THE METAZOAN PARASITES OF THE HETEROSOMATA OF THE GULF OF THE ST. LAWRENCE.

by

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I N D E X

I. INTRODUCTION

There has been little investigation of the parasitic fauna of the North Atlantic Ocean bordering Canada. The literature reveals that no one group of fish has ever been covered by workers in this area, a situation not found in European waters of the Atlantic. Attempts have been made at classification and distribution studies, some of which introduced new species to taxonomy, but always concerning mixed groups of fish.

The first of these was by Stafford (1904) whose work unfortunately, was signally incomplete. As a result, many of his species have fallen into synonymy, even to the extent of a single species now being found in more than one genus. Miller (1941) was able to clear partially the resulting chaos in his paper entitled "A critical study of Stafford's report on trematodes of Canadian fish".

The next investigation of trematodes of fish from the North West Atlantic was made by Cooper (1915), in his paper on marine and fresh water hosts. Since this date there has not been a study made on the class Trematoda, as a whole, although Wolfgang (1954a, 1954b, 1955a, 1955b) has monographed the trematode Stephanostomum baccatum in flatfish of eastern Canada, and Wolfgang and Myers (1954) have described a new species from the codfish ovary.

Nematodes of the genus Porrocaecum have been mentioned in eastern Canadian waters by Scott (1950, 1953,

1955, 1956). Acanthocephala have been studied only as part of Montreuil's work on the seal parasites of the Magdalen Islands (1955).

The copepod parasites of marine fish are fairly well known from eastern waters through the work of Bere (1930), who studied these in the Passamaquoddy region. Wilson recorded a copepod from Cape Breton Island in 1932, and several others in 1944. Stock (1915) gave the first record of a parasitic copepod, Chondracanthus cornutus (= Acanthochondria cornuta) on Pseudopleuronectes americanus in eastern Canadian waters.

Other reports have been published on the parasites of the fish of Canada, but without exception these have been on Pacific marine fish, or fresh water and Arctic species.

The one fairly comprehensive work of the waters covered in this present survey, was made by Heller (1949), who described the metazoan parasites of 15 species of hosts. The hosts represented 11 genera of teleosts and two genera of elasmobranchs. Unfortunately no one group of fish present in eastern Canadian waters was completely covered.

The present survey was confined to the species of Heterosomata taken in the Gulf of the St. Lawrence. In all eight species of flatfish have been reported from this area; of these only seven were captured:-

Glyptocephalus cynoglossus (Linne, 1758), witch.
Hippoglossoides platessoides (Fabricius, 1780), plaice.
Hippoglossus hippoglossus (Linne, 1758), halibut.
Limanda ferruginea (Storer, 1839), yellowtail flounder.
Liopsetta putnami (Gill, 1864), smooth flounder.
Pseudopleuronectes americanus (Walbaum, 1792), winter flounder.
Scophthalmus aquosus (Mitchill, 1814), sand flounder.
Reinhardtius hippoglossoides (Walbaum, 1792), the Greenland or lesser halibut was not taken during the study.

Several of the seven species of hosts examined in this work are found not only on the North Atlantic seaboard, but also in European waters. As a preliminary, it was therefore deemed advisable to construct a check list of all the metazoan parasites of the Heterosomata of the world. This has been completed and is included at the end of the survey, together with a list of those parasites taken from the flatfish in the Gulf of the St. Lawrence.

II. MATERIALS AND METHODS

The fish used in this study were taken with all types of gear used for fishing in eastern Canada. Included were the drag, beam trawl, long-line, hand line, purse seine, cod trap, herring gill net, cod gill net, Danish seine, box net, beach seine and even the lobster trap. The survey was commenced late in 1954, when a few specimens were taken, and continued until July, 1956. Some of the host specimens were taken from the museum collection of the Station de Biologie Marine at Grande-Riviere, where they had been preserved in formalin.

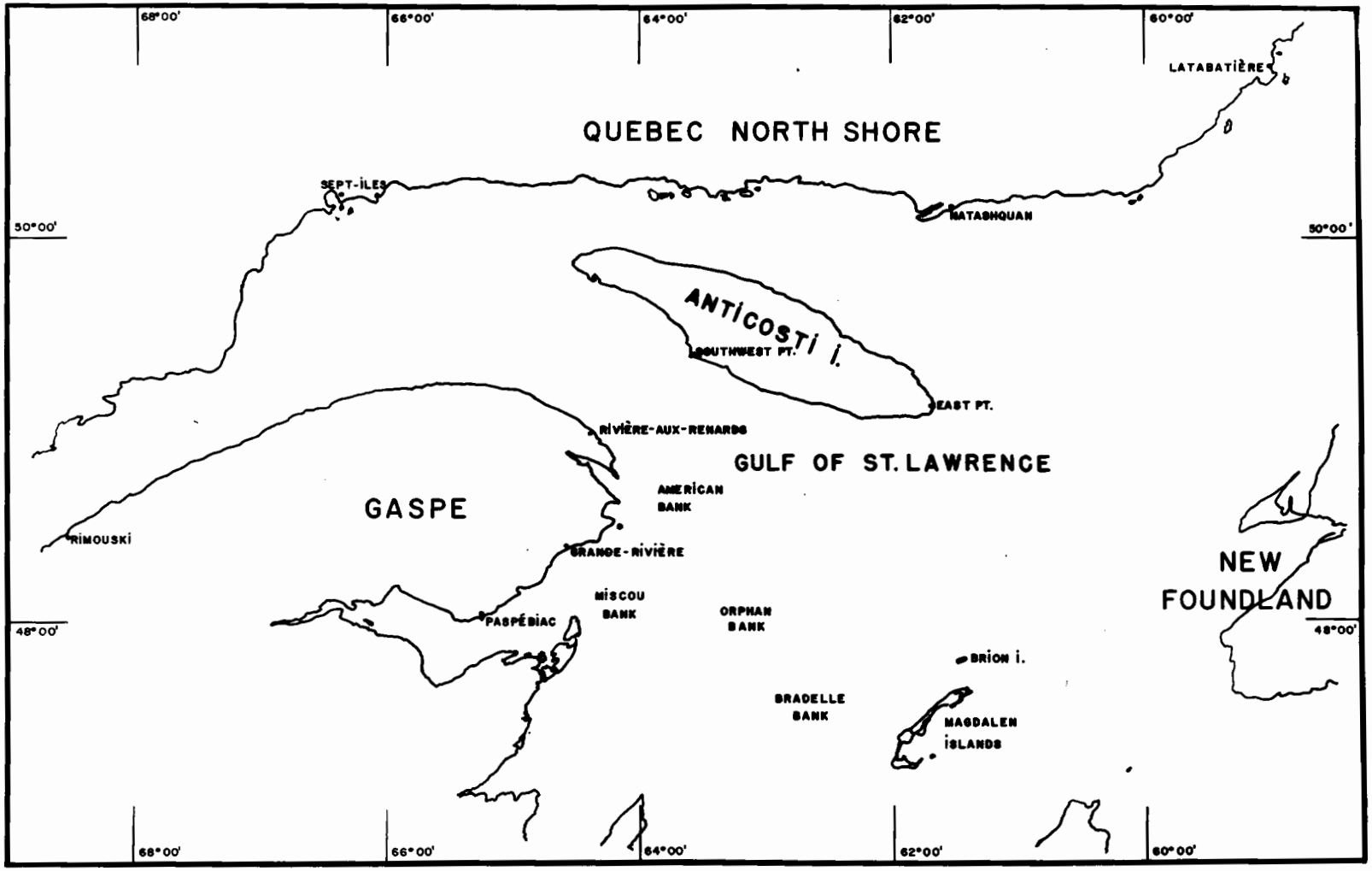
One hundred specimens of each of the six species of flatfish were used as the basis for this study; the seventh species Liopsetta putnami was represented by only sixty specimens, due to the inability to locate its habitats. Fifty-five of these specimens were taken in a box net, set under the ice in Gaspe harbour during the winter of 1955-56. The areas and positions from which the material was taken are illustrated in Figure I.

Whenever possible, the fish were processed immediately after landing. Those fish that were not, were held in a refrigerated room at approximately minus 25 degrees centigrade; other fish were received as formalized specimens. In a few cases, through the kind cooperation of other workers, parasitic specimens were received after removal from their hosts. The position

FIGURE I.

Map of the area covered in the survey of the metazoan parasites of the Heterosomata of the Gulf of St.Lawrence.

Figure 1.


68°00'
66°00'
64°00'
62°00'
60°00'
LATABATIÈRE
QUEBEC NORTH SHORE
SEPT-ÎLES
MATASHQUAN
50°00'
ANTICOSTI I.
SOUTHWEST PT.
EAST PT.
RIVIÈRE-AUX-RENARDS
GULF OF ST. LAWRENCE
AMERICAN BANK
GASPE
RIMOUSKI
GRANDE-RIVIÈRE
NEW FOUNDLAND
MISCOU BANK
ORPHAN BANK
PASPÉBIAC
48°00'
BRION I.
BRADELLE BANK
MAGDALEN ISLANDS

and method of capture of the hosts were recorded, together with the number of species from various depths.

The fish, if processed fresh in the laboratory, were examined externally with the aid of an illuminated magnifier. They were then washed with salt water, and the water used passed through a series of sieves to remove any small ectoparasites. The branchial and oral cavities were examined for parasites. The gill filaments were removed and an examination made using the stereo-dissecting microscope.

A count was made of the metacercariae inevitably present on the fins and body surfaces of the fish. A scalpel was used to make an opening behind the pectoral arch. Bandage scissors were then used to cut an opening above the digestive tract; this flap was clipped back, leaving the gut in plain view. The external surface of the digestive tract was examined and any encysted parasites noted. The digestive tract was tied off behind the pectoral arch and as close to the anus as possible; the gut was then removed, still tied at both extremities. The body cavity was washed out and the wash water passed through sieves, so that any parasites present were captured.

Two longitudinal incisions were made behind the body cavity and the gonads removed from alongside the vertebral column. The digestive tract and gonads were placed in separate beakers containing an isotonic solution

(one part of sea water to two parts of distilled water). The fish were filleted and the fillets kept with the remainder of the fish for further study.

The digestive tract was further tied off, behind the stomach, pyloric caeca, first, second and last third of the intestine. The liver was removed, care being taken to remove the hepatic mesenteries with the organ. The stomach was opened in a large petri dish containing the isotonic solution; and the contents were examined under the dissecting microscope. Material not of parasitic nature, was placed in a separate dish for examination to ascertain the food diet of the host. Any parasites present were divided according to a superficial examination as to group type (i.e. Trematoda, Nematoda, etc.).

The same procedure was followed throughout the examination of the string partioned digestive tract, and the parasites processed as separate collections.

In some cases, as in the halibut and witch, it was found that the intestinal mucus hindered the finding of the smaller parasites; in order to remove or break down this mucus the following method was devised. The intestinal contents were placed in a Waring blender, with about ten times their volume in water, which contained Aerosol in a 0.1% solution. This method was first proposed by Montreuil (personal communication) using however a 0.5-1.0% solution of acetic acid. The blender was run for 30 seconds at slow

speed, the contents were then allowed to settle for an hour. After this period, most of the mucus had accumulated at the top, where it was easily removed by skimming with a filter paper. The mucus was placed in a series of sieves and thoroughly washed so that any specimens that had been held in suspension were then visible. The parasitic specimens were removed from the bottom of the Waring blender jar, they were then clean and free from mucus.

The trematodes and acenthocephalids were placed in Syracuse watch glasses of the isotonic solution and left overnight to relax. The cestodes were also held in the same way, out were lifted periodically by the scolex, compelling them to die in an extended condition. The nematodes were killed in boiling 70% ethanol, and when cool were stored in a mixture of 70% ethanol plus 25% white glycerine. The ectoparasitic trematodes were placed in the isotonic solution and allowed to relax over night. The copopods were stored in 4% formalin for further study.

