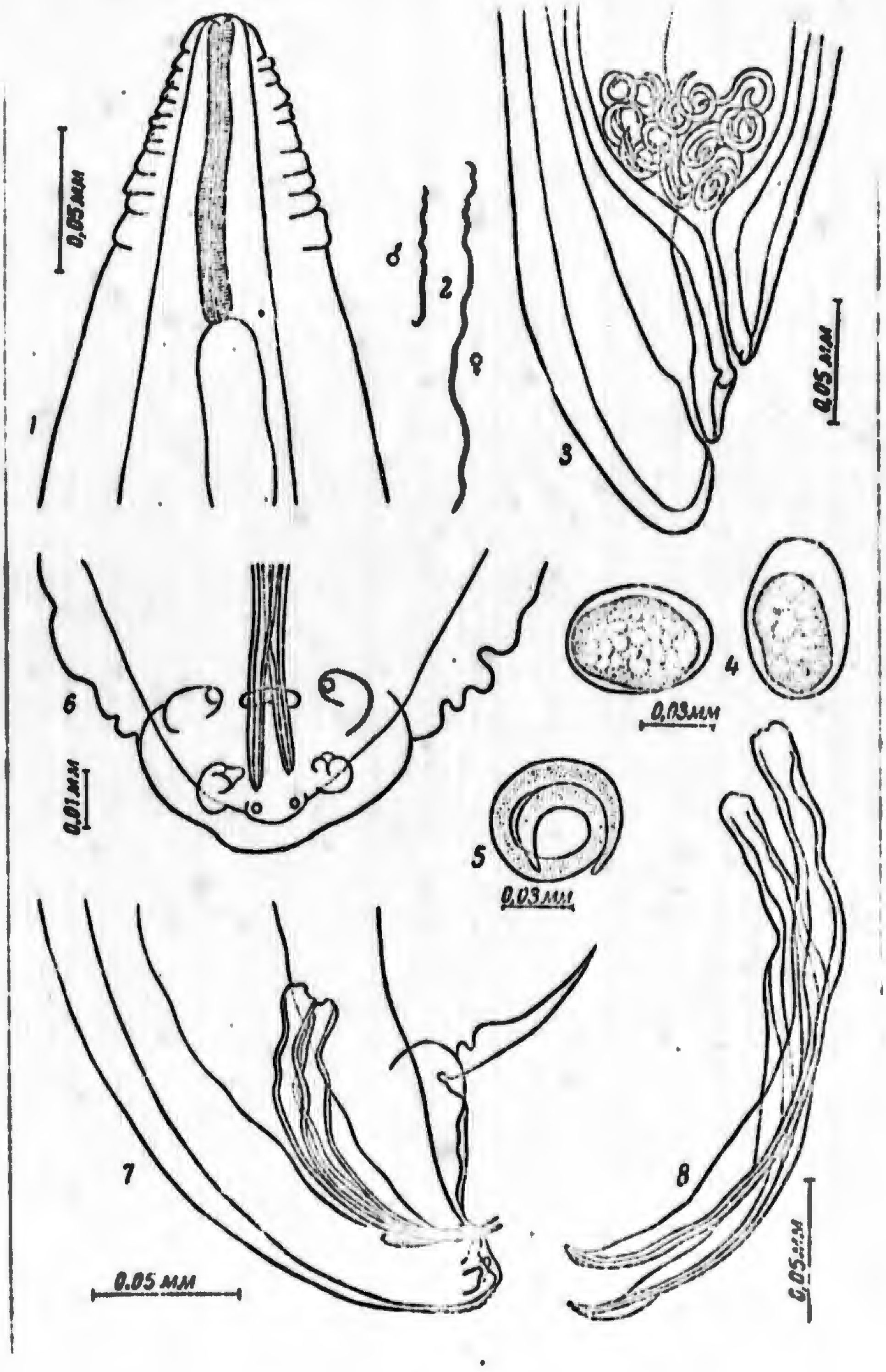

Figure 192.

Halocercus (Posthalocercus) ponticus (Delamure, 1946).
1. Anterior end of the body; 2. Male and female; 3. Caudal end of the female in lateral view; 4. Fertilized ovum; 5. Larvae; 6. Ventral view of the bursa; 7. Caudal end of the male in lateral view; 8. Spicules (after Delamure, 1946).

p. 288 The caudal end of the body is conical. Its tip is blunted. The vulva and the anus are ventrally located. The vulva is surrounded by two prominent lips which hang over a little toward the rear end of the body. The length of the base of both lips is 0.031 to 0.035 mm, with a height of the lower lip of 0.0118 mm. The vulva is placed forward of the anus, 0.071 to 0.090 mm from the caudal end and 0.086 to 0.134 mm from the dorsal wall of the body. The distance from the anus to the vulva equals 0.031 to 0.039 mm. The anus is not surrounded by prominent lips, and is located 0.047 to 0.059 mm from the dorsal wall of the body. The greatest width of the single uterus is 0.098 to 0.110 mm. The length of the vagina is 0.335 to 0.387 mm, its width 0.082 to 0.120 mm. The uterus and vagina are filled with ova and larvae. The larvae which developed in the eggs are spirally rolled up. They have a soft, easily destroyable membrane (shell). The length of the eggs is 0.045 to 0.047 mm, their width is 0.027 to 0.055 mm. The larvae are 0.189 to 0.193 mm long, and 0.010 to 0.012 mm wide.

Viviparous.

Literature: Delamure, 1946, p. 110; Delamure, 1951a, p. 103, Skryabin, Shikhobalova, Schulz, Popova, Boyev, Delamure, 1952, p. 768.

GENUS Delamurella (Gubanov, 1952).

Delamurella hyperoodoni (Gubanov, 1952).

Host: Hyperoodon ampullatus Forster - the highbrow bottle-nosed whale.

Location in host: Lungs (trachea).

Géographic distribution: USSR, the Sea of Okhotsk (the Kuril Islands region).

Material: We examined the material of N. M. Gubanov, all together 12 specimens of males and females.

Description of species (after Gubanov, 1952)[1]. Thread-shaped, viviparous nematodes of average size. The cuticle is striated lateraly and lengthwise. The anterior end is tapered, and provided with a poorly developed oral capsule which is 0.011 to 0.013 mm wide and 0.003 to 0.004 mm deep. The esophagus is constricted forward, and considerably widened toward the rear. The neural ring is located at a distance of 0.142 to 0.153 mm, and the excretory pore at a distance of 0.257 to 0.295 mm from the anterior end of the body.

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1. Published the first time.

Male. The body length is 42.1 to 54.3 mm, with a maximum width of 0.867 to 1.0 mm. The width of the body is 0.301 to 0.339 mm in the area of the esophageal end, and it is 0.226 mm at the start of the bursa. The esophagus is 0.528 to 0.64 mm long. The width of the esophagus at the oral capsule is 0.038 to 0.042 mm, while in the widened rear part it is 0.132 to 0.150 mm. The caudal end is fine, curved on the abdominal side of the body, and it is provided with a copulatory bursa with rudimentary ribs; the bursa is not differentiated into lobes. Before the bursa, ventrad right and left from the median line, the cuticle of the body forms two powerful prebursal wings which are 1.414 to 1.886 mmin length with a maximum width (in lateral view) of 0.113 mm. The prebursal wings are provided with a wide lateral and a narrow lengthwise striation. The bursa is 0.161 to 0.172 mm long, and 0.172 mm wide, almost round, without any differentiation into lobes. Its ventral surface is provided with cuticular folds, which in general form a complicated cuticular ornament which makes the bursa non-transparent. The bursa ribs are represented by five prominent tubercles the anterior pair of which represents the rudiments of the ventral ribs, and the posterior pair the buds of lateral ribs.

p. 292 The dorsal rib is represented by an unpaired eminence. Each rudiment of the ventral rib has a base which is 0.030 mm wide on which two poorly noticeable tubercle arise in the height of 0.015 mm. Each bud of the lateral rib is 0.021 to 0.026 mm in height, with a base width of 0.026 mm; each one bears three pisifrom papillae. The bud of the dorsal rib reaches a height of 0.010 to 0.015 mm, with a base width of 0.023 to 0.030 mm. It is provided with two weakly shown papillae which are far away from each other. The spicules are 0.320 to 0.360 mm long, with a maximum width of 0.053 to 0.061 mm. They are curved, wing-shaped, and of equal size. The proximal ends of the spicules are spongy, blunted; the distal ends are tapering. In lateral view the auxiliary organ is 0.115 to 0.122 mm long, 0.011 mm wide, falciform. Its proximal end is tapering, while the distal end is blunted. The rear wall of the cloacal opening is at a distance of 0.053 to 0.057 mm from the caudal end.

Female. The body length is 49.0 to 65.3 mm, with a maximum width of 0.848 to 1.05 mm. The width of the body is 0.301 to 0.320 mm in the area of the esophageal end, and 0.169 to 0.176 mm at the level of the vulva, while at the level of the anus it is 0.057 to 0.075 mm. The esophagus is 0.528 to 0.622 mm long. The width of the esophagus at the oral capsule is 0.038 to 0.042 mm, while in the widened posterior part it is 0.107 to 0.132 mm. The tail of the female is conical. The vulva and the anus are located ventrally. The vulva is surrounded by two not too large lips and is placed forward from the anus 0.153 to 0.211 mm from the caudal end. The anus is located at a distance of 0.057 to 0.061 mm from the tip of the tail, and at a distance of 0.103 to 0.150 mm posteriorly from the vulva. The vagina is widened at the site where it joins the uteri, while farther backward it is gradually narrowed. The length of vagina is 0.848 to 1.131 mm, and the maximum width is 0.150

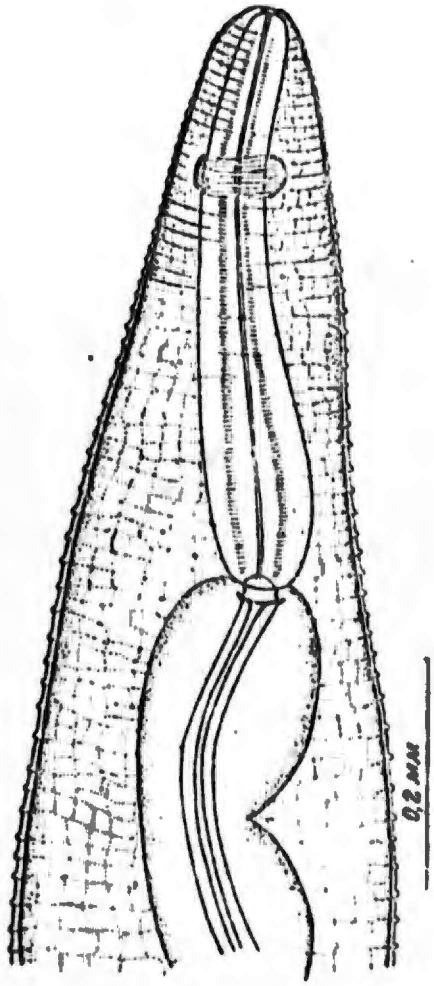

Figure 193.
Delamurella Hyperoodoni (Gubanov, 1952). Anterior end of the body (after Gubanov, 1952).
(From Skryabin, Shikhobalova, Schulz, Popova, Boyev, Delamure, 1952).

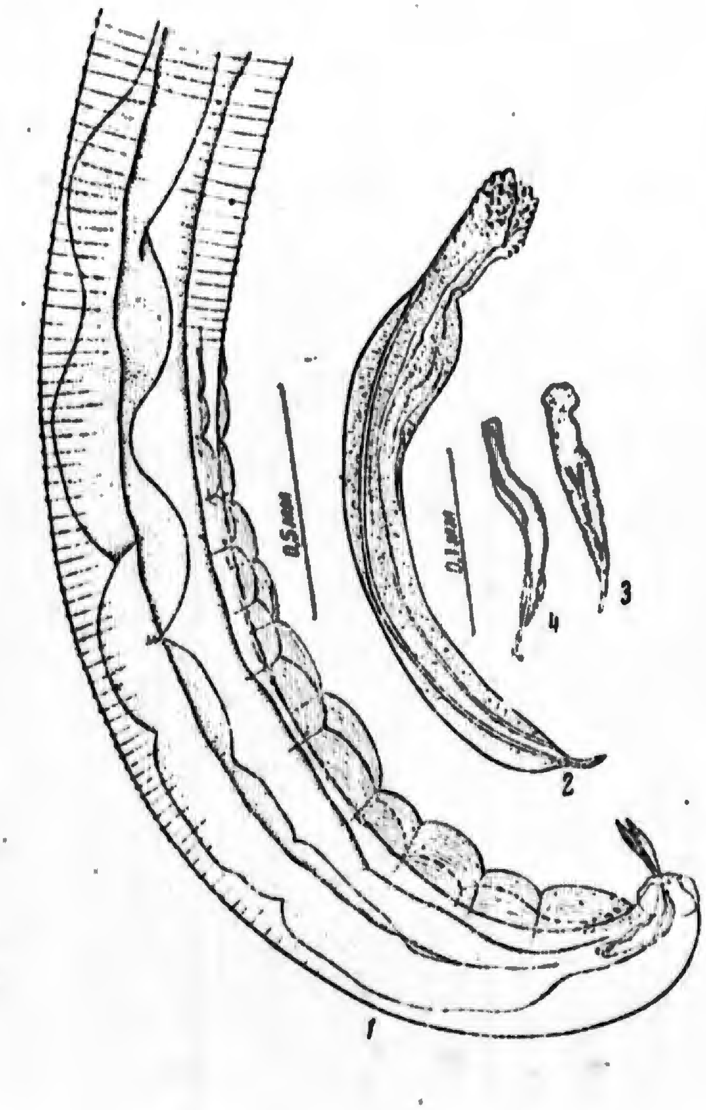

Figure 194.

Delamurella hyperoodoni (Gubanov, 1952).
1. Lateral view of the caudal end of the male; 2. Spicule; 3, 4. Auxiliary organ in ventral and lateral view (after Gubanov, 1952).
(From Skryabin, Shikhobalova, Schulz, Popova, Boyev, Delamure, 1952).

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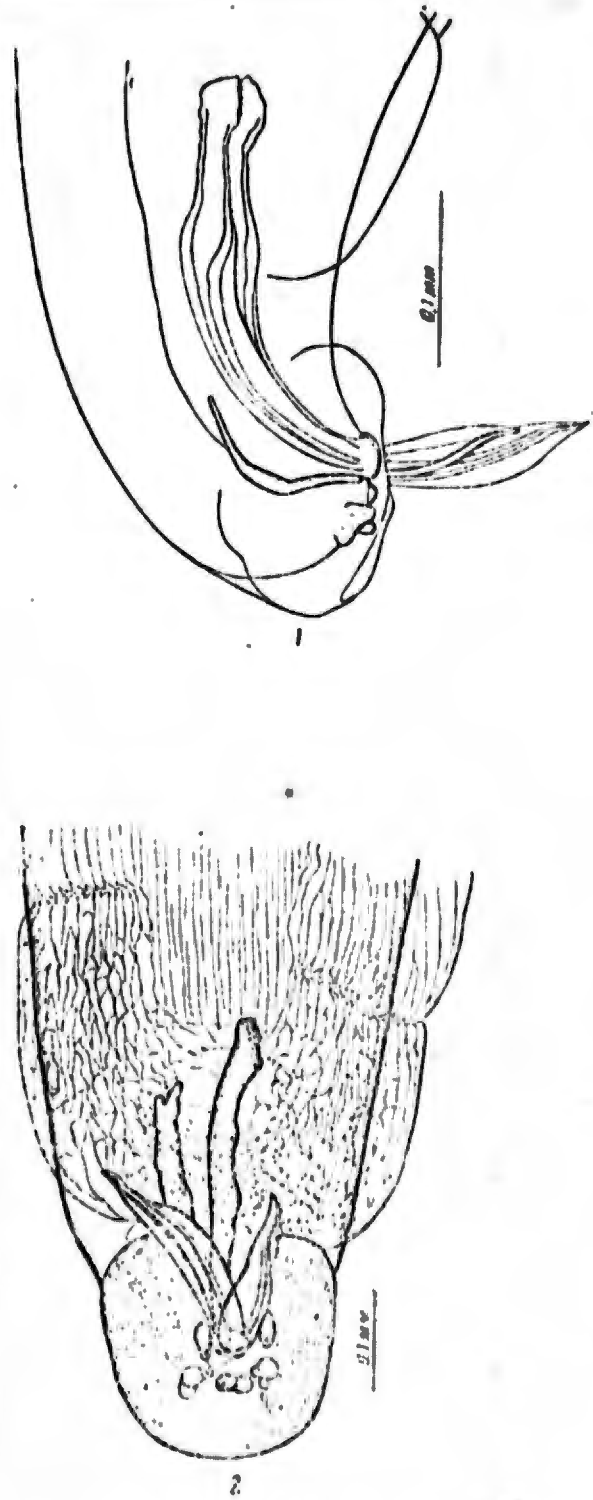

Figure 195
Delamurella hyperoodoni
(Gubanov, 1952).
1. Lateral view of the bursa;
2. Ventral view of the same;
(From Skryabin, Shikhobalova, Schulz, Popova, Boyev, Delamure, 1952)

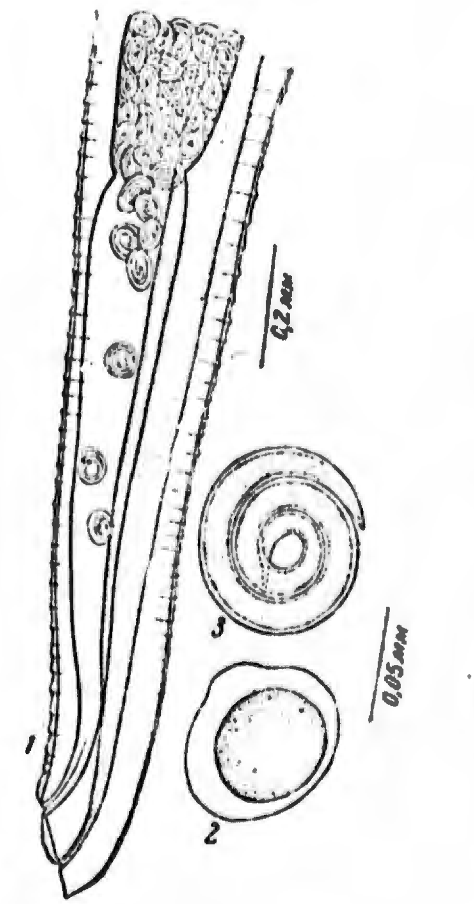

Figure 196
Delamurella hyperoodoni
(Gubanov, 1952).
1. Lateral view of the caudal end of the female; 2. Egg;
3. Larva (original).

to 0.169 mm. Two long uteri are filled with eggs at their initial segments; the eggs are in all stages of hatching, and the lower sectors of the uteri, just as also the vagina, are filled with developed spirally rolled up larvae. The eggs are 0.057 to 0.076 mm long, 0.053 mm wide, provided with a thin transparent membranous shell. The length of the larvae is 0.364 to 0.380 mm, their width is 0.015 mm.

Subfamily Stenurinae (Skrjabin, 1942).

Table

for determination of genera of the subfamily Stenurinae.

1 (6). Ventral preanal suctorial (organ of Künh) is absent in the males.

2 (3). Parasites of terrestrial flesh-eating mammals (Family Viverridae). The cuticle is wide, with numerous folds over the entire length of the body. The esophagus is piriform. The dorsal rib is short, powerful, it splits distally into three branches. The spicules are wing-shaped. There is an auxiliary organ. Parasites of the respiratory organs of viverrids ... Stenuroides (Gerichter, 1951).

3 (2). Parasites of cetaceans.

4 (5). Spicules short, leaf-shaped. There is an auxiliary organ. A dorsal lobe, of the bursa is not differeniated. The lateral and dorsal ribs are long, relatively well developed, with a tendency to branching at the distal ends. Parasites of the auditory organs, respiratory organs, and of the blood carrying system of toothed cetaceans (Family Delphinidae) ... Stenurus (Dujardin, 1845).

5 (4). Spicules long, thread-shaped. Auxiliary organ absent. A dorsal lobe of the bursa is differentiated. The lateral and dorsal ribs of the bursa are short, relatively well developed, with tendency to branching distal ends.

Parasites of the organs of hearing of the toothed cetaceans (Family Delphinidae) ... Otophocaenurus (Skrjabin, 1942).

p. 293 6 (1). The ventral preanal, suctorial organs are present in the males. The bursa is not differentiated by lobes. Spicules thread-shaped. There is an auxiliary organ. Parasites of the lungs and blood carrying system of dolphins ... Torynurus (Baylis and Daubney, 1925).

GENUS Stenurus (Dujardin, 1845).

Synonyms: Pharurus (Leuckart, 1848, partly); Prosthecosacter (Diesing, 1851, partly).

Table

for species determination of the Genus Stenurus.

1 (8). The dorsal rib of the bursa is approximately of the same size as the lateral.

2 (5). The bursa is not differentiated by lobes. Parasites of phocaenas and aphalines.

3 (4). Spicules 0.13 to 0.17 mm; auxiliary organ 0.049 to 0.060 mm long. Parasites of phocaenas ... S. minor (Kühn, 1829).

4 (3). Spicules 0.16 to 0.20 mm long; auxiliary organ 0.072 to 0.088 mm long. Parasites of aphalines ... S. ovatus (Linstow, 1910).

5 (2). Bursa differentiated by lobes. Parasites of white pilot whales and of finless porpoises.

6 (7). Spicules growing together. The body length of the males is 18 to 22 mm, that of the females 21 to 28 mm; spicules 0.2 mm long. Parasites of white whales ... S. pallasii (van Beneden, 1870).

7 (6). Spicules are not grown together.

8 (1). The dorsal rib of the bursa is much smaller than the lateral ribs.

9 (10). Spicules 0.38 to 0.57 mm long, auxiliary organ 0.01 mm. Parasites of finless porpoises ... S. auditivus

(Hsü and Hoeppli, 1933).

10 (9). Spicules 0.15 mm long. Parasites of pilot whales ... S. Globicephalus (Baylis and Daubney, 1925).

Stenurus minor (Kuhn, 1829; Baylis and Daubney, 1925).

Synonyms: [*Strongylus minor* (Kühn, 1829); *Stenurus inflexus* Dujardin, 1845 (nec *Strongylus inflexus* Rudolphi, 1808); *Prosthecosacter minor* (Kühn, 1829) Diesing, 1851; *P.* (*Stenurus*) *minor* (Kühn, 1829) Diesing, 1861; *Pseudalius minor* (Kühn, 1829) Schneider, 1866; *Pharurus minor* (Kühn, 1829) Cobbold, 1879; *Stenurus phocaenae* Dougherty, 1943

Host: Phocaena phocaena (= Ph. communis), porpoise; Ph. phocaena relicta Abel - the Azov Black Sea porpoise; Delphinapterus leucas Pall., beluga.

Location in host: Organs of hearing, bronchi, heart, circulatory vessels (veins).

Geographic distribution: Arctic Ocean, North Atlantic, North Sea, Black Sea and the Sea of Azov, the Asian shoreline of the Pacific Ocean. In the USSR: The Black Sea, the Sea of Azov, and the Pacific Ocean.

Material: Hundreds of males and females caught by us at autopsies of Ph. phocaena relicta for Nos. 1, 8, 9, 10, 11, 25, 26, 27, 28, 44, 99, 100, 101, and about one hundred specimens collected by A. I. Krotov (1951) from Delphinapterus leucas caught near Sakhalin Island.

Description of species (after the own examinations of the specimens from Phocaena ph. relicta). Nematodes of light brown color. In comparison with other pseudaliids, the cuticle is thick, lengthwise striated.

Male. The body length is 17.8 to 22.3 mm, maximum width of the body in the area of the esophageal end is 0.175 to 0.215 mm, at the cloacal level it is 0.116 to 0.135 mm. The mouth is surrounded by 12 papillae. The excretory aperture
p. 295 is located at a distance of 0.234 to 0.300 mm from the anterior end. Two postcervical papillae are located at the same level. The mouth leads into an oral capsule which is 0.030 to 0.035 mm wide, with a depth of 0.020 mm. The

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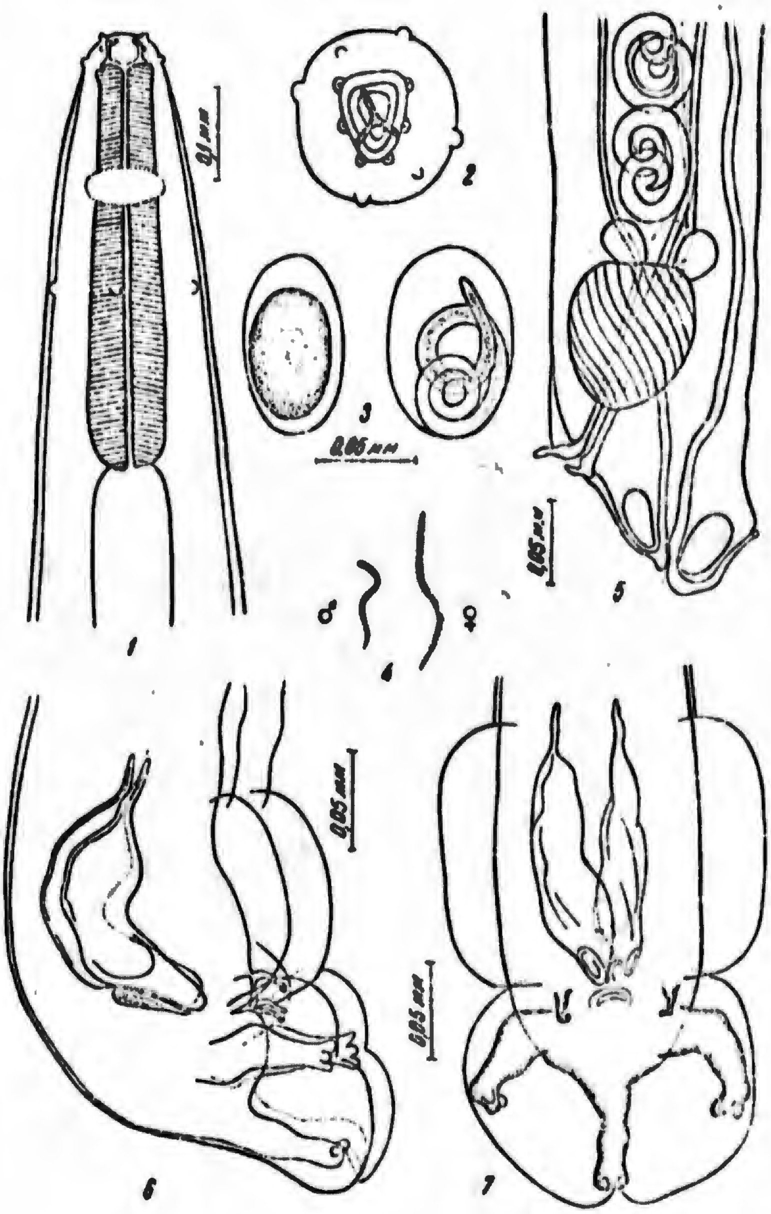

Figure 197.

Stenurus minor

(Kühn, 1829; Baylis and Daubney, 1925).

1. Anterior end of the body; 2. Apical view of the head end; 3. Fertilized egg and egg with larva; 4. Male and female; 5. Lateral view of the caudal end of the female; 6. Lateral view of the bursa; 7. The same in ventral view (After Delamure, 1952).

esophagus is cylindrical, 0.418 to 0.458 mm long, somewhat widened in its posterior part. The width of the esophagus is 0.064 to 0.085 mm. The neural ring is 0.120 to 0.150 mm from the head end. The tail of the male bears a well developed bursa which is 0.140 to 0.198 mm long, 0.165 to 0.200 mm wide. The bursa is bucket-shaped; a dorsal lobe is not shown. The ventral ribs are with two stalk-like papillae of 0.019 to 0.022 mm length, located right and left from the cloaca. Two lateral ribs and one dorsal rib are relatively well developed. The lateral ribs are 0.057 to 0.085 mm long, and 0.018 to 0.025 mm wide. The distal ends of the lateral ribs are provided with three ovally elongated papillae which Skryabin considers as rudiments of antero-medio-postero-lateral ribs. Approximately at the middle of the lateral rib an unpaired sessile papilla is located, which is the bud of an extero-lateral rib. The dorsal rib is 0.060 to 0.065 mm long, with a width of 0.012 to 0.016 mm, somewhat widened at its distal end which bears two oval papillae. On the anterior lip of the cloaca,an unpaired stalk-like papilla is sitting. Before the bursa the cuticle forms two elongated lateral wings of 0.423 to 0.550 mm length. The spicules are thread-shaped, curved, non-accreted, with a length of 0.130 to 0.168 mm with a width of 0.040 to 0.050 mm. The proximal ends of the spicules are thin, the distal ends are widened. The auxiliary organ is oval, thin at its proximal end, 0.049 to 0.060 mm in length, with a width of 0.006 to 0.009 mm.

Female. The body length is 20.2 to 26.0 mm, with a maximum width of 0.544 to 0.585 mm. At the area of the esophageal end, the body width is 0.234 to 0.285 mm, at the level of the vulva it is 0.090 to 0.120 mm, at the anus level it is 0.032 to 0.056 mm. The length of the esophagus is 0.429 to 0.493 mm, its width0.084 to 0.102 mm. The neural ring is at a distance of 0.201 to 0.241 mm from the head end. The cervical papilla is at a distance of 0.260 to 0.272 mm and the excretory aperture at a distance of 0.268 to 0.282 mm from the head end. The anus is located subventrally at a distance of 0.055 to 0.065 mm from the dorsal wall of the body. The vulva is located in front of the anus at a distance of 0.119 to 0.136 mm, and its anterior lip is provided with an outgrowth (appendix) which is not much smaller in size. The vagina is provided with a powerful sphincter whose length is 0.088 to 0.096 mm, and its width 0.058 to 0.072 mm. The sexual channel before the vagina is filled with curved larvae of a length of 0.250 to 0.260 mm. The beginning portion of the uteri is filled with eggs at different stages of development.

Literature: Skryabin, 1924, p. 41; Delamure, 1945, p. 105 (?); Skryabin, Shikhobalova, Schulz, Popova, Boyev, Delamure, 1952, p. 768 to 771; Kühn, 1829a, p. 152; Kühn, 1829 b, p. 189 (?); Kuhn, 1829c, P. - the rest of the literature on page 295 is illegible.