The trematodes, after being relaxed in the manner previously mentioned, were fixed in Gilson's fluid (1898) for at least 24 hours; after fixation the specimens were washed with tap water for 24 to 48 hours.

At this point the trematodes, that were to be stained with Mayer's carmalum, were placed in a solution of stain that had been diluted in the ratio of one part to one hundred parts of 5% potassium alum. This procedure

necessitated holding the specimens in the staining solution for as long as one month. At first some of the specimens were destroyed by fungus during staining; to counteract this a crystal of thymol was added to the stock solution of the stain.

The specimens were rinsed with 5% alum, to wash away any of the adherent stain. It was found that the easiest specimens to study were those that had only the internal organs stained. This was achieved by bleaching; the trematodes were transferred to a very dilute solution of potassium permanganate (slight pink colour); when they had taken on a light bronzy sheen they were placed in distilled water. The next step was immersion in a 4% solution of oxalic acid in water, where they turned white almost immediately. This was followed by washing in tap water for two hours.

The usual steps of dehydration were then followed through the alcoholic concentrations of 15%, 30%, 50%, 60%, 70%, 80%, 90%, 95%, and two changes of absolute of one hour each.

In some cases the trematodes were stained with Grenacher's alcoholic borax carmine or Best's carmine of 1906. The procedure was then modified so that dehydration up to the 70% stage was completed after fixation and washing. The trematodes were stained with Grenacher's for two hours, or Best's for one hour. In the case of both types of

stain, differentiation was required to counteract the resultant over-staining; for this purpose a 1½% solution of hydrochloric acid in 70% ethanol was used. Dehydration was completed in the same manner as was used for those trematodes stained with Mayer's carmalum.

Clearing varied as different methods were used. At first, attempts were made to clear with 1,4-Dioxane using two changes of twelve hours each, and mounting with Permount (a synthetic naphthalene polymer dissolved in toluene). Although the resulting specimens were satisfactory, handling of a large number was hazardous, owing to the extreme toxicity of the vapour given off by the dioxane. The use of stages of progressive concentrations of terpineol in absolute alcohol was tried. The mounting medium in this case was pure balsam (not xylol purified balsam). The specimens had a tendency to take up air, become opaque and therefore useless.

The most successful method was the use of progressive concentrations of methyl salicylate in absolute alcohol, and the subsequent mounting in balsam diluted with methyl salicylate. If the stages of concentration were of small size, such as one part of methyl salicylate to ten parts of absolute alcohol, one to nine, one to eight, etc., the results were excellent, but any attempts to quicken this process by greater changes were usually doomed to failure, evident upon mounting.

The specimens were mounted on the usual glass slides and covered with cover slips. If the specimens were large, small fragments of glass were placed under the cover slip to support it; open paper clips were used to provide the correct tension to keep the cover slip in touch with the glass fragments. No attempt was made to apply pressure to the specimens themselves, as distortion and displacement of the internal organs occur. This can result in a description of a new species based purely on bad technique.

The Acanthocephala present in or on, the digestive tract were processed in the manner above with the following additions. Any encysted acanthocephalan parasites were dissected out of their limiting membranes before dehydrating and staining. The stains used were Grenacher's, Mayer's, Best's carmines and combination haematoxylin (Van Cleave, 1953). The clearing was carried out in seven stages using methyl salicylate, methyl benzoate, terpineol and balsam as suggested by Montreuil (1955). This method gave highly satisfactory results, and had the advantage of presenting well cleared specimens twice before mounting, so that the specimens could be easily manipulated for the necessary hook counts.

The flatfish studied were usually infected with nematodes of the subfamily Anisakinae; these parasites were often found in the axial muscles. In the examination

of the fillets the same technique was followed as has been used in the study of cod fillets (Ronald, 1955). This procedure made use of the fluorescent phenomenon of the dead worm. The fish were measured and filleted; the fillets weighed, and then examined in a darkened room with the aid of a "black-light" lamp. The worms were killed previously by freezing the fish for twenty-four hours at minus twenty-five degrees centigrade; the dead worm was clearly seen by its blue-white fluorescence, energized by the ultraviolet lamp.

The nematodes, as was mentioned previously, were stored in 70% ethanol with 25% glycerine. As many of them were held for a considerable period of time in this medium, the study of the internal organs was facilitated, as the glycerine permeated the cuticle and the nematodes appeared as transparent as in the living specimens. In the few poorly cleared cases, either lactophenol d'Amann or beech-wood creosote were used to obtain clear visibility through the cuticle. En face views were made in several cases, using the technique described by Basir (1949); the mounting medium, glycerine jelly was used for comparative studies in semi-permanent mounts. After study all nematodes, excepting those stained with Mayer's carmalum, were returned to the vials of glycerine alcohol.

The cestodes, when alive, were placed in the stain of Rukhadze and Blajin 1929 for one hour, then washed for four hours in water; the cestodes were killed in the

process of staining by the lactic acid present. Dehydration was carried out, followed by clearing in methyl salicylate, and the specimens mounted in balsam which had been diluted with methyl salicylate. If the tapeworms were dead before being stained, Mayer's carmalum was used after treatment with Langenbeck's (1898) modification of Kleinenberg's (1879) fixative.

The copepods, that had been stored in formalin, were examined superficially in this dilute preservative. For more detailed study they were boiled in 10% potassium hydroxide; this left the sclerotized exoskeleton intact, but removed the softer parts of the body. The exoskeleton was dehydrated up to 90% ethanol and mounted in "euparal, vert" on a microscope slide, with a cover slip firmly in contact with supporting glass chips.

When dealing with specimens numbered in the thousands, methods are needed to speed up the transfer of the parasites through the various solutions employed in washing, dehydrating, staining, etc. The method described here was employed after trying various techniques, and was found to be the quickest and safest in preventing loss of minute specimens.

All vials used were of the one size, four cms. in length and 1.8 cms. in diameter, with a capacity of eight mls. The vials were held in racks 45 cms. long, with two rows of holes of two cms. diameter. These racks

of vials were processed as a unit and handling was facilitated by having all the specimens in the same stage in the one unit.

The vials were filled by using a five mls. M.C.A. burette connected to a reservoir of the liquid in use. To empty the vials, a small diameter porosity tube, modified by removal of one lip, was inserted in the vials. A rubber hose was attached to the uncut end of the porosity tube; this hose was joined to the inlet of a thick walled jar; from the outlet of this jar, another hose led to an aspirator pump attached to a water tap. The passage of water through the pump caused a vacuum to be created in the jar and a consequent suction in the porosity tube. The specimens were held against the sieve of the tube while the liquid was being drawn off, and up into the jar. Upon closing a clamp the suction ceased and the specimens fell back into the vial. It was found that by using this system the time required for processing could be cut in half, a substantial saving when dealing with over a thousand vials. A further advantage was that some vials contained several hundred microscopic specimens, many of which would have undoubtedly been lost if the specimens had been lifted from one vial to another, or if a pipette had been used to transfer the liquid.

All drawings were made with the aid of a camera lucida, and photomicrographs were made by using an attachment camera on both the dissecting and compound microscopes.

RESULTS

Under the heading of materials and methods, the number of fish of each species was stated. In all a total of 660 specimens of the Heterosomata were used as a basis for this study.

Order C O P E P O D A

The parasites of the order Copepoda were classified according to Sar's comprehensive work, with those modifications thought requisite by Wilson (1932).

Suborder ARGULOIDA

Family ARGULIDAE

Genus *Argulus* Müller, 1785.

Argulus megalops Smith, 1872-73.

Host: *Pseudopleuronectes americanus*.

Location: Skin, over entire body surface.

Locality: Magdalen Islands.

The host specimens were taken from House Harbour lagoons by means of a small plancton beam trawl. The waters of these lagoons are shallow, and therefore of higher temperature during the summer months than the surrounding ocean. In a sample of 15 fish examined, it was found that they all carried this parasite, but there

were never more than two specimens present; all parasites were female. The identification was made by comparing the specimens with Wilson's (1932, 1944) and Meehean's (1940) descriptions of A. megalops. The presence of nine saucer-shaped segments and one rectangular basal segment in each supporting rod of the maxillary sucking disc, was confirmation of the diagnosis. This parasite has been found previously on the winter flounder (Pseudopleuronectes americanus), and on the summer flounder (Paralichthys dentatus), sand flounder (Scophthalmus aquosus), plaice (Hippoglossoides platessoides), sea robin (Prionotus carolinus), long horned sculpin (Myoxocephalus octodecimspinosus), goosefish (Lophius piscatorius). All of these hosts are part of the littoral benthos.

Argulus megalops spinosus Wilson, 1944.

Host: Pseudopleuronectes americanus.

Location: Skin, over entire body surface.

Locality: Magdalen Islands.

These parasites were taken from the same 15 fish noted above as carrying Argulus megalops. The infection was heavier by the subspecies, in that up to 37 specimens were taken from one winter flounder only 75 mm. in length.

Previous collections of this parasite have been made by Johansen, these were identified by Wilson (1944). He gave the hosts as Liopsetta putnami and Acanthocottus octodecimspinosus, again fish that are found on the bottom

of the sea. A few specimens of Liopsetta putnami were examined from the same area but never in the live state, so that it was impossible to substantiate Johansen's findings for the Gulf.

The morphology of this subspecies does not differ greatly from that of A. megalops. The antennae and mouth parts of the female differ slightly; in both sexes the presence of five or six saucer-shaped segments and one longer basal segment in the maxillary sucking disc, are the main distinctive characteristics. The ratio of males to females was found to be in the order of 2:5.

Suborder CALIGOIDA

Genus Lepeophtheirus Nordmann, 1832.

Lepeophtheirus hippoglossi (Krøyer, 1857).

Host: Hippoglossus hippoglossus.

Location: Skin, usually near the head on the dorsal surface.

Locality: East and South West Point, Anticosti Island; Brion Island, Magdalen Islands; LaTabatiere, north shore of the Gulf of the St. Lawrence.

The two specimens from East Point, Anticosti Island were taken from a medium sized halibut. One of these copepods was a male 12 mm. in length, the other a female 14 mm. in length. These two specimens were larger than those described by Scott, T. and A. (1913), and the sexual dimorphism was less marked.

In April of 1956, two halibut were taken on a long line in nine metres of water off South West Point, Anticosti Island. These two fish together carried 46 specimens of Lepeophtheirus hippoglossi, 32 of which were females. In the case of 11 of the 14 males, the hyperparasitic monogenetic trematode Udonella caligorum was present; the female of the copepod species showed a lower incidence of parasitic infection, only five of the female L. hippoglossi carried U. caligorum. This latter parasite is discussed more fully under the description of the trematodes recorded in this survey.

The specimens from the Brion Island halibut were part of a composite sample of ectoparasites from 12 fish, captured on hand lines in September of 1954. The total number of parasites was 29, of which 28 were females; the solitary male was found in the company of a female on one host. These specimens fitted more closely to the length requirements given by Scott, T. and A. (op. cit.). The mean length of the 28 females was 13.0 mm., while the male measured 8.0 mm. in length.

A halibut, captured in the summer of 1953 at LaTabatiere, was found to be parasitized by 20 L. hippoglossi females, the mean length of which was closer to those of Brion Island specimens than the Anticosti material.

Family DICHELESTHIIDAE

Genus Hatschekia Poche, 1902.

Hatschekia hippoglossi (Krøyer, 1837).

Host: Hippoglossus hippoglossus.

Location: Gills.

Locality: Brion Island, Magdalen Islands; East Point, Anticosti Island.

A small halibut, 22.5 kilograms in weight, taken in 1954 at Brion Island, carried three females of Hatschekia hippoglossi. A larger halibut, taken later in the same year, was more heavily parasitized with 12 copepods, of which one was a male. Another halibut, taken at the same time, was found to be carrying eight females of this parasite in the branchial cavity.

The two hosts from the Anticostic area had ten H. hippoglossi each in their gills; one of these was a young specimen, in which the distal ends of the second antennae had not been formed into apical hooks. All specimens were females.

The living specimens were flat white in colour, the ovisace a reddish-grey, the intestine a dark line within the body cavity.

The length of all the specimens taken lay between 7 to 9 mm. This agrees closely with Wilson (1932), who gave the length as 6 to 8 mm., and Scott's (1918) figure of nine mm. The egg strings were ten mm. long on the

largest female, again a substantiation of Krøyer's (1837) and Wilson's (1932) figures.

The apical hook of the second antenna is simple, not barbed and heavily sclerotized. The length from its base, at the distal end of the antenna to the furthest extremity of the recurved hook, is 0.28 mm.

Suborder LERNAEOPODOIDA

Family CHONDRACANTHIDAE

Genus Acanthochondria Oakley, 1927.

Acanthochondria flurae (Krøyer, 1863).

Host: Hippoglossoides platessoides.

Location: Branchial and oral cavities.

Locality: Grande-Riviere.

A medium sized fish taken in May, 1955 was parasitized by one specimen of A. flurae. The site of attachment was on the inner dorsal surface of the mouth. Two further specimens were taken in 1956, from two plaice measuring approximately 30 and 37 cms. in length. On one fish, the site of infection was the first gill ray; while on the other, the copepod was firmly attached to the inside of the operculum. In the case of the last two fish, the examination was made immediately upon bringing the fish on board the boat, so that the position of infection was certain. The situation of the parasite in the previous

case was unusual, unless the copepod had moved from its favoured site in the gills, upon the death of the host. All of the specimens examined were female, the hosts were taken close to the shore in 9 to 18 metres of water..

Family LERNAEOPODIDAE

Genus Parabrachiella Wilson 1915.

Parabrachiella rostrata (Krøyer, 1837).

Host: Hippoglossus hippoglossus.

Location: Gills.

Locality: Brion Island, Magdalen Islands; LaTabatiere, north shore of Gulf of St. Lawrence.

The Brion Island halibut had six females of this species in the gills, the Gulf north shore halibut, carried three females. The male was not found. The lengths of the copepods were shorter than those previously recorded by Wilson (1932), who gave the measurement of five to six mm. for the length of the cephalothorax and 6 to 6.5 mm. for the length of the trunk. In the present material, the cephalothorax was 4 to 5.5 mm., the trunk 4 to 5 mm. in length.

Class C E S T O D A

The tapeworms were poorly represented in the flatfish, only four species being recognisable. Many of the cestodes present could not be determined specifically owing to their immaturity. Identifications were made by consulting the works of Dollfus (1942, 1953) and Wardle and McLeod (1952).

Order T E T R A P H Y L L I D E A

Scolex pleuronectis Müller, 1788.

It is believed that this species will, in the future, prove to be the larval forms of several closely related species of cestodes. Until the time arrives when the life histories of these tapeworms are known, the trivial name Scolex pleuronectis will have to suffice.

Hosts: Hippoglossoides platessoides; Hippoglossus hippoglossus; Limanda ferruginea.

Location: Stomach and intestine of halibut.
Pyloric caeca and intestine of the witch.
Intestine only of the plaice.

Locality: H. platessoides: Grande-Riviere.
H. hippoglossus: Brion Island, Magdalen Islands; East Point, Anticosti Island.
L. ferruginea: Miscou Bank; Entry Island, Magdalen Islands.

This parasite has been recorded previously from the plaice, in European waters by Diesing (1850), Lönnberg

Figure II.

Scolex pleuronectis larva from the caeca of *Limanda ferruginea*, showing the scolex partially introverted.

Figure III.

Scolex pleuronectis larva from the caeca of *Limanda ferruginea*, showing the scolex extroverted

Figure II.

Figure III.

(1889), Müller (1780a, 1789) and Nicoll (1910); the only previous record from American waters was that of Linton (1924). In the present collection only two specimens were found; these were taken from two plaice captured on a long line, 1000 metres off shore from Grande-Riviere.

In the yellowtail flounder, S. pleuronectis was found frequently. This parasite, however, was never present in great numbers, the highest count being two per fish. In all the yellowtail studied, the incidence of this parasite was 15%. The commonest number of worms found was two, which were usually free in the pyloric caeca. Linton (1901) found this parasite (Scolex polymorphus Dujardin) free in the intestine of the same host in the Woods Hole region.

S. pleuronectis was present in 80% of the halibut examined and up to 63 specimens were found in one fish. The geographical area in which the most highly parasitized fish were found was in the vicinity of the Magdalen Islands.

The mean figure of incidence was 12 tapeworms per fish; these were usually found in the stomach.

Müller (1780c) recorded S. pleuronectis from the halibut in northern European waters; while Cobbold (1858, 1883) also recorded it as a parasite of the halibut in the waters around Great Britain. This present record is the first report of this parasite in North American waters.

The larvae did not differ in size or morphological structure from host to host. The length of the entire

worm was between 0.8 and 2.4 mm., the scolex measured 0.18 to 0.22 mm. in length by 0.20 to 0.24 mm. at its widest point. The scolex is four lobed, carrying a thick edged bothridium on each lobe. The bothridia measure 0.115 to 0.170 mm. in length. In some specimens, a transverse ridge crosses the bothridium, dividing it into a small anterior and a larger posterior locular. In about half of the 600 specimens examined, there was a small apical sucker of 0.050 to 0.074 mm. in diameter. These latter specimens would tend to corroborate the results of the experimental infection carried out by Curtis (1911), who obtained adult specimens of Phoreiobothrium triloculatum from a shark after feeding with infected Cyoscion regalis. Linton (1889) found what he described as a new genus Phoreiobothrium based upon the genotype P. lasium in a shark. He included at a later date (1909), the species P. triloculatum. The genotype of Phoreiobothrium was distinguished from the closely related species in the genus Cylindrophorus Diesing, 1863, by the presence of an apical sucker. The apical sucker present in about 300 specimens of S. pleuronectis, suggests that the halibut, witch and plaice may be the intermediates for this parasite, which would develop into an adult upon being liberated in the intestine of an elasmobranch.

Phyllobothrium sp., larva.

Host: Limanda ferruginea.

Location: Pyloric caeca.

Locality: Miscou Bank.

Four small tapeworm larvae were found in the pyloric caeca of one yellowtail. These larvae differed from the tetraphyllid larvae, described under the name of S. pleuronectis, in that the bothridia lacked transverse ridges and were globular in shape; the body was also smaller in size. The body length was 0.79 to 1.05 mm. by 0.28 to 0.48 mm. wide. The bothridia measured 0.126 to 0.150 mm. in diameter. A small apical sucker was present, 0.084 mm. in diameter.

These larvae resemble Woodland's description of the genus Scyphophyllidium (1927), except for the presence of the apical fifth sucker. Woodland (1934) described a closely related genus Myzophorus with an apical fifth sucker, but it has been recorded only from fresh water hosts of the southern hemisphere. Although the position of these four larvae in the genus Scyphophyllidium seems most probable, it is not felt that the diagnostic characteristics are marked enough to attempt a classification beyond Phyllobothrium sp. It should be noted that Heller (1949) recorded Scyphophyllidium giganteum (Van Beneden, 1858) from Raja scabrata in the same waters as those in which the present material was obtained.

Tetraphyllidea, plerocercoid.

Host: Limanda ferruginea.

Location: Intestine, encysted in wall.

Locality: Entry Island, Magdalen Islands.

Two small plerocercoids were removed from their site of encystment inside the intestinal tract, close to the junction of the pyloric caeca. The plerocercoid was coiled within the cyst and measured 3.1 mm. in length by 0.20 mm. in width. The scolex was rounded in shape, 0.3 mm. in diameter, a slight constriction occurred between the scolex and the body.

It was not possible to make an identification of more specific nature.

Order S P A T H E B O T H R I D E A

Family DIPLOCOTYLIDAE Wardle and McLeod, 1952

Genus Diplocotyle Krabbe, 1874.

Diplocotyle olrikii Krabbe, 1874.

Hosts: Hippoglossoides platessoides; Limanda ferruginea; Pseudopleuronectes americanus.

Location: Intestine of all three hosts.
Pyloric caeca in L. ferruginea.

Locality: H. platessoides in St. Mary's Bay, Nova Scotia;
L. ferruginea in St. Mary's Bay;
P. americanus in St. Mary's Bay;
Passamaquoddy Bay, New Brunswick.

Figure IV.

Scolex of Diplocotyle olrikii from the intestine of Hippoglossoides platessoides.

Figure IV.

This parasite was not found in any flatfish taken further north than Nova Scotia, and the infection was low in the parasitized fish. In the yellowtail, only three specimens of D. olrikii were found, no fish carried more than one parasite, and the incidence was only 3%. The winter flounder carried one or two tapeworms in 13% of the fish examined, a considerable increase over the incidence in the yellowtail flounder. The plaice were lightly infected with one to two specimens in the four fish from St. Mary's Bay.

D. olrikii has been found previously in Pseudopleuronectes americanus, taken in the Gulf by Heller (1949), who found 17 specimens in one fish. Unfortunately she only examined three specimens of this fish, so no true incidence figure is shown.

The size of the tapeworms found in this present survey was variable, the length ranged from 5 to 25 mm., the width from 0.3 to 0.8 mm. The scolex was rounded, 0.50 to 0.70 mm. in diameter. The two holdfasts were spherical in shape and formed two separate units. This parasite is predominantly found in fish belonging to the genus Salmo; and it has been suggested by Wardle (1933), that the flatfish are abnormal hosts and therefore the morphology of D. olrikii differs greatly in pleuronectid and salmonoid hosts.

Order P S E U D O P H Y L L I D E A

Family PTYCHOBOTHRIIDAE

Genus Clestobothrium Rudolphi, 1808.

Clestobothrium crassiceps (Rudolphi, 1808).

Host: Hippoglossus hippoglossus.

Location: Pyloric caeca.

Locality: East Point, Anticosti Island.

C. crassiceps was found by Linton (1941) in the halibut; this is the only record of this parasite in a pleuronectid host anywhere in the world. It is interesting, therefore, to find specimens of this parasite in fish of the Gulf. The two cestodes were twisted together in one arm of the caeca. The halibut, from which these specimens were obtained, weighed 67.5 kilograms.

C. crassiceps is a common parasite of the fish of the genus Merluccius (hake) in most parts of the world. This unusual host record may therefore be due to the ingestion of a hake by the halibut, followed consequently by the release of the tapeworm into the caeca of the halibut upon digestion of the smaller fish. The two specimens of C. crassiceps measured from 20 to 30 mm. in length, and neither carried mature segments.

Family BOTHRIOCEPHALIDAE

Genus *Bothriocephalus* Rudolphi, 1808.

Bothriocephalus scorpii Müller, 1776.

Hosts: *Limanda ferruginea*; *Liopsetta putnami*; *Scophthalmus aquosus*.

Location: Caeca and intestine of *L. ferruginea* and *Liopsetta putnami*; Stomach, caecum and intestine of *Scophthalmus aquosus*.

Locality: Magdalen Islands; Grande-Riviere; St. Mary's Bay, Nova Scotia; Passamaquoddy Bay, New Brunswick.

B. scorpii was the commonest parasite found in the sand flounder (*S. aquosus*); every host specimen examined was parasitized by from one to six of these tapeworms. The caecal arms were often blocked by the twisted and knotted cestodes. In some cases, a cestode would lie with its scolex in the stomach of the host and its convoluted body passing through the intestinal caeca into the small intestine.