Stenurus auditivus (Hsü and Heoppli, 1933)

Host: Neomeris phocaenoides Cuvier - the finless porpoise.

Location in host: Auditory organs.

Geographic distribution: Pacific Ocean, China.

Description of species (after Hsü and Heoppli, 1933). The anterior end of the body of these parasites is thicker than the posterior end. The cuticle ...(illegible) ...

p. 296 The oral aperture is round, lipless. There are two circles of papillae. The inside circle consists of six small papillae placed very close to the oral aperture and having only one neural ending. The outside circle also consists of six papillae from which four submedian ones are large, with double neural endings, while two lateral ones are small, with only one neural ending. Near the two lateral papillae of the external circle two amphides are located. The oral capsule is wide and flat. The esophagus is club-shaped.

Male. The body length is 28.0 to 35.0 mm, its width is 0.35 to 0.42 mm. The oral capsule is 0.007 to 0.008 mm deep, with a width of 0.027 to 0.029 mm. The length of the esophagus (including the oral capsule) is 0.40 to 0.41 mm, its width at the anterior part is 0.057 to 0.062 mm, in the posterior part it is 0.072 to 0.082 mm. The neural ring is at a distance of 0.13 to 0.15 mm from the anterior end of the body. The posterior end of the body is always curved on the abdominal side, and is provided with a well developed sexual bursa which consists of one dorsal, two ventral and two lateral lobes.[1] All lobes are well differentiated. The dorsal lobe is always curved in the middle of its length in the ventral side, and therefore it is always hidden more or less by the lateral lobes, if we look at the bursa from the lateral side. The dorsal rib ends with two very short, divergent branches on whose distal ends there is located a papilla with one neural ending on the ventral surface. The lateral lobes are well developed, and clearly separated from the dorsal lobes, if we look from the ventral side. The lateral rib of each lobe ends in four branches, one of which is longer than the others, moreover, on the ventral side of the distal end of each lateral rib, a small papilla is sitting. Each of the two ventral lobes is supported by one ventral rib which splits into two small branches that end with a papilla. The prebursal papillae are missing because of the poor condition of the material. The spicules are 0.38 to 0.57 mm long, welded together, however their anterior and posterior ends are free. The auxiliary organ is short and wide; the length of the auxiliary organ is 0.009 mm, and its width 0.030 mm.

1. In the original description of this species (Hsü and Hoeppli, 1933) it was shown that the bursa is provided with one ventral lobe, whereas later, evidently, it was correctly noted that the bursa has two ventral lobes. Unfortunately, the very much schematized drawing does not give a good representation of the number and form of these lobes.

Female. The body length is 45.0 to 55.0 mm, its width is 0.46 to 0.57 mm. The depth of the oral capsule is 0.010 to 0.011 mm, its width is 0.030 to 0.032 mm. The length of the esophagus (including the oral capsule) is 0.40 to 0.47 mm. The width of the esophagus in the anterior portion is 0.062 to 0.068 mm, in the posterior portion 0.072 to 0.077 mm. The neural ring is away from the anterior end at a distance of 0.13 to 0.15 mm. The vulva is located directly in front of the anus. The distance between them is equal to 0.007 mm. In the uterus and vagina, larvae and eggs are found fully developed. The eggs are 0.042 mm long, width is 0.024 mm. The larvae (near the vulva) are 0.20 to 0.28 mm in length, and 0.010 to 0.015 mm in width. The tail of the female is very blunt and short with two lateral papillae at the tip.

Literature: Skryabin, Shikhobalova, Schulz, Popova, Boyev, Delamure, 1952, p. 770; Hsü and Hoeppli, 1933, p. 156 to 158.

Stenurus globicephalus (Baylis and Daubney, 1925).

Host: Globicephalus melas (Traill) - the pilot whale.

Location in host: wind pipe (blow hole), bronchi, blood carrying system.

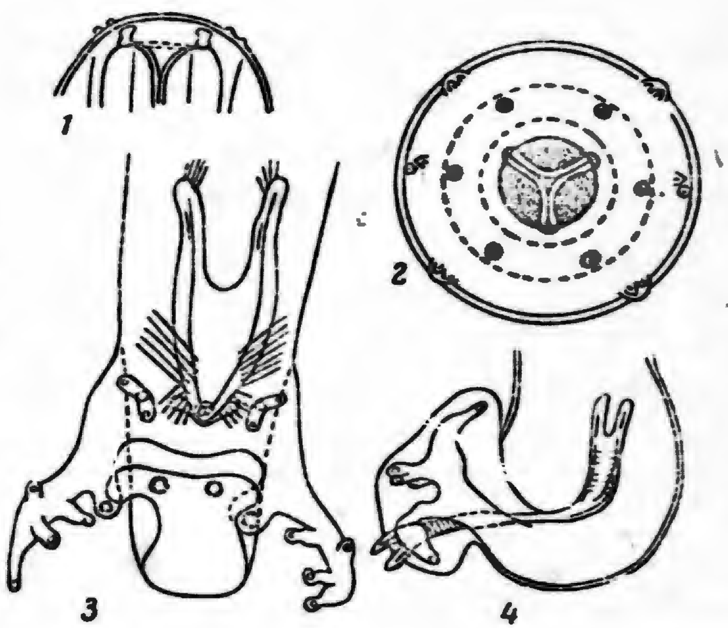

Figure 198.

Stenurus auditivus (Hsü and Hoeppli, 1933).

1. Anterior end; 2. Apical view of the same; 3. Ventral view of the bursa; 4. Lateral view of the same (after Hsü and Hoeppli, 1933).

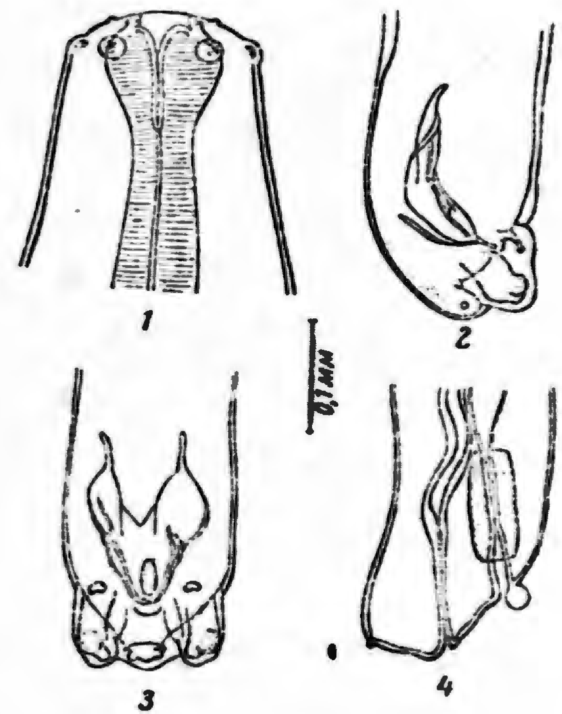

Figure 199.

Stenurus globicephalus (Baylis and Daubney, 1925).

1. Ventral end of the head end of the female; 2. Lateral view of the caudal end of the male; 3. Ventral view of the same; 4. Caudal end of the female in lateral view (after Baylis and Daubney, 1925).

p. 298 Geographic distribution: North Atlantic.

Description of species (after Baylis and Daubney, 1925). The mouth is provided with a capsule whose width is 0.033 to 0.050 mm in the anterior part, and 0.075 to 0.100 mm in the posterior part. The walls of the oral capsule edge into the esophagus for a very short distance. The diameter of the head end is about 0.15 mm at the level of the posterior head papillae. The cervical papillae stand out by 0.35 mm from the anterior end (inthe female). The esophagus (together with the oral capsule) is 0.56 to 0.65 mm in length, clubbed at its rear portion. The cuticular pavement of the esophagus is thickened at some distance from the anterior end, in the form of an esophageal infundibulum.

Male. The body length is 30 mm, with a maximum width of 0.37 mm. The posterior end is provided with a small bursa, distinctly split into three blades. Before the bursa, the cuticle is slightly swollen. The lateral ribs are blunt. Their terminal ends are provided wihh three short, undeveloped appendices. The dorsal rib is short and wide. The prebursal papillae are absent. Spicules are 0.15 mm in length. Their auxiliary organ is 0.07 mm in length.

Female. The body length is 45 mm, maximum body width is 0.55 mm. The vulva is located at a distance of 0.09 mm from the rear end of the body. The anterior lip of the vulva is provided with a spherical cuticular swelling. The total length of the vagina and of the uterine trunk is 1.04 mm.

Literature: Skryabin, Shikhobalova, Schulz, Popova, Boyev, Delamure, 1952, p. 770; Baylis and Daubney, 1925, p. 206 to 207; Freund, 1933, p. 50; Baylis, 1932, p. 403, 410; Dougherty, 1943, p. 20; Vogelsand-Lund, 1947, p. 17.

Stenurus ovatus (Linstow, 1910; Baylis and Daubney, 1925).

Synonym: Pseudalius ovatus (Linstow, 1910).

Host: Tursiops tursio Fabr. (= T. truncatus), - the aphaline.

Location in host: wind pipe, bronchi, blood carrying vessels.

Geographic distribution: Mediterranean Sea (Elba Island), the Black Sea (Kerenskiy Strait) in the USSR.

Material: 508 males and females, removed by us from two aphalines which were caught in the Kerenskiy Strait (Postmortem No. 12 and 13, May 1941).

Description of species (after our own research on the specimens from Black Sea aphaline). Thread-shaped white pseudaliids. The males are smaller than the females. The esophagus is cylindrical. The mouth is surrounded with papillae.

Male. The body length is 16.4 to 21.1 mm with a maximum width of 0.168 to 0.208 mm. The width of the body is 0.096 to 0.112 mm in the area of the esophageal end, and 0.072 to 0.088 mm at the cloacal level. The oral aperture is surrounded by 12 papillae. The oral capsule is 0.008 mm in width. There are four postcervical papillae on the level of the center of the esophagus, of 0.272 to 0.278 mm from the anterior end. The esophagus is 0.438 to 0.536 mm in length, with a width of 0.040 to 0.052 mm, slightly widened in its rear portion. The caudal end of the body is not curved on the ventral side, and is provided with a well developed copulatory bursa.

Female. The bursa is 0.120 to 0.148 mm in length, with a width of 0.104 to 0.144 mm. A central small notch (channel) divides the bursa into two equal lateral lobes. The dorsal lobe of the bursa is not expressed. On the anterior lip of the cloaca, an unpaired stalk-like papilla

is situated whose length is 0.012 to 0.016 mm. The ventral ribs of the bursa are represented by a pair of
p. 299 large stalk-like papillae whose length is 0.018 to 0.028 mm. These papillae are located at the level of the cloaca, and are provided with small club-shaped thickenings at the ends.

The lateral ribs are strong. They extend somewhat backwards from the level of the cloaca. The length of the lateral ribs is 0.048 to 0.068 mm, with a maximum width of 0.020 to 0.028 mm. At the start of each lateral rib (on the side turned toward the median plane) is a papilla whose length is 0.006 to 0.008 mm. Evidently, these papillae must be considered rudiments of externo-lateral ribs. Each of the distal ends of the lateral ribs also bears one papilla. Each of these papillae is provided with three prominent tubercles. These tubercles evidently must be considered rudiments of antero-medio and postero-lateral ribs.

The dorsal rib of the bursa is represented by one strong trunk with a length of 0.052 to 0.064 mm and with a width (at the distal end before the papillae) of 0.016 to 0.020 mm. At the end of the dorsal rib are three papillae. Two lateral papillae have a mammillary shape. The distance between their tips equals 0.028 to 0.040 mm. The third (middle) papilla is cone-shaped. Its length is 0.004 to 0.012 mm.

The spicules are of the same structure. The upper third of the spicules is thin, with larger swellings at the proximal ends. The middle and the posterior portion of the spicules is widened and thickened. The length of the spicules is 0.164 to 0.200 mm with a maximum width of 0.032 to 0.036 mm. The proximal (thin) appendix of the spicule has a length of 0.056 to 0.068 mm. With a ventral position of the nematode, the auxiliary organ is of an ellipsoid form, somewhat widened at the proximal end, and narrowed at the distal end. The length of the auxiliary organ is 0.072 to 0.088 mm, width is 0.006 to 0.010 mm.

Female. The body length is 24.40 to 39.10 mm, with a maximum width of the body at 0.216 to 0.272 mm. The body width is 0.092 to 0.104 mm at the level of the vulva (without the cuticular swelling), and at the level of the anus it is 0.048 to 0.064 mm. The esophagus is 0.507 to 0.585 mm un length, with the largest width at 0.048 to 0.060 mm. The caudal end of the body is conical. The anus and the vulva are located subventrally, and are surrounded with a strong cuticular swelling. This swelling most often consists of three parts which can be seen at a lateral position of the nematode. If, however, the nematode is placed ventrally, then the mentioned swelling has the character of a crater (funnel). The length of the cuticular swelling is 0.080 to 0.100 mm. The vagina is provided with a strong sphincter. The length of the vagina is 0.585 to 0.741 mm. The length of the sphincter of the vagina is 0.016 to 0.026 mm with a width of 0.016 to 0.020 mm. The vulva is located at the anterior margin of the cuticular swelling at a distance of 0.052 to 0.088 from the anus, and at a distance of 0.056 to 0.068 mm from the vaginal sphincter. The anterior lip of the vulva is provided with a finger-shaped outgrowth (processus vulvaris anterior), whose length is 0.020 to 0.036 mm. The posterior lip of the vulva is also provided with an outgrowth (processus vulvaris posterior) whose length is 0.032 to 0.038 mm. In a ventral position of the nematode, these two processes, which are located inside the crater-shaped cuticular swelling, have the form of laterally situated thickenings.

The anus is located subventrally in the posterior boundary of the crater-shaped swelling of the cuticule. There are no prominent lips. The caudal end of the female is provided with two club-shaped processes of 0.010 to 0.016 mm length. The upper ones of these processes are provided with a globe-shaped widening. The egg and the larvae fill up the uteri and the vagina. The length of the eggs is 0.055 to 0.067 mm with the width of 0.027 to 0.039 mm. The length of the larvae is 0.280 to 0.380 mm, with a width of 0.010 to 0.011 mm. Viviparous.

Literature: Delamure, 1949, p. 110 to 113; Skryabin, Shikhobalova, Schulz, Popova, Boyev, Delamure, 1952, p. 55; Linstow, 1910, p. 133; Baylis and Daubney, 1925, p. 208; Baylis, 1928, p. 464; Freund, 1933, p. 55; Dougherty, 1943, p. 20.

p. 301 Stenurus pallasii (van Beneden, 1870; Dougherty, 1943.

Synonyms: *Strongylus arcticus* Cobb, 1888; *Pseudalius arcticus* (Cobb, 1888) Linstow, 1900; *Stenurus arcticus* (Cobb, 1888) Baylis et Daubney, 1925

Host: Delphinapterus leucas Pall. - the beluga.

Location in host: Organs of hearing, bronchi, blood carrying system.

Geographic distribution: Arctics. It was not found in the USSR.

Description of species (after Cobb, 1888). The cuticle is smooth. The oral aperture is surrounded with papillae. At a distance of 0.023 mm from the head end, four papillae are sitting which are arranged submedianly. The esophagus is somewhat widened forward and backward. The neural ring is at 0.2 mm distance from behind the mouth.

Male. The body length is 18 to 22 mm, or 20 mm as an average. The largest width of the body is in the middle where it reaches 1.04 mm. Forward and backward from the greatest width, the body is tapering gradually. The tail of the male has a bursa whose edge is divided into six lobes. At a distance of 0.2 mm from the caudal

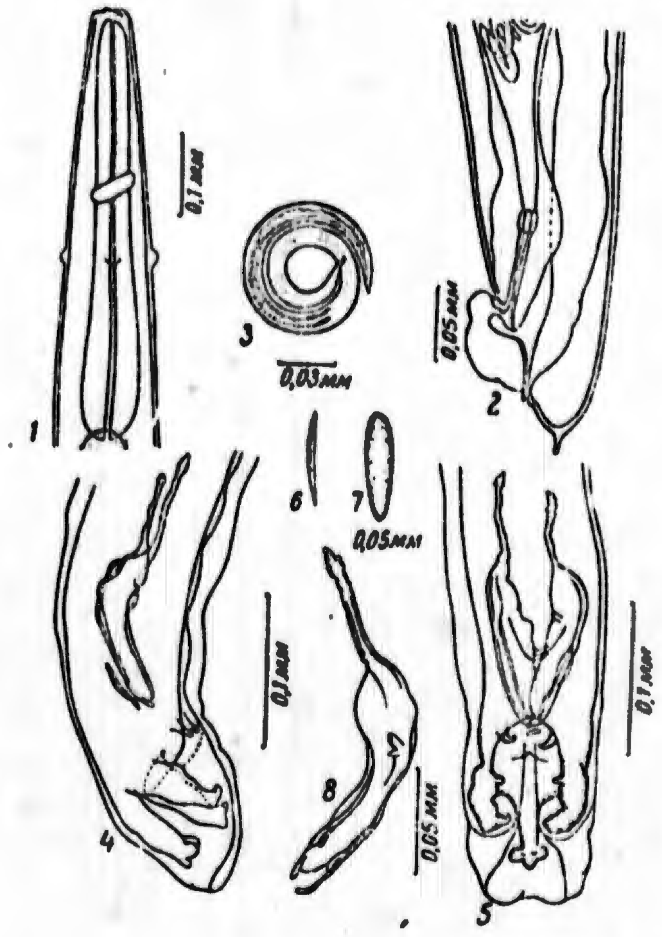

Figure 200.
Stenurus ovatus (Linstow, 1910; Baylis and Daubney, 1925).
1. Anterior end of the body; 2. Lateral view of the caudal end of the female; 3. Larva; 4. Lateral view of the caudal end of the male; 5. Ventral view of the same; 6. Auxiliary organ in lateral view; 7. Ventral view of the same; 8. Spicule.
(After Delamure, 1949).

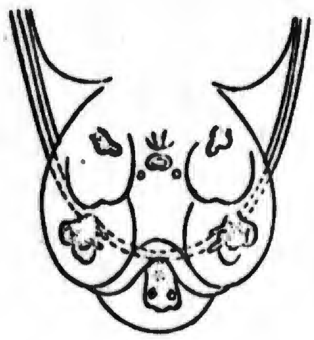

Figure 201.
Stenurus pallasii
(van Beneden, 1870; Dougherty, 1943).
Ventral view of the bursa (after Linstow, 1900).

end, on each ventral submedian line pair of papillae are lacated. The spicules are equal in size, strongly curved, adherent to each other. Their length is 0.2 mm.

Female. The body length is 21 to 28 mm with the greatest width of 1.05 mm. The vulva is located at a distance of 0.1 mm, and the anus at a distance of 0.5 mm from the caudal end.

Literature: Skryabin, Shikhobalova, Schulz, Popova, Boyev, Delamure, 1952, p. 770; Van Beneden, 1870, p. 366; Cobb, 1888, p. 64; Cobb, 1889, p. 150; Linstow, 1900a, p. 366—367; Linstow, 1906, p. 114; Baylis and Daubney, 1925, p. 208; Freund, 1933, p. 44; Baylis, 1932, p. 403, 409; Dougherty, 1943, p. 18—20.

GENUS Stenuroides (Gerichter, 1951).

Stenuroides herpestis (Gerichter, 1951).

Host: Herpestes ichneumon - the ichneumon ("Pharao's mouse").

Location in host: Lungs.

Geographic distribution: Israel.

Literature: Skryabin, Shikhobalova, Schulz, Popova, Boyev, Delamure, 1952, p. 804 to 805; Gerichter, 1951, p. 187 to 188.

GENUS Otophocaenurus (Skrjabin, 1942).

Otophocaenurus oserskoi (Skrjabin, 1942).

Synonym: Pharurus oserskoiaae (Skrjabin, 1942; Dougherty, 1949.

Host: Delphinapterus leucas Pall - the beluga.

Location in host: The organs of hearing.

Geographic distribution: USSR - Pacific Ocean (Sakhalin).

Material: We examined material kept in the museum of the All Union Institute of Helminthology.

Description of species (after Skryabin, 1942).

Male. Body length is 21 to 26 mm with a maximum width of 0.57 to 0.65 mm. The width of the body in the cloacal region reaches 0.09 mm, at the level of the esophageal end it is 0.378 mm. The anterior end is always blunted, the
p. 303 oral aperture is surrounded by 12 head papillae located in two concentric circles, with two lateral and four submedian papillae in each circle. There is a perceptible oral capsule which reaches 0.046 mm width and 0.012 depth. The length of the esophagus is 0.65 to 0.76 mm with a width of 0.110 to 0.136 mm. The neural ring is at a distance of 0.132 to 0.152 mm from the head end. The caudal end terminates in a bursa which is composed of markedly differentiated lobes: two lateral and one median. The length of the bursa is 0.092 mm, with a width of 0.010 mm. In front of the bursa on the ventral surface of the body, right and left from the midline, there is a strong cuticular swelling, forming sort of prebursal wings. The width of these wings reaches its maximum dimension in the rear part, forward however they gradually contract, and, finally, come to naught. The total length of this formation is 0.55 mm. Evidently, this cuticular swelling is a homologue of the organ of Kühn of the genus Torynurus

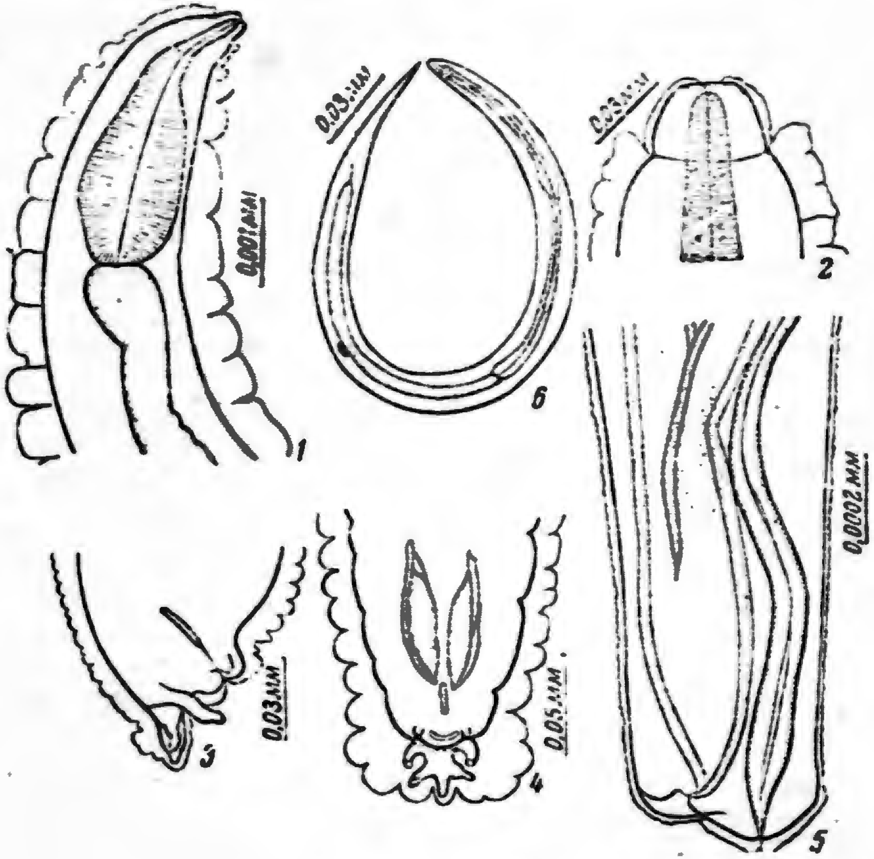

Figure 202.

Stenuroides herpestis (Gerichter, 1951).
1. Anterior end of the body; 2. Ventral view of the head end; 3. Lateral view of the caudal end of the male; 4. The same in ventral view; 5. Caudal end of the female in lateral view; 6. Larva (after Gerichter, 1951).

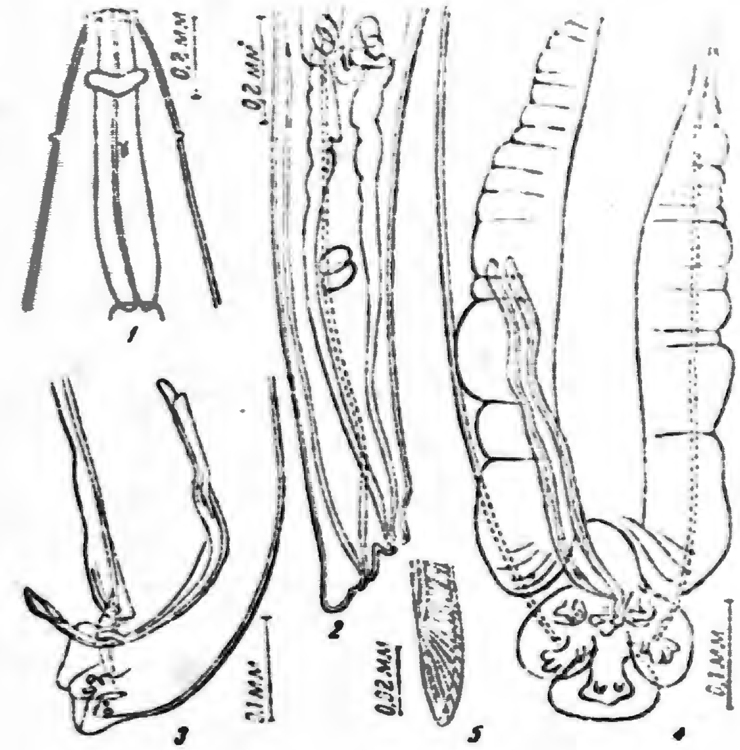

Figure 203.

Otophocaenurus oserskoi (Skrjabin, 1942).
1. Anterior end of the body; 2. Lateral view of the caudal end of the female; 3. Lateral view of the caudal end of the male; 4. The same in ventral view; 5. Distal end of the spicule (after Skrjabin, 1942).

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which underwent a regressive metamorphosis and lost the cavity with four glandular formations.

The genital bursa of the male is trilobed. Here the posterior lobe has independent free edges which do not depend upon the lateral lobes. The cloaca stands away from the rear end of the body at a distance of 0.1 mm. Before the cloaca, an unpaired papilla is located, which protrudes forward. The ventral ribs are represented as a basal body from which stalks of 0.037 mm length fo off, having at the tip a thickening which ends in two papillae (rudiments of the ventro-ventral and latero-ventral ribs sitting on a common basis). The lateral ribs are represented by a single wide trunk 0.015 mm in length, and 0.014 mm in width, which splits into four branches: three terminal branches corresponding to the antero-medio - and postero-lateral ribs, and one columnar rib which goes off from the base of the common lateral trunk, and hangs over rearward and inward. This is the rudiment of the externo-dorsal rib. The dorsal rib is represented by a medianly placed disk 0.026 mm in length with a width of 0.034 mm. The distal edge of the disk has the tendency to form three lobes. On the surface of this disk there are two large columnar papillae which turn with their tips backward.

There are two spicules which are equal size. To the main thread-like structure of the spicules under acute angle two narrow wings are joined. They are straited crosswise, and at the distal end of the spicule they form two sharp-pointed tips. The length of the spicules is 0.30 to 0.40 mm with a width of 0.010 to 0.013 mm. There is no auxiliary organ.

Female. The body length is 26.0 to 36.0 mm with a maximum width of 0.81 to 0.88 mm. The body width is 0.45 to 0.47 mm at the area of the rear part of the esophagus; in the area of the vulva it is 0.126 to 0.162 mm; at the level of the anus it is 0.072 to 0.080 mm. The neural ring is at a distance of 0.23 to 0.25 mm, and the excretory aperture at a distance of 0.32 to 0.45 mm, while the well perceptible cervical papillae are at 0.31 to 0.45 mm from the head. The esophagus reaches 0.72 to 0.81 mm in length, with a width of 0.126 to 0.144 mm. The tail of the female is conical, stands off from the tip of the tail at a distance of 0.065 to 0.072 mm. The vulva is located at a distance of 0.069 to 0.072 mm forward from the anus. The posterior lip of the vulva is provided with a tuberous thickening, the homologue of the processus vulvaris posterior. On the anterior lip of the vulva the tubecle is weakly manifested. The vagina is provided with an elongated sphincter, 0.15 mm in length, with a width of 0.06 mm. The length of the whole vagina is 0.85 to 0.86 mm, with a width of 0.11 mm. At the tail end of the uterus, there are still unripe eggs, 0.042 mm in length, and 0.026 mm in width.

p. 304 Literature: Skryabin, 1942, p. 45 to 46; Skryabin, Shikhobalova, Schulz, Popova, Boyev, Delamure, 1952, p. 772; Dougherty, 1943, p. 21; Dougherty, 1944, p. 92 to 94; Dougherty, 1949, p. 232 to 233.

GENUS Torynurus (Baylis and Daubney, 1925).

Table

for the species determination of the Genus Torynurus.

1 (2). The body length of the males is 20.5 to 31.2 mm, of the females 31 to 66 mm. The spicules are 0.54 to 0.65 mm long. Parasites of porpoises and pilot whales ... T. Convolutus (Kuhn, 1829).

2 (1). The body length of the males is 16 mm, of the females 16.5 mm. The spicules are 0.84 mm long. Parasites of narwhals ... T. alatus (Leuckart, 1848).

Torynurus convolutus (Kühn, 1829; Baylis and Daubney, 1925).

Synonyms: *Strongylus convolutus* Kühn, 1829; *Prosthecostrongylus convolutus* (Kühn, 1829) Diesing, 1851; *Pseudalius convolutus* (Kühn, 1829) Schneider, 1866; *Pseudalius bicostatus* Linstow, 1906; *Pharurus convolutus* (Kühn, 1829) Dougherty, 1943

Host: Phocaena phocaena L. (Ph. communis) - the porpoise; Phocaena sp., Globicephalus melas (Traill) - the pilot whale (G. ventroicosa).

Location in host: Bronchi, blood carrying vessels of the lungs.

Geographic distribution: North Atlantic (Europe). In the USSR, the Pacific Ocean (Sakhalin).

Description of species (after Skryabin)[1].

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1. Published the first time.