There were from one to three *B. scorpii* present in the gut of 14 specimens of *Limanda ferruginea* examined. The smooth flounder (*L. putnami*) was lightly infected; only 30% were parasitized, but by never less than two cestodes and never by more than five. *Bothriocephalus scorpii* has been recovered as a parasite of 21 species of Heterosomata, captured in all oceans of the world.

Bothriocephalus claviceps (Goeze, 1782).

Host: Pseudopleuronectes americanus.

Location: Intestine.

Locality: Grande-Riviere.

In 1955 a small winter flounder, 11 cms. in length, was taken in a beach seine; there were three cestodes measuring from 60 to 100 mm. in length, by 1.5 to 2.2 mm. in width. The holdfast was small and rapidly changed shape, in the living specimen. It was capable of elongating with the normal extension of the tapeworm, and contracting into a globular form as the worm itself contracted.

The presence of non-operculated eggs was useful in the diagnosis of this species. Linton (1941) has recorded this parasite from the P. americanus and L. ferruginea of the Woods Hole region.

Class T R E M A T O D A

Order M O N O G E N E A

Suborder MONOPISTHOCOTYLEA Odhner, 1912

Superfamily CAPSALOIDEA Price, 1936

Family UDONELLIDAE Taschenberg, 1879

Genus Udonella Johnston, 1835

Udonella caligorum Johnston, 1835.

Host: Lepeophtheirus hippoglossi on Hippoglossus hippoglossus.

Location: Female -- L. hippoglossi, attached to the ovisacs.
Male -- on the carapace.

Locality: H. hippoglossus taken at South West Point, Anticosti Island.

Udonella caligorum has been reported in the literature, as a parasite of Caligus sp. on Hippoglossus hippoglossus (Van Beneden, 1858; Braun, 1890, Johnston, 1865). It has also been found on the same genus of copepod, parasitic on Platichthys flesus (Monticelli, 1889b). The above records are from waters of the eastern Atlantic and the Mediterranean Sea; the only record of U. caligorum on a halibut in North American waters was by Hoyle in 1888.

This present record is interesting, in that the number of parasites present on the copepod far exceeds any previous record and that the copepod represents a new host record for this trematode. U. caligorum was found

Figure V.

Lepeophtheirus hippoglossi taken from Hippoglossus Hippoglossus , on the ventral surface of the carapace are young specimens of Udonella caligorum , on the lateral surface a mature trematode can be seen

Figure V.

on five of 32 females, and 11 of 14 males present on one halibut. The male copepod was parasitized by both young and mature adults. The young forms were always on the ventral surface of the carapace; while a few mature adults were attached to the lateral and dorsal surfaces. On the female copepod, U. caligorum was always attached to the ovisacs, the position on the egg strings varied; the trematodes were usually grouped laterally, or, on the distal end of the ovisac giving it the appearance of a "lion's tail".

The male of Lepeophtheirus hippoglossi carried from 15 to 74 trematodes usually grouped together around the second and third pairs of biramose legs. The female of L. hippoglossi carried from 8 to 26 parasites on the ovisacs.

Udonella caligorum was classified as a commensal by Van Beneden (1858). It was noticed, in the specimens studied, that after removal of these trematodes from the ovisacs, part of the egg strings had been removed by the parasite. A careful study of the egg strings indicated many small indentations along their lengths, suggesting that, by a "leech like" movement, the trematodes were able to bring the cuticularized inner wall of the pharynx in contact with the egg strings; the normal inversion of the pharynx which followed, removed small particles of the ovisac.

The mature adult specimen of Udonella caligorum measured from 2.4 to 3.5 mm. in length and 0.38 to 0.560 mm. in breadth. The young worms were variable in size, the shortest was 0.35 mm., and the longest 2.5 mm.

Family CAPSALIDAE Baird, 1853

Genus Entobdella Blainville, in Lamarck, 1818

Entobdella hippoglossi (Müller, 1776).

Host: Hippoglossus hippoglossus.

Location: Skin.

Locality: South West Point, Anticosti Island; Brion Island, Magdalen Islands.

Entobdella hippoglossi is one of the commonest ectoparasites of the halibut and is widely distributed geographically. It has been recorded many times in the literature, usually from the common halibut, but less frequently from the smaller Pacific halibut, (Hippoglossus stenolepis) by Johnston (1929), Linton (1940), Margolis (1952a) and Winter (1954).

In the Gulf of the St. Lawrence one to five trematodes were found on 40% of the halibut examined.

The measurements of the specimens did not coincide closely with those of Price (1939). Dawes (1947) has also noted this discrepancy and in a footnote says:

> "Price may be in error regarding the breadth of the body and the size of the opisthaptor. He gave the measurements 13-18 mm. and 3.6-4.8 mm. for length and breadth and, taking small figures together, this gives a breadth equal to 0.27-0.28 body length. But his Fig. 1 illustrates a breadth which is 0.63 or 0.77 body length, according to whether or not we exclude the opisthaptor from the statement of length. The opisthaptor was stated to be 3.6-4.8 mm. diameter, i.e. of the same breadth as the body, yet his figure clearly shows its breadth to be less than half that of the body, at most four-ninths."

The specimens from the Gulf measured 12 to 17.5 mm. in length by 6 to 7 mm. in breadth. The body shape is irregularly elliptical with indentations between the cephalic lobe and the body. The opisthaptor is large, measuring 3.5 to 4.7 mm. in diameter. Three pairs of large hooks are present with 14 larval marginal hooklets. The three pairs of hooks closely resemble those described for this species by Price (1939) and Dawes (1947). In the specimens studied, 23% were found to contain eggs, these were tetrahedral in shape and possessed long filaments.

Entobdella curvunca, n. sp.

It was found that not all the monogenetic trematodes present on the halibut, resembled the previously described species, E. hippoglossi. A survey of the known species indicated that these parasites, although belonging to the genus by virtue of the presence of glandular areas on the cephalic lobes, did not correspond to any of the

Figure VI.

A. The three pairs of hooks of the opisthaptor of Entobdella curvunca.

B. The three pairs of hooks of the opisthaptor of Entobdella hippoglossi.

Both species taken from the skin of Hippoglossus hippoglossus.

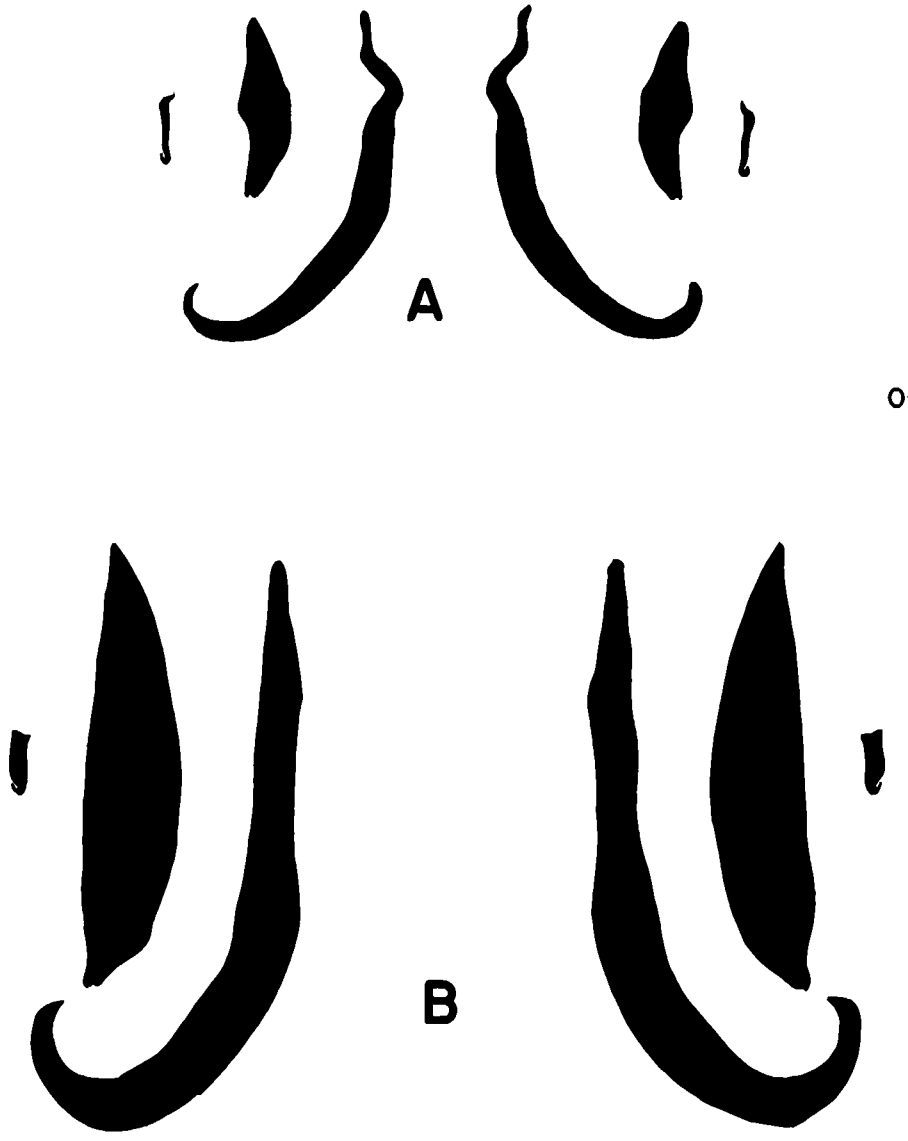


Figure VI.

descriptions published. These ectoparasites are therefore described here as a new species. The parasite was fairly common on the halibut, 26% of the hosts carried this ectoparasite on their bodies. The greatest number found was five, the least one; the usual number present was two per fish.

Description: The colour of the living trematode is almost pure white, with few pigmented areas. The body is in the shape of an elongated ellipse, 7 to 13 mm. long by 3 to 6 mm. wide; the cephalic lobe is definitely emarginated from the rest of the body by lateral constrictions. The anterior haptors are poorly formed into elliptical slightly depressed glandular areas; the line of demarcation is weakly defined between the two prohaptors. The opisthaptor has the characteristics of the genus; it is sucker-like, 1.5 to 2.5 mm. in diameter, and is surrounded by a marginal membrane 0.055 to 0.075 mm. in width. The ventral surface is concave, and the posterior two thirds bears radiating rows of prominent papillae; the papillae decreasing in size as they approach the centre of the opisthaptor. The opisthaptor is armed with three pairs of large hooks and 14 marginal hooklets. The hooks of the first pair are pointed and flat bladed, 0.39 to 0.455 mm. in length and their breadth at the widest point is 0.091 to 0.143 mm. The second pair of hooks are longer 0.546 to 0.990 mm., the tips of which are recurved and pointed, the roots

twisted and slender, width 0.052 to 0.091 mm. The third pair of hooks are recurved into fine points posteriorly with curved indentations anteriorly, with a length of 0.085 to 0.119 mm., and with a width of 0.025 to 0.040 mm. The marginal hooks are twisted and approximately 0.055 mm. in length by 0.004 mm. wide.

The mouth is situated ventrally, slightly posterior to the marginal constrictions that limit the prohaptor from the body. The pharynx is 0.40 to 0.80 mm. long by 0.46 to 0.58 mm. wide. The intestine bifurcates into two main arms close behind the pharynx, the two arms pass the length of the body, sending off four branches anteriorly and ten branches laterally. A junction is formed anterior to the opisthaptor between the two main canals.

The common genital atrium is at the left and slightly posterior to the lateral marginal constriction of the prohaptor. A cirrus pouch is present, elongated and rounded in shape, lying between the pharynx and the ovary. Its base is closer to the anterior extremity of the ovary than to the posterior edge of the pharynx. The ovary is broadly elliptical in shape, 0.60 to 0.85 mm. long by 0.56 to 0.76 mm. wide.