Male. The body length is 20.50 to 31.25 mm, maximum width 0.27 to 0.30 mm. The width of the body at the area of the esophageal end is 0.17 to 0.18 mm, at the cloacal area it is 0.075 to 0.090 mm, before the bursa, at a distance of 0.54 mm from the caudal end, the body width reaches 0.342 mm. The head end bears 12 papillae, located in two concentric circles, two lateral and four submedian papillae for each circle. The neural ring is 0.127 to 0.149 mm from the anterior end of the body. Behind it two symmetrical postcervical papillae are situated which are placed at a distance of 0.225 to 0.332 mm from the head end. Somewhat backward from the cervical papillae (by 0.230 to 0.340 mm) the excretory aperture is located. On the surface of the cuticle of the anterior part of the body, striation is perceptible which runs oblique to the body axis so that the stripes meet in an acute angle from the lateral ribs of the parasite to the ventral and dorsal midlines.

The esophagus is slightly widened in its posterior portion. The length of the esophagus is 0.522 to 0.576 mm with a width of 0.09 to 0.11 mm. The oral capsule is absent. At examination of the rear end of the male from the ventral side, the presence of two single organs strikes the eye: the bursa and the suctorial organ. The bursa has a pentagonal or hexagonal from. The length of the bursa is 0.08 to 0.10 mm with a width of 0.15 mm. The suctorial organ, which is located in front (anteriorly to) of the bursa, has a huge size. It is egg-shaped and has a length 0.5 mm with a maximum width of 0.29 mm. This formation, which was here named the "preanal organ of Kühn," is characterized by a cuticular cowl which stands out above the level of the ventral surface of the parasite's body. Starting with two lateral folds anteriorly to the cloaca, these folds fuse together with each other anteriorly. On the bottom of this cowl, four glandular elongated oval formations are located whose posterior pair measures 0.144 to 0.160 x 0.060 - 0.061 mm, and with its posterior edges it joins directly to the genital bursa (right and left), while the anterior pair (right and left) is of somewhat larger size, 0.172 to 0.200 mm
p. 305 in length and o.060 mm in width. In a preparation clarified with lactic acid numerous muscular strands are perceptible which radially spread out from the above mentioned glandular formations.

The genital bursa has a very special construction. The anterior edge of the cloaca bears an unpaired papilla. The rudiment of the ventral ribs is represented by a columnar formation on whose tip, at careful study, two papillae can be discerned: rudiments of the ventro-ventral and latero-ventral ribs. The lateral ribs themselves are very large. Their distal end is split into three processes (rudiments of the antero-medio- and

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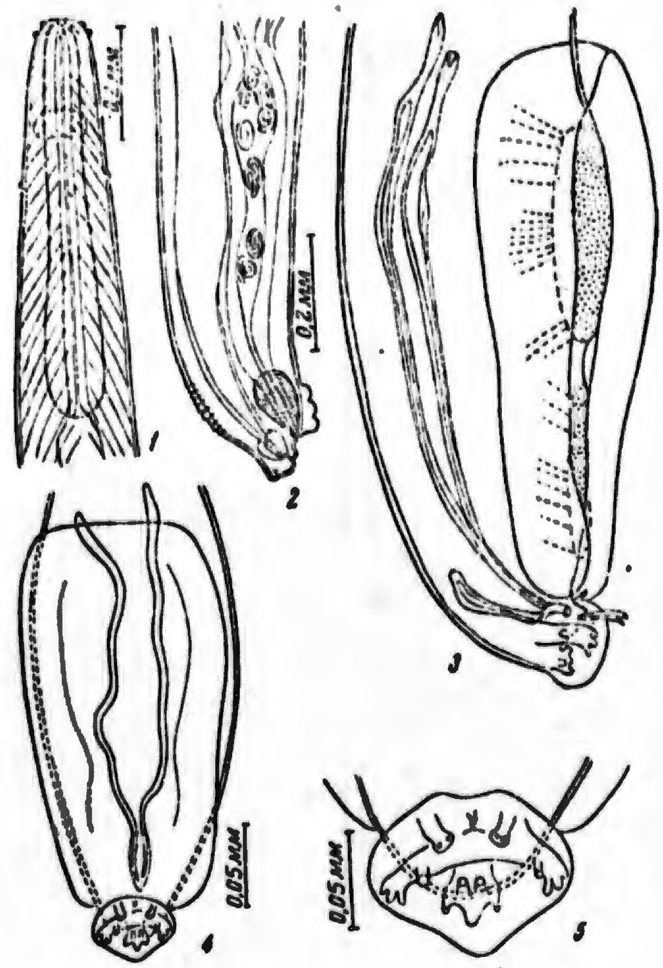

Figure 204.

Torynurus convolutus (Kuhn, 1829; Baylis and Daubney, 1925).

1. Anterior end of the body; 2. Lateral view of the caudal end of the female; 3. Lateral view of the caudal end of the male; 4. Ventral view of the same; 5. Ventral view of the bursa (after Skryabin)[1].

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1. Published the first time.

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postero-lateral ribs). In addition, from the middle of the common trunk of the lateral ribs, a columnar papilla detaches itself: the rudiment of the antero-dorsal rib. Unlike its form in the Stenurus minor, this rudiment has a columnar configuration being evidently a step forward in the process of phylogenesis. The dorsal rib is represented by a disk with three outgrowths, a large one, and two
p. 306 smaller lateral ones. The impression is obtained that this disk is homologus to the organ corresponding in many Synthetocaulinae in which the dorsal rib is represented by a disk with a whole bouquet of papillae. The length of the ventral rib is 0.019 mm. The dorsal disk is 0.032 mm in length, with a width of 0.019 mm at the base. The spicules are equal, thread-shaped, with a length of 0.54 to 0.65 mm and with a width of 0.019 to 0.023 mm. The proximal end of the spicules is shaped like a handle which merges into the wider mid-portion consisting of the body and wing. The wing gradually vanishes, in the posterior third of the spicule's length and the spicule ends with a spicular curved end. The auxiliary organ has a widened proximal and a constricted distal end, and is 0.11 mm long.

Female. The body length is 31.0 to 66.3 mm with a maximum width of 0.468 mm. The width of the body in the area of the esophageal end is 0.196 to 0.216 mm, at the level of the vulva it is 0.086 to 0.090 mm, in the area of the anus it is 0.050 to 0.054 mm. The esophagus reaches a length of 0.63 to 0.66 mm, with a width of 0.09 to 0.11 mm. The neural ring is located at a distance of 0.144 mm from the head end, while the excretory aperture and the cervical papillae are at a distance of 0.33 mm.

The anus stands off from the tip of the tail at a distance of 0.025 to 0.042 mm, while the vulva is at the same distance from the anus (0.030 to 0.045 mm). Before the vulva, there is a processus vulvaris anterior, 0.072

to 0.096 mm in length, having the shape of a comb with an undulating free edge. On the tip of the tail, two subdorsal papillae are present. The sphincter of the vagina is 0.16 mm long with a width of 0.07 mm.

Literature: Skryabin, 1942 (manuscript); Skryabin, 1942, p. 41; Skryabin, Shikhobalova, Schulz, Popova, Boyev, Delamure, 1952, p. 775; Kühn, 1929a, p. 365; Diesing, 1851, p. 324; Monn, 1861, p. 177—178; Cobbold, 1864, p. 91; Cobbold, 1879, стр. 423; Schneider, 1866, стр. 174; Linstow, 1888a, стр. 17; Linstow, 1906, стр. 114; Scott, 1908, p. 89—90; Baylis et Daubney, 1925, p. 209; Yorke and Maplestone, 1926, p. 171; Freund, 1933, p. 47, 50; Baylis, 1932, p. 404 [illegible]; Schmidt-Ries, 1939, p. 102; Dougherty, 1943, p. 20; Dougherty, 1944, p. 93.

Torynurus alatus (Leuckart, 1848) nov. comb.

Synonyms: *Prosthecosacter alatus* (Leuckart, 1848) Diesing, 1851; *Strongylus (Pharurus) alatus* (Leuckart, 1848); *Pseudalius alatus* Linstow, 1888 not *Strongylus alatus* Linstow, 1879; *Stenurus (?) alatus* (Leuckart, 1848) Baylis et Daubney, 1925; *Pharurus alatus*, (Leuckart, 1848) Stiles et Hassall, 1905 in Dougherty, 1943

Host: Monodon monoceros L, - narwhal (unicorn fish).

Location in host: Cranial cavity, Eustachian tube, veins, lungs.

Geographic distribution: North Atlantic (coast of Greenland).

Description of species (after Linstow, 1888). The body is elongated, narrower toward the rear than forward, of brown color. The anterior end is provided with a widened oral cavity on whose base a small papilla is sitting laterad from each side. A crosswise striation of the cuticle is not noticed. The musculature is strong, of the holomyerial type.

Male. The body length is 16 mm with a 0.4 mm width. Toward the rear end, the body is considerably tapered. The esophagus is short. Its length is 1/25.5 of the body length. There is a bursa which is supported by ribs. The edges of the bursa are turned. Two ventral ribs are located in front of the cloaca. Each comparatively powerful lateral rib bears three finger-shaped papillae. The dorsal rib has two papillae. The length of the spicules is 0.84 mm.

Female. The body length is 16.5 mm; its width is 0.48 mm. The esophagus is 1.27.6 of the body length. Two

p. 307 round processes surround the anus. In front of these processes there is an oval border of cuticule in whose center the vagina opens as a transverse cleft. The vagina and two uteri are filled with larvae whose length is 0.36 mm and their width is 0.013. Viviparous.

Literature: Skryabin, Shikhobalova, Schulz, Popova, Boyev, Delamure, 1952, p. 775; Leuckart, 1848, p. 26; Diesing, 1851, p. 324, 325; Molin, 1861, p. 178; Linstow, 1888d, p. 15—17; Baylis and Daubney, 1925, p. 208; Freund, 1933, p. 45; Baylis, 1932, p. 411; Dougherty, 1943, p. 20.

Subfamily Skrjabingylinae (Skrjabin, 1933).

Table

for determination of the genera of the subfamily Skrjabingylinae.

1 (2). Each separate lateral lobe of the bursa is provided with five to six undeveloped ribs. The vulva opens somewhat posteriorly to the middle of the body. Parasites of the frontal sinuses of carnivorous (land) mammals ... Skrjabingylus (Petrow, 1927).

2 (1). Each separate lateral lobe of the bursa is provided with three undeveloped ribs. The vulva opens preanally. Parasites of the lungs of dolphins, ... Skrjabinalius (Delamure, 1942).

GENUS Skrjabingylus (Petrow, 1927).

Synonyms: Filaria no Leuckart, 1842; Spirotera no Lecukart, 1842; Filaroides no Weyenberg, 1868.

At the present time this genus unites three species which are not parasitizing in marine mammals, but these species are relatives of the helminths which are parasitic in the lungs of dolphins.

1. Skrjabingylus nasicola (Leuckart, 1842; Petrow, 1927).

Synonyms: *Spiroptera nasicola* Leuckart, 1842; *Filaria nasicola* Leuckart, 1842; *Filaroides mustelarum* Weyenberg, 1868; *Filaria mustelarum* Stossich, 1893

Definitive hosts: Mustela(M.) erminea L. - ermine weasel; M. (M.) nivalis L. - weasel; M (M.) sibirica Pall. Siberian mink; M. (Putorius) putorius L. - polecat; Lutra lutra L. - otter; Lutreola lutreola L. - European mink.

Intermediate host: Land mollusks.

Location in host: Frontal sinus.

Geographic distribution: Eurasia, in the USSR, Siberia, Kazakhstan, the oblasts of Moscow, Arkhangelsk, Sverdlovsk.

Literature: Petrov, 1927, p. 138 to 149; 1928, p. 259; Petrov, 1937, p. 31 to 36; Petrov and Gagarin, 1937, p. 291 to 295; Petrov, 1941; Petrov, 1948, p. 62 to 63; Petrov, 1950, p. 61 to 67; Skryabin, Shikhobalova, Schulz, Popova, Boyev, Delamure, 1952, p. 776 to 780; Leuckart, 1842, p. 43.

2. Skrjabingylus shitwoodorum (Hill, 1939).

Definitive hosts: Mephitis mesomelas, M. occidentalis, Spilogale interrupta, S. gracilis, - skunks.

Intermediate host: Limax maximus, L. cinereus, L. flavus, L. niger, Agrilimax agrestis, Limax sp. - terrestrial mollusks.

Location in host: Frontal sinuses.

Geographic distribution: North America.

Literature: Hill, 1939, p. 475 to 478; Dikmans and Goldberg, 1949, p. 9 to 11.

p. 308 3. Skrjabingylus petrowi (Bagaenow in Petrow, 1941).

Definitive host: Martes (M.) zibellina L. - sable; M. (M.) foina Erxleben - the stone martin; experimentally, the polecat.

Intermediate host: Succinea putris - terrestrial mollusk.

Location in host: Frontal sinuses.

Geographic distribution: USSR (Moscow Oblast).

Literature: Petrov, 1941; Petrov and Gagarin, 1938, p. 33 to 45; Petrov and Gagarin, 1938a, p. 127 to 133; Skryabin, Shikhobalova, Schulz, Popova, Boyev, Delamure, 1952, p. 780.

GENUS Skrjabinalius (Delamure, 1942)[1].

Skrjabinalius cryptocephalus (Delamure, 1942)[1].

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1. See Skryabin, 1942.

Host: Delphinus delphis ponticus Barabasch, The Black Sea white-sided dolphins.

Location in host: Lungs.

Geographic distribution: USSR ... Black Sea.

Material: Hundreds of males and females from Black Sea white-sided dolphins autopsied in the period from 1939 to 1948.

Description of species (after Delamure, 1946). Nematodes of comparatively large size. The anterior end of the body is spirally intorted, sometimes with knots and always included in a piriform, frequently calicified capsule of the host's tissues. The nematode can be completely extracted only at the opening of the capsule from which a suppurative mass folows out at incision. The free middle and posterior portion of the parasite's body lies in the lumens of bronchi and bronchioli. The anterior end of the body is tapering. The mouth is without a capsule, and is surrounded with four cuticular eminences. The esophagus is cylindrical, slightly widened at its posterior end.

Male. The male reaches 67.8 to 75.0 mm in length, with a maximum width of 0.448 to 0.621 mm.

From the rear end of the body to the intrusion of the parasite in the piriform capsule it is 37.0 to 57.30 mm. The width of the body in the area of the esophageal end is 0.108 to 0.136 mm. The excretory aperture is at a distance of 0.200 to 0.235 mm from the head end. The esophagus is 0.224 to 0.352 mm in length, with a width of 0.036 to 0.048 mm. The bursa is weakly developed. It is represented by two distinctly limited lateral lobes. The length of the bursa is 0.084 to 0.116 mm, its width 0.128 to 0.152 mm. The length of the lateral lobes of the bursa is 0.076 to 0.104 mm, its width 0.040 to 0.052 mm. The cloaca is placed at a distance of 0.036 to 0.048 mm from the posterior end of the body. The bursal ribs are rudimentary. The pair of ventral ribs is represented by buds in the height of 0.012 to 0.016 mm with a width of the base at 0.024 to 0.036 mm, with one papilla. The pair of lateral ribs are represented by the buds in the height of 0.016 to 0.024 mm, with a width of the base of 0.016 to 0.028 mm. Each bud of the lateral rib bears three papillae. The bud of the dorsal rib is represented by the formation of a bean-shaped form without papilla. The bursa has no dorsal lobe. There are two spicules of equal size. Each spicule is edged by two transparent wings. The proxmial ends of the spicules are spongy and thickened, while the distal ends are constricted. In the first third of the spicules there is slight widening. The
p. 310 length of the spicules is 0.721 to 0.838 mm, the maximum width 0.024 to 0.036 mm. The auxiliary organ is weakly chitinized. Its length is 0.076 to 0.112 mm, the maximum width is 0.020 to 0.028 mm.

The female reaches a length of 40.84 to 76.17 mm. From the caudal end to the site of intrusion into the

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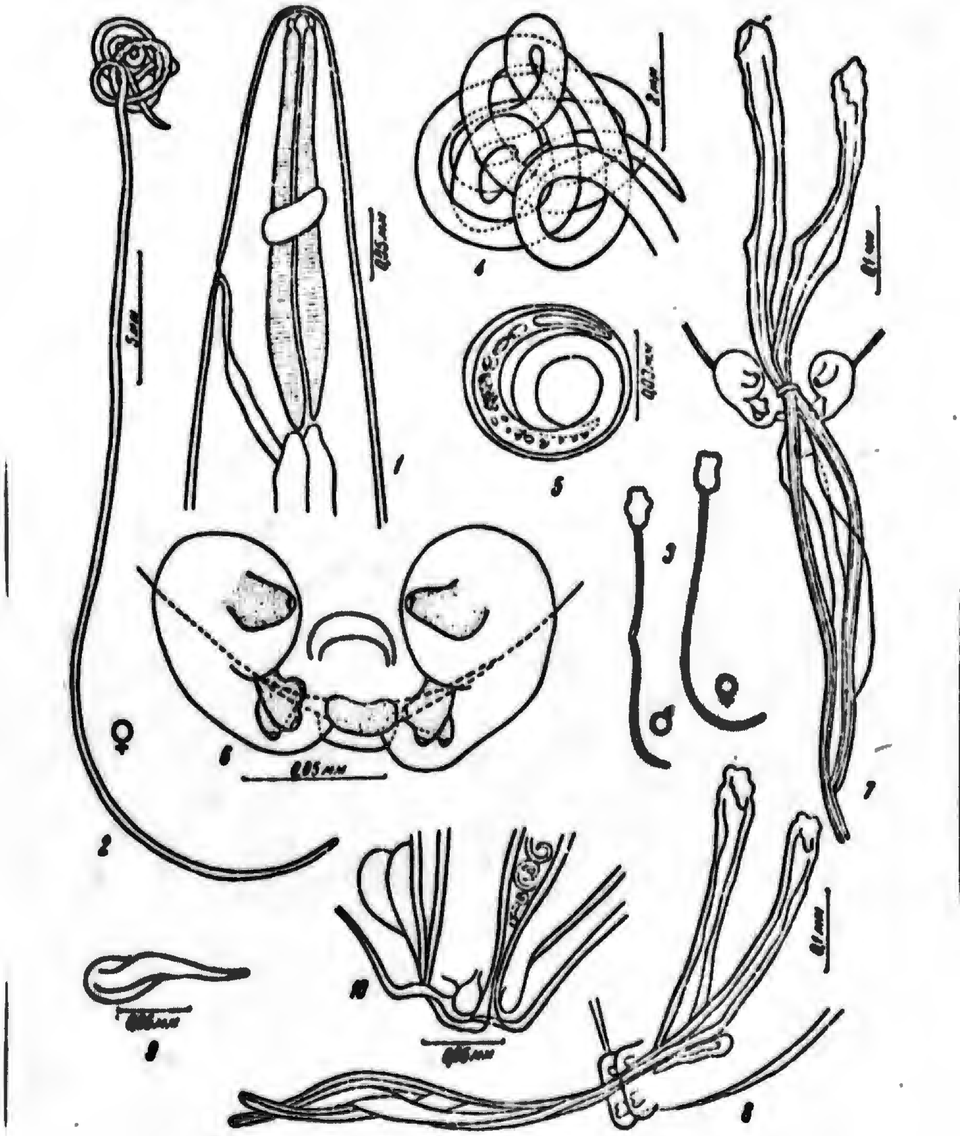

Figure 205.

Skrjabinalius cryptocephalus

(Delamure, 1942).

1. Lateral view of the anterior end of the body.
2. Overall view of the female; 3. Male and female;
4. Prepared anterior end of the body; 5. Egg;
6. Ventral view of the bursa; 7. Ventral view of the caudal end of the male; 8. Lateral view of the same; 9. Auxiliary organ; 10. Lateral view of the caudal end of the female. (After Delamure, 1946).

piriform capsule it is 33.10 to 49.90 mm. The maximum width of the body is 0.448 to 0.624 mm. The width of the body in the area of the esophageal end is 0.108 to 0.140 mm. The excretory aperture is at a length of 0.192 to 0.200 mm from the head end. The length of the esophagus is 0.248 to 0.360 mm, and its width 0.036 to 0.052 mm.

The tail of the female is blunt. The anus and the vulva are located subterminally. The vulva is surrounded by prominent lips and is located at a distance of 0.044 to 0.060 mm from the anus. A processus vulvaris is absent.

In the genital tubular organs of the female, eggs as well as larvae are visible. In the upper parts of the uteri, the eggs are at different stages of hatching. The length of the eggs is 0.044 to 0.064 mm, their width is 0.024 to 0.036 mm. The length of the eggs containing larvae is 0.076 to 0.086, their width is 0.044 to 0.056 mm. The larvae have a length of 0.201 to 0.220 mm and a width of 0.012 mm; they fill up the rear segments of the uteri and the vagina. The egg is provided with two very thin transparent shells. The inner shell is completely adjoining the egg mass, or the larva which is formed in the egg.

Viviparous.

Below are the results of a study of the structure of eggs and of the embryonal development of the S. cryptocephalus.

The fertilized eggs have a regular oval form. Their length is 0.06174 to 0.7600 mm (M = 0.07361 mm) with a width of 0.03528 to 0.05699 mm (M = 0.04294 mm). In all subsequent stages of development the oval form of the eggs is preserved until the time when the living larva which starts to develop in the egg does not begin to exercise pressure upon the delicate eggshell in the direction of its short axis. The egg of the S. Cryptocephalus is provided with two very fine, smooth shells (membranes). The externalmembrane is 0.006 mm thick, stands away far from the mass of the egg,and is usually clearly perceptible. The internal membrane is poorly distinguishable, but it clearly stands out if the egg is stained with a weak solution of methlene blue. The thickness of the internal membrane cannot be measured. It is attached to the mass of the egg almost everywhere, and is a thin and, evidently very elastic (it is somewhat stretched out as the larva is growing).

The first stages of hatching are similar to those in other viviparous pseudaliids (e.g., in the Stenurus minor). The egg undergoes a complete, even cleavage. The first furrow is put up perpendicularly to the long axis of the egg. The second leads first to the formation of the stage of three blastomeres, and then to the stage of four blastomeres. The stage of four blastomeres forms a rhombus figure.

The subsequent stages of cleavage and the form-shaping lead to the development of the one layer and two layer embryo. It should be mentioned that by this time the embryo is already considerably stretched along the egg's length, and its surface consists of fine ectodermal cells. Further development leads to the formation of the tadpole shaped larva in whose body, oval inclusions are disseminated here and there. Approximately at the end of this stage, the embryo begins to show a slight mobility.

Later, the formation of larvae follows. The larva, according to its growth, first makes one, and then a second coil within the egg membrane.

The formed larvae break through the thin membrane of the egg and enter the terminal segments of the uterus. At this stage of development the larvae have a primordial esophagus and intestine.

The birth of the larvae (as we successfully observed
p. 313 in freshly caught females, placed in warm sea water) goes on with rhythmic contraction of the posterior segments of the uteri and of the vaginal sphincter. The larvae are pushed out of the female's body as if from a syringe.

The body length of these larvae is 0.18522 to 0.22050 mm (M = 0.20910 mm), with a maximum width of 0.00882 to 0.01200 mm (M = 0.01151 mm). The length of the esophagus is 0.01764 to 0.02400 mm (M = 0.01815 mm), with the maximum width of 0.00200 to 0.00214 mm (M = 0.00202 mm). The anterior end of the larva's body is evenly constricted. The larva does not have any such auxiliary organs as a stylet, thorns and the like. The posterior end of the body of larvae is cone shaped. The length of this segment is 0.00588 mm. It should be also remarked that at studying the various developmental stages of eggs of the S. cryptocephalus our attention was repeatedly attracted to the small oval corpuscles which are always found in the dividing egg between its external and internal membranes. These corpuscles are very intensively stained with hematoxylin and, most probably, they should be considered as products of the reductional division (meiosis) of the egg cell. As it is known, in the nematodes the fertilization is preceded by maturation (Ivanov, 1937, p. 163). The stages of the egg's maturation coincide with the formation of the membranes. Thus, the directing corpuscles remain inside the egg membrane, until the burst of the latter when the larva escapes from them.

Literature: Skryabin, 1941, p. 336; Skryabin, 1942, p. 41; Delamure, 1945, p. 102 to 104; Delamure, 1946, p. 105 to 107; Delamure, 1950, p. 238; Delamure, 1951a, p. 100 to 102; Skryabin, Shikhobalova, Schulz, Popova, Boyev, Delamure, 1952, p. 780 to 783; Dougherty, 1943, p. 21; Dougherty, 1944, p. 92, 94.

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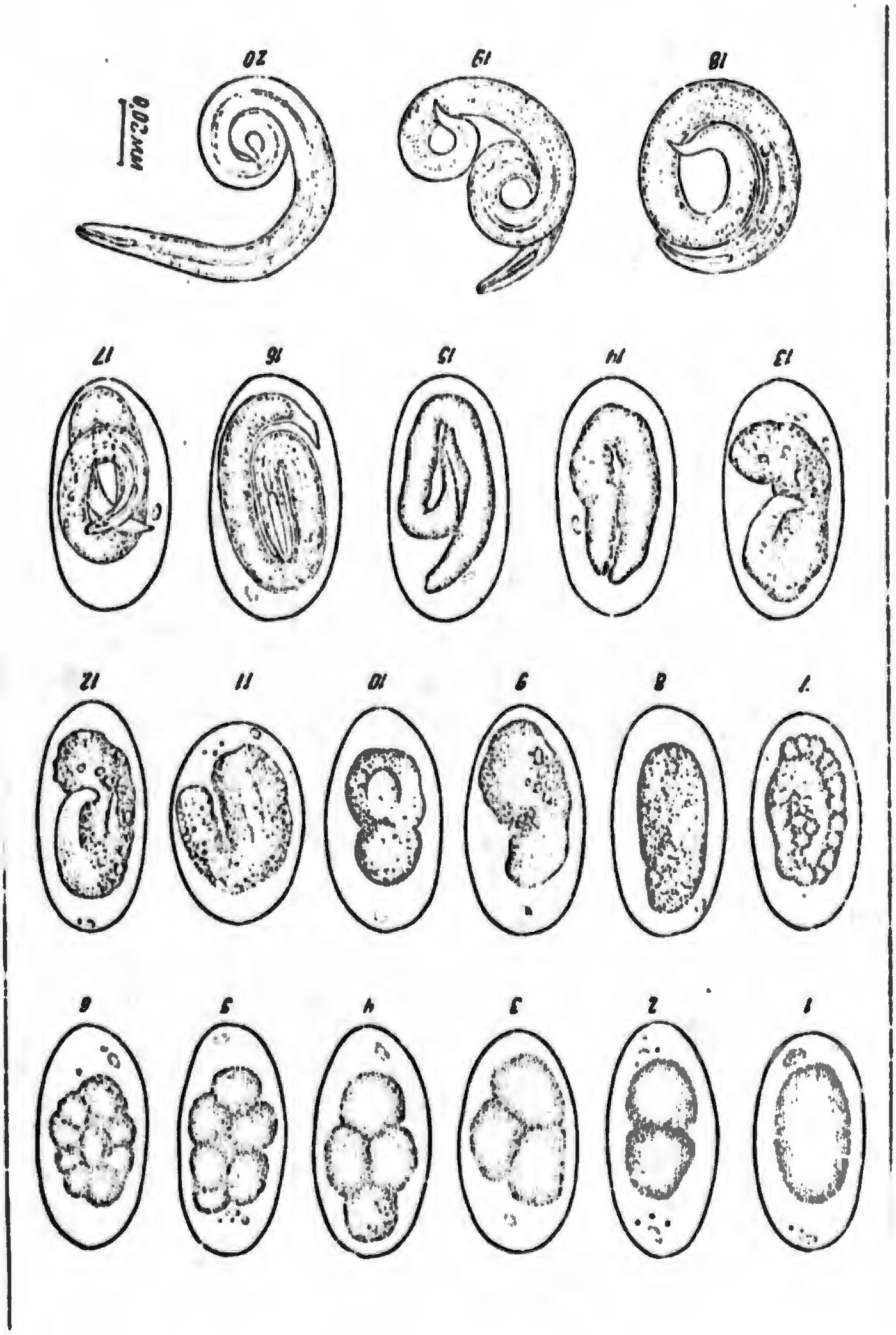

Figure 206.

Skrjabinalius cryptocephalus

(Delamure, 1942).

Embryonal stages of development (original).

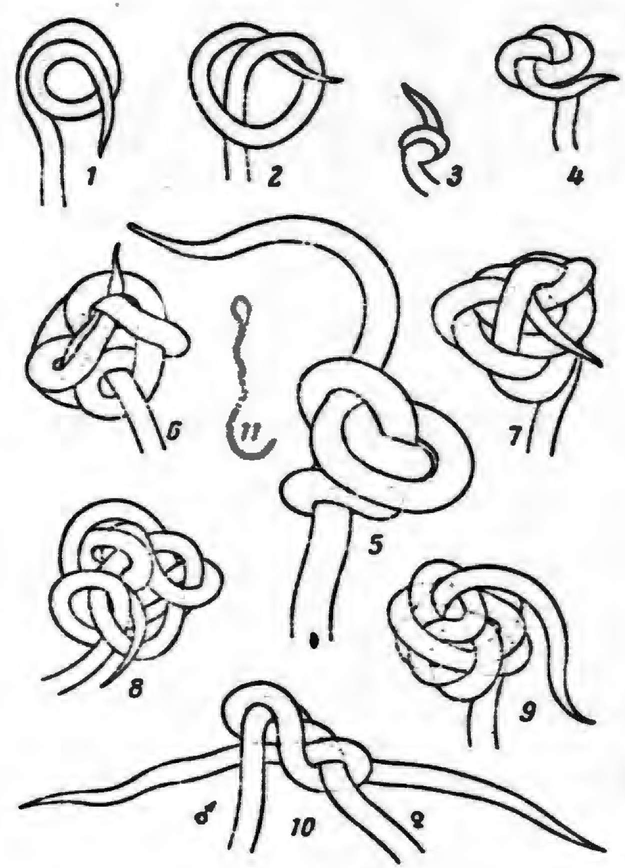

Figure 207.
Skrjabinalius cryptocephalus (Delamure, 1942). Anterior end of the body extracted from the piriform capsules: 1,2,3,4. Simple knots of young pseudaliids; 5,6,7,8,9. Complex knots of sexually mature pseudaliids; 10. Male and female extracted from a single capsule (Delamure, 1951).