The two testes are hexagonal in shape, touching on the median line, equatorial in position. They measure 1.08 to 1.32 mm. in length, by 0.72 to 1.06 mm. in width. The vitellaria is well developed and follicular; occupying almost the entire body area, but less closely packed

Figure VII.

Entobdella curvunca sp. n. parasitic upon Hippoglossus hippoglossus

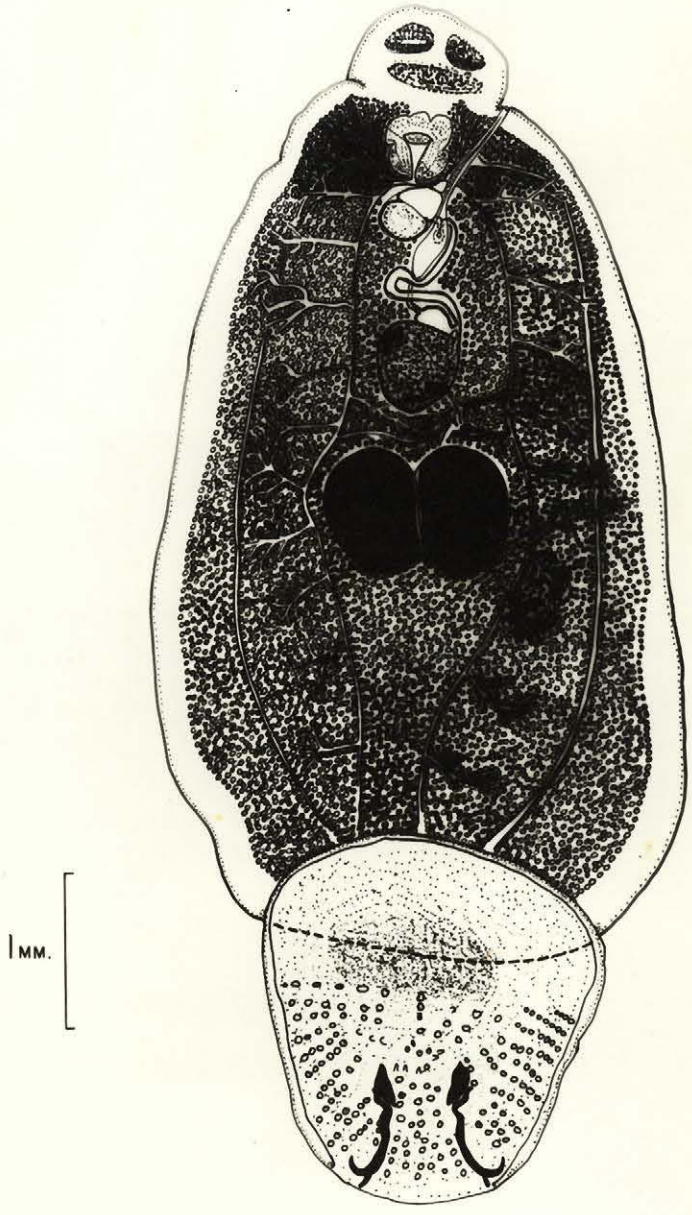


Figure VII.

laterally, and limited anteriorly by the anterior margin of the pharynx and posteriorly by the opisthaptor. The uterus is lightly coiled and contains few eggs. The vagina opens behind the common genital aperture.

Host: Hippoglossus hippoglossus.

Location: Skin.

Locality: LaTabatiere, north shore of the Gulf of St. Lawrence; Anticosti Island; Brion Island, Magdalen Islands.

Order D I G E N E A

Suborder GASTEROSTOMATA Odhner, 1905

Family BUCEPHALIDAE Poche, 1907

Subfamily PROSORHYNCHINAE Nicoll, 1914

Genus Prosorhynchus Odhner, 1905

Prosorhynchus squamatus Odhner, 1905

Host: Hippoglossus hippoglossus.

Location: Stomach and intestine.

Locality: East Point, Anticosti Island.

Two specimens were taken on May 30th, 1955, from one halibut, captured on a long line at a depth of 72 metres, from the waters off Anticosti Island. Stafford (1907) recorded Gasterostomum armatum Molin from the halibut; Odhner (1905) stated that G. armatum of Molin, 1861 differs from G. armatum of Olsson, 1868 and Levinsen, 1881. Odhner pointed out that Gasterostomum armatum of

Molin was synonymous with Monostomum crucibulum Rudolphi, 1819. He, therefore, created a new genus Prosorhynchus with the genotype Prosorhynchus squamatus. The present survey substantiates Stafford's record that this trematode is a parasite of the halibut in Canadian waters.

The two specimens examined were young adults, one of which had several eggs in the uterus. The length was 0.80 to 1.10 mm. with a width of 0.35 to 0.48 mm.

Suborder PROSOSTOMATA Odhner, 1905

Family FELLODISTOMATIDAE Odhner, 1911

Subfamily FELLODISTOMATINAE Odhner, 1911

Genus Steringophorus Odhner, 1905

Steringophorus furciger (Olsson, 1868)

Hosts: Glyptocephalus cynoglossus; Hippoglossus hippoglossus; Limanda ferruginea; Liopsetta putnami; Pseudopleuronectes americanus.

Location: Stomach -- G. cynoglossus, L. ferruginea.
Pyloric caeca -- G. cynoglossus, H. hippoglossus, Limanda ferruginea, Liopsetta putnami, P. americanus.
Intestine -- H. hippoglossus, Limanda ferruginea, P. americanus.

Locality: All parts of the Gulf of St. Lawrence.

The incidence of Steringophorus furciger in the Heterosomata, varied markedly in individual specimens, as well as between different species. The yellowtail (L. ferruginea) carried the greatest number of parasites, one

specimen harboured 98 trematodes in its digestive tract. The least number of S. furciger found in any one parasitized fish was five. The incidence figure was 86% for the yellowtail flounder. These specimens were not always mature adults (absence of eggs in uterus), 25% were immature.

This trematode was found in the witch in 70 of the 100 fish examined, in numbers varying from one to four. The immature flukes made up 80% of this number. In the smooth flounder 70% of the fish examined were parasitized by one or two trematodes, all of which were mature specimens. The winter flounder was lightly infested, in 4% of the sample, only a single mature worm was found in each of the four fish. This parasite was easily recognisable from the descriptions of Odhner (1905), Lebour (1908a), Linton (1940) and Miller (1941). The shape was highly variable and was very dependent on the method of fixation.

Genus Steringotrema Odhner, 1911

Steringotrema cluthense (Nicoll, 1909)

Host: Hippoglossus hippoglossus.

Location: Stomach.

Locality: Miscou Bank.

This is the first record of this parasite from the halibut; it was found in only one of the fish examined. Only two of these trematodes were present in the stomach,

identification was made by consulting the description given by Dawes (1946).

Steringotrema pagelli (Van Beneden, 1870)

Host: Hippoglossus hippoglossus.

Location: Intestine.

Locality: Miscou Bank.

A single specimen was found in a small halibut taken in 18 metres of water. This is another parasite record for this fish. The presence of a large ventral sucker, almost three times the diameter of that of the oral, indicated the parasites position in this species.

Family ALLOCREADIIDAE Stossich, 1904

Subfamily LEPOCREADIINAE Odhner, 1905

Genus Lepidapedon Stafford, 1904

Lepidapedon rachion (Cobbold, 1858)

Host: Scophthalmus aquosus.

Location: Intestine.

Locality: Pleasant Bay, Magdalen Islands.

This is the first record of L. rachion in any flatfish; the hosts recorded previously have all been gadoids.

The long ribbon-like shape, long prepharynx and short oesophagus distinguished this genus from any other

in the subfamily. Its length was 3.2 mm. with a breadth of 0.74 mm.; this ratio of length to width placed it in the species L. rachion rather than L. elongatum, in which the length is longer in proportion to its width. The species is well described by Dawes (1947). It was present in 2% of the fish examined only as a solitary specimen.

Subfamily ALLOCREADIINAE Looss, 1902

Genus Podocotyle (Dujardin, 1845)

Podocotyle atomon (Rudolphi, 1802)

Hosts: Hippoglossoides platessoides; Hippoglossus hippoglossus; Limanda ferruginea; Liopsetta putnami; Pseudopleuronectes americanus.

Location: Intestine -- Hippoglossoides platessoides; Hippoglossus hippoglossus; Limanda ferruginea; Pseudopleuronectes americanus.
Caeca -- Limanda ferruginea.
Stomach -- Limanda ferruginea; Liopsetta putnami.

Locality: Gulf of St. Lawrence.

Podocotyle atomon has been noted for its morphological variations, this fact has caused several new species to be described in the literature, which have later fallen into synonomy with P. atomon. In the present survey over four hundred specimens were examined; the measurements of these were wide enough in range to include three other described species.

The highest incidence was in the yellowtail, where

50% of the fish were parasitized by Podocotyle atomon. The numbers present varied from 1 to 21 parasites per fish; 20.6% of which were immature. In the winter flounder parasitism occurred in 14% of the fish studied, there were 1 to 9 trematodes in the intestine; only 3% of which were immature. The plaice showed an incidence figure of 7%; there were from 2 to 20 trematodes in each fish. The incidence in the halibut was 10%, never more than two parasites were found in a fish. The smooth flounder had a parasitic incidence of 20%, a single trematode was found in each specimen.

The description of those specimens of P. atomon examined is as follows:

The length is 1.5 to 3.5 mm. and the width 0.47 to 0.89 mm. The oesophagus is usually longer than the pharynx; the vitellaria run laterally, they are follicular and well developed; they may or may not fill the intertesticular space. The testes are tandem and measure at least half the width of the body. The presence of the trilobed ovary was not used taxonomically, as some specimens of P. atomon were found to have two or even four lobes present.

The presence of Podocotyle atomon in Hippoglossoides platessoides and Liopsetta putnami formed 2 new host records for this parasite.

Podocotyle olssoni Odhner, 1905

Host: Limanda ferruginea.

Location: Caeca.

Locality: Miscou Bank.

P. olssoni was found with P. atomon in the caeca of a medium sized yellowtail flounder; this fish was captured in ten fathoms of water. L. ferruginea carried 16 of these parasites, all of which were mature. Heller (1949) expresses some doubt as to the validity of the species, suggesting that they may be "strongly contracted specimens of P. reflexa". The measurements made on living specimens did not substantiate her hypothesis. The extended length of the living worms was 3.90 mm., 2.95 mm. upon contraction. The width was from 0.42 mm. when contracted to 0.34 mm. when extended. The testes were less than half the width of the body in the extended parasite. The oral sucker's width was slightly less than that of the ventral. The oesophagus was usually shorter than the pharynx.

P. olssoni has been reported from Beaufort, North Carolina and Woods Hole by Linton (1901, 1905); he also records P. olssoni from Limanda ferruginea, so that this survey extends the range of this parasite northwards.

Genus Plagioporus Stafford, 1904

Plagioporus varia (Nicoll, 1910)

Hosts: Glyptocephalus cynoglossus; Hippoglossus hippoglossus; Limanda ferruginea; Pseudopleuronectes americanus.

Location: Pyloric caeca of L. ferruginea. Intestine of G. cynoglossus and P. americanus.

Locality: Miscou Bank; Grande-Riviere; Magdalen Islands.

Plagioporus varia was represented by a single specimen in three of the four hosts; four specimens of L. ferruginea carried this parasite, two of P. americanus, and only one specimen of G. cynoclossus was parasitized. The halibut was found to carry from one to seven parasites in 15 fish.

The trematodes from the halibut closely resemble those classified by Yamaguti (1953) as Plagioporus (Caudotestis) nicolli, but Dawes (1946) states that "Issaitchikow (1928) proposed the erection of the sub-genera Caudotestis, Mediantestis and Lebouria, with the types nicolli n.sp., tumidula and idonea respectively, an apparently unnecessary procedure as regards British species". The specimens examined from the flatfish also lacked enough morphological differences to require subgeneric division.