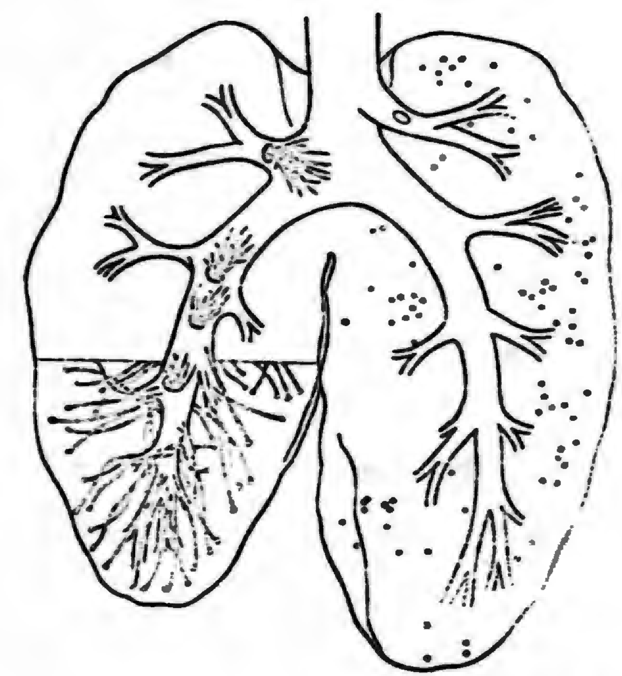

Figure 208.
Schematic drawing of the lungs of the white-sided dolphin invaded by the pseudaliid Skrjabinalius cryptocephalus; in the left lung the sites of location of the head end of the parasites are shown (after Delamure, 1951).

Subfamily Sobolevingylinae (Romanov, 1952).

This subfamily consists of a single genus whose unique species, parasitic in sable, is related to helminths of cetaceans.

GENUS Sobolevingylus (Romanov, 1952).

Sobolevingylus petrowi (Romanov, 1952).

Host: Martes (M.) zibellina L. - the sable.

Location in hosts: Lungs.

Geographic distribution: USSR (Krasnoyarsk krai).

Literature: Romanov, 1952, p. 323 to 330; Skryabin, Shikhovalova, Schulz, Popova, Boyev, Delamure, 1952, p. 782 to 783.

Origins Of The Adaptations Of Pseudaliids To The Parasitic Life In The Organs Of Respiration Of Cetaceans.

While studying the fauna of parasitic worms of the dolphins in the Baltic Sea and the Sea of Azov, we gathered some material for the knowledge of the origin of adaptations in pseudaliids which parasitize in their respiratory organs. The present section is devoted to this problem.

Repeated observations under expeditional conditions as well as laboratory examinations convinced us that the morphological, physiological and biological characteristics
p. 314 of helminths which are parasites in the respiratory organs of dolphins have developed under the influence of their medium of habitation which for them is not only the organism of the host, but also the conditions under which the host is living.

As it is known, dolphins are secondary aquatic animals. In connection with their transition from the terrestrial to the aquatic form of life, they underwent considerable changes. Life in the watery element was

was reflected in a radical manner not only on the morphology but also the physiology of dolphins. It is well known that even the finest details of the biology of these splendid animalsshow the aquatic form of their life. In our task, of course, a description of the characteristics of dolphins which developed under the effect of the environment is not included. On this and the adjacent problems, the zoological literature is diverse and rich (Barabasch-Nikiforov, 1935, 1940; Kleinenberg, 1936, 1938, 1940, 1947, 1952; Kravchenko, 1932, Kreps, 1939; Narkhov, 1938; Sleptsov, 1940; Tomilin, 1938, 1946a, 1947b; Tsalkin, 1938, 1940, and many others).

In this section we touch only upon such peculiar characteristics of respiration in the dolphins as secondary aquatic animals under whose effect adaptations of their pulmonary parasites from the family Pseudaliidae have developed.

It is known, that in the parasitic worms which live in the organs directly communicating with the external environment, in the processes of natural selection powerful organs of fixation develop. These organs provide a chance for the parasite to keep itself at the place where it usually parasitizes. It is also known that in the various helminth groups there are different modes of fixation. They correspond with the nature of the conditions under which one or the other species is living.

In this connection, the adaptation of nematodes which are parasites in the respiratory organs of small cetaceans presents great interest.

The cetaceans, as it is known, must from time to time, float on the surface in order to obtain fresh air needed for respiration. In this respect, D. delphis ponticus which lives in the Black Sea and Ph. phocaena, the dolphin of the Azov, float every 5 minutes on the surface, while the T. tursio floats every 15 minutes (Kreps, 1939). We remark that when they float on the surface dolphins (just as a few other cetaceans) make such a sharp expiration that it is heard at a considerable distance in a calm weather.

For the helminths which parasitize in their respiratory organs the periodical sharp expiration creates a constantly existing danger of being ejected with the jet of the vehemently discharged air out of the trachea and bronchi of the host's lung. This possibility is actually realized in regard to "phylogenetically young" pseudalliids, the Stenurus minor and the S. ovatus. In case of a sharp expiration of the dolphin, the mentioned pseudaliids are often pushed out with the jet into the oral or nasal cavity, and then they abandon the host's body. We established this repeatedly in those cases when dolphin hunters of the Yalta Marine Fish Farm, at our request, brought in live dolphins of the Ph. relicta species which is called "puff up" for its noisy, sharp expiration. One day we observed a similar phenomenon in live T. tursio dolphins which were brought in. It follows that the conditions are peculiar for a parasitic life in the repiratory organs of cetaceans.. These conditions differ considerably from the conditions for parasitic life in the lungs of terrestrial mammals. By studying the mentioned anatomical and physiological characteristics of respiration in the dolphins, we can understand the origin and the significance of those wonderful adaptations to remaining in the lungs which we find in "phylogenetically old" pseudaliids, in the para-
p. 315 sites of the respiratory organs of dolphins. In studying the helminths dolphins of the Black Sea and Sea of Azov, we detected the following species of pseudaliids as can be seen from the above outline:

⌈1) *Skrjabinalius cryptocephalus* Delamuro, 1942;
2) *Halocercus taurica* Delamuro, 1942;
3) *Halocercus ponticus* Delamuro, 1946;
4) *Halocercus kleinenbergi* Delamuro, 1951;
5) *Stenurus minor* (Kühn, 1829) Baylis et Daubney, 1925;
6) *Stenurus ovatus* Linstow, 1910.⌋

Let us examine the adaptations of these pseudaliids to the peculiar conditions of parasitic life in the respiratory organs of dolphins.

Adaptation of the S. cryptocephalus

In S. cryptocephalus (parasite of the respiratory organ of D. delphis ponticus) the adaptations are excellently manifested which assure the impossibility to be expelled from the lungs of the host as a result of a sharp expiration. The head end of the body of this pseudaliid is spirally coiled up, and very frequently it is tied in many complicated knots. We often had the opportunity to observe in vitro, how the twisted worm, after looping the loop from its own body, "ran through" the head end in this loop, thereby forming a knot. With the aging of the parasite, such a complicated knot appears, the body flexures in this knot are so irreversibly fixed that it cannot be unwound (figure 207). However, the most anterior portion of the pseudaliid's body (for a 10 to 15 mm distance from the terminally located mouth) remains free from knots for the whole life and is able to make simple movements. The knotted anterior portion of the body of S. cryptocephalus is buried in the lung tissue in a thick, eventually calcified piriform capsule. The remaining part of the body lies free in the lumina of bronchioli, bronchi, or trachea (figures 208, 209). When this part of the body is pulled for the purpose of extraction of the parasite, it breaks off, since the knotted anterior end cannot pass through the small aperture of the piriform capsule. The latter, by the way, is formed from tissues of the host dolphin, and evidently is the result of the host's reaction to the parasite in its body.

From these it follows that throughout their whole life the pseudaliid S. cryptocephalus specimens remain fastened to a definite segment of the lung, and consequently, they cannot creep over into the animal's other segments.

The described method of localization does not interfere at all with the meeting of the sexes. Nematodes whose anterior ends are localized in various segments of the lung have a full facility of coitus, for the posterior ends of their bodies (where the sexual apertures open in the males and females) are situated in the lumina of the respiratory pipes. Now, here are born the larvae.

The sharp expiration of the dolphin pushes the mucus into the upper sector of the respiratory pathways with a mixture of pus which is formed as a result of pathological anatomical changes in the lungs caused by the parasitizing of the S. cryptocephalus in them. Together with these masses, larvae are pushed into the dolphin's mouth, and they are then washed away with water.

Adaptation of the Halocercus taurica.

In case of the H. taurica, the parasite of the respiratory organs of the Ph. phocaena relicta dolphins, the adaptations for remaining in the lungs are somewhat different from those which we saw in the representative of the genus Skrjabinalius.

p. 317 The anterior and middle portion of the body of H. taurica is deeply intruded into the pulmonary parenchyma, but they do not have knots,and are not enclosed in a capsule. The parasite makes sort of stitches through the lung parenchyma in different directions.

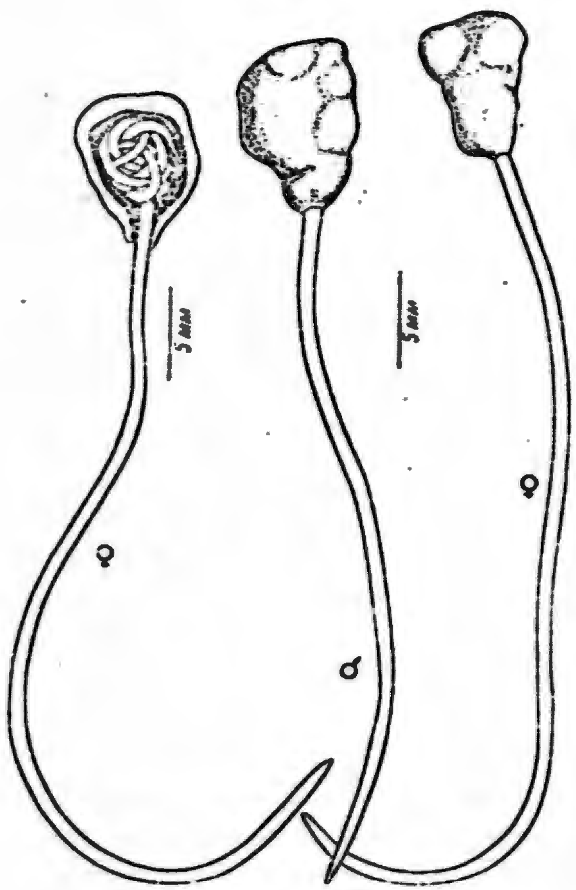

Figure 209.
Skrjabinalius cryptocephalus
(Delamure, 1942).
Overall view of nematodes whose anterior ends are enclosed in piriform capsules (after Delamure, 1951).

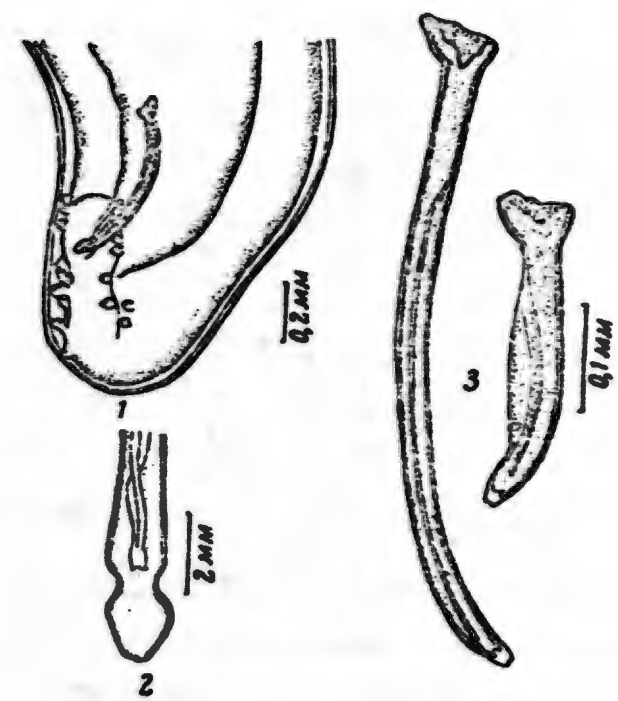

Figure 210.
Crassicauda crassicauda
(Creplin, 1829; Leiper et Atkinson, 1914).
1. Caudal end of the male; 2.Caudal end of the female; 3. Spicules (after Skryabin and Andreyev, 1934).

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When the trachea and bronchi are opened, the posterior segment of the body of this helminth usually cannot be found. Only when the small bronchioli are dissected, does the rear segment of the body become noticeable.

Coitus of the sexes is also assured. The sharp expiration of the host dolphin cannot push out this parasite from the finest passages and, of course, not from the lung tissue.

Adaptation of Halocercus ponticus.

The pseudaliid H. ponticus also parasitizes in the lungs of Ph. relicta. In this parasite the peculiarities of fixation are expressed to a still greater degree than those which we found in the H. taurica. The pseudaliids are completely embedded in the parenchyme of the lungs where, having coiled up into tubercles of some specimens, they live surrounded by a fine elastic capsule from the host's tissues, which communicates with alveoli. When the affected lungs are inspected from the surface, usually the multiple nidules of invasion can be well perceived. At the opening of these small foci, a tubercle of nematodes can be extracted which consists of 1 to 2 males and 2 to 3 females. The tubercle is somewhat isolated from the respiratory passages, and the exit of the pseudaliids into these is impossible.

The coitus of the sexes is not hindered at all. The larvae which are born in a fine capsule evidently pass into the alveoli, they move up to the upper segments of the respiratory pathways, and in the end they also drop into the water.

Adaptation of Halocercus kleinenbergi

This pseudaliid species is parasitic in the lungs of D. delphis ponticus. The whole body of the worm is (with the exception of the caudal end) embedded in the parenchyme of the dolphin's lung. In difference from other species, the pseudaliid Halocercus kleinenbergi retains itself in the lung tissue, by forming numerous loops with flexures of its own body. At some places, the body of the worm resembles a stretched-out and flattened spiral on which are widely spaced knots. The extraction of such a parasite by pulling on the posterior end of the body (which is turned into the lumen of a small bronchiolus) is absolutely impossible.

These worms, being gigantic in size for a pseudaliid, are met by other individuals of the same species in the lung tissue which were embedded from some other side of the lung. After meeting,the helminths braid around each other and sometimes knot up, and therewith they are still more solidly kept in the lung. If the tissue could be removed from the lung, so that the worms would remain untouched, then the mutual arrangement of them would resemble to a pulled out, irregular many-celled network.

As in the preceding cases, the coitus of the sexes is assured. An interesting characteristic of this species should be the unquestionable fact that the anterior end is embedded in a small lacuna, or a blood vessel, which in diameter coincides with the diameter of the parasite's body, and the parasite is dringking the blood of the host. The middle portion of the parasite's body, as it was indicated above, lies in the lung parenchyma, while the posterior brief segment is in the lumen of a fine respiratory tubule. This characteristic of localization is interesting in many respects. Having migrated from the blood carrying system into the respiratory organs, the pseudaliid H. kleinenbergi had not lost its association with the blood. This fact is of extreme interest, since it is a new, beautiful
p. 318 documentation which corroborates the theory of Academician K. N. Skryabin (1941) about the origin of respiratory-organ parasites (pneumohelminths) from parasites of the circulatory system (angiohelminths).

The following conclusions can be drawn from this.

1. The conditions of parasitic life in the respiratory organs of cetaceans, as secondary aquatic animals, considerably differ from the condition of parasitizing in the respiratory organs of terrestrial mammals.

2. The periodical sharp expiration, peculiar to cetaceans, created for the helminths which are parasitic in their respiratory organs a constantly existing possibility of being thrown out with the jet of vehemently expired air out of the trachea and bronchi of the lungs of the host. In correspondence with this morphological and physiological characteristic of the respiration of cetaceans, in the pseudaliids which are parasitic in the lungs of dolphins, useful adaptations appeared for fixation.

3. The formation of anatomic and physiological adaptations in the pseudaliids to the peculiar conditions of existence in the respiratory organs of dolphins went on evidently in correspondence with those anatomical and physiological changes of respiration which the remote ancestors of the now living small toothed cetaceans underwent in connection with their transition from the terrestrial to the aquatic form of life.

Order SPIRURIDA (Chitwood, 1933).
Family Crassicaudidae (Skrjabin and Andreeva, 1934).
Subfamily Crassicaudinae (Yorke and Maplestone, 1926).

At the present time, the subfamily Crassicaudinae unites two genera, for whose determination the following table is given:

Table
of determination of the genera of
the Subfamily Crassicaudinae

1 (2). Caudal wings absent ... Crassicauda (Leiper and Atkinson, 1914).

2 (1). Caudal wings present ... Placentonema (Gubanov, 1951).

GENUS Crassicauda (Leiper and Atkinson, 1914).

Table

of species determination of the Genus Crassicauda.[1]

1 (4). Spicules present.

2 (3). Spicules very uneven: the larger ... 0.620 mm, the smaller ... 0.300 mm. The cloaca is 0.5 mm from the caudal end, while the vulva is 1.3 to 1.5 mm. The eggs are 0.030 x 0.050 mm in size. Parasites of baleen cetaceans ... Crassicauda crassicauda (Creplin, 1829).

3 (2). The spicules are almost even. 0.124 to 0.135 mm. The cloaca is at a distance of 1.078 mm from the caudal end, while the vulva is at a distance of 4.30 mm. The eggs is 0.030 x 0.054 mm in size. Parasites of belugas and bottle-nose whales ... Crassicauda giliakiana (Skrjabin and Andreeva, 1934).

4 (1). Spicules are absent.

5 (8). Parasites of teethed cetaceans.

6 (7). The cloaca is located at a distance of 0.4 mm from the caudal end. The egg is 0.035 x 0.060 mm in size. Parasites of bottle-nose whales ... Crassicauda bennetti (Spaul, 1926).

p. 319 7 (6). The cloaca is located at a distance of 0.7 to 0.8 mm from the caudal end. The egg is 0.029 x 0.040 mm in size. Parasites of gray dolphins ... Crassicauda grampicola (Johnston and Mawson, 1941).

8 (5). Parasites of bearded cetaceans. The cloaca is located at a distance of 5 to 7 mm ... Crassicauda boopis (Baylis, 1920).

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1. The species C. magna was not put into the table since we did not find its description.

Crassicauda crassicauda (Creplin, 1829; Leiper and Atkinson, 1914).
(Figure 210).

Hosts: Balaena mysticetus L. - the Greenland whale; Balaenoptera musculus L. - blue whale; B. borealis Less. - the sei whale; B. acutorostrata Lacep. (= Balaena rostrata)- small rorqual; B. physalus L. - the fin whale; Mageptera nodosa Boon. (= M. longimana) - the humpback whale; ?Ziphius cavirostris Cuv. - the ziphioid whale; Tursiops tursio Fabric. (= T. truncatus) - the aphaline.

Location in host: Urogenital system.

Geographic distribution: Atlantic Ocean (north and south hemispheres).

Description of species (after Skryabin and Andreyeva, 1934).

Male. The larger spicule reaches a length of 0.558 mm and a width of 0.037 mm while the smaller is 0.273 mm long, and 0.048 mm wide. The opening of the cloaca is located at a distance of 0.052 mm from the caudal end. The width of the tail is 0.605 mm at the region of the cloaca.

Female. The vagina is located at a distance of 2.016 mm from the caudal end. The tail before the narrowing is 1.17 mm in width, while at the site of narrowing it is 0.702 mm.

Literature: Skryabin and Andreyeva, 1934, p. 24; Skryabin, Shikhobalova, Sobolyev, 1949, p. 238;

Creplin, 1829, p. 871, 874; Dujardin, 1845, p. 50; Diesing, 1851, p. 264; Molin, 1858, p. 374; Beneden, 1870, p. 356; Cobbold, 1879, p. 4[illegible]; Jägerskiöld, 1891, p. 129; Leiper et Aktinson, 1914, p. 223; Baylis, 1916б, p. 144; Hamilton, 1916, p. 132; Baylis, 1920a, p. 418-419; Baylis, 1922a, p. 9; Baylis, 1928a, p. 320; Baylis, 1929, p. 550; Joyeux et Baer, 1931, p. 198; Baylis, [illegible], p. 405; Freund, 1932, p. 29, 33 etc.

Crassicauda bennetti Spaul, 1926

Host: Hyperoodon sp. (probably, H. planifrons) - the bottle-nose whale.

Location: Kidneys.

Geographic distribution: Unknown.

We do not give a description since we do not have the corresponding literature.

Literature: Spaul, 1926, p. 581.

Crassicauda boopis (Baylis, 1920).

Host: Megaptera nodosa Bonn. - the humpback whale; Balaenoptera physalus L. - the fin whale.

Location in host: Urogenital system.

Geographic distribution: Atlantic Ocean, the Sea of Okhotsk (the Kuril Islands belt).

Description of species (after Gubanov, 1952, who examined a specimen of fin whale caught in the Sea of
p. 320 Okhotsk)[1]. Large nematodes with a cylindrical body narrowed at the ends. The cuticle is thin, transparent, slightly striated crosswise. The head end bears two lips with lateral protrusions, and two large lateral and four submental papillae. The pharynx is cylindrical. The esophagus is divided into muscular and glandular sectors. The females and males are described according to large fragments.

1. Published the first time.

Fragment of the male's body. This is 230 to 280 mm long, and 1.5 to 2.0 mm thick. The pharynx is 0.08 mm long, and 0.06 mm wide. The esophagus is muscular, long, and narrow, 1.5 mm in length and 0.1 mm in width. The neural ring is located at a distance of 0.34 mm from the
p. 321 anterior end. The tail is constricted laterally, plicated, spirally convoluted. The cloaca stands off from the tip of the tail at a distance of 1.8 mm. From the cloaca forward, a groove stretches out. There are no spicules. There are five pairs of postanal, one pair of anal and four pairs of preanal papillae.

p. 320

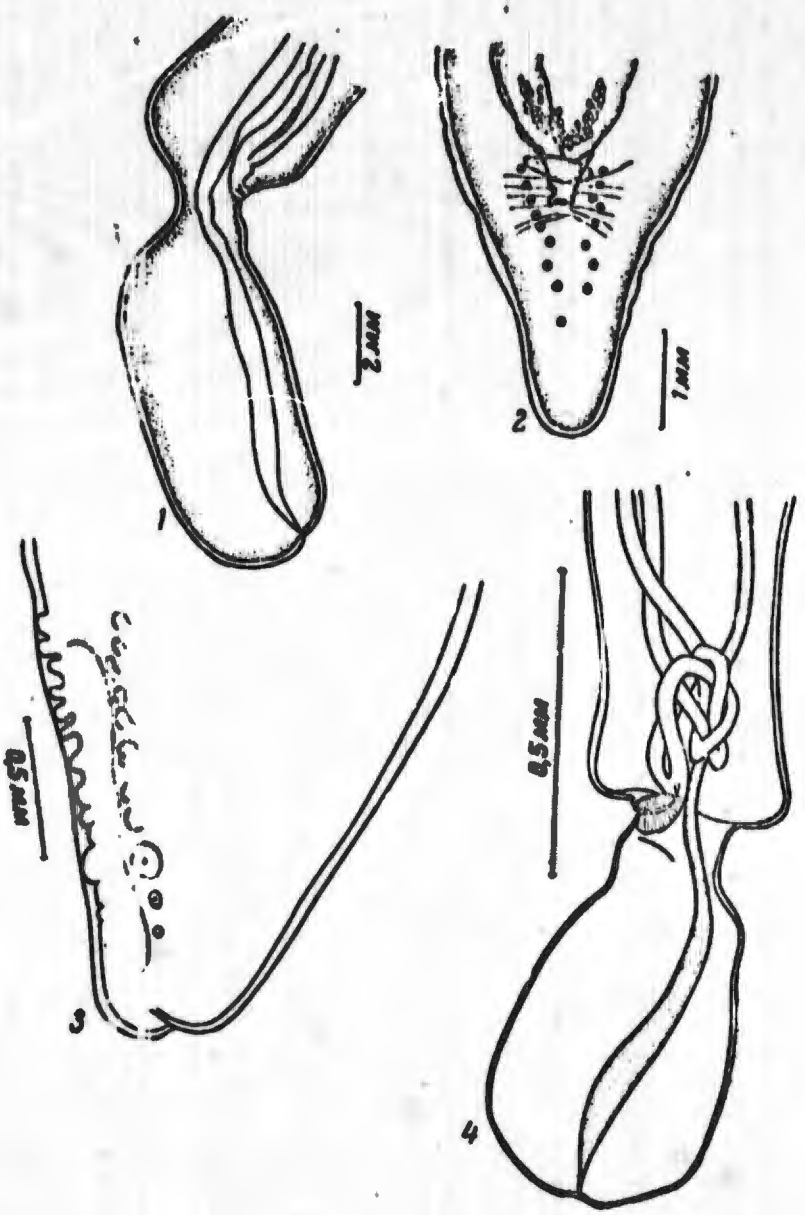

Figure 211.

Crassicauda boopis (Baylis, 1920).

1. Caudal end of the female; 2. Ventral view of the caudal end of the male; 3. The same in latero-ventral view; 4. Caudal end of the female (after Skryabin and Andreyeva, 1934 (1, 2), after Baylis, 1920 (3, 4).

p. 321 Fragment of the female's body. It is 390 to 520 mm in length, with a width of 2.5 to 3.2 mm. The caudal conclike appendix is 3.4 to 4.0 mm in length, and 4.0 mm wide. The constriction which unites the cone-like appendix with the body is 2 mm long, and 2.4 mm wide. The opening of the vulva is located in the anterior part of the constriction, and it stands away from the tail end at a distance of 5.8 mm. The egg is oval, with a thick membrane; the length of the egg is 0.048 mm, while its width is 0.028 mm. The mature ovum contains a larva.

Literature: Skryabin, Andreyeva, 1934, p. 24; Gubanov, 1952; Skryabin, Shikhobalova, Sobolyev, 1949, p. 238; Baylis, 1920, p. 410, 417; Freund, 1932, p. 32; Baylis, 1932, p. 404 et al.

Crassicauda giliakiana (Skrjabin et Andreeva, 1934).

Host: Delphinapterus leucas Pall. - the beluga; Hyperoodon ampullatus Forst. - the high-brow bottle-nose whale.

Location in host: Kidneys and ureters.

Geographic distribution: The Sea of Okhotsk (the estuary of the Amur River, the Kuril Islands).

Description of species (after Skryabin and Andreyeva, 1934). The body of the male and female is rolled up into a spiral, especially in the anterior part. The anterior end is blunt, and rounded. The oral aperture is located terminally, limited by two laterally protruding lips. There are thick anterior papillae from which are two lateral and four submedian. The oral aperture leads into an elongated pharynx which is 0.162 mm long and 0.055 mm wide (dorso-ventral diameter). From the lateral side, the pharynx is a cylindrical organ with thick parallel central and dorsal walls. From the dorso-ventral side the pharynx appears considerably narrowed, and at the level of the anterior papillae it forms a spindle-shaped widening. On cross section the pahrynx is oval, at which the larger axis is located in a dorso-ventral direction.

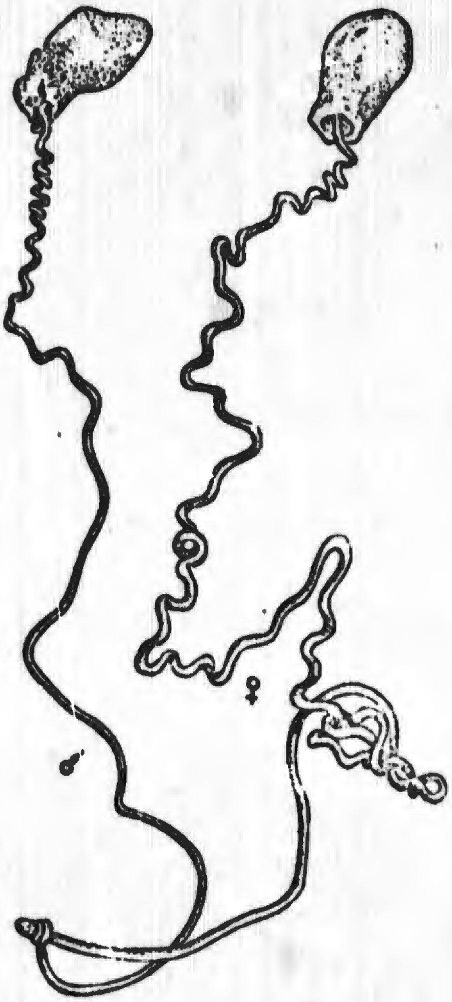

Figure 212.

Crassicauda giliakiana

(Skrjabin and Andreeva, 1934).

Male and female whose anterior end of the body is embedded in a renal lobulus of the beluga. (Considerably reduced, after Skrjabin and Andreyeva, 1934).

p. 322 Male. In the stretch out position it reaches 355 mm in length with a maximum diameter of 1.75 mm. The aperture

of the cloaca is located at a distance of 1.25 to 1.68 mm from the tail end. The body width in the area of the cloaca reaches 1.10 to 1.25 mm. The posterior end is blunt and rounded. There are four pairs of preanel papillae located more or less symmetrically. The first pair is located at the level of the cloacal opening. The second pair is just in front of these, while the remaining two pairs are arranged so that the lines which connect the second, third and fourth pairs of papillae form an angle of 45° to 60° with the longitudinal axis. The postanal papillae are located very irregularly. On an accurately studied specimen, it was possible to establish exactly the presence of five papillae on the right side, while on the left side there were four. All papillae, both preanal and postanal, are stalk-like, and they sit on a thickened mushroom-like peduncle. On the tip of the caudal end there is a group of papillae on thin peduncles, but structurally perceptibly different from the mentioned postanal papillae. We suppose that the papillae of this group, which we call "caudal papillae," are analogous to those which we frequently find in males of the genus
p. 323 Habronema and in some Spirurata. The anterior pair of the caudal group of papillae evidently correspond to the caudal glands. There are two somewhat smallish spicules that become perceptible only after a long treatment with lactic acid. The spicules are almost equal in size.

The right spicule reaches 0.135 mm in length and 0.035 mm in width, while the left spicule is 0.124 mm long and 0.025 mm wide. The spicules are hollow; here, their proximal ends are widened into funnel shape of granular structure, while the distal ends do not have openings and they are blunt and rounded. There is no auxiliary organ in all cases.

Female. The total length of the studied specimen is 610 mm. The maximum width is 4 mm. In case of an adult

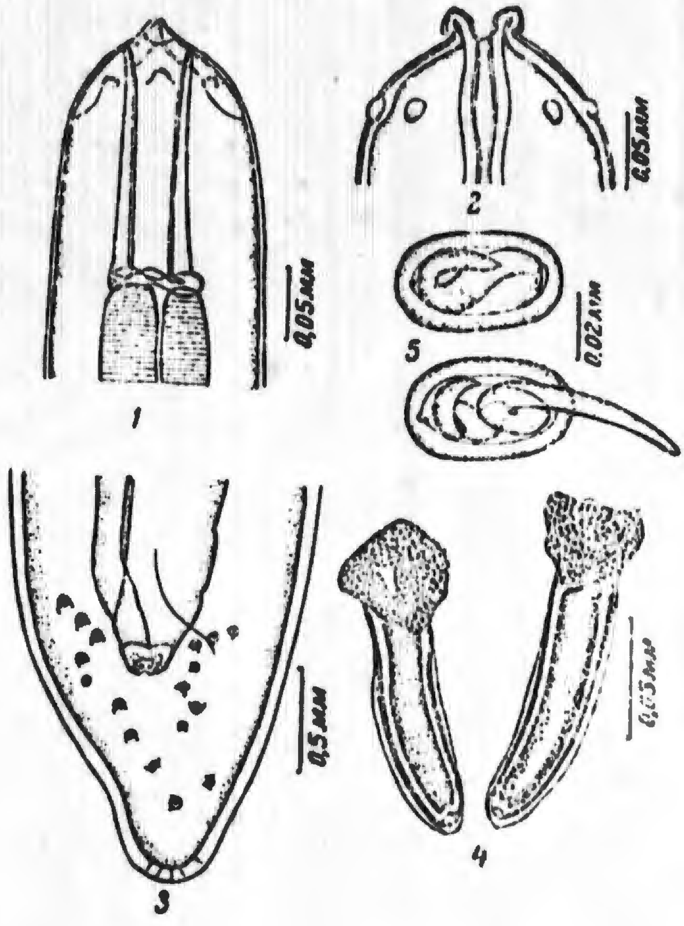

Figure 213.

Crassicauda giliakiana

(Skrjabin and Andreeva, 1934).

1. Lateral view of the anterior end of the body; 2. Ventral view of the posterior end; 3. Ventral view of the male's caudal end; 4. Spicules; 5. Eggs with larva. (After Skryabin and Andreyeva, 1934).

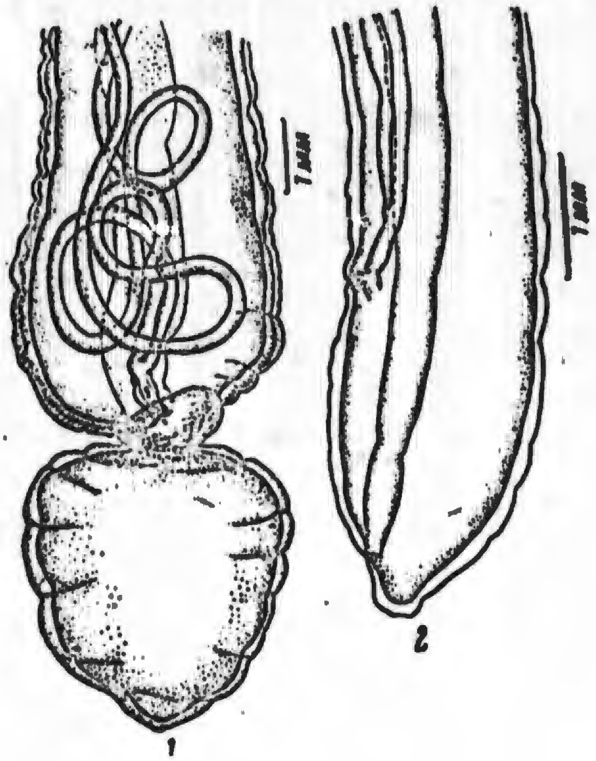

Figure 214.

Crassicauda giliakiana

(Skrjabin and Andreeva, 1934).

1. Ventral view of the caudal end of a sexually mature female; 2. Lateral view of the same, of a sexually immature female (after Skryabin and Andreyeva, 1934).

female, the posterior part of the tail is separated from the rest of the body by a perceptible stricture on which the opening of the vulva is located. The vulva is 4.3 mm from the posterior end, which corresponds to the length of the caudal appendix, whose width reaches 4 mm, while the width of the isthmus is four times smaller (1.02 mm).

The shape of this caudal appendix has a rather specific character, being of irregular spherical formation for which the longitudinal and transverse axes are almost equal (about 4 mm). The vulval orifice is located slant-wise. It leads into a short vagina 0.75 mm in length which continues into two uteri forming a somewhat complicated system of coils.

The ripe eggs with larvae are provided with thick shells. The length of the eggs is 0.054 mm, their width
p. 324 0.030 mm. The anal orifice is located subterminally. The caudal end of sexually immature females differs considerably in its structure from the caudal end of sexually mature females. They do not have any minor sign of constriction in the vulvar region, which is 2.75 mm from the tail end. The width of the body in the vulvar region reaches 1.7 mm, which equals the width of the body in the adjoining sectors. The anal opening is located subterminally 0.05 mm from the posterior end.

Literature: Skryabin and Andreyeva, 1934, p. 18 to 23; Skryabin, Shikhobalova, Sobolyev, 1949, p. 238; Gubanov, 1952 (dissertation).

Crassicauda grampicola (Johnston and Mawson, 1941).

Host: Grampus griseus (Cuvier) (= Gramphidelphis exilis), - the gray dolphin.

Location in host: ?

Geographic distribution: New South Wales.

Historical Information

Johnston and Mawson (1941) described the species C. grampicola after a few specimens of males and females which lacked the head ends of their bodies. These authors had not a single integral specimen of this species, therefore the below introduced description is very incomplete. It was based only at the study of the rear ends of nematode bodies. In addition, Johnston and Mawson did not compare the form, which they describe, with the other species of

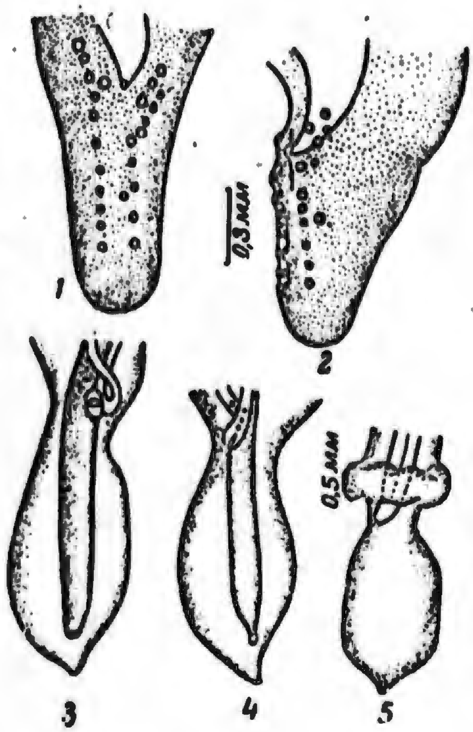

Figure 215.
Crassicauda grampicola
(Johnston and Mawson, 1941).
1. Ventral view of the male's posterior end; 2. The same in lateral view; 3, 4, 5. Caudal ends of females (after Johnston and Mawson, 1941).

the genus Crassicauda which were already known in 1941, which must be also considered as a fault of the mentioned authors. By studying all of these, at the same time we were inclined to consider the G. grampicola as an independent species on the ground that 1) this is the first crassicaud recorded in Grampus griseus, and 2) the small size of its tail and especially the location of the anus in the males distinguish this species from all other species of the Crassicauda genus.

Description of species (after Johnston and Mawson, 1941). The largest ength of the studied fragments was 10 cm.

Male. The maximum width of the body is 0.9 mm. The rear end lacks caudal wings. The spicules are absent. The small oval cloaca is located 0.7 to 0.8 mm from the bluntly rounded posterior end of the body, which is provided with papillae. There are a total of 25 papillae. They are located on the ventral surface of the tail,
p. 325 being arranged in two rows, one containing 13 papillae, and the other 12. The location of the papillae is not symmetrical and not steady. Before the cloaca, on each side of the median line, 3 to 4 papillae are usually located. The remaining papillae are placed postanally, forming two more or less straight rows.

Female. The form of tail varies, which is possibly due to growth. Some tails are prolonged, whereas others are considerably widened. Here, their length is the same as their width. However, all investigated caudal ends of the females terminate in a conical tip at the base of which the anal orifice is located. At the site of the isthmus of the tail the vulva is placed, as this happens in all other species of the Crassicauda genus. The eggs are oval, 0.040 mm in length and 0.029 mm in width.

Literature: Skryabin, Shikhovalova, Sobolyev, 1949, p. 238; Johnston and Mawson, 1941, p. 430, 433 to 434.

Crassicauda magna (Johnston and Mawson, 1939).

Host: Kogia breviceps (Bl.) - the dwarf sperm whale.

Location in host: ?

Geographic distribution: South Australia.

I do not give a description, since the necessary literature is not available.

Literature: Skryabin, Shikhobalova, Sobolyev, 1949, p. 238; Johnston and Mawson, 1939, p. 261 to 268.

GENUS *Placentonema* (Gubanov, 1951).

Placentonema gigantissima (Gubanov, 1951).

Host: *Physeter catodon* L. - the sperm whale.

Location in host: placenta.

Geographic distribution: Pacific Ocean (the Kuril Islands zone).

Description of species (after Gubanov, 1951). Very large nematodes, with a body that tapers at the ends, covered with thin transparent cuticle which, with the exclusion of the anterior end, is free of transverse striation. The oral aperture is of oval shape, and it bears two simple lateral lips on whose basis one-one pair of papillae and one amphide is located. The pharynx is cylindrical. The esophagus is clearly divided into a muscular and a glandular department.

The *male* of this gigantic nematode reaches 0.04 to 3.75 mm in length, 809 mm in width. The length of the oral orifice reaches 0.048 mm, with a width of 0.016 mm. The pharynx is 0.14 mm in length, and 0.008 mm in width. The anterior muscular segment of the esophagus is 2.18 to 4.0 mm long, and 0.1 to 0.14 mm wide. The glandular segment of the esophagus is 67.7 mm in length, 0.6 mm in width. The caudal end is blunt, curved in the ventral direction. The cloacal opening stands off the posterior end of the body at 1.4 to 1.6 mm distance. On its side are located thin cuticular wings whose length is 1.26 to 1.4 mm, while the maximum width is 0.6 to 0.7 mm. On the basis of the wings, four pairs of preanal and three pairs of postanal stalk-like, granularly built papillae are. Back from the wings, three pairs of sessil papillae of the same structure are placed. In addition to this, there are two anal papillae. The width of the caudal end is at 1.4 to 1.9 mm distance from the cloacal level.

p. 326

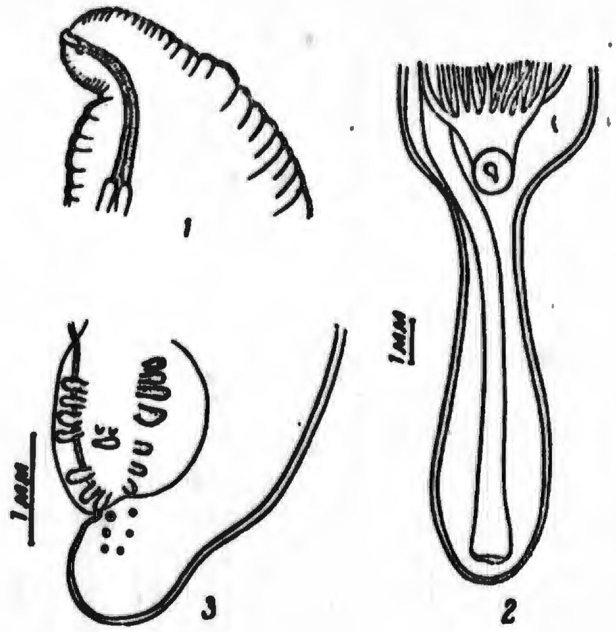

Figure 216.

<u>Placentonema gigantissima</u>

(Gubanov, 1951).

1. Anterior end of the body; 2. Caudal end of the female; 3. Caudal end of the male (after Gubanov, 1951).

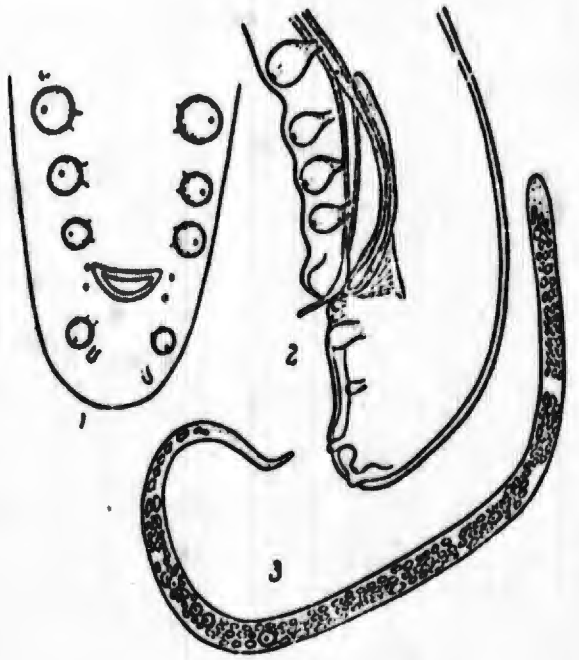

Figure 217.

Dirofilaria immitis (Leidy, 1856).

1. Ventral view of the caudal end of the male; 2. Lateral view of the same; 3. Larva (after Faust, 1937, from Skryabin and Shikhobalova, 1948).

p. 327 The female is 6.75 to 8.4 meters long and 1.5 to 2.5 cm wide. The pharynx is 0.12 mm in length and 0.008 mm in width. The muscular segment of the esophagus is 2.7 to 2.8 mm in length, 0.20 to 0.26 mm in width. The glandular segment of the esophagus equals 63.6 mm in length and 0.56 to 0.60 mm in width. The caudal end is rounded, piriformly stretched out, divided by a constriction which is at a distance of 11.3 mm from the tail end. The anus stands off from the same end at a distance of 0.8 to 1 mm. The vulva is placed 12.4 to 14.8 mm in front of the anus. The uterus is multiple (32 uteri). The ovijector is short. The ripe egg is oval in shape, 0.049 mm long, and 0.030 mm wide, and it contains the formed larva.

Literature: Gubanov, 1951, p. 1123 to 1125.

Family FILARIIDAE (Cobbold, 1864).

Subfamily FILARIINAE (Stiles, 1907).

To the subfamily Filariinae, as this can be seen from the mongraph of Skryabin and Shikhobalova (1948), 38 genera belong, including the genera Onchocerca (Diesing, 1841) and Dirofilaria Railliet and Henry, 1911. Both of these genera include filarial species which were recorded in marine mammals.

Table

for the determination of the genera of the subfamily Filariinae whose representatives were found in marine mammals.

1 (2). The mouth is surrounded by ten or six papillae. The tail of the male is spiral-shaped, bluntly rounded, and provided with wings. Parasites of the heart and subcutaneous fat tissue of primates, carnivora, ruminant pinnipeds and marsupials ... genus Dirofilaria (Railliet and Henry, 1911).

2 (1). The mouth is surrounded by eight papillae. The caudal wings are absent. Parasites of the tendons, and intermuscular connective tissue of terrestrial mammals, and of a very few cetaceans ... genus Onchocerca (Diesing, 1841).

GENUS Dirofilaria (Railliet and Henry, 1911).

Historical Information

In 1937, Faust studied filaria from the right half of the heart of a sea lion (Zalophus californianus) which died in the zoological garden of New Orleans. At his disposal this author had 22 sexually mature parasites from the heart (9 males and 13 females), and a large number of microfilaria from the peripheral blood of the host. Fasst, who did not know of the work of Lyubimov (1927), came to the conclusion that the parasites found in the sea lion are identical with the filariae described by Leidy from the seal Phoca vitulina. Since the filaria which Faust studied proved to be unquestionably a representative of the genus Dirofilaria, he conferred upon it the name Dirofilaria spirocauda (?) (Leidy, 1856).

The attention of Desportes (1939 - 1940) was attracted by this circumstance. Having been acquainted with the work of Lyubimov, he came to the conclusions that two different species of filariae are parasitizing in the blood of pinnipeds: one is the Skrjabinaria spirocauda (Leidy, 1858), which belongs to the Setaridae, and the other, which Faust found, belongs to the Filariidae and is distinguished from Dirofilaria immitis only by its residence in another host.

Skryabin and Shikhobalova (1948), not looking at the morphological similarity of the filaria which Faust
p. 328 described from the sea lion WITH Dirofilaria immitis, and believing that these forms cannot be identical since they live in different hosts, separated the filaria which was found in the heart of the sea lion into a special species which they called Dirofilaria fausti Skrjabin and Shikhobalova, 1948. The genus Dirofilaria, according to the revise of K. M. Skryabin and N. N. Shikhobalova, unites 29 species from which 28 are parasitic in terrestrial mammals (rodents, hoofed animals, carnivora, primates), and in man, while one, the Dirofilaria fausti, is parasitic in the Californian sea lion.

It seems to us that the segregation of this from into an independent species there are no sufficient grounds, and that it must be considered as pertinent to the species of Dirofilaria immitis for the following reasons. First of all, it should be pointed out that D. fausti does not differ morphologically from a typical D. immitis. This species parasitizes in the heart and the pulmonary artery of dogs, cats, foxes, and other terrestrial carnivorous mammals, which live in tropical and subtropical countries, which by the way coincides with the territory of Zalophus californianus that lives on the shores of California. There is nothing exceptional in the circumstance that the mentioned filaria was found in a pinniped, since among the terrestrial carnivorous mammals and the pinnipeds there are also other common species of helminths. Finally, the fact is very interesting and it deserves attention. One speaks of the fact that D. immitis meets with conditions in the organism of the sea lion which are similar to those which the worm usually finds in the organism of terrestrial carnivorous mammals. In its turn, this can serve as proof for the fact that until the present time the terrestrial carnivorous mammals and the pinnipeds preserved a certain physiological vicinity.

Dirofilaria immitis (Leidy, 1856).

Synonyms: *Dirofilaria spirocauda* Faust, 1937 nec Leidy, 1858; *D. fausti* Skrjabin et Schikhobalova, 1948

Definitive hosts: Zalophus californianus, the Californian sea lion, but mostly dogs, cats, foxes, and other flesh-eaters.

Intermediate hosts[1]: Blood sucking insects Culex (Culex) pipiens, C. (Culex) fatigans (Europe), C. (Culex) territans (North America), Aedes (Stegomyia) aegypti (Australia), A. (Ochlerotatus) caspius (Europe, Asia, Africa), A. (Ochlerotatus) sollicitans (North America), A. (Ochlerotatus) taeniorhynchus (America), A. (Ochlerotatus) canadensis and others (after Skryabin and Shikhobalova, 1948).

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1. All intermediate hosts were established for those representatives of D. immitis which were found in dogs, cats, foxes, and other terrestrial flesh-eating animals. It is unknown which intermediate hosts infect the sea lion.

Location in host: The heart.

Geographic distribution: It was found in the Zalophus californianus in a zoological garden (USA). In other hosts -- almost in all tropical and subtropical countries. In the USSR, the parasite was found in the heart of dogs (in Kazakhstan, Uzekistan, Abkhazia, and in the Far East).

Description of species (after Faust, 1937, from Skryabin and Shikhobalova, 1948). Since Faust considers this species morphologically identical with Dirofilaria immitis, he gives only a very short description, which is based chiefly upon the number and location of the caudal papillae. The length of mature parasites is similar to that of Dirofilaria immitis. The male is provided with 3 to 4 pairs of large semisessile egg-
p. 329 shaped caudal papillae. The asymmetry of their arrangement is very weakly expressed. More often there are three pairs of them, while there is no fourth pair, and in all cases the first pair is the largest. The first three pairs are postanal, while the last one is supplemental. Moreover, there are two pairs of small papillae on the lateral sides of the cloaca, and a pair of large postanal papillae. Nearer the tail end one pair or two pairs of small asymmetrically placed papillae are located. The length of thelarge spicule is 0.316 to 0.330 mm,and the length of the small one is 0.210 to 0.220 mm. The microfilariae do not have a cap. Their length is about 0.2354 mm. The neural

ringiis at a distance from the head end which is equal to 20.4% of the body length. The excretory aperture is at a distance equal to 29% of the body length. The excretory cell is at a distance equal to 32.6% of the body length. The right sexual cell is at 60%, the anal aperture at 75.5%, and the cell placed closest to the caudal end is at 90% of body length.

Literature: Skryabin and Shikhobalova, 1948, p. 160 to 162; Skryabin, Shikhobalova, Sobolyev, 1949, p. 303; Faust, 1937, p. 135 (quoted after Skryabin and Shikhovalova, 1948).

GENUS Onchocerca (Diesing, 1841)

Onchocerca fulleborni (Hoeppli and Hsü, 1929).

Synonym: Crassicauda fulleborni (Hoeppli and Hsü, 1929; Baylis, 1932).

Host: Neomeris phocaenoides (Cuvier), finless porpoise.

Location in host: Connective tissue nodes in the musculature around the vagina.

Geographic distribution: Pacific Ocean (near Amoy Islands). It was not recorded in the USSR.

Historical Information.

In 1929, Hoeppli, Hsü and Wu described the nematode Onchocerca fulleborni (Hoeppli and Hsü and Wu, 1929), from connective tissue nodes located in the musculature around the vagina of the finless porpoise (Neomeris phocaenoides) caught in the Pacific Ocean near Amoy Islands.

The genus Onchocerca -- judging from the works of Skryabin and Shikhobalova (1948), Skryabin, Shikhobalova, Sobolyev, (1949), unites fifteen species of nematodes whose definitive hosts are rarely man or dolphin, but very frequently the large livestock and horses. The intermediate hosts of the species of this genus are blood-sucking dipterous insects. The above mentioned authors write that the species O. fulleborni, a parasite of Neomeris phocaenoides, although only very imperfectly described, nevertheless is evidently a representative of the Onchocerca genus. But it can be segregated into an independent species, if its repeated study will corroborate that it has no spicule.

It should be mentioned that Baylis (1932, p. 405), transferred the species O. fulleborni to the genus Crassicauda. Thus, if it is also considered that Skryabin, and Shikhobalova (1948) were not sure that this species is an unquestionable representative of the genus Onchocerca, the question about its position in the system of nematodes is to be considered unsolved. Repeated good description is needed, based upon the study of a good quality of material, and until then the place of O. fulleborni in the system of the Onchocerca genus must be considered arbitrary.

Description of species (after Hoeppli and Hsü, 1929). The cuticle is provided with large ring-shaped thickenings.
p. 330 On the cephelic end lips are not perceptible. The mouth is surrounded by four submedian and two lateral papillae.

Male. The body length (approximately made, according to individual fragments) is about 20 mm, its width 0.7 mm. The thickness of the cuticle is 0.06 mm. Spicules could not be seen (according to the drawing there are nine pairs of caudal papillae).

Female. The body length is 30 mm, its width 0.9 mm. The thickness of the cuticle is 0.07 mm.

Literature: Skryabin and Shikhobalova, 1948, p. 25[illegible] to 260; Skryabin, Shikhobalova, and Sobolyev, 1949, p. 332 to 336; Hoeppli and Hsü, Wu, 1929, p. 33

Family Setariidae (Skrjabin and Shikhobalova, 1945).

Numerous species of the family Setariidae parasitize in terrestrial vertebrates (reptiles, birds, and mammals), and only one species of the genus Skrjabinaria (Lubimov, 1927) (Subfamily Dipetalonematinae, Wehr, 1935) parasitizes in pinnipeds.

Nine genera belong to the subfamily Dipetalonematinae including the genus Skrjabinaria (Lubimov, 1927).

GENUS Skrjabinaria (Lubimov, 1927).

Historical Information.

In 1858, Leidy described a nematode under the name Filaria spirocauda which was found in the right half of the heart of the seal Phoca vitulina.

This species was studied in detail by Lubimov (1927) who established its pertinence to the special genus Skrjabinaria in the system which they created for the family Setariidae (see also the historical information for the genus Dirofilaria).

Diagnosis of the genus Skrjabinaria (after Lubimov, 1927). Dipetalonematinae. The cuticle is finely striated longitudinally. The body is narrowed at both ends. The mouth is surrounded by a cuticular formation in the shape of a hexagonal star among whose angles there is one papilla for each angle. There is a small oral capsule. There is a single short esophagus.

Male. The caudal end is curled up as a spiral with three turns. Seven pairs of papillae are on it: three preanal pairs and four postanal pairs. The spicules are very uneven, and of complicated structure. The large one is thick in its anterior portion, cylindrical, while in its posterior portion it is flat, narrow, bending. The smaller spicule is wide and curved. There is no auxiliary organ.

Female. The caudal end is somewhat curved and is provided with one sessile papilla, located terminally. The vulva opens into the anterior third of the body at a considerable distance from the rear end of the esophagus. Ovoviviparous. The larva has a blunted celpalic end; it is equipped with denticles, but the rear end has a wing-shaped pointed appendix.

The typical and presently the unique species is: *Skrjabinaria spirocauda* (Leidy, 1858, after Freund, 1932).

Skrjabinaria spirocauda (Leidy, 1858; Lubimov, 1927).

Synonyms: *Filaria spirocauda* (Leidy, 1858; *Skrjabinea spirocauda* (Leidy, 1858, after Freund, 1932).

Host: *Phoca vitulina* L. - the common seal; *Ph. hispida* Schr. - ringed seal.

p. 331 Location in host: Heart cavities.

Geographic distribution: North Sea (Helogoland Station). In the USSR, Moscow zoological garden.

Description of species (after Lubimov, 1927). Lubimov described the species after one undamaged male, and after three fragments of females.

Male. The body is white. Its length is 140 mm, with a width of 0.669 mm. The cephalic end is provided with papillae whose number cannot be counted when the male is in a lateral position. The neural ring is located at a distance of 0.397 mm from the head end. The esophagus is of 1.86 mm length, with a width of 0.13 mm at its rear portion. The caudal end is spirally convoluted into three to four turns, without wings. There are seven pairs of symmetrically arranged sexual papillae, three of which are preanal and four postanal. The individual pairs are at various distances from each other, and not all of them are easily perceptible. The cloaca is located 1.67 mm from the caudal end. There are two spicules, unequal in size, of complicated structure, and dissimilar. The length of the

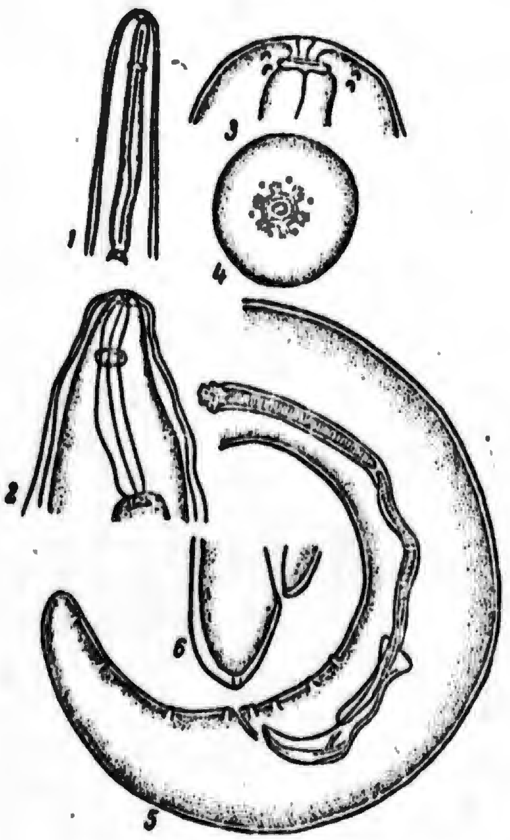

Figure 218.
Skrjabinaria spirocauda
(Leidy, 1858; Lubimov, 1927).
1, 2. Anterior end of the body; 3. Head end; 4. Apical view of the same; 5. Lateral view of the caudal end of the male; 6. Lateral view of the caudal end of the female. (After Lubimov, 1927, from Skryabin and Shikhobalova, 1948).

larger spicule is 0.648 mm, and it is of a very complicated structure. The anterior half, which is wider (0.021 mm), is an irregular hollow cylinder. The posterior half of the spicule is flat, half as narrow as the anterior, sharply

p. 332 demarcated from the anterior half, and, bending irregularly. It ends with a truncated, jagged edge. Along their entire length, both halves of the spicule have transverse striation. The length of the smaller spicule is 0.243 mm, and it is of simpler structure. It consists of two platelets with irregular surfaces which meet with their ventral edges under an angle. The platelets originate from a wide triangular base where they have the smallest width; on the ventral side they are curved in hook shape, reaching the maximum width of 0.027 mm at the site of the bend, and they end bluntly. Both ends of the body are rounded.

Female. (The measurements were made on individual fragments). The body is white, with a yellowish brown "middle," transparent over the entire length. The length of all three fragments of the body equals 137 mm, with a width 1.34 mm. The cuticle, beside the very thin longitudinal striation, bears tranverse wrinkles over its entire extent (probably due to the rupture of the body). On the head end, this wrinkling forms an intumescence, while on the rear end it makes an irregualr undulatory wing-shaped formation. The head end is extended in a piriform shape, and has a blunt end. In a lateral position, a few papillae can be barely distinguished on it. In an apical position, the rounded oral aperture is clearly visible and is limited by a cuticular formation in the shape of a hexagonal star. Between each angle of this star a papilla is located (a total of six papillae). The esophagus is shorter than in the male. It is 1.246 mm long. The vulva is located 28.0 mm from the head end. The caudal end is curved, and it has the shape of a rather pointed cone, with one large papilla which is positioned terminally. The anus opens subterminally. Vivparous. The larvae fill the uterus entirely in the parts adjacent to the vulva, and are in a coiled condition. They are rather thick, with a size of 0.324 x 0.027 mm. The blunted anterior end of the larva is armed with denticles, but the rear end terminates in a ring-shaped pointed appendix. The length of the esophagus of the larva is 0.078 to 0.080 mm. The anus is 0.048 mm from the caudal end.