The trematodes measured from 1.15 to 1.34 mm. in length by 0.48 to 0.61 mm. in width. The oral sucker

was circular, 0.17 mm. in diameter, the ventral sucker was wider than long (0.325 to 0.260 mm.). The eggs were bluntly pointed at both ends and measure 0.069 to 0.078 mm. in length and 0.40 to 0.050 mm. in width. All of the fish noted above are new host records for this parasite.

Genus Peracreadium, Nicoll, 1909

Peracreadium commune (Olsson, 1867)

Host: Limanda ferruginea.

Location: Pyloric caeca.

Locality: Miscou Bank.

A single specimen of P. commune was found in one yellowtail flounder. Linton (1901) reported this parasite from Pseudopleuronectes americanus, but did not find it in L. ferruginea. This present material, therefore, represents the first record of this parasite in the yellowtail. Dawes (1947) suggested that this species will probably become synonymous with Peracreadium genu (Rudolphi, 1879). The specimen taken was 1.80 mm. in length, with a pharynx measuring 0.135 mm. long by 0.091 mm. wide. The presence of the spindle shaped pharynx determined the parasites specific position.

Stenakron vetustum, Stafford, 1904

Host: Limanda ferruginea.

Location: Intestine, close to the anus.

Locality: Miscou Bank.

This parasite was found in 14% of the L. ferruginea examined in numbers of from 2 to 31, over half of these were young with few if any eggs in the uterus.

Linton (1901) was the first to record this species but did not name it; his host was the same as in the present material. Miller (1941) in reviewing Stafford's material states that "In the one specimen in which the ovary can be seen clearly it consists of three separate and distinct oval parts. Thus there are apparently three ovaries". An interesting observation but incorrect, the ovary is made up of from two to four lobes which are joined by very fine tubular connections; these are not apparent in poorly stained specimens.

The trematode measures from 1.30 to 1.75 mm. in length and 0.70 to 0.95 mm. in width. The oral sucker has a diameter of from 0.13 to 0.21 mm., the acetabulum from 0.25 to 0.32 mm. The testes are irregularly shaped and "fitted" together; the ovary may be partially surrounded dorso-ventrally by the posterior testis.

Family ACANTHOCOLPIDAE Lühe, 1909

Genus Stephanostomum Looss, 1899

Stephanostomum baccatum (Nicoll, 1907)

Hosts: Glyptocephalus cynoglossus; Hippoglossoides platessoides; Hippoglossus hippoglossus; Limanda ferruginea; Liopsetta putnami; Pseudopleuronectes americanus.

Location: Metacercariae on body surfaces, musculature, branchial and oral cavities. Adults in pyloric caeca and intestine.

Locality: Gulf of St. Lawrence.

The metacercarial form of Stephanostomum baccatum is one of the commonest trematode parasites of the Heterosomata in the Gulf. The encysted parasite was found on every flatfish studied, the greatest number found was 527.

Scophthalmus aquosus was the most heavily parasitized of all the flatfish. The most highly parasitized specimens of this species were taken in the shallow waters of the lagoons at the Magdalen Islands. Wolfgang (1954a, 1954b, 1955a, 1955b) recently completed a very thorough survey of these parasites in Canadian waters. A discrepancy occurs between his incidence figures (1954a) and those of the present survey; he indicates low incidence in the fish from the Baie-des-Chaleurs area. Although his sampling was carried out on the south side, it is not felt that any great difference in incidence should be found in the twenty-six mile width of this bay. The small fish of all species

in this area are invariably infected with Stephanostomum baccatum metacercariae, not, as he stated just in a few cases with small numbers of parasites. In 15 of the halibut examined, Stephanostomum baccatum cysts were found free in the intestine. Young adults were removed from the outside of the stomach wall of Pseudopleuronectes americanus, Hippoglossus hippoglossus, and Limanda ferruginea. These trematodes were, in some cases, still encysted but had all the characteristics of the adult worm. The oral spines were not always present in their full number; if lacking, they were replaced by the small, rounded pubescent spines (Wolfgang 1955a, page 121).

The only specimens of Stephanostomum baccatum found bearing eggs were those taken from the halibut. The halibut captured close to Anticosti Island were parasitized by from three to eleven specimens; the fish from Magdalen Islands always carried a single specimen. In all, twelve of the fish were found to harbour S. baccatum.

Wolfgang (1955b) divided the species recorded by Caballero (1952) into five groups dependent on the shape and size of the vitellaria. This table, listing the species with their respective differences in morphology, was a useful taxonomic guide.

The length of the adult trematode in the halibut was from 2.05 to 2.75 mm., with a width, at the acetabulum of 0.425 to 0.475 mm., at the posterior testis 0.540 to

Figure VIII.

The metacercaria of Stephanostomum baccatum , the cyst was found attached to the stomach wall of Hippoglossus hippoglossus.

Figure IX.

Stephanostomum baccatum found free in the caeca of Hippoglossus hippoglossus.

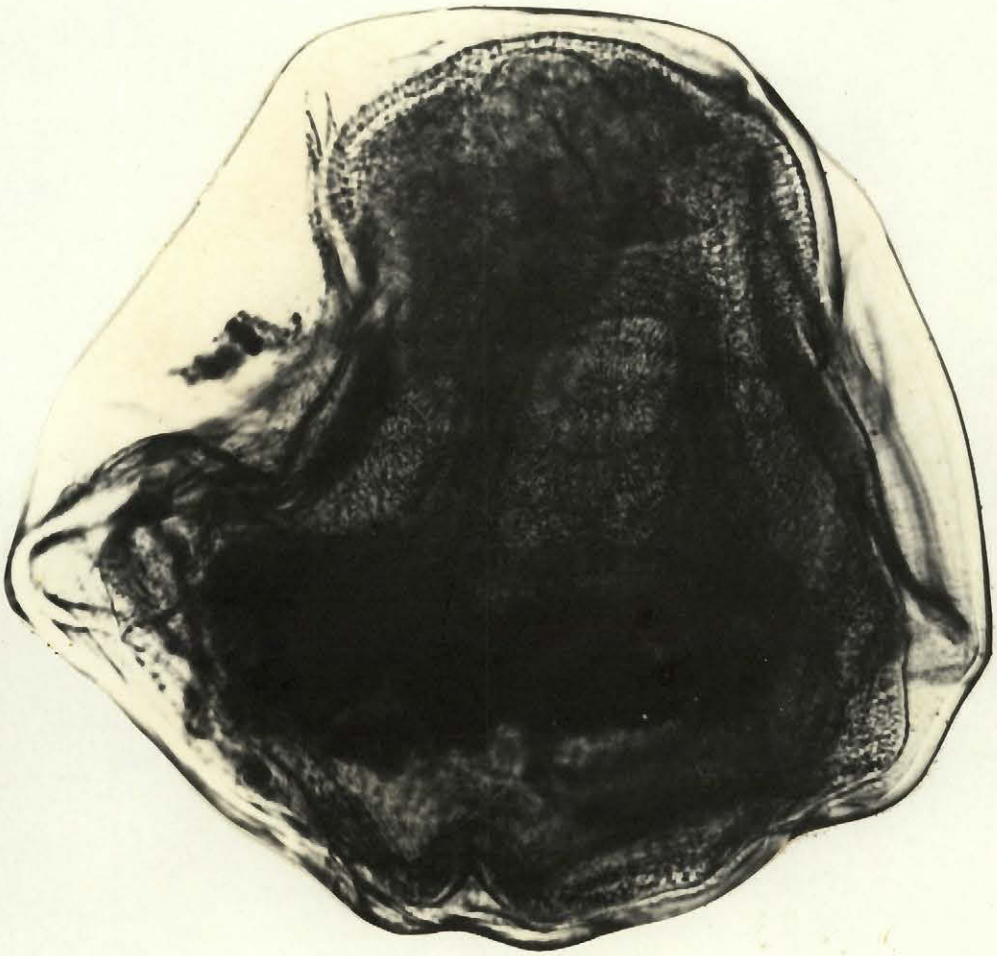


Figure VIII.

Figure IX.

0.680 mm. The oral sucker, measured from the anterior extremity to the base of the oral spines, had a length of 0.069 to 0.082 mm. and a width of 0.180 to 0.220 mm. The acetabulum is circular, having a diameter of from 0.280 to 0.320 mm. The eggs are 0.062 to 0.064 mm. long by 0.033 to 0.035 mm. wide.

The vitellaria is uninterrupted, and the cirrus short and unarmed. The body is spined, and the spines decrease in size posteriorly, the spination ending at the level of the posterior limit of the vitellaria.

Family ZOOGONIDAE Odhner, 1911

Genus Steganoderma Stafford, 1904

Steganoderma (Steganoderma) formosum Stafford, 1904

Host: Hippoglossus hippoglossus.

Location: Pyloric caeca and intestine.

Locality: Miscou Bank; East Point, Anticosti Island.

Yamaguti (1952) divided the genus Steganoderma into the two subgenera Steganoderma and Lecithostaphylus. Miller (1941) doubted Manter's (1926) differentiation of the one genus into the two genera -- Steganoderma for Stafford's (1904) material and Lecithostaphylus of Odhner (1911). The division at subgeneric level is more acceptable, as the differences between the two subgenera are not marked enough to classify them at a higher level.

Stafford's (1904) original description indicates spination of the body, one specimen in the present survey lacked body spines. However, three other specimens, taken from another fish, had these spines. The specimens taken measured 2.50 to 3.05 mm. in length by 0.65 to 0.75 mm. in width. The spines were larger at the anterior end of the body. The oral and ventral suckers were circular and of the same size, with a diameter of 0.22 mm. The eggs were 0.030 to 0.039 mm. long by 0.012 to 0.020 mm. wide.

Family AZYGIIDAE Odhner, 1911

Genus Otodistomum Stafford, 1904

Otodistomum veliporum (Creplin, 1837)

Hosts: Glyptocephalus cynoglossus; Limanda ferruginea.

Location: Digestive tract, liver, gonads.

Locality: Miscou Bank; Grande-Riviere; Magdalen Islands.

Heller (1949) reviewed the literature concerning the genus Otodistomum and described O. cestoides from Raja scabrata; she was uncertain as to the correct trivial name for this parasite. Dawes (1947), in a comprehensive review of the genus, makes O. cestoides synonymous with O. veliporum. He also states "The distinction put forward by Odhner for the separation of O. cestoides and O. veliporum is useless".

Figure X.

Otodistomum veliporum metacercaria encysted on the outside of the intestine of Limanda ferruginea.

Figure X.

The metacercariae of Otodistomum have been found previously in the witch by Nicoll (1913) and Scott (1909). The presence of larval O. veliporum in Limanda ferruginea forms a new host record.

In one of the yellowtail flounders the intestinal tract, body cavity and perianal region were covered with approximately 500 cysts of this parasite. In studying these trematodes, it was noted that the body was often rigid and in a "petrified" state, brittle to the touch and yellowish in colour. The cyst contained a granulated white fluid, in which the worm was bathed. It was obvious that many of the trematodes were dead, perhaps due to the strong host reaction of this fish.

O. veliporum was present in 6% of the specimens of Limanda ferruginea examined.

In the witch, the parasite was usually found in a viable condition, the specimens attained a length of 2.30 mm. and a width of 1.10 mm. The suckers differed in size with the ventral being the larger 0.80 mm., the oral 0.52 mm. in diameter. The excretory vessel is Y shaped and extended anteriorly to the sides of the oral sucker.

The parasites were often found between the muscle fibres of the gut wall, and they even protruded into the lumen.