Literature: Lubimov, 1927, p. 303 to 309; Skryabin and Shikhobalova, 1948, p. 526 to 528; Skryabin, Shikhobalova, Sobolyev, 1949, p. 448; Leidy, 1858, p. 110 to 112; Wulker, 1930a, p. 296 to 298.

CONTRIBUTION TO THE BIOLOGY AND ECOLOGY OF FILARIAE, WHICH PARASITIZE IN MARINE MAMMALS.

It is well knownthat all filariae are typical biohelminths. The definitive hosts of filariae are mammals, birds, reptiles, and amphibia. The intermediate hosts are mosquitoes (Culicidae) and very rarely other dipterous insects (black flies, horeseflies, stable flies). The information which is available in the literature on the supposition that fleas and ticks can be also intermediate hosts of some filariae requires verification and confirmation (Skryabin and Shikhobalova, 1948). If filarial contamination of terrestrial vertebrates happens as a result of their being attacked by blood sucking dipterous insects which are invaded with microfilariae, then of course the question arises how the marine mammals, animals which lead an aquatic form of life, become contaminated with filariae? Unfortunately, no one was ever seriously concerned with this interesting problem. The intermediate hosts of the filariae which parasitize in marine mammals are unknown. We recall that they are also unknown for many other filariae which parasitize in terrestrial animals.

p. 333 It is evident from the above that only on the basis of indirect findings are we able to judge about the biology of filariae parasitizing in marine mammals. As it is evident from the above, in pinnipeds and cetaceans three species of filariae were recorded: Dirofilaria immitis (host ... Zalophus californianus and the land flesh-eaters), Skrjabinaria spirocauda (host ... Phoca vitulina) and Onchocerca fulleborni (host ... Neomeris Phocaenoides). The first two species parasitize in the cavities of the heart of pinnipeds and the latter in the musculature of the vagina. We recall that in the system of nematodes, the position of the species of O. fulleborni, is not clarified; consequently, we are unable to have an opinion about its biology on the basis of analogies with other similar species. On the contrary, in regard to the biology of the species S. spriocauda there is such a possibility. By comparing the facts, we came to the conclusion that the biological cycle of this species of filariae occurs by the same type as the cycle of the filariae of land vertebrates. For proof we have the species of D. immitis which is parasitic in land flesh-eaters, but is also found in pinnipeds. It is known that the contamination of land flesh-eaters with this species happens through blood sucking insects, and, consequently, there is absolutely no ground to think that the sea lion was contaminated by any other way. The fact is that the aquatic form of life of the pinnipeds (and of some cetaceans)[1] should not be considered to hinder this contact with blood-sucking insects.

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1. The finless porpoise - Neomeris phocaenoides - in which the filaria Onchocerca fulleborni was detected frequents the shores of China, and even ascends along the Yang-Tszy-Tszyan River higher than Ting-Ting Lake. While"resting" on the surface near the shore, as is the habit of some dolphins, it could be subjected to an attack by the local blood-sucking insects).

It is well known that as a rule pinnipeds are inhabitants of the near-shore zone, not counting the period of giving birth and mating, when all pinnipeds require a solid substrate. In this time contact with dipterous blood-sucking insects is not only possible, but indeed occurs on a mass scale. Black flies, flies and mosquitoes in large numbers attack those animals lying on the shore (especially those which rest and are in a semi-drowsy condition) chiefly hurting their eyelids and lips, i.e, the most vulnerable parts which are supplied with blood and are the most accessible to the blood-sucking insects. The fact of finding filariae in the *Phoca vitulina* and *Zalophus californianus* corroborates our thought about the possibility of contamination of these beasts with filariae through blood-sucking *Diptera*. Both of these species spend a lot of time on the shore, including those points of the area where blood-sucking insects abound in warm seasons of the year. It is possible that other species of pinnipeds which come inshore at places where blood-sucking insects are disseminated are also attacked by filariae, but these parasites hitherto remained unknown to science.

In conclusion it should be stated that on the questions touched here our opinion does not coincide with the opinion of Wulker (1929, 1930a). Even though this author did not find microfilariae in seal lice (*Echinophthirius horridus*) picked from a seal which was caught at Helgoland Station in 1912, and which proved to be invaded by filariae of *Skrjabinaria spirocauda*, he nevertheless asserts that these ectoparasites are indeed the intermediate hosts of the filariae of pinnipeds. It seems to us that one could agree with Wulker's opinion if filariae were also found in such pinnipeds which avoid the shore. In addition, we recall that seal lice are rather wide-spread endo-parasites of the
p. 334 pinnipeds. Being intermediate hosts of filariae (as Wulker supposes) and possessing the ability of passing from one

host to another, as it seems to us, the filariae should be very widely spread among their definitive hosts, which is, however, not so.

Addendum to the Nematodes of Pinnipeds and Cetaceans

First Addendum

Two works appeared in the foreign press whose authors suspect Arctic pinnipeds and cetaceans in the dissemination of trichinellasis. This question has a great scientific and practical significance, therefore we should deal with it at some length.

In 1948 the work of Thorborg, Tulinius and Roth appeared which was devoted to the study of trichinellasis in Greenland. Having thrown light upon the dissemination of trichinellasis in detail at the various points of Greenland, the authors attempted to explain the sources of this invasion. As a result they reached the conclusion that in northern Greenland there is a natural concentration of trichinellasis which is represented by animals sought by hunters and by some other animals. Following this, they suspected bears, reindeers, dogs and hares as well as seals, walrusses and belugas to figure in the dissemination of trichinellasis. In the final analysis the authors concentrated their attention only on marine mammals. By comparing the findings in the outbreaks of trichinellasis with the times of walrus hunting, the authors established that the outbreaks coincide with the beginning of hunting these animals, and they announced the hypothesis that evidently walrusses are a source of trichinellasis invasion among the population of northern Greenland. By reasoning in an analogical way and not taking in account that the coincidence of the outbreaks with the times of hunting could have been accidental, for the dissemination of trichinellasis the mentioned authors also suspected the belugas, whose meat, just as the meat of walrusses, is used for food by the population of northern Greenland.

In 1949, a second work appeared in the foreign press on trichinellasis in Greenland (Roth, 1949[1]). The author shows that for the purpose of elucidating the source of trichinellasis in Greenland, various mammals were examined in the northwestern part of that country. The sled-dogs, bears, polar foxes, hares, walrusses, crested seals, bearded seals, whales, narwhals, were subjected to trichinelloscopy. The most damaged proved to be sled-dogs (70%), and polar bears (30%).[2] In the total number of examined polar foxes, 3% were found invaded. However, in other animals trichinellasis was not found. This also included 133 examined walrusses among which not a single invaded animal was found. Parallel with this, Roth shows that intensive trichinella invasion was supposedly found in a seal caught in Thule (western Greenland). The author considers these unverifiable cases as a proof of the possibility of a contamination of the people with trichinellasis from walrusses, since they are also marine mammals.

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1. An abstract from the journal "Parazitologiya," No. 1 (20), 1952).
2. Cases of trichinellasis of a polar bear-cub were described by V. P. Koryazhnov (1946) in our literature.

We are not sure of the correctness of Roth's conclusions. It seems for us that the form of life of the pinnipeds and cetaceans excludes the possiblity of their becoming invaded by trichinellasis. In any case, the above quoted facts require a thorough verification and additional corroboration.

p. 335 There is every reason to believe that the spreaders of trichinellasis in Greenland can be the sled-dogs, which are consumed by the population of that country for food. In addition to this, according to the findings of the first of the above quoted works, it is not excluded that the outbreaks of trichinellasis in Greenland occurred as a result of pork preserves of bad quality.

Second Addendum.

Roussel de Vauzeme (1934) described a series of interesting observations on nematodes which live as commensals on baleen (whalebone) Antarctic whales.[1] Among the forms which he could observe his attention was caught by small nematodes found in a grayish-brown sticky substance on the cetacean baleens of the whale caught near the Falkland Islands. Roussel called these nematodes Odontobius ceti. The author gave a very brief description of the species, having paid the chief attention to the study of the life form of these nematodes.

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1. Baylis, in 1923, established that Roussel studied the material from Balaena australis (now called Eubalaena glacialis australis), and not from B. mysticetus, as Roussel states.

After almost 90 years, Baylis (1923) examined the anatomical and morphological characteristics of O. ceti on a material from Balaenoptera musculus and B. physalus, caught in the southern Shetlands. This author came to the conclusion that the species O. ceti belongs to the free-living nematodes, passing over to semi-parasites or sooner to commensalism. Baylis writes that in agreement with the classification of free-living nematodes, elaborated by Mikoletsky (1922), the species O. ceti should go into the subfamily Oncholaiminae of the family Odontopharyngidae. The genus Odontobius, in the opinion of Baylis, is related to the genus Oncholaimus.

Being acquainted with the work of I. N. Filip'ev (1918-1921), we ascertained that the series of species which had belonged to the genus Odontobius were transferred by him into a second genus, since he considered that this genus "does not have free representatives" (p. 15).

In the work of Chitwood (1950), we did not find reference to the work of Roussel. Chitwood does not even mention the family Odontopharyngidae.

Not having other required literature at our disposal, we could not establish the modern systematic position of the species O. ceti. At the same time, we had the impression that this species cannot be considered a free-living or parasitic nematodes, as well.

Wishing to study the species O. ceti in detail, we tried to get fresh material from the Antarctics through scientific workers navigating on the "Slava," but unfortunately did not get it.

Considereing all the above, we came to the conclusion that this species is not a parasite of whales.

Literature: Roussel de Vauzeme, 1834, p. 326 to 333; Baylis, 1923, p. 617 to 623.

Table 9. Comparison of the trematode fauna of the northern and southern existing seals.

Trematode species / Виды трематод	Phocinae					Cystophorinae		Lobodoninae				Monachinae
	Phoca	Erignathus	Halichoerus	Histriophoca	Pagophoca	Cystophora	Mirounga	Lobodon	Hydrurga	Leptonychotes	Ommatophoca	Monachus
Cryptocotyle lingua	+						+					
Echinostoma acanthoides	+											
Metorchis albidus			+			+						
Ogmogaster antarcticus								+		+		
Opisthorchis tenuicollis		+	+			+						
Orthosplanchnus arcticus	+	+			+							
Orthosplanchnus fraterculus		+										
Phocitrema fusiforme	+											
Pseudamphistomum truncatum	+		+		+	+						
Rossicotrema venustus	+											
Sum of trematode species / Итого видов трематод	6	3	3	0	2	3	1	1	0	1	0	0
Trematode species known for each of the present seal subfamilies / Итого видов трематод, известных для каждого из подсемейств настоящих тюленей	9					4		1				0

... (broken text)... their ... helminths and through the same objects of nutrition they come in contact with pinnipeds, and serve as the main source of their invasion with trematodes.

From this it follows that in the North the existence of the mentioned species of trematodes is corroborated on the one hand by the invaded pinnipeds, while on the other hand, evidently to a greater degree, by the other vertebrates indicated (finally, with the participation of the corresponding intermediate hosts).

Then why is the trematode fauna of the southern Antarctic pinnipeds so poor? This is evidently caused by the fact that on the continent of Antarctis and on the Antarctic Islands terrestrial carnivourous mammals are absent. If the seals originally found here present were invaded by trematodes, then eventually these trematodes should have vanished, since their usual definitive host, which are so well represented in the northern hemisphere, did not appear here. Our point of view can be partly corroborated by the example of the Mirounga angustirostris, whose area of habitation stretches from the Antarctic to California. In case of the representative of this species which live in the Antarctics, not a single trematode species was recorded, while in the representative of Mirounga which live on the shores of California, where, as it is known, carnivorous mammals and diverse marine birds exist,
p. 380 the trematode Cryptocotyle lingua was recorded. It is possible that our elucidation of the above mentioned fact will be subjected to criticism, but there is no doubt about the relationship which we established between the number of trematode species parasitizing in seals, and the presence of carnivorous land mammals in the given geographic area.

Let us now turn to the cestodes. The existing seals are hosts of two orders of cestodes: Cyclophyllidea and Pseudophyllidea. The list of cestodes here is represented by seventeen species from which two belong to the tetrabothriids (the genera Anophryocephalus and Trigonocotyle), while fifteen belong to the diphyllobothriids (the genera Pyramicocephalus and Diphyllobothrium). Thus, in the present seals four cestode genera are represented from the thirteen recorded in pinnipeds and cetaceans. From these four genera, one (pyramicocephalus) is found exclusively in the present seals, but only in forms which live in the northern hemisphere.

Table 10. Comparison of the cestode fauna of existing seals (Phocidae).

Cestode species and genera / Виды и роды цестод	Phocinae					Cystophorinae		Lobodontinae				Monachinae
	Phoca	*Erignathus*	*Halichoerus*	*Histriophoca*	*Pagophoca*	*Cystophora*	*Mirounga*	*Lobodon*	*Hydrurga*	*Leptonychotes*	*Ommatophoca*	*Monachus*
Anophryocephalus												
A. anophrys	+											
Trigonocotyle												
T. skrjabini	+											
Diphyllobothrium												
D. antarcticum											+	
D. cordatum	+	+			+							
D. fasciatus	+											
D. latum	+	+				+						+
D. lanceolatum	+	+										+
D. ventropapillatum									+			
D. macrocephalus		+										
D. quadratum									+	+		
D. perfoliatum										+		
D. schistochilus	+	+			+							
D. scotti											+	
D. tectus							+		+	+		
D. tetrapterus	+	+				+						
D. wilsoni										+	+	
Pyramicocephalus												
P. phocarum	+	+				+						
Sum of cestode species / Итого видов цестод	9	7	0	0	2	3	1	0	3	4	3	3
Cestode species known for each of the present seal subfamilies. / Всего видов цестод, известных для каждого из подсемейств настоящих тюленей	10					4		7				3

p. 381 In contrast to this, in the helminth fauna of the cestodes in the southern representatives of the present seals there is not a single genus peculiar to them.

As a result of the analysis of the species composition of cestodes parasitizing in northern and southern Phocidae

(Table 10), we established that in the northern phocids ten species are parasitic, in which seven are peculiar to them, one in Odobaenidae, one is found in Otariidae, and one is found in Monachinae. For the southern phocids seven species of cestodes are known which belong only to the genus Diphyllobothrium; moreover, all these species are parasitic exclusively in southern Phocidae. Different from the trematodes, the cestodes of Phocidae, with the exception of Diphyllobothrium cordatum and D. latum, contain no species which would have been simultaneously recorded in carnivorous land mammals, or in any other kind of vertebrates. Evidently it is a fact that the intermediate hosts of the diphyllobothriids are small pelagic crustacea and fishes represented in the zone of habitation of both the southern and northern Phocidae. It is interesting to note that Monachus monachus (subfamily Monachinae) is the host of three species of cestodes which parasitize in northern Phocidae. In the West Indian seal, hitherto not a single cestode species was recorded which is characteristic for southern Phocidae.

In existing seals, the nematodes are represented by seven genera which belong to three suborders: Ascaridata, Strongylata and Filariata; moreover, in southern Phocidae only one suborder, the Ascaridata (Table 11) was recorded. The total sum of known nematode species for Phocidae is thirteen, from among which are three multi-zonal species (Anisakis similis, Contracaecum osculatum, and Terranova decipiens) common in northern and southern phocids. Six nematode species are found only in northern Phocidae, and three only in southern Phocidae. In addition to this, in the Monachinae (M. schauinslandii) one species (Contracaecum turgidum) was found which is absent both in northern and southern Phocidae, and is the only known species at the present time which is exclusively characteristic for

Monachinae. Two other species of nematodes (C. osculatum, and T. Decipiens), recorded in representatives of this subfamily of existing seals, are also widely represented in other marine mammals.

Let us turn now to the acanthocephalans (Table 12). For Phocidae a total of six acanthocephalan species are known, from which one belongs to the genus Bolbosoma, and five to the genus Corynosoma. These species are divided into northern and outhern groups to correspond to the dissemination of their hosts. For northern Phocidae four species of acanthocephalans are known from which only one species (Corynosoma reductum is peculiar only to them. For southern phocids two species are known (C. hammani, and C. bullosum) whereas both these are parasitic exclusively in southern Phocidae.

Thus, if among the trematodes, cestodes, and acanthocephalans there is not a single species which can be found in the northern and in the southern Phocidae, such species exist among the nematodes.

In summary of the given comparison, we came to the following conclusions.

1. The helminth fauna of northern and southern Phocidae is very markedly different. From forty-six recorded species of helminths in Phocidae only four (8.5%) are common for the northern and southern groups of these seals. All the four species (C. lingua, A. similis, C. osculatum, T. decipiens) are known parasites of other marine mammals, while one of them (C. lingua) is entirely uncharacteristic for these animals.

2. There is a direct relationship between the number of trematode species which parasitize in the existing seals, and the presence of terrestrial carniovorous mammals in the p. 382 given geographic zone. The presence of a considerable number of trematode species in pinnipeds which live under northern latitudes, and the absence of these helminths in

pinnipeds of southern latitudes evidently is explained mainly by this cause.

3. Cestodes species and acanthocephalsn species recorded in Phocidae are divided into a group of southern species parsitizing in Lobodininae, and partly in Mirounga, and a group of northern species parasitizing in Phocinae and Cystophora.

4. Among the nematodes of Phocidae there are both ordinary species and species which are exclusively southern and exclusively northern.

5. All the helminths known at the present time in Monachinae have northern orientation.

Table 11. Comparison of the nematode fauna of existing seals (Phocidae).

Nematode species / Виды нематод	Phocinae					Cystophorinae		Lobodoninae				Monachinae
	Phoca	Erignathus	Halichoerus	Histriophoca	Pagophoca	Cystophora	Mirounga	Lobodon	Hydrurga	Leptonychotes	Ommatophoca	Monachus
Anisakis schupakovi	+											
Anisakis similis			+				+					
Contracaecum osculatum	+	+	+		+	+	+	+	+	+		+
Contracaecum radiatum									+	+	+	
Contracaecum rectangulum								+	+	+		
Contracaecum stenocephalum									+	+		
Contracaecum turgidum												+
Terranova decipiens	+	+	+		+		+			+	+	+
Phocascaris phocae					+							
Phocascaris netsiki	+											
Otostrongylus circumlitus	+											
Parafilaroides gymnurus	+											
Skrjabinaria spirocauda	+											
Sum of nematode species / Итого видов нематод	7	2	3	0	3	1	3	2	4	5	2	3
Nematode species known for each of the present seal subfamilies: / Всего видов нематод, известных для каждого из подсемейств настоящих тюленей	9					3		5				3

COMPARATIVE ANALYSIS OF THE HELMINTH FAUNA OF THE SPECIES OF THE PHOCA GENUS

Comparison of the helminth fauna of Phoca hispida with the helminth fauna of Phoca vitulina.

It is interesting to compare the helminth fauna of the small systematic groups of the family Phocidae. In this respect the helminth fauna of the endemic species represents a special interest, for instance, of such species as Phoca
p. 383 caspica, Phoca sibirica, Histriophoca fasciata, Halichocerus grypus. It makes sense to thoroughly analyze the helminth fauna of the several species of the Monachus genus or to compare the helminth fauna of those species of pinnipeds which have an amphiboreal or circumpolar dissemination, and so on. Unfortunately, we do not have at our disposal data on the helminth fauna of some interesting species of pinnipeds, and in regard to a part of others these informations are very scanty.

Table 12. Comparison of the acanthocephalic fauna of existing seals (Phocidae).

Роды и виды акантоцефалов	Phocinae					Cystophorinae		Lobodontinae				Monachinae
	Phoca	*Erignathus*	*Halichoerus*	*Histriophoca*	*Pagophoca*	*Cystophora*	*Mirounga*	*Lobodon*	*Hydrurga*	*Leptonychotes*	*Ommatophoca*	*Monachus*
Bolbosoma												
B. nipponicum	+											
Corynosoma												
C. bullosum							+	+				
C. hamani									+	+	+	
C. reductum	+											
C. semerme	+		+			+						
C. strumosum	+	+	+		+	+						
Sum of acanthocephalic species: Итого видов акантоцефалов	4	1	2	0	1	2	1	1	1	1	1	0
Acanthocephalic species known for each of the present seal subfamilies: Всего видов акантоцефалов, известных для каждого из подсемейств настоящих тюленей	4					3		2				0

Let us start with the analysis of the helminth fauna of the genus Phoca. This genus, as it is well known, is disseminated in the northern hemisphere. On the one hand, it unites froms living in the Arctic zone (Phoca hispida), and forms which are distributed amphiboreally, in the Atlantic and in the Pacific Oceans (Phoca vitulina), and on the other hand it contains endemic species and subspecies disseminated within the range of the Boreal region. The latter ones have a comparatively small area of habitation, in some cases limited by shores of closed seas and lakes (Phoca caspica, Ph. sibirica, Ph. hispida ladogensis, and so on). Before passing over to the analysis of the helminth fauna of the subspecies and endemic species of the genus Phoca, the helminth fauna of the species Phoca hispida should be compared with the helminth fauna of Phoca vitulina as a whole (i.e., including the various subspecies).

The helminth fauna of Phoca hispida (See Table 13) consists of nineteen species, three of which are trematodes, five are nematodes, and four are acanthocephalans.

In the Phoca vitulina the recorded species are four less, i.e., fifteen helminth species: namely, four trematodes, four cestodes, five nematodes and two acanthocephalans.

p. 384 Analysis of the quality composition of the helminth fauna of this and the other species of seals showed both similarity and difference. The similarity is expressed in the fact that in both species of seals we found common species of helminths. Such species are nine: among them one is trematode (Pseudamphistomus truncatum), two are cestodes (Diphyllobothrium latum and D. tetrapterus), four are nematodes (Contracaecum osculatum, Terranova decipiens, Otostrongylus circumlitus, and Skrjabinaria spirocauda), and two are acanthocephalans (Corynosoma semerme, and C. strumosum).

Table 13. Comparison of the helminth fauna of the species of the Phoca genus.

Helminths parasitic in the seal of genus Phoca. Гельминты, паразитирующие у тюленей рода *Phoca*	Species of the Phoca genus Виды рода *Phoca*			
	Phoca hispida	*Phoca vitulina*	*Phoca caspica*	*Phoca sibirica*
1	2	3	4	5
Cryptocotyle lingua		+	+	
Echinostoma acanthoides		+		
Orthosplanchnus arcticus	+			
Phocitrema fusiforme	+			
Pseudamphistomum truncatum	+	+		
Rossicotrema venustus		+		
Anophryocephalus anophrys	+			
Trigonocotyle skrjabini	+			
Diphyllobothrium cordatum		+		
Diphyllobothrium fasciatus	+			
Diphyllobothrium latum	+	+		
Diphyllobothrium lanceolatum	+			
Diphyllobothrium schistochilus		+		
Diphyllobothrium tetrapterus	+	+		
Pyramicocephalus phocarum	+			
Anisakis schupakovi			+	
Contracaecum osculatum	+	+		+
Terranova decipiens	+	+		
Phocascaris netsiki	+			
Otostrongylus circumlitus	+	+		
Parafilaroides gumnurus		+		
Skrjabinaria spirocauda	+	+		
Halbosoma nipponicum	+			
Corynosoma reductum	+			
Corynosoma semerme	+	+		
Corynosoma strumosum	+	+	+	
	19	15	3	1

The difference of the compared helminth fauna is perhaps expressed better than their similarity. Thus, in the helminth fauna of the Ph. hispida ten species figure which are unknown for Ph. vitulina, while in the helminth fauna of the latter, there are six such species which are not met with in Ph. hispida (See Table 13). It is interesting that from
p. 385 the indicated ten species of helminths which are parasitic in

Phoca hispida the majority is characteristic for the Arctic region, and only a few are characteristic for the Boreo-Pacific Subregion.(for the subspecies Ph. hispida ochotensis). Another picture is offered by Ph. vitulina. The majority of the helminth species which are parasitic in this seal are characteristic for the Bore-Pacific Subregion, and only a small part is characteristic also for the Arctic area. This phenomenon is accepted in the light of the geographic position of the diving areas of Ph. hispida and Ph. vitulina. The first of these species is distributed mainly in the Arctic region, and, although the second also has an amphi-boreal dissemination, its main population resides in the Boreo-Atlantic Subregion.

Let us look now to the helminths which are found only in Ph. hispida and Ph. vitulina, and are not known for other pinnipeds, as well as the species which parasitize exclusively in Ph. hispida, or Ph. vitulina. A single species belongs to the first category, Otostrongylus circumlitus, while eight species belong to the second.

Thus, only in Ph. hispida six species were recorded (Anophryocephalus anophrys, Trigonocotyle skrjabini, Diphyllobothrium fasciatus, Phocascaris netsiki, Parafilaroides gymnurus, Corynosoma reductum), and two only in Ph. vitulina (Echinostoma acanthoides, and Skrjabinaria spirocauda).

What of the other species of helminths known for Ph. hispida and Ph. vitulina? It appears that all of them are also known for other hosts. It is a fact that the areas of habitation of Ph. hispida and Ph. vitulina coincide at many points with the habitats of other pinnipeds as well as with the areas of living of other definitive and, evidently, intermediate hosts. For this reason, and due to the common food chains, a wide exchange occurs in the helminth fauna. It is known that in similar cases the area of the helminth's habitat usually is much larger than the area of its host's habitat. It is also known that if the area of the definitive, intermediate and supplemental hosts coincides only at two or three spearate points, then the helminth's area will be discontinuous. This is evidently in reference to the nematode Otostrongylus circumlitus which is found in the North and White Seas and in the Sea of Okhotsk, i.e., there where the areas of P. hispida and P. vitulina coincide.

Comparison of the Helminth Fauna of the Various Subspecies of the Species Phoca vitulina and Phoca hispida.

The species Ph. vitulina is prepresented by two, and the species Ph. hispida by seven subspecies. The subspecies of Ph. vitulina have amphiboreal distributions. Thus, the typical subspecies Ph. vitulina vitulina is widely distributed in the shore waters of the northern part of the Atlantic Ocean, as well as in the North, Baltic and Barents Sea.

The second subspecies, Ph. vitulina largha, is disseminated in the Bering Sea, partly in the Arctic Ocean (from Northern promontory to Barrow promontory), as well as in the Seas of Okhotsk and of Japan up to the Peter the Great Bay, along the Pacific Oceanic shoreline of North America up to Vancouver and to California (Smirnov, 1935; Ognev, 1935). In helminthological aspect, the subspecies Ph. vitulina vitulina was thoroughly studied, but the subspecies Ph. vitulina largha was unfortunately not studied satisfactorily. While for the Ph. vitulina vitulina fifteen species of helminths are known, in Ph. vitulina largha only two species were recorded; moreover, they can not characterize the helminth fauna of this seal, since these worms are very widely disseminated species. There is no doubt that the helminth fauna of Ph. vitulina largha should differ from the helminth fauna of Ph. vitulina vitulina. These subspecies of seals ... (text interrupted on page 385; pp. 386 and 387 are missing).

HELMINTH FAUNA OF CETACEANS.

Comparative characteristics of the Helminth Fauna of Baleen and Toothed Whales.

According to the data of A. G. Tomilin (1951) and of other authors, at the present time the baleen whales are represented by ten species. These species can be united in six genera which pertain to three families in the system: Balaenidae, Balaenopteridae, and Rhachianectidae. The helminth fauna of the baleen whales was studied better than, for instance,the helminth fauna of the ziphioids or of the dolphinoids. From the ten species, seven were studied in helminthological respect (Table 14). The literature does not have any information about the helminth fauna of three species (Noebalaena marginata, Balaenoptera brydei, Rhachianectes glaucus) nor did we have the original material from these whales.

A comparative analysis of the helminth fauna of baleen whales is of considerable interest, even if for the reason that various groups of baleen whales are distinguished by the composition of consumed food. Thus, the right whales (Balaenidae) live chiefly on small crystaceans and pteropod molluscs; consequently, they are planktophage. The gray Whales (Rhachianectidae) live on benthopelagic crustaceans in shallows near the shores, while the majority of rorquals (Balaenopteridae) is plankto-ichthyophage. They live on crustaceans and fishes which are in the surface layers of the sea.

The specific biocological peculiarities which are peculiar to the baleen whales (for instance, regular migration) should have been unquestionably reflected upon the formation of a special helminth fauna which in the baleen whales is represented by twenty species: four trematode species, seven cestode species, four nematode species, and five species of acanthocephalans (Table 14).

It is surprising that in the helminth fauna composition of the baleen whales not a single one is exclusively their own family or subfamily of helminths. Only one subfamily, that of the Ogmogasterinae, is distinguished whose representatives mostly parasitize in baleen whales. From eleven genera represented in the helminth fauna of baleen whales only one, the genus Priapochephalus, is characteristic exclusively for these animals. Among other genera of helminths we should mention Ogomgaster, Diplogonoporus, Crassicauda, and Bolbosoma whose representatives are comparatively often parasitic in baleen whales. Eleven species of helminths are peculiar exclusively for baleen whales:

(*Fasciola skrjabini, Lecithodesmus goliath, Ogmogaster plicatus, Tetrabothrium affinis, T. arsenyevi, T. ruudi, Priapocephalus grandis, P. minor, Diplogonoporus balaenopterae, Crassicauda boopis, Bolbosoma hamiltoni.*

p. 389 It is characteristic that the majority of these species is usually parasitic in may species of baleen whales (Table 14). This refers first of all to the rorquals in which fifteen of these species of helminths were listed out of the twenty species which are generally known for the family Balaenopteridae. In the given case this tells probably of a similarity of the composition of the rorquals' food.

The right whales (Balaenidae) were studied in helminthological respect somewhat poorer than the rorquals. A total of seven species of helminths were recorded in them, however, six of them are represented also in the helminth fauna of rorquals. Evidently, the presence of a comparatively large number of species common to rorquals and right whales is also a sequela of a slight similarity in the composition of food.

Comparing the helminth fauna of Balaenidae and Balaenopteridae we also established that in Balaenidae not a single species of helminths exists which is not present also in the helminth fauna of Balaenopteridae. On the contrary, in the helminth fauna of the latter family, such

Table 14. Analysis of the helminth fauna of baleen whales.

Helminths recorded in baleen bearded whales / Гельминты, зарегистрированные у усатых китов	Balaena mysticetus	Balaena glacialis	Balaenoptera musculus	Balaenoptera acutorostrata	Balaenoptera borealis	Balaenoptera physalus	Megaptera nodosa
Fasciola skrjabini				+			
Lecithodesmus goliath	+			+	+	+	
Ogmogaster antarcticus			+				
Ogmogaster plicatus			+	+	+	+	
Tetrabothrium affinis			+		+	+	
Tetrabothrium arsenyevi					+		
Tetrabothrium ruudi						+	
Priapocephalus grandis		+	+		+	+	
Priapocephalus minor					+	+	
Diplogonoporus balaenopterae					+	+	
Phyllobothrium delphini	+						
Anisakis simplex			+	+			
Terranova decipiens			+	+			
Crassicauda boopis						+	+
Crassicauda crassicauda	+		+	+	+	+	+
Bolbosoma balaenae	+		+	+	+	+	+
Bolbosoma brevicolle		+	+	+	+	+	
Bolbosoma hamiltoni			+			+	
Bolbosoma nipponicum				+	+	+	
Bolbosoma turbinella		+	+		+	+	+

species are in existence (Table 14). Probably, the intermediate hosts of these species of helminths are fishes which are not in the ration of right whales.

Studying the main difference in nutrition and in the form of life of the baleen and toothed whales, we made an attempt at comparing their helminth fauna. First of all, it should be mentioned that from sixteen families of helminths known for cetaceans (Table 15), in the two suborders of whales helminths are recorded which belong to eight families (Campulidae, Fasciolidae, Diphyllobothriidae, Tetra-
p. 390 bithruudae, Phyllobothriidae.

Table 15. Comparison of the helminth fauna of baleen and toothed cetaceans.

Families of helminths recorded in the helminth fauna of Cetacea. Семейства гельминтов, представленные в гельминтофауне китообразных (Cetacea)	*Mystacoceti*			*Odontoceti*			
	Balaenidae	*Balaenopteridae*	*Rhachianectidae*	*Physeteridae*	*Ziphiidae*	*Delphinidae*	*Platanistidae*
Brauninidae						+	
Campulidae	+	+		+	+	+	
Fasciolidae		+				+	
Galactosomatidae						+	
Notocotylidae		+					
Opisthorchidae						+	
Ratziidae							+
Troglotrematidae						+	
Diphyllobothriidae		+		+		+	
Tetrabothriidae	+	+		+	+	+	
Phyllobothriidae	+			+	+	+	
Anisakidae		+		+	+	+	+
Crassicaudidae	+	+		+	+	+	
Filariidae						+	
Pseudaliidae					+	+	
Polymorphidae	+	+		+	+	+	
Total: Итого	5	8	0	7	7	14	2

Anisakidae, Crassicaudidae, Polymorphidae.

Finally, not all these families are characteristic to an equal degree for the baleen and toothed whales. Thus, for instance, the family Campulidae is represented by an overwhelming majority of species in toothed whales (and some in pinnipeds), and by only one species in baleen whales. Species of the family Anisakidae are also chiefly represented in toothed whales (and in pinnipeds), and only by two species in the baleen whales. On the contrary, among representatives of the subfamily Ogmogasterinae, which are common parasites of the baleen whales, not even one was recorded in toothed whales. The families of cestodes do not display a similar tendency, neither do the families Crassicaudidae and

Polymorphidae.

Below, we deal specifically with the characteristics of the helminth fauna of various groups of toothed cetaceans, yet right now let us remark that in the composition of their helminth fauna families, subfamilies, genera and many species of helminths are found which are peculiar to them only. Thus, exclusively in the toothed whales are recorded one family (Brauninidae), four subfamilies (Delphinicolinae, Nasitrematinae, Braunininae, Pseudaliinae), fourteen genera and forty-seven species of helminths. It should be mentioned that from the number of other families of helminths, the Campulidae and Pseudaliidae are characteristic for toothed cetaceans. However, the above n.med family and subfamilies of helminths cannot characterize the helminth fauna of all
p. 391 toothed whales, is also recorded in Delphinidae, whereas the helminth fauna of the families Physeteridae, Ziphidae, and Platanistidae is poor, only with the genera and species of helminths peculiar to them. Thus, two genera and seven species of helminths were recorded exclusively in Physeteridae, two genera and two species of helminths exclusively in Ziphidae, and no genus and only one species exclusively in Platanistidae.

How can the fact be explained that in the composition of the helminth fauna of baleen whales the families and subfamilies of helminths are not exclusively of their own, while in the composition of the helminth fauna of toothed whales (in Delphinidae) they are ? Not having at our disposal all the necessary materials, we were hampered in answering this question. At the same time by analyzing and comparing the facts, we established that in the helminth fauna of sperm whales, which were rather well investigated in helminthological respect, just as also in the helminth fauna of toothed whales, the families and subfamilies of helminths are not exclusively peculiar to them. The sperm whales as well as th toothed whales make long distance migrations, and it is possible that the noted characteristic common to the helminth fauna of sperm whales and toothed whales, is somehow connected with the long range migrations of these animals. In the helminth fauna of the ziphioid whales (Ziphidae) and river dolphins (Platanistidae) there are also no families or subfamilies peculiar exclusively to these cetaceans, but this is because the helminth fauna of Ziphidae and Platanistidae have been only scantily studied.

Helminth Fauna of the Sperm Whales (Physeteridae).

The family of sperm whales (Physeteridae) unites two genera: Physeter and Kogia. The genus Physeter is represented by the species Ph. catodon (cachalot), while the genus Kogia is represented by the species K. breviceps (dwarf sperm whale).

The helminth fauna of K. breviceps is insufficiently studied. It is known that in this species the cestode Phyllobothrium delphini (larva) and the nematode Pseudaterranova kogiae are parasitic. On the contrary, the helminth fauna of the cachalot (Ph. catodon) was well studied, chiefly due to the investigation by N. M. Gubanov (1952).

From the work of A.A. Kirpichnikov (1950) and the works of investigators it is evident that the distribution of cachalots and the abundance of these animals in one or another area of the Pacific Ocean is determined by the distribution and the population of cephalopodic molluscs which serve as their main fodder. A. A. Kirpichnikov writes that "the coordinated quality of these latter (the cephalopodic molluscs --- S.D.*) to warm waters of high salinity explains the increase in the number of cachalots in the tropical and subtropical zones of all oceans." And furthermore, "the sites of concentration of cachalots in warm and high-salinity tropical waters are determined chiefly by bathymetric conditions (presence of shoals with rich accumulations of cephalopods), but under polar latitudes they are tied mainly with the spread of streams of warm currents" (Kirpichnikov, 1950, p. 23, 24). From this it is evident that the dissemination of the cachalot in the Pacific Ocean is determined by specific causes. These causes ultimately must be reflected upon the composition of the helminth fauna of these whales.

We established that in the cachalot thirteen species of helminths were recorded (not counting Diplogon porus sp., and Trigonocotyle sp.), including one trematode species, three cestode species, seven nematode species, and two acanthocephalan species (Table 16). It is interesting that from the thirteen species of helminths, seven were recorded
p. 392 in the cachalot (Zalophotrema,

Moreover, Trigonocotyle sp., and Diplogonoporus sp. are evidently also species peculiar to the cachalot exclusively.

It should be emphasized that representatives of two genera, the Hexagonoporus and the Placentonema were found only in cachalots. These genera, just as the above indicated species, define the helminth fauna peculiar to cachalot to sufficient degree. Unfortunately, we do not know the intermediate hosts of the helminth species peculiar exclusively to cachalot, however it can be supposed that they pertain to those species of animals which form the staple food of this toothed whale. Furthermore, it is interesting to remark that the helminth genera and species which are not specific for the cachalot were recorded in the majority for other cetaceans, chiefly in the representatives of the suborder of toothed whales. Only two species of helminths enter into the composition of the helminth fauna of the cachalot which are also common with the fauna of pinnipeds. Here belongs the widely disseminated larva of the cestode

Table 16. Analysis of the helminth fauna of the sperm whale (Physeter catodon).

Виды гельминтов, констатированные у кашалотов, добытых в разных точках мирового океана a	Гельминты, зарегистрированные только у кашалота b	Гельминты, зарегистрированные у кашалота и у других зубатых китов c	Гельминты, зарегистрированные у кашалота и у усатых китов d	Гельминты, зарегистрированные у кашалота и у ластоногих e
Zalophotrema curilensis	+			
Tetrabothrium curilensis	+			
Phyllobothrium delphini		+	+	+
Hexagonoporus physeteris	+			
Anisakis catodontis	+			
Anisakis dussumierii		+		
Anisakis iranizkii	+			
Anisakis physeteris	+			
Anisakis simplex		+	+	+
Anisakis skrjabini		+		
Placentonema gigantissima	+			
Bolbosoma brevicolle			+	
Bolbosoma capitatum		+		
Итого Total	7	5	3	2

curilensis, Tetrabothrium curilensis, Hexagonoporus physeteris, Anisakis catodontis, A. iranizkii, A. physeteris, Placentonema gigantissima).

a. Species of helminths found in cachalots caught at different points of the Pacific Ocean.
b. Helminths recorded in cachalots only.
c. Helminths recorded in cachalots and in other toothed whales.
d. Helminths recorded in cachalots and in baleen whales.
e. Helminths recorded in cachalots and in pinnipeds.

Phyllobothrium delphini which is very often parasitic in cachalots, dolphins and very rarely in pinnipeds and in baleen whales, and the nematode Anisakis simplex which was recorded in various marine mammals.

In the helminth fauna of the cachalot several representatives of helminth families are absent which have representatives recorded in toothed whales (Notocotylidae, Fasciolidae), and a series of genera whose representatives are parasitic in the same whales (Fasciola, Ogmogaster, Lecithodesmus, Priapocephalus, Crassicauda). Only three species of helminths are known which are common for cachalots and toothed whales (Phyllobothrium delphini, Anisakis simplex, Bolbosoma brevicolle).

p. 393 By a comparison of the helminth fauna of cachalots with the helminth fauna of other toothed cetaceans (Ziphidae, Delphinidae, Platanistidae), only five common species were found: Phyllobothrium delphini (common with Ziphidae and Delphinidae), Anisakis dussumierii (common with Delphinidae), A. simplex (common with Ziphidae and Delphinidae), Anisakis skrjabini and Bolbosoma capitatum (common with Delphinidae).

From what was said it is evident that the peculiar ecologo-biological characteristics of the cachalot brought with themselves the formation of such a helminth fauna in this whale which is different both from the helminth fauna of baleen whales and from the helminth fauna of other toothed whales.

It is interesting to find out the characteristics of the helminth fauna of cachalots caught at individual points of the Pacific Ocean. The analysis of the material which we have indicates that the helminth fauna of cachalots caught in various oceans is not identical. Thus, for instance, in cachalots caught in the Atlantic Ocean, Anisakis catodontis, A. physeteris, and Bolbosoma capitatum were found. In the cachalots of the Atlantic no trematodes and cestodes were hitherto found. In the Indian Ocean only one species, Anisakis physeteris, was found in cachalots. Parallel with this, the helminth fauna of cachalots caught in the Pacific Ocean is of various shape. It is represented by nine species: (*Zalophotrema curilensis, Tetrabothrium curilensis, Phyllobothrium delphini, Hexagonoporus physeteris, Anisakis dussumierii, A. ivanizkii, A. simplex, A. skrjabini, Placentonema gigantissima*).

The species A. Skrjabini was found also in a cachalot caught in the Indian Ocean. The relatively large number of helminths observed in cachalots of the Pacific Ocean is partly due to the fact that these whales caught in the Pacific Ocean were examined in helminthological respect better than the cachalots caught in other oceans. At the same time, peculiar helminth faunas of the cachalots examined in various oceans are available since the helminths observed in these whales in the Atlantic (*Anisakis catodontis*, *A. physeteris*, *Bolbosoma capitatum*), in spite of a thorough search, could not be found in cachalots of the Pacific Ocean. Evidently, the helminth fauna of cachalots residing in the tropics (shoals of females and non-mature specimens of both sexes accompanied by individual males), should differ from the helminth fauna of males migrating to far distances.

We do not have, however, facts at our disposal which could corroborate this hypothesis.

Helminth Fauna of Ziphioid Whales (Ziphidae).

The ziphioids are represented by five genera: *Ziphius*, *Berardius*, *Hyperoodon*, *Mesoplodon*, and *Tasmacetus*. In sum, the family of *Ziphidae* unites fifteen species of cetaceans from which actually only two species were examined in helminthological respect: *Hyperoodon ampullatus* and *Mesoplodon bidens*. In a third species, *Ziphius cavirostris*, hitherto only one nematode was observed, the *Crassicauda crassicauda*, which is not characteristic of *Ziphidae*.

From this it is evident that unfortunately we are unable to offer an exhaustive analysis of the helminth fauna of ziphioid whales. We limit ourselves to a few tentative remarks.

In the helminth fauna of *Ziphidae* twelve helminth species are listed at present among which one species is trematode (*Oscharinella sobolevi*), three species are cestodes (*Tetrabothrium forsteri*, *Strobilocephalus triangularis*, *Phyllobothrium delphini*), five species are nematodes (*Anisakis*
p. 394 *simplex*, *A. skrjabini*, *Delamurella hyperoodoni*, *Crassicauda crassicauda*, *C. giliakiana*), and three species are

acanthocephalans (Bolbosoma balaenae, B. turbinella, B. vasculosum). In spite of the imperfection of helminthological research, already now we can notice the peculiar helminth fauna of ziphioid whales. Two genera are known in the composition of the helminth fauna of Ziphidae which are unknown for other cetaceans. These genera (Oschmarinella, Delamurella) are exclusively peculiar to ziphioids. Both were observed in the Pacific Ocean. Each of them is represented at present only by one species (Oschmarinella sobolevi and Delamurella hyperoodoni). There is no doubt that, in due course, "beraradiuses," many species of "ligulodonts," ziphioids proper, and other species of the family Ziphidae will be subjected to autopsies. Interesting helminthological findings should be expected whose examination gives the chance for a more complete outlining of the helminth fauna of Ziphidae.

Characteristics of the Helminth Fauna of Dolphinoids (Delphinidae).

The family of Delphinidae is the most populous among other families of cetaceans. It unites three subfamilies: Delphininae, Phocaeninae, and Delphinapterinae. The first of these subfamilies is represented by fifteen genera, the second by three genera, and the third by two genera. All together in the family of Delphinidae forty-six species of cetaceans are included, not counting the various subspecies. Many of these species are very widely disseminated. Some of them have been poorly known at present. In particular, in helminthological respect, until 1952 only twenty species of dolphinoids were investigated; moreover, unfortunately, not all of even these have been studied to a satisfactory extent. What we said does not give us any right to make any kind of final conclusion on the helminth fauna of the family as a whole, however, a few tentative remarks and conclusions of general order are possible, and even at the contemporary state of our knowledge.

In the helminth fauna of dolphinoids sixty-five species of helminths are listed, not counting the doubtful and undetermined species (Table 17). In this number there are twenty trematode species, ten cestode species, thirteen nematodes species and five species of acanthocephalans. Finally, not all the species and genera of helminths known to occur in dolphinoids are specific for these cetaceans. Thus, for instance, among the cestodes and acanthocephalans there is not a single helminth genus which is exclusively peculiar to dolphinoids. Among these groups of helminths there are only five species recorded only in dolphinoids (*(Trigonocotyle lintoni, T. spasskyi, Diphyllobothrium fuhrmanni. D. stemmacephalum, Corynosoma cetaceum).*

In contrast to the cestodes and acanthocephalans, trematodes and nematodes occur not only with many species, but also with genera and even subfamilies, and one family all of which are exclusively peculiar to dolphinoids. Thus, one family (Brauninidae) is listed exclusively in dolphinoids, and three trematode subfamilies (Brauninae, Delphinicolinae, Nasitrematinae), also eight genera (Campula, Leucasiella, Synthesium, Nasitrema, Amphimerus, Delphinicola, Pholeter, Braunina), and eighteen species (

(Fasciola skrjabini, Campula delphini, C. folium, C. gondo, C. laevicaecum, C. oblonga. C. palliata, C. rochebruni, Lecithodesmus nipponicus, Leucasiella mironovi, Odhneriella seymouri, Orthosplanchnus elongatus, Synthesium tursionis, Nasitrema spathulatum, Amphimerus lancea, Delphinicola tenuis, Pholeter gastrophilus, Braunina cordiformis)

We can find almost the same picture for nematodes. One nematode subfamily is exclusively proper for dolphinoids ... (text breaks off on p. 394)...

p. 395 **Table 17. Analysis of the helminth fauna of dolphinids. (Delphinidae)**

Виды гельминтов, представленные в гельминтофауне дельфиновых	a Гельминты, зарегистрированные			
	у *Delphininae*	у *Phocaeninae*	у *Delphinapterinae*	у дельфиновых и у других хозяев [1]
1	2	3	4	5
Fasciola skrjabini	+			
Campula delphini	+			
Campula folium		+		
Campula gondo	+			
Campula laevicaccum	+			
Campula oblonga		+		
Campula palliata	+			
Campula rochebruni	+			
Lecithodesmus nipponicus	+			
Leucasiella mironovi			+	
Odhneriella seymouri			+	
Orthosplanchnus elongatus		+		
Synthesium tursionis	+			
Nasitrema spathulatum		+		
Galactosomum erinaceum	+			?
Opisthorchis tenuicollis		+		+ л. х.
Amphimerus lancea	+			l. kh.
Delphinicola tenuis	+			
Pholeter gastrophilus		+		
Braunina cordiformis	+			
Tetrabothrium forsteri	+			+ к. k
Strobilocephalus triangularis	+			+ к. k
Trigonocotyle lintoni	+			
Trigonocotyle spasskyi	+			
Diphyllobothrium fuhrmanni	+	+		
Diphyllobothrium lanceolatum		+		+ л. l
Diphyllobothrium latum		+		+ л. х. д.
Diphyllobothrium stemmacephalum		+		l. kh. d.
Phyllobothrium delphini	+			+ л. к. l.k.
Monorygma grimaldii	+			+ к. k.
Anisakis alexandri	+			
Anisakis dussumierii	+			+ к. k.
Anisakis kükenthalii			+	
Anisakis simplex	+	+	+	+ л. к.
Anisakis tursionis	+			l.k.

a. Helminths recorded in

1. Species of helminths represented in the helminth fauna of dolphinides.

2. Delphininae; 3. Phocaeninae; 4. Delphinapterinae;

5. In dolphinoids and in other hosts[1]

1. Other cetaceans (k), pinnipeds (l), carnivorous mammals (kh), birds (p), other animals (d).

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CHARACTERISTICS FEATURES OF THE HELMINTH FAUNA OF PINNIPEDS AND CETACEANS

Analysis of the Helminth Fauna of Pinnipeds in the Light of Their Ecology and Phylogenesis.

In the present section we wish to analyze the connections of the helminth fauna of pinnipeds with the helminth fauna of terrestrial mammals and partly also with the helminth fauna of marine birds. These connections, we shall see below, on the one hand are conditioned by ecological causes, and on the other hand by causes of a philogenetic order.

In the preceding chapters we repeatedly mentioned species of helminths which are parasitic in pinnipeds, terrestrial carnivorous mammals including the sea otter and in marine birds. We mentioned also two species of cestodes common to the pinnipeds, terrestrial carnivorous mammals and man, and one nematode species which is parasitic in marine turtles, but it is also recorded in pinnipeds. Information on all these helminths is given in Table 46. From this table it can be seen that at the present time fifteen helminth species are known which are common to pinnipeds, terrestrial carnivorous mammals,and birds. This number includes also eight trematodes species, two cestode species, three nematode species and two acanthocephalans species. Of course, these species must be given corresponding evaluation. It is necessary, as far as it is possible, to elucidate the causes which promoted the appearance of these common species. Let us start with the trematodes.

The trematodes, which are common to pinnipeds, terrestrial carnivorous mammals, and birds, are represented by the families Opisthorchidae (four species), Heterophyidae (two species), Echinostomatidae(one species), and Campulidae (one species).

Representatives of the family of *Opisthorchidae* belong to genera whose overwhelming majority is parasitic in terrestrial carnivorous mammals and birds (*Opisthorchis*, *Metorchis*). The representatives of the families *Heterophyidae* *Rossicotrema venustus* and *Cryptocotyle lingua*, also belong to a genus where the majority of the species are parasitic in terrestrial mammals and birds, while the representative of the family *Echinostomatidae*, the *Mesorchis denticulata*, belongs to a genus whose species are parasitic invarious terrestrial vertebrate animals. None of the three mentioned trematode families, as it is well known, is characteristic for pinnipeds, or for cetaceans, but they are characteristic for land animals.

These common species, as it seems to us, appeared as a result of the fact that the pinnipeds, on the one hand, maintained an ecological connection until the present time with terrestrial carnivorous mammals, on the other hand they
p. 460 established similar connections with marine birds. Thus, the appearance of the mentioned common species of trematodes can be explained by ecological causes.

To become convinced about this, it is enough to analyze the composition of the hosts of the mentioned trematodes. Thus, for instance, in the composition of the hosts of the echinostomid *M. denticulatus*, in addition to the sea lion in which it was once recorded various species of marine birds enter. In the list of the hosts of the heterophyid *C. lingua*, in addition to the seal, there are the dog, the fox, and the polar fox, but first of all again the marine birds in which this trematode is usually parasitic. On the contrary, among the hosts of the heterophid *R. venustus* and of the opistorchid *O. tenuicollis*, *P. truncatum* and *M. albidus* there are no birds, but, in addition to pinnipeds, terrestrial carnivorous mammals are well represented. It is entirely possible that for all species of trematodes

p. 459 Table 46. Exchange of Helminth Fauna Between Pinnipeds, Terrestrial Carnivorous Mammals and Marine Birds.

a Семейства и виды гельминтов	c Дефинитивные хозяева		
	b Ластоногие	d Наземные млекопитающие (включая калана)	e Птицы, рептилии, человек
1	2	3	4
Campulidae			
Orthosplanchnus fraterculus	*Odob. rosmarus, Erign. barbatus*	1 Калан	
Echinostomatidae			
Mesorchis denticulatus	*Zalophus californianus*		2 Гагарка, гагара, крачка, чайка
Heterophyidae			
Rossicotrema venustus	*Phoca vitulina.*	3 Собака, кошка, лисица, енот	
Cryptocotyle lingua	*Mirounga angustirostris, Ph. vitulina, Ph. caspica*	4 Собака, лисица, песец	5 Гагарка, чайка, крачка, клуша
Opisthorchidae			
Opisthorchis tenuicollis	*Erign. barbatus, Halich. grypus, Cyst. cristata*	6 Россомаха, кошка, ([illegible]), волк, циветта	
Pseudamphistomum truncatum	*Halich. grypus, Cyst. cristata, Ph. vitulina, Ph. hispida, Pagophoca groenlandica*	7 Собака, кошка, лисица, енот, собака, хорек, норка, выдра, россомаха.	
Metorchis albidus	*Halich. grypus, Cyst. cristata*	8 Кошка, волк, лисица	
Phocitrema fusiforme	*Ph. hispida Call. ursinus*	9 Калан	
Diphyllobothriidae			
Diphyllobothrium cordatum	*Odob. rosmarus, Erign. barbatus, Ph. vitulina, Pagophoca groenlandica*	10 Собака	11 Человек (?)
Diphyllobothrium latum	*Odob. rosmarus, Erign. barbatus, Cyst. cristata, Ph. vitulina, Ph. hispida, Monachus monachus*	12 Кошка, собака, *Canidae, Felidae, Viverridae, Mustelidae, Ursidae*	13 Человек
Anisakidae			
Contracaecum rectangulum	*Hydr. leptonyx, Lept. weddelli, Lob. carcinoph.*		14 Альбатрос
Contracaecum radiatum	*Hydr. leptonyx, Lept. weddelli, Ommatoph. rossi*		15 Страпета, альбатрос
Filariidae			
Dirofilaria immitis	*Zalophus californianus*	16 Собака, кошка, лисица	

Table 46 Continued.

a Семейства и виды гельминтов	c Дефинитивные хозяева		
	b Ластоногие	d Наземные млекопитающие (включая калана)	e Птицы, рептилии, человек
1	2	3	4
Polymorphidae			17
Corynosoma semerme	*Odobaenus rosmarus, Halichoerus grypus, Cystophora cristata, Ph. vitulina, Ph. hispida*		Бакланы, крохали
		18	19
Corynosoma strumosum	*Odob. rosmarus, Eumet. jubatus, Erign. barbatus, Halich. grypus, Cyst. cristata, Ph. vitulina, Ph. hispida, Ph. caspica, Pagophoca groenlandica*	Собака, кошка	Бакланы, крохали, поганки

Legend:

a. Helminth families and species

b. Pinnipeds

c. Definitive hosts

d. Terrestrial mammals (including sea otter)

e. Birds, reptiles, man

1. Sea otter; 2. Razor bill, great northern diver, tern, seagull; 3. Dog, cat, fox, raccoon; 4. Dog, fox, polar fox; 5. Razorbill, seagulls, tern, black-crowned night heron; 6. Wolverine, cat,(wild) wolf, civet cat; 7. Dog, cat, fox, raccoon, dog, polecat, mink, otter, wolverine; 8. Cat, wolf, fox; 9. Sea otter; 10. Dog; 11. Man (?); 12. Cat, dog, Canidae, etc.; 13. Man; 14. Albatros; 15. Migrating albatros; 16. Dog; 17. Cormorants, mergansers; 18. Dogs, cats; 19. Cormorants, mergansers, grebes.

which are common to pinnipeds, terrestrial carnivorous mammals and marine birds, supplemental hosts are the fishes which are food for these animals.

In Table 46 two more species of trematodes are indicated which we did not mention at present. These are the campulid O. fraterculus and the opistorchid Ph. fusiforme. Both these species were recorded in pinnipeds and sea otter, but they are not known for terrestrial carnivorous mammals and birds. The genus Phocitrema is specially interesting, as if it were declining from the "terrestrial" opistorchids and changing over exclusively to a "marine" genus which, due to the ecological vicinity of pinnipeds and sea otter, became adapted to a parasitic life in these animals. As to the campanulid O. fraterculus, on the one hand this was observed in pinnipeds of the Spitsbergen, and on the other hand it was found in the sea otter which, as it is well known, resides in the near-shore waters of the northern Pacific Ocean, but it has not been hitherto recorded in pinnipeds of the Pacific Ocean. This species is evidently a chip-off of the helminth fauna of cetaceans for which the family Campulidae is characteristic, with the inclusion of this species.

Thus, we see that more than half of all helminth species, which are common to pinnipeds, land mammals and birds, are represented by trematodes. Among these trematodes the extensive circle of definitive hosts makes up the overwhelming majority whose food composition evidently includes
p. 461 such species as fishes which are intermediate hosts for trematodes. Let us now look at the cestodes.

The cestodes which are common in pinnipeds and terrestrial carnivorous mammals are represented only by two species: Diphyllobothrium cordatum and D. latum (Table 46). In pinnipeds no cestode was recorded which is common with marine birds. It is interesting that in case of D. latum the definitive hosts are in such a variety that it is difficult to say for which of them it is the most frequently found parasite. As to D. cordatum, it is evidently most often met with in pinnipeds, extremely infrequently in dogs and still less often in man (if we consider that the information on the parasitic life of this species in man is reliable). From these it is evident that as to the line of cestodes the connection of the helminth fauna of pinnipeds with the helminth fauna of land flesh-eating mammals is not as clearly expressed as for the line of trematodes.

Among the nematodes three species are known from which two (Contracaecum rectangulum and C. radiatum) are common in pinnipeds and marine birds, and one (Dirofilaria immitis) is common in pinnipeds and terrestrial carnivorous mammals. These three species, just as also many others undoubtedly, corroborate the fact of exchange between helminth faunas in a given case on the one hand between pinnipeds and birds of the southern hemisphere and on the other hand between pinnipeds and terrestrial carnivorous mammals of the tropics. Let us now consider the acanthocephalans.

In the composition of the acanthocephalans of the pinnipeds one species is known which is common with birds (Corynosoma semerme), and one species which is common in pinnipeds, birds and terrestrial carnivorous mammals (C. strumosum). The supplemental hosts of these species are fishes which serve as food for pinnipeds andmmarine birds.

From all this it is evident that as a result of the historically complicated ecological connections of pinnipeds with land carnivorous mammals and marine birds, in these animals common speciesoof trematodes, cestodes, nematodes, and acanthocephalans appear. All these species in some way or another prove that there is an exchange of helminth fauna. The enrichment of some species of hosts with helminths occurs at the expense of other hosts. This interesting phenomenon, as V. A. Dogel' (1947) remarks, has still not been worked out sufficiently. We will be satisfied if our above given facts prove to be suitable for a special investigation in this direction.

After having finished with the common species, it is interesting to turn to other species and genera whith figure in the helminth fauna of pinnipeds. For instance, two species of the genus Uncinaria (U. lucasi and U. hamiltoni) should be pointed out which were observed only in pinnipeds, whereas all other species of this genus are parasitizing in terrestrial carnivorous mammals.

A special attention is due, however, not to these species, but to those genera of nematodes which were observed only in pinnipeds, but which belong to helminth families which are generally not characteristic for pinnipeds. We have in mind the genera Skrjabinaria, Parafilaroides and Otostrongylus.

The genus Skrjabinaria, represented exclusively in pinnipeds, is interesting because it belongs to the family Setariidae all species of which are parasitic in terrestrial vertebrates (different mammals, birds, reptiles). This genus evidently turned into a "marine" genus in connection with the transition of the ancesters of pinnipeds from a land form to an aquatic form of life.

Special interest is due finally to the genera Parafilaroides and Otostrongylus. The Parafilarcides genus belongs to the family Filaroididae whose species are parasitic in the respiratory pathways or in blood vessels, ... (text breaks off with p. 461, pp. 462 to 479 missing).

APPENDIX

DISTRIBUTION OF HELMINTHS BY HOSTS

ORDER: Pinnipedia

Otaria byronia

Anisakis patagonica (Linstow, 1880) Baylis, 1920.
Contracaecum osculatum (Rud, 1802) Baylis, 1920.
Uncinaria hamiltoni Baylis, 1933.

Eumetopias jubatus

Anophryocephalus ochotensis Delamure et Krotov, 1955.
Pyramicocephalus phocarum (Fabricius, 1780) Monticelli, 1890,
Anisakis simplex (Rud., 1809) Baylis, 1920.
Anisakis tridentata Kreiss, 1938.
Anisakis sp.
Contracaecum osculatum (Rud., 1802) Baylis, 1920.
Terranova decipiens (Krabbe, 1878) Baylis, 1916.
Parafilaroides nanus Dougherty et Herman, 1947.
Parafilaroides prolificus Dougherty et Herman, 1947.
Parafilaroides sp.
Bolbosoma bobrovoi Krotov et Delamure 1952.
Corynosoma strumosum (Rudolphi, 1802).