O. veliporum was present in 80% of the witch examined, the number of specimens present ranging from 1 to 27.

Family HEMIURIDAE Lühe, 1901

Subfamily HEMIURINAE Looss, 1907

Genus Hemiuris Rudolphi, 1809

Hemiuris communis Odhner, 1905

Hosts: Hippoglossus hippoglossus; Liopsetta putnami.

Location: Stomach.

Locality: Magdalen Islands.

H. communis was found in 2% of the specimens of L. putnami examined, always as a solitary specimen. In the halibut, 25% of the fish carried from one to five parasites. The length of the soma in these specimens was from 1.54 to 1.82 mm., the breadth 0.30 to 0.54 mm. The modal length of 67 specimens taken from both hosts was 1.63 mm., the width 0.39 mm. The length to the width was in the ratio of four to one.

The oral sucker measured from 0.14 to 0.22 mm. in length and 0.16 to 0.22 mm. in width. The modal diameter was 0.18 mm. The pharynx was 0.108 to 0.154 mm. long by 0.011 to 0.012 mm. wide. The ventral sucker was spherical with a diameter of 0.18 to 0.40 mm.; the mean was 0.26 mm. The oral sucker and the ventral sucker are in the ratio of 7:9. The eggs were 0.020 to 0.039 mm. in length by 0.009 to 0.020 mm. wide.

The trematodes were striated on the ventral surface to the level of the ecsoma; in the region of the

Figure XI.

Hemiuris communis from the stomach of Hippoglossus hippoglossus.

Figure XI.

oral sucker, there was slight striation of the dorsal surface.

Hemiuris levinseni Odhner, 1905

Host: Hippoglossus hippoglossus.

Location: Stomach.

Locality: Magdalen Islands.

Manter (1926) gives the diagnostic characteristic for this species as the equal size of the two suckers. In some of the specimens taken in this survey, the oral sucker was found to be slightly larger than the ventral. Odhner's (1905) original description of this species indicates that this difference may occur.

A single specimen was taken from the halibut. This parasite is quite common in the waters of the northern Gulf, but as a parasite of Gadus callarias (Heller, 1949).

Hemiuris appendiculatus (Rudolphi, 1802)

Host: Hippoglossus hippoglossus.

Location: Stomach.

Locality: Grande-Riviere.

Linton (1940) has described specimens found in fish of the Woods Hole region, the specimens recorded here agree closely with his material. The number of parasites found, varied from 1 to 49, only 4% of the halibut harboured H. appendiculatus.

The comparative size of the ventral sucker in the present material placed the specimens within the species. The oral sucker measured 0.21 mm., while the ventral sucker was 0.347 mm. in diameter.

Hemiuris sp.

Hosts: Hippoglossoides platessoides; Limanda ferruginea; Pseudopleuronectes americanus.

Location: Stomach of L. ferruginea. Intestine of L. ferruginea, H. platessoides and P. americanus.

Locality: Miscou Bank; Le Fond George, Magdalen Islands; Orphan Bank.

A few specimens were found either encysted or free in the stomach and intestine of these hosts; the presence of paired vitellaria placed them in the genus Hemiuris, but the development of the other internal organs was not complete. The ecsoma was contracted in all specimens; the length of the soma was 2.40 mm., the suckers were almost identical in size, with a slight bias towards an increase in the size of the acetabulum.

The incidence of Hemiuris sp. was, one parasite in four of the yellowtail, two to six in three specimens of the winter flounder and five parasites in one plaice.

Genus Gonocerca Manter, 1925

Gonocerca crassa Manter, 1934

Host: Limanda ferruginea.

Location: Stomach.

Locality: Miscou Bank.

This is not an unusual parasite of the Heterosomata, Manter (1934) has recorded four other pleuronectids as hosts for G. crassa. The present material also forms a new host record. Twenty-one specimens were found in the stomach of a yellowtail flounder.

The position of the testes in the hind body, and the pretesticular position of ovary, together with the lack of filaments on the eggs were the criteria used in identifying these specimens as the species G. crassa.

Genus Genolinea Manter, 1925

Genolinea laticauda Manter, 1925

Host: Hippoglossus hippoglossus.

Location: Stomach.

Locality: East Point, Anticosti Island.

A single specimen was found in the stomach of a small halibut which was taken in 3.5 metres of water. Manter (1925) described this species from the halibut in

the waters of the coast of Maine. The present record extends the geographical limits of this parasite northwards.

The dimensions of the specimens closely followed the description of Manter, the vitellaria were situated behind the ovary, the intestinel caeca reached the posterior extremity of the body and the uterus coiled back to the level of the vitellaria.

Subfamily DEROGENETINAE Odhner, 1927

Genus Derogenes Lühe, 1900

Derogenes varicus (Müller, 1784)

Hosts: Hippoglossoides platessoides; Hippoglossus hippoglossus; Limanda ferruginea; Liopsetta putnami; Pseudopleuronectes americanus.

Location: Stomach of L. putnami. Stomach and intestine of H. platessoides and P. americanus. Stomach, intestine and caeca of H. hippoglossus and L. ferruginea.

Locality: Gulf of St. Lawrence.

The cosmopolitan parasite D. varicus was well represented in the flatfish of the Gulf. All the yellow-tail flounders carried this parasite, in numbers ranging from 1 to 112. Forty-five per cent of the halibut examined were found to harbour from 1 to 44 trematodes of this species. The winter flounder was lower in incidence with 10% of the fish having 1 to 28 trematodes. Seven per cent of the plaice were parasitized by D. varicus, the number present

Figure XII.

Derogenes varicus from the stomach of *Hippoglossus hippoglossus*.

Figure XIII.

Lateral view of *Derogenes varicus*.

Figure XII.

Figure XIII.

was from 1 to 8. The smooth flounder, L. putnami was lightly infected with 4% of the fish having one or two trematodes in their stomachs. All the specimens found in the plaice and the smooth flounder were immature, while the halibut carried only mature trematodes. Ten per cent of the trematodes in the winter flounder, and 16.7% of those in the yellowtail were immature.

The specimens examined were typical of those described by Odhner (1905), Nicoll (1907) and Dawes (1947). It was noticed that in many of the parasites examined, the cuticle was annulated dorsally to the posterior extremity of the mouth, and that the mouth was partially overhung by a lip. The modal measurements of 1000 specimens was noted. The length of the trematode was 2.20 mm., the width 0.45 mm. The oral sucker is smaller than the ventral, 0.28 by 0.24 mm. and 0.44 by 0.44 mm. respectively. The eggs were 0.054 mm. in length by 0.030 mm. in width.

Subfamily STERRHURINAE Looss, 1907

Genus Brachyphallus Odhner, 1905

Brachyphallus crenatus (Rudolphi, 1802)

Host: Hippoglossus hippoglossus.

Location: Stomach and intestine.

Locality: Gulf of St. Lawrence.

This parasite was present in 50% of the halibut examined; the number of parasites present in any one fish varied from 1 to 112. Those halibut that carried a great number of B. crenatus were taken in the waters of the Magdalen Islands. Only four specimens were found in the intestine, thus the stomach appears to be the favoured site of infection.

Miller (1941) in his revision of Stafford's (1904) material found, that the twelve specimens described as Hemiurus appendiculatus by Stafford, were in reality B. crenatus. The halibut was listed by Stafford as one of the hosts for his Hemiurus appendiculatus. This present work therefore, forms the second record of Brachyphallus crenatus in this host.

The specimens measured were 1.35 to 1.95 mm. in length and 0.27 to 0.39 mm. in width. The ventral sucker was the larger, 0.15 to 0.20 mm., while the oral was 0.14 to 0.18 mm. The eggs measured 0.020 to 0.025 mm. long by 0.010 to 0.016 mm. wide.

These specimens were smaller than those described by Heller (1949) from fish taken in the Baie-des-Chaleurs, this is to be expected as variation does exist in specimens from different hosts (Dawes, 1947). Heller's material was taken from Clupea harengus, Osmerus mordax and Salmo solar.

Family APOROCOTYLIDAE Odhner, 1912

Genus Aporocotyle Odhner, 1900

Aporocotyle simplex Odhner, 1900

Host: Hippoglossoides platessoides.

Location: Intestine.

Locality: Miscou Bank.

A single specimen was found in the intestinal mesentery of a plaice. The host was 37 cms. in length and taken in a drag at a depth of 36 metres. This is a new host record for Aporocotyle simplex, and also the first time it has been found in North American waters.

The parasite measured 3.80 mm. in length and 0.57 mm. in width. The cuticle carried spines, the largest of which were on the ventral surface, in groups of 11 to 17. The number of testes present in this specimen was 143 (a greater number than that recorded by Odhner, 1900). The ovary is oval with a small indentation on the anterior edge; the length is 0.15 mm., and the width 0.20 mm.

The vitellaria is well developed and follicular, limited posteriorly at the posterior extremity of the ovary. This specimen of A. simplex was not found to have eggs present in the uterus.

Family HETEROPHYIDAE Odhner, 1914

Subfamily CRYPTOCOTYLINAE Lühe, 1909

Genus Cryptocotyle Lühe, 1899

Cryptocotyle lingua (Creplin, 1825)

Hosts: Glyptocephalus cynoglossus; Hippoglossoides platessoides; Hippoglossus hippoglossus; Limanda ferruginea; Liopsetta putnami; Pseudopleuronectes americanus; Scophthalmus aquosus.

Location: Body surface, and inside of all external orifices.

Locality: Gulf of St. Lawrence.

The highest incidence of C. lingua was found in two species of fish, the winter and sand flounders, all specimens of these fish were infected. One specimen of S. aquosus carried 851 encysted parasites. The infection was heavy enough to cause complete blindness in one eye of this sinistral flatfish.

The halibut was lightly infected, 14% of the fish carrying from 5 to 37 specimens of C. lingua. The smooth flounder was slightly higher in incidence with 21%, and harbouring 2 to 41 trematodes. The incidence in the plaice was high 78% in inshore waters, one fish carrying 151 metacercariae. The smooth flounders, captured by ice fishing in Gaspe Bay, were lightly parasitized, while specimens taken off shore carried a greater number of metacercariae and were higher in incidence (63%).

Figure XIV.

The metacercaria of Cryptocotyle lingua from the mouth of Liopsetta putnami , a circle of heavy pigmentation is visible around the parasite.