Zalophus californianus

Mesorchis denticulata (Rud., 1802) Dietz, 1909.
Pricetrema zalophi (Price, 1932).
Zalophotrema hepaticum Stunkard et Alvey, 1929.
Dirofilaria immitis (Leidy, 1856).
Parafilaroides decorus Dougherty et Hermann, 1947.
Corynosoma obtuscens Lincicome, 1943.
Corynosoma osmeri Fujita, 1921.

Arctocephalus australis

Adenocephalus pacificus Nybelin, 1931.
Contracaecum corderoi Lent et Freitas, 1948.
Contracaecum osculatum (Rud., 1802) Baylis, 1920.
Porrocaecum sulcatum (Rud., 1819) Baylis, 1923.

Arctocephalus doriferus

Diphyllobothrium arctocephalinum Johnston, 1937.
Contracaecum osculatum (Rud., 1802) Baylis, 1920.
Terranova decipiens (Krabbe, 1878) Baylis, 1916.
Corynosoma australe Johnston, 1937.

Callorhinus ursinus

Phocitrema fusiforme Goto et Ozaki, 1930,
Adenocephalus septentrionalis Nybelin, 1931.
Clestobothrium glaciale Cholodkovsky, 1914,
Diphyllobothrium krotovi n. sp.
Diphyllobothrium macrocephalus (Linstow, 1905.
Anisakidae g. sp.
Terranova decipiens (Krabbe, 1878. Baylis, 1916.
Uncinaria lucasi Stiles, 1901.
Bolbosoma bobrovoi Krotov et delamure, 1952.
Bolbosoma nipponicum Yamaguti, 1939.

Odobaenus rosmarus

Odhneriella rossica Skrjabin, 1915.
Orthosplanchnus fraterculus Odhner, 1905.
Diphyllobothrium cordatum (Leuckart, 1863) Gedoelst, 1911.
Diphyllobothrium latum (L., 1758) Lühe, 1910.
Diphyllobothrium roemeri (Zschokke, 1903).
Anisakis rosmari (Baylis, 1916) Baylis, 1920.
Contracaecum osculatum (Rud., 1802) Baylis, 1920.
Terranova decipiens (Krabbe, 1878) Baylis, 1916.
Corynosoma semerme (Forsell, 1904) Lühe, 1911.
Corynosoma strumosum (Rud., 1802).

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Distribution of Helminths by Hosts

Phoca vitulina

Cryptocotyle lingua (Creplin, 1925).
Echinostoma acanthoides (Rud., 1819) Cobbold, 1860.
Pseudamphistomum truncatum (Rud., 1819) Lühe, 1908.
Rossicotrema venustus (Ransom, 1920).
Diphyllobothrium cordatum (Leuckart, 1863) Gedoelst, 1911.
Diphyllobothrium hians (Diesing, 1850).
Diphyllobothrium schistochilus (Germanos, 1895).
Diphyllobothrium latum (L., 1758) Lühe, 1910.
Diphyllobothrium tetrapterus (Siebold, 1848).
Schistocephalus solidus (Müller, 1776) (anmuna).
Contracaecum osculatum (Rud., 1802) Baylis, 1920.
Terranova decipiens (Krabbe, 1878) Baylis, 1916.
Parafilaroides gymnurus (Railliet, 1899) Dougherty, 1946.
Otostrongylus circumlitus (Railliet, 1899) Bruyn, 1933.
Skrjabinaria spirocauda (Leidy, 1858) Lubimov, 1927.
Corynosoma semerme (Forssell, 1904) Lühe, 1911.
Corynosoma strumosum (Rudolphi, 1802).

Phoca hispida

Orthosplanchnus arcticus Odhner, 1905.
Phocitrema fusiforme Goto et Ozaki, 1930.
Pseudamphistomum truncatum (Rud., 1819) Lühe, 1908.
Anophryocephalus anophrys Baylis, 1922.
Trigonocotyle skrjabini Krotov et Delamure, 1955.
Diphyllobothrium fasciatus (Krabbe, 1865).
Diphyllobothrium hians (Diesing, 1850).
Diphyllobothrium latum (L., 1758) Lühe, 1910.
Diphyllobothrium lanceolatum (Krabbe, 1865)
Diphyllobothrium tetrapterus (Siebold, 1848).
Pyramicocephalus phocarum (Fabricius, 1780) Monticelli, 1890.
Schistocephalus solidus (Müller, 1776) (anmuna).
Contracaecum osculatum (Rud., 1802) Baylis, 1920.
Terranova decipiens (Krabbe, 1878) Baylis 1916
Phocascaris netsiki Lyster, 1940.
Otostrongylus circumlitus (Railliet, 1899) Bruyn, 1933.
Skrjabinaria spirocauda (Leidy, 1858) Lubimov, 1927.
Bolbosoma nipponicum Yamaguti, 1939.
Corynosoma reductum (Linstow, 1905).
Corynosoma semerme (Forssell, 1904) Lühe, 1911.
Corynosoma strumosum (Rud., 1802).

Phoca caspica

Cryptocotyle lingua (Creplin, 1925).
Anisakis schupakovi Mosgovoy, 1951.
Corynosoma strumosum (Rud., 1802).
? *Pseudechinostomum adrena* Schupakov, 1936.
?*Eustrongylides excisus* Jägerskiold, 1908.
? *Dioctophyme* sp.

Phoca sibirica

Contracaecum osculatum baicalensis Mosgovoy et Ryjikov, 1950.

Phoca sp.

Diplogonoporus septentrionalis Cholodovsky, 1914.

Erignathus barbatus

Opisthorchis tenuicollis (Rud., 1819) Stiles, et Hassall, 1896.
Orthosplanchnus arcticus Odhner, 1905.
Orthosplanchnus fraterculus Odhner, 1905.
Diphyllobothrium cordatum (Leuckart, 1863) Gedoelst, 1911.
Diphyllobothrium hians (Diesing, 1850).
Diphyllobothrium latum (L. 1758) Lühe, 1910.
Diphyllobothrium lanceolatum (Krabbe, 1865).
Diphyllobothrium macrocephalus (Linstow, 1905).
Diphyllobothrium schistochilus (Germanos, 1895).
Diphyllobothrium tetrapterus (Siebold, 1848).
Pyramicocephalus phocarum (Fabric., 1780).
Contracaecum osculatum (Rud., 1802) Baylis, 1920.
Terranova decipiens (Krabbe, 1878) Baylis, 1916.
Corynosoma strumosum (Rud., 1802).

Halichoerus grypus

Metorchisa albidus (Braun, 1893) Lühe, 1899.
Opisthorchis tenuicollis (Rud., 1819) Stiles et Hassall, 1896.
Pseudamphistomum truncatum (Rud., 1819) Lühe, 1908.
Anisakis similis (Baird, 1853) Baylis, 1920.
Contracaecum osculatum (Rud., 1802) Baylis, 1920.
Terranova decipiens (Krabbe, 1878) Baylis, 1916.
Corynosoma strumosum (Rud., 1802).
Corynosoma semerme (Forssell, 1904) Lühe, 1911.

Pagophoca groenlandica

Orthosplanchnus arcticus Odhner, 1905.
Pseudamphistomum truncatum (Rud., 1819) Lühe, 1908.

Diphyllobothrium cordatum (Leuckart, 1863) Gedoelst, 1911.
Diphyllobothrium schistochilus (Germanos, 1895).
Anisakidae g. sp.
Contracaecum osculatum (Rud., 1802) Baylis, 1920.
Phocascaris phocae Höst, 1932.
Terranova decipiens (Krabbe, 1878) Baylis, 1916.
Corynosoma strumosum (Rud., 1802).

Cystophora cristata

Metorchis albidus (Braun, 1893) Lühe, 1899.
Opisthorchis tenuicollis (Rud., 1819) Stiles et Hassall, 1896.
Pseudamphistomum truncatum (Rud., 1809) Lühe, 1908.
Diphyllobothrium latum (L., 1758) Lühe, 1910.
Diphyllobothrium tetrapterus (Siebold, 1848).
Pyramicocephalus phocarum (Fabric., 1780) Monticelli, 1890.
Contracaecum osculatum (Rud., 1802) Baylis, 1920.
Corynosoma semerme (Forssell, 1904) Lühe, 1911.
Corynosoma strumosum (Rud., 1802).

Mirounga angustirostris

Cryptocotyle lingua (Creplin, 1925).
Terranova decipiens (Krabbe, 1878) Baylis, 1916.

Mirounga leonina

Diphyllobothrium tectus (Linstow, 1892).
Anisakis similis (Baird, 1853) Baylis, 1920.
Contracaecum osculatum (Rud., 1802) Baylis, 1920.
Terranova decipiens (Krabbe, 1878) Baylis, 1916.
Uncinaria hamiltoni Baylis, 1933.
Corynosoma bullosum (Linstow, 1892).

Lobodon carcinophagus

Ogmogaster antarcticus Johnston, 1931.
Contracaecum osculatum (Rud., 1802) Baylis, 1920.
Contracaecum rectangulum (Linstow, 1907) Baylis, 1920,
Corynosoma bullosum (Linstow, 1892).

Hydrurga leptonyx

Diphyllobothrium ventropapillatum n. sp.
Diphyllobothrium quadratum (Linstow, 1892).
Diphyllobothrium tectus (Linstow, 1892).
Contracaecum osculatum (Rud., 1802) Baylis, 1920.
Contracaecum radiatum (Linstow, 1907) Baylis, 1920.
Contracaecum rectangulum (Linstow, 1907) Baylis, 1920.
Contracaecum stenocephalum (Railliet et Henry, 1907).
Corynosoma hamanni (Linstow, 1892).

Leptonychotes weddelli

Ogmogaster antarcticus Johnston, 1931.
Diphyllobothrium archeri (Leiper et Atkinson, 1914).
Diphyllobothrium perfoliatum Railliet et Henry, 1912.
Diphyllobothrium quadratum (Linstow, 1892).
Diphyllobothrium rufum Leiper et Atkinson, 1914.
Diphyllobothrium tectus (Linstow, 1892).
Diphyllobothrium wilsoni (Shipley, 1907) Railliet et Henry, 1912.
Phyllobothrium delphini (Bosc, 1802) (личинка).
Contracaecum osculatum (Rud., 1802) Baylis, 1920.
Contracaecum radiatum (Linstov, 1907) Baylis, 1920
Contracaecum rectangulum (Linstow, 1907) Baylis, 1920.
Contracaecum stenocephalum (Railliet et Henry, 1907).
Terranova decipiens (Krabbe, 1878) Baylis, 1916.
Corynosoma hamanni (Linstow, 1892).
Corynosoma sipho Railliet et Henry, 1907.

Ommatophoca rossi

Diphyllobothrium antarcticum (Baird, 1853).
Diphyllobothrium scotti (Shipley, 1907).
Diphyllobothrium wilsoni (Shipley, 1907) Railliet et Henry, 1912.
Contracaecum radiatum, (Linstow, 1907) Baylis, 1920.
Terranova decipiens (Krabbe, 1878) Baylis, 1916.
Corynosoma hamanni (Linstow, 1892).

Monachus monachus

Diphyllobotrium hians (Diesing, 1850).
Diphyllobothrium latum (L., 1758) Lühe, 1910.
Diphyllobothrium lanceolatum (Krabbe, 1865).
Diphyllobothrium tetrapterus (Siebold, 1848).
Contracaecum osculatum (Rud., 1802) Baylis, 1920.
Terranova decipiens (Krabbe, 1878) Baylis, 1916.

Monachus schauinslandii

Contracaecum turgidum Chapin, 1925.

Distribution of Helminths by Hosts

ORDER: Cetacea

Balaena mysticetus

Lecithodesmus goliath (van Beneden, 1858) Braun, 1902.
Phyllobothrium delphini (Bosc, 1802) (личинка).
Crassicauda crassicauda (Creplin, 1829) Leiper et Atkinson, 1914.
Bolbosoma balaenae (Gmelin, 1790).

Eubalaena glacialis

Priapocephalus grandis Nybelin, 1922.
Bolbosoma brevicolle (Malm, 1867).
Bolbosoma turbinella (Diesing, 1851) Porta, 1908.

Balaenoptera musculus

Ogmogaster antarcticus Johnston, 1931.
Ogmogaster plicatus (Creplin, 1892) Jägerskiöld, 1891.
Priapocephalus grandis Nybelin, 1922.
Tetrabothrium affinis (Lönnberg, 1891) Lönnberg, 1892.
Anisakis simplex (Rud., 1809) Baylis, 1920.
Terranova decipiens (Krabbe, 1878) Baylis, 1916.
Crassicauda crassicauda (Creplin, 1829) Leiper et Atkinson, 1914.
Bolbosoma balaenae (Gmelin, 1790).
Bolbosoma brevicolle (Malm, 1867).
Bolbosoma hamiltoni Baylis, 1929.
Bolbosoma turbinella (Diesing, 1851) Porta, 1908.

Balaenoptera acutorostrata

Fasciola skrjabini n. sp.
Lecithodesmus goliath (van Beneden, 1858) Braun, 1902.
Ogmogaster plicatus (Creplin, 1829) Jägerskiöld, 1891.
Anisakis simplex (Rud., 1809) Baylis, 1920.
Terranova decipiens (Krabbe, 1878) Baylis, 1916.
Crassicauda crassicauda (Creplin, 1829) Leiper et Atkinson, 1914.
Bolbosoma balaenae (Gmelin, 1790).
Bolbosoma brevicolle (Malm, 1867) Porta, 1908.
Bolbosoma nipponicum Yamaguti, 1939.

Balaenoptera borealis

Lecithodesmus goliath (van Beneden, 1858) Braun, 1902.
Ogmogaster plicatus (Creplin, 1829) Jägerskiöld, 1891.
Priapocephalus grandis Nybelin, 1922.
Priapocephalus minor Nybelin, 1928.
Tetrabothrium affinis (Lönnberg, 1891) Lönnberg, 1892.
Tetrabothrium arsenyevi n. sp.
Diplogonoporus balaenopterae (Lönnberg, 1892).
Diphyllobothrium sp.
Crassicauda crassicauda (Creplin, 1829) Leiper et Atkinson, 1914.
Bolbosoma balaenae (Gmelin, 1790).

Bolbosoma brevicolle (Malm, 1867).
Bolbosoma nipponicum Yamaguti, 1939.
Bolbosoma turbinella (Diesing, 1851) Porta, 1908.

Balaenoptera physalus

Lecithodesmus goliath (van Beneden, 1858) Braun, 1902.
Ogmogaster antarcticus Johnston, 1931.
Ogmogaster plicatus (Creplin, 1829) Jägerskiöld, 1891.
Priapocephalus grandis, Nybelin, 1922.
Priapocephalus minor Nybelin, 1928.
Tetrabothrium affinis (Lönnberg, 1891) Lönnberg, 1892.
Tetrabothrium ruudi Nybelin, 1928.
Diplogonoporus balaenopterae (Lönnberg, 1892).
Crassicauda boopis Baylis, 1920.
Crassicauda crassicauda (Creplin, 1829) Leiper et Atkinson, 1914.
Bolbosoma balaenae (Gmelin, 1790).
Bolbosoma brevicolle (Malm, 1867) Porta, 1908.
Bolbosoma hamiltoni Baylis, 1929.
Bolbosoma nipponicum Yamaguti, 1939.
Bolbosoma turbinella (Diesing, 1851) Porta, 1908.

Megaptera nodosa

Crassicauda boopis Baylis, 1920.
Crassicauda crassicauda (Creplin, 1829) Leiper et Atkinson, 1914.
Bolbosoma balaenae (Gmelin, 1790).
Bolbosoma turbinella (Diesing, 1851) Porta, 1908.

Physeter catodon

Zalophotrema curilensis Gubanov, 1952.
Tetrabothrium curilensis Gubanov, 1952.
Trigonocotyle sp.
Phyllobothrium delphini (Bosc, 1802) (личинка).
Diplogonoporus sp.
Hexagonoporus physeteris Gubanov, 1952.
Anisakis catodontis Baylis, 1929.
Anisakis dussumierii (v. Beneden, 1870) Baylis, 1920.
Anisakis ivanizkii Mosgovoy, 1949.
Anisakis physeteris Baylis, 1923.
Anisakis simplex (Rud., 1809) Baylis, 1920.
Anisakis skrjabini Mosgovoy, 1949.
Anisakidae g. sp.

Placentonema gigantissima Gubanov, 1951.
Bolbosoma brevicolle (Malm, 1867) Porta, 1908.
Bolbosoma capitatum (Linstow, 1880) Porta, 1908.
Bolbosoma physeteris Gubanov, 1952.
Corynosoma curilensis Gubanov, 1952.

Kogia breviceps

Phyllobothrium delphini (Bosc, 1802) (личинка).
Pseudoterranova kogiae (Johnston et Mawson, 1939).
Crassicauda magna (Johnston et Mawson, 1939).

Ziphius cavirostris

Crassicauda crassicauda (Creplin, 1829) Leiper et Atkinson, 1914.

Hyperoodon ampullatus

Oschmarinella sobolevi Skrjabin, 1947.
Strobilocephalus triangularis (Diesing, 1850) Baer, 1932.
Trigonocotyle sp.
Diphyllobothrium sp.
? *Nybelinia* sp.
Anisakis simplex (Rud., 1809) Baylis, 1920.
Anisakis skrjabini Mosgovoy, 1949.
Crassicauda giliakiana Skrjabin et Andreeva, 1934.
Delamurella hyperoodoni Gubanov, 1952.
Bolbosoma balaenae (Gmelin, 1790).
Bolbosoma turbinella (Diesing, 1851) Porta, 1908.

Hyperoodon sp.

Crassicauda bennetti Spaul, 1926.

Mesoplodon bidens

Monostomum delphini Diesing, 1850.
Strobilocephalus triangularis (Diesing, 1850) Baer, 1932.
Tetrabothrium forsteri (Krefft, 1871) Fuhrmann, 1904.
Phyllobothrium delphini (Bosc, 1802).
Anisakis simplex (Rud., 1809) Baylis, 1920.
Bolbosoma vasculosum (Rud., 1819).

Delphinus delphis

Braunina cordiformis Wolf, 1903.
Campula delphini (Poirier, 1886) Bittner et Sprehn, 1928.
Campula palliata (Looss, 1885) Looss, 1901.
Campula rochebruni (Poirier, 1886) Bittner et Sprehn, 1928.
Distomum philocholum Creplin, 1845.
Galactosomum erinaceum (Poirier, 1886) Bittner et Sprehn, 1928.
Tetrabothrium forsteri (Krefft, 1871) Fuhrmann, 1904.
Monorygma grimaldii (Moniez, 1889) Baylis, 1919 (личинка).
Phyllobothrium delphini (Bosc, 1802) (личинка).
Anisakis simplex (Rud. 1809) Baylis, 1920.
Anisakis typica (Diesing, 1860) Baylis, 1920.
Halocercus delphini Baylis et Daubney, 1925.
Halocercus kleinenbergi Delamure, 1951.
Skrjabinalius cryptocephalus Delamure, 1942.
Bolbosoma vasculosum (Rud., 1819).
Corynosoma cetaceum Johnston, 1913.
Corynosoma sp.

Delphinus sp.

Monorygma grimaldii (Moniez, 1889) Baylis, 1919 (личинка).

Globicephalus melas

Campula gondo Yamaguti, 1942.
Trigonocotyle lintoni Guiart, 1935.
Phyllobothrium delphini (Bosc, 1802) (личинка).
Monorygma grimaldii (Moniez, 1889) Baylis, 1919 (личинка).
Anisakis typica (Diesing, 1860) Baylis, 1920.
Stenurus globicephalus Baylis et Daubney, 1925.
Torynurus convolutus (Kühn, 1829).
Bolbosoma capitatum (Linstow, 1880) Porta, 1908.

Grampus griseus

Phyllobothrium delphini (Bosc, 1802) (личинка).
Crassicauda grampicola Johnston et Mawson, 1941.

Lagenorhynchus acutus

Strobilocephalus triangularis (Diesing, 1850) Baer, 1932.
Monorygma grimaldii (Moniez, 1889) Baylis, 1919 (личинка).

Lagenorhynchus albirostris

Anisakis simplex (Rud., 1809) Baylis, 1920.
Halocercus lagenorhynchus Baylis et Daubney, 1925.

Lagenorhynchus cruciger

Anisakis simplex (Rud., 1809) Baylis 1920.

Distribution of Helminths by Hosts

Anisakis typica (Diesing, 1860) Baylis, 1920.

Orca orca

Fasciola skriabini n. sp.
Trigonocotyle spasskyi Gubanov, 1952.
Anisakis simplex (Rud., 1809) Baylis, 1920.
Anisakis sp.

Orcella brevirostris

Amphimerus lancea (Diesing, 1850) Barker, 1911.

Prodelphinus (Stenella) graffmani

Braunina cordiformis Wolf, 1903.

Prodelphinus longirostris

Campula laevicaecum Yamaguti, 1942.
Delphinicola tenuis Yamaguti, 1933.
Lecithodesmus nipponicus Yamaguti, 1942.
Diphyllobothrium fuhrmanni Hsü, 1935.
Anisakis dussumierii (v. Beneden, 1870) Baylis, 1920.
Corynosoma sp.

Pseudorca crassidens

Anisakis simplex (Rud., 1809) Baylis, 1920.
Bolbosoma capitatum (Linstow, 1880) Porta, 1908.

Sotalia guianensis

Halocercus brasiliensis Lins, 1933.

Sotalia sinensis

Anisakis alexandri Hsü et Hoeppli 1933.

Sotalia tucuxii

Amphimerus lancea (Diesing 1850) Barker, 1911.

Steno rostratus

Strobilocephalus triangularis (Diesing, 1850) Baer, 1932.
Tetrabothrium forsteri (Krefft, 1871) Fuhrmann, 1904.
Bolbosoma capitatum (Linstow, 1880) Porta, 1908.

Tursiops tursio

Braunina cordiformis Wolf, 1903
Synthesium tursionis (Marchi, 1872) Stunkard et Alvey, 1930.
Monorygma grimaldii (Moniez, 1889) Baylis, 1919 (личинка).
Phyllobothrium delphini (Bosc, 1802) (личинка).
Diphyllobothrium sp.
Anisakis tursionis Crusz, 1946.
Crassicauda crassicauda (Creplin, 1829) Leiper et Atkinson, 1914.
Halocercus lagenorhynchus Baylis et Daubney, 1925.
Stenurus ovatus Linstow, 1910.
Corynosoma cetaceum Johnston, 1943.

Phocaena phocaena

Campula oblonga Cobbold, 1858.
Distomum phylocholum Creplin, 1845.
Opisthorchis tenuicollis (Rud., 1819) Stiles et Hassall, 1896.
Pholeter gastrophilus (Kossak, 1910) Odhner, 1914.
Diphyllobothrium latum (L., 1758) Lühe, 1910.
Diphyllobothrium lanceolatum (Krabbe, 1865).
Diphyllobothrium stemmacephalum (Cobbold, 1858).
Anisakis simplex (Rud., 1809) Baylis, 1920.
Anisakis typica (Diesing, 1860) Baylis, 1920.
Terranova decipiens (Krabbe, 1878) Baylis, 1916
Halocercus invaginatus (Quekett, 1841) Dougherty, 1943.
Halocercus ponticus Delamure, 1946.
Halocercus taurica Delamure, 1942.
Pseudalius inflexus (Rud., 1809) Schneider, 1866.
Stenurus minor (Kühn, 1829).
Torynurus convolutus (Kühn, 1829) Baylis, et Daubney, 1925.
Corynosoma semerme (Forssell, 1904) Lühe, 1911.
Corynosoma strumosum (Rud., 1802).

Neomeris phocaenoides

Campula folium Ozaki, 1935.
Nasitrema spathulatum Ozaki, 1935.
Orthosplanchnus elongatus Ozaki, 1935.
Diphyllobothrium fuhrmanni Hsü, 1935.
Halocercus pingi Wu, 1929.
Stenurus auditivus Hsü et Hoeppli, 1933.
Onchocerca fulleborni Hoeppli, Hsü et Wu, 1929.

Phocaenoides dalli

Halocercus kirbyi Dougherty, 1944.

Delphinapterus leucas

Leucasiella mironovi Krotov et Delamure, 1952.
Odhneriella seymouri (Price, 1932) Skrjabin, et Schulz, 1935.
Anisakis kükenthalii (Cobb., 1889) Baylis, 1920.
Anisakis simplex (Rud., 1809) Baylis, 1920.
Otophocaenurus oserskoi Skrjabin, 1942.
Stenurus pallasii (v. Beneden, 1870) Dougherty, 1943.

Appendix

Crassicauda giliakiana Skrjabin et Andreeva, 1934.
Corynosoma strumosum (Rud., 1802).

Monodon monoceros

Anisakis simplex (Rud., 1809) Baylis, 1920.
Terranova decipiens (Krabbe, 1878) Baylis, 1916.
Torynurus alatus (Leuckart, 1848) n. comb.

Platanista gangetica

Cyclochis campula (Cobbold, 1870) Lühe, 1908.
Distoma andersoni Cobbold, 1876.
Contracaecum lobulatum (Schneider, 1866) Baylis et Daubney, 1923.

Inia geoffroyensis

Anisakis insignis (Diesing, 1851) Baylis, 1920.

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LIST OF HELMINTHS REPORTED IN PINNIPEDIA RESIDING IN U.S.S.R. WATERS

СПИСОК ГЕЛЬМИНТОВ, ЗАРЕГИСТРИРОВАННЫХ У ЛАСТОНОГИХ, ОБИТАЮЩИХ В ВОДАХ СССР

Trematoda Трематоды

Cryptocotyle lingua (Creplin, 1925).
Odhneriella rossica Skrjabin, 1915.
Orthosplanchnus arcticus Odhner, 1905.
Phocitrema fusiforme Goto et Ozaki, 1930.
? *Pseudechinostomum advena* Schupakov, 1936[1].

Cestoda Цестоды

Anophryocephalus ochotensis Delamure et Krotov, 1955
Clestobothrium glaciale Cholodkovsky, 1914.
Diphyllobothrium cordatum (Leuckart, 1863) Gedoelst, 1911.
Diphyllobothrium krotovi n. sp.
Diphyllobothrium lanceolatum (Krabbe, 1865).
Diphyllobothrium romeri (Zschokke, 1903).
Diphyllobothrium schistochilus (Germanos, 1895).
? *Diplogonoporus septentrionalis* Cholodkovsky, 1914.
Pyramicocephalus phocarum (Fabric., 1780) Monticelli, 1890.
Trigonocotyle skrjabini Krotov et Delamure, 1955.

Нематоды Nematoda

Anisakis schupakovi Mosgovoy, 1951.
Anisakis simplex (Rud., 1809) Baylis, 1920.
Anisakis sp.
Anisakidae g. sp.
Contracaecum osculatum (Rud., 1802) Baylis. 1920.
Dioctophyme sp.
? *Eustrongylides excisus* Jägerskiöld, 1908.
Otostrongylus circumlitus (Railliet, 1899) Bruyn, 1933.
Phocascaris phocae Höst, 1932.
Skrjabinaria spirocauda (Leidy, 1858) Lubimov, 1927.
Terranova decipiens (Krabbe, 1878) Baylis, 1916).

Акантоцефалы Acanthocephala

Bolbosoma bobrovoi Krotov et Delamure, 1952.
Bolbosoma nipponicum Yamaguti, 1939.
Corynosoma reductum (Linstow, 1905).
Corynosoma semerme (Forssell, 1904) Lühe, 1911.
Corynosoma strumosum (Rudolphi, 1802).

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1. Doubtful and insufficiently described forms designated by question mark.

p. 488 LIST OF HELMINTHS REPORTED IN CETACEA RESIDING IN U.S.S.R. WATERS

СПИСОК ГЕЛЬМИНТОВ, ЗАРЕГИСТРИРОВАННЫХ У КИТООБРАЗНЫХ, ОБИТАЮЩИХ В ВОДАХ СССР

Trematoda Трематоды

Campula palliata (Looss, 1885) Looss, 1901.
Lecithodesmus goliath (van Beneden, 1858) Braun, 1902.
Leucasiella mironovi Krotov et Delamure, 1952.
Odhneriella seymouri (Price, 1932) Skrjabin et Schulz, 1935.
Ogmogaster antarcticus Johnston, 1931.
Ogmogaster plicatus (Creplin, 1829) Jägerskiöld, 1891.
Oschmarinella soboleri Skrjabin, 1947.
Zalophotrema curilensis Gubanov, 1952.

Cestoda Цестоды

Diplogonoporus balaenopterae (Lönnberg, 1892).
Diplogonoporus sp.
Diphyllobothrium sp.
Hexagonoporus physeteris Gubanov, 1952.
? *Nybelinia* sp.
Phyllobothrium delphini (Bosc, 1802).
Priapocephalus minor Nybelin, 1928.
Tetrabothrium curilensis Gubanov, 1952.
Trigonocotyle spasskyi Gubanov, 1952.
Trigonocotyle sp.

Nematoda Нематоды

Anisakis dussumierii (v. Beneden, 1870) Baylis, 1920.
Anisakis ivanizkii Mozgovoy, 1940.
Anisakis kükenthalii (Cobb., 1889) Baylis, 1920.
Anisakis simplex (Rud., 1809) Baylis, 1920.
Anisakis skrjabini Mozgovoy, 1949.
Anisakidae g. sp.
Crassicauda boopis Baylis, 1920.
Crassicauda giliakiana Skrjabin et Andreeva, 1934.
Delamurella hyperoodoni Gubanov, 1952.
Halocercus kleinenbergi Delamure, 1951.
Halocercus ponticus Delamure, 1946.
Halocercus taurica Delamure, 1942.
Otophocaenurus oserskoi Skrjabin, 1942.
Placentonema gigantissima Gubanov, 1951.
Skrjabinalius cryptocephalus Delamure, 1942.
Stenurus minor (Kühn, 1829).
Stenurus ovatus Linstow, 1910.
Torynurus convolutus (Kühn, 1829) Baylis et Daubney, 1925.

Acanthocephala Акантоцефалы

Bolbosoma physeteris Gubanov, 1952.
Bolbosoma turbinella (Diesing, 1851) Porta, 1908.
Corynosoma curilensis Gubanov, 1952.

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