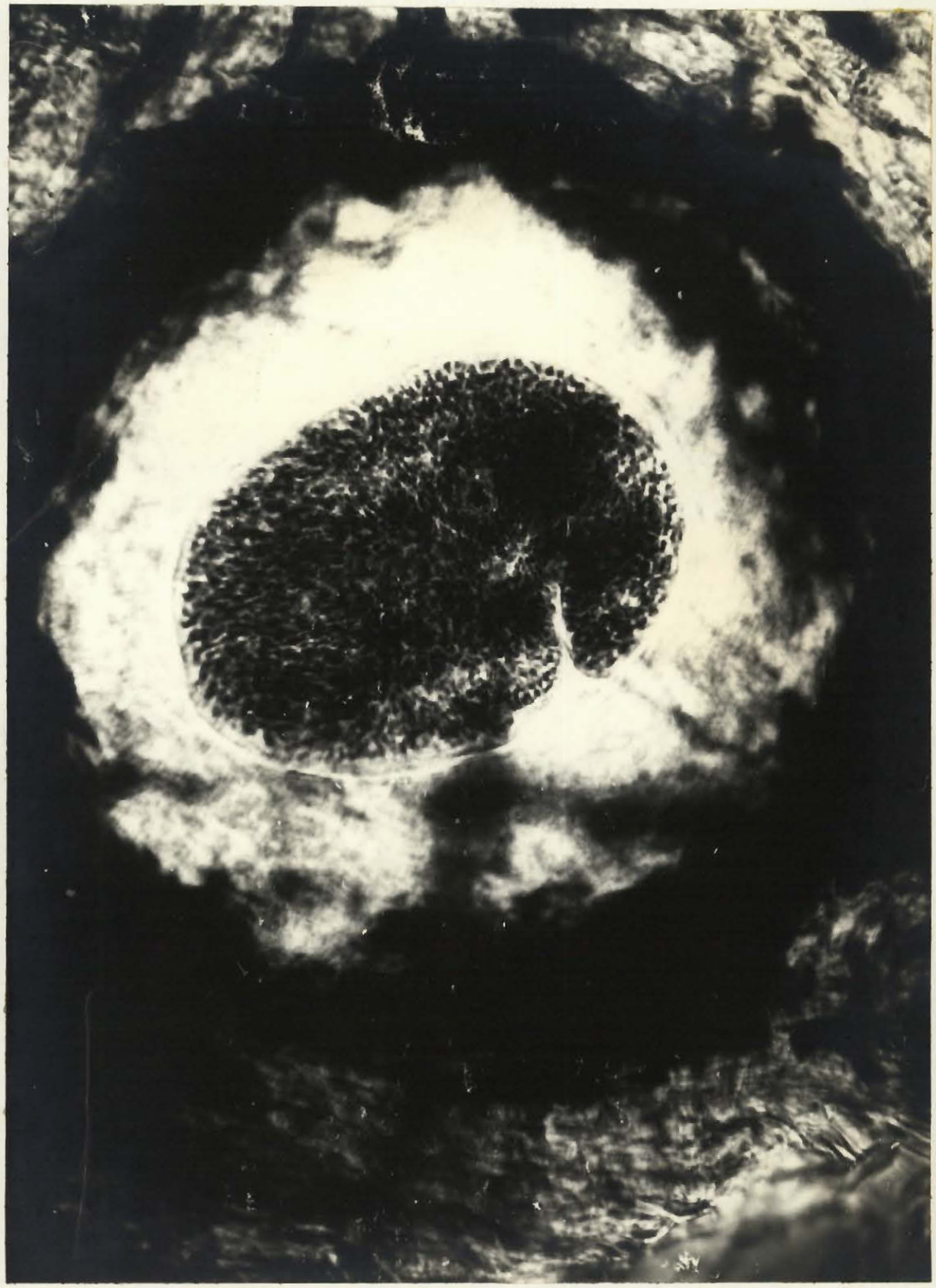


Figure XIV.

Cryptocotyle lingua, in its adult stage, is mainly a parasite of birds, although it has been found in carnivores and seals. The cercariae develop in Littorina littorea (Stunkard, 1930), the genus Littorina is present in the Gulf waters. After passing out from the molluscan intermediate host, they penetrate the second intermediate host, a fish, in this case a species of the Heterosomata. The metacercariae encyst and cause a host reaction, this brings about pigmentation of the area surrounding the parasite.

The preferred site of infection by the metacercariae on the flatfish is either on the dorsal or ventral body surfaces; the tail is also heavily infected dorsally. The parasite is sometimes found on the gill filaments and encysted in the oral cavity.

Class N E M A T O D A

Order A S C A R O I D E A, Railliet and Henry, 1915

Subfamily ANISAKINAE, Railliet and Henry, 1912

Genus Contracaecum Railliet and Henry, 1912

Contracaecum gadi (Müller 1776)

Hosts: Glyptocephalus cynoglossus; Hippoglossoides platessoides; Hippoglossus hippoglossus; Limanda ferruginea; Pseudopleuronectes americanus.

Location: Intestinal tract, encysted on all internal organs.

Locality: Grande-Riviere; Magdalen Islands; Miscou Bank; Orphan Bank; Bradelle Bank.

Heller (1949) in her identification of nematodes from Gadus callarias and other fish of the Gulf of St. Lawrence followed the work of Punt (1941), placing those worms having both an oesophageal appendix and an intestinal caecum in the species C. aduncum (Rudolphi, 1802). Dollfus (1953), in a critical review of Punt's work, regarded those C. aduncum found in the cod (Gadus callarias) and flatfish as synonymous with Contracaecum gadi, thereby following the suggestion of Johnston and Mawson (1943b, 1945). In doing so, Heller's material became listed under the latter name. The arguments of Dollfus seem valid and his classification was followed with the exception of those specimens which had not reached maturity.

Contracaecum gadi was not present in great numbers in any of the hosts recorded above. The highest indicence was in the halibut where 14% were infected with from 1 to 15 nematodes. The winter flounder was also high in incidence with 10% of the fish infected with one to three nematodes; the witch was almost identical in its parasitic incidence, 9% of the hosts carried the same number of nematodes as the winter flounder. The lowest incidence was in the yellowtail where only one fish was infected, and this was by a single nematode.

The nematodes were between 24 and 69 mm. in length and from 0.150 to 0.390 mm. in width. Margolis (1952a) indicates his doubt in Kahl (1939) and Punt's (1941) claims that the largest specimens of C. aduncum (= C. gadi) are found in the largest of the hosts. The material taken in this present work substantiates his doubts; a specimen of Hippoglossoides platessoides 80 mm. in length carried an adult worm 69 mm. long in its intestine.

Contracaecum sp. larvae

Hosts: Glyptocephalus cynoglossus; Hippoglossoides platessoides; Hippoglossus hippoglossus; Limanda ferruginea; Pseudopleuronectes americanus; Scophthalmus aquosus.

Location: Exterior of internal organs, usually attached to the mesenteries; muscles.

Locality: Gulf of St. Lawrence.

These were the immature nematodes of the genus Contracaecum, mentioned above. The presence of both the oesophageal appendix and the anterior intestinal caecum was diagnostic for the genus. There was little variation in the size of these nematodes from C. gadi, but it was felt that it would be inadvisable to classify them specifically until the life cycle is known. The chaos brought about by erroneous taxonomic classifications made on immature fish nematodes has been clearly demonstrated in Johnston and Mawson's work (1943b).

Genus Porrocaecum Railliet and Henry, 1912

Porrocaecum sp.

Hosts: Glyptocephalus cynoglossus; Hippoglossoides platessoides; Hippoglossus hippoglossus; Limanda ferruginea; Liopsetta putnami; Pseudopleuronectes americanus; Scophthalmus aquosus.

Location: Axial musculature; body cavity; exterior of pyloric caeca and intestine.

Locality: Gulf of St. Lawrence.

The name Porrocaecum is used here for only those specimens measuring 28 mm. or more in length; with an oesophagus divided into an anterior muscular region and a posterior ventriculus; and in which an intestinal caecum is always present. Larvae that do not fall into this category are placed under the heading of Anisakinae larva or have already been described under the heading of Contracaecum sp.

Scott (1956) has recently made a study of the parasites of the genus Porrocaecum present in the Atlantic cod (Gadus callarias). He concludes that probably only one species, Porrocaecum decipiens (Krabbe, 1878), is present in this host. Unfortunately his statistical analysis is not absolutely convincing as he bases his decision on the absence of bimodality in the length-frequencies of the parasites, a dangerous thing to do when dealing with a species that has been shown to be greatly variable in its comparative measurements (Punt 1941; Baylis 1929, 1944; Kahl 1938; Walker 1930). It is for this reason that the specimens recorded here, although morphologically indistinguishable from those in the cod are listed under the name of Porrocaecum sp.

A survey was made of the incidence of this nematode in the flesh of the six species of flatfish.

In the cod fish (Gadus callarias), of the same waters, the incidence in the smaller inshore fish is higher than that of fish taken from deeper waters. The reverse of this situation was found in the Heterosomata. Nine per cent of yellowtail flounders examined were parasitized, always by a single worm; the incidence by weight of fillet was 0.73 nematodes per 1000 grams of fillet. Eight per cent of the winter flounders examined were parasitized, with 0.25 nematodes per 1000 grams of fillet. Seven per cent of the sand flounders were parasitized, with 0.37

nematodes per 1000 grams of fillet; 13.6% of the smooth flounders were parasitized, with 0.46 nematodes per 1000 grams of fillet. Twelve per cent of the witch were parasitized, with 0.40 nematodes per 1000 grams of fillet.

The incidence in offshore fish was 45.5% for a pooled sample of the six species, the fish carried 0.48 nematodes per 1000 grams of fillet. It can be seen that more of the offshore flatfish are parasitized by Porrocaecum sp. than the inshore specimens, but the incidence figure by weight of fillet was higher in some species of flatfish from the shoaler waters.

Subfamily ANISAKINAE, larva

Hosts: Glyptocephalus cynoglossus; Hippoglossoides platessoides; Hippoglossus hippoglossus; Limanda ferruginea; Liopsetta putnami; Pseudopleuronectes americanus; Scophthalmus aquosus.

Location: External surface of internal organs; musculature; body cavity.

Locality: Gulf of St. Lawrence.

All larval nematodes that lacked caeca are placed together under this heading; there is little doubt that specimens of the genera Porrocaecum and Contracaecum are present, together with specimens of the larval Anisakis. Johnston and Mawson (1945) have attempted to distinguish the genera by the shape of the cysts and the position of the larvae. It is not felt, after examining the present material, that this system is of any great value.

The cysts were often joined in one mass; the cysts measuring approximately 1.8 mm. in length and having a width of 1.4 mm. In a few cases the cyst was between the muscle fibres of the gut wall, and was not apparent until dissected out. There were sometimes present two or three small coiled nematodes in the one cyst. Eighty per cent of the halibut carried from 1 to 231 encysted nematodes. Fifty per cent of the yellowtail flounder were parasitized but with fewer worms, 1 to 13. Twenty per cent of the smooth flounder were parasitized by 1 to 11 nematodes; a lower incidence of 11% was recorded for the sand flounder, with one to three nematodes present. Nine per cent of the winter flounder were parasitized by 1 to 14 parasites. Five per cent of the plaice were parasitized with one to seven nematodes. Only three per cent of the witch carried a single specimen.

Order S P I R U R O I D E A Railliet and Henry, 1915

Family CUCULLANIDAE Barreto, 1916

Subfamily CUCULLANINAE Yorke and Maplestone, 1926

Genus Cucullanus Müller, 1777

Cucullanus heterochrous Rudolphi, 1802

Hosts: Limanda ferruginea; Pseudopleuronectes americanus.

Location: Intestine of P. americanus; stomach of L. ferruginea.

Locality: Miscou Bank; Grande-Riviere.

Dollfus (1953) has reviewed, with typical thoroughness, those specimens of the genus Cucullanus that are found in marine fish. His suggestion that all specimens from flatfish belong to the one species, C. heterochrous, is followed here.

A single male specimen was found in the stomach of L. ferruginea and three males and one female in the intestine of four specimens of P. americanus.

The specimens conformed to the description given by Tornquist (1931). The presence of C. heterochrous in L. ferruginae and P. americanus increases the reported pleuronectid hosts from nine to eleven.

Phylum A C A N T H O C E P H A L A

Order P A L A E A C A N T H O C E P H A L A Meyer, 1931

Family ECHINORHYNCHIDAE Cobbold, 1879

Genus Echinorhynchus Zoega in Müller, 1776

Echinorhynchus gadi Müller, 1776

Hosts: Glyptocephalus cynoglossus; Hippoglossoides platessoides; Hippoglossus hippoglossus; Limanda ferruginea; Liopsetta putnami; Pseudopleuronectes americanus; Scophthalmus aquosus.

Location: Digestive tract, and encysted in mesenteries of the internal organs.

Locality: Gulf of St. Lawrence.

Echinorhynchus gadi has been described from many hosts including ten species of Heterosomata. The present survey increases this number to 15, the new host records are for the following fish: G. cynoglossus, H. platessoides, L. ferruginea, L. putnami and S. aquosus.

The literature on this acanthocephalan parasite is extensive; the specific determination was made by consulting the works of Lühe (1911), Linton (1933), Markowski (1933), Nigrelli (1946), Van Cleave (1925), Dollfus (1953) and Meyer (1933).

E. gadi was very common in the flatfish, 52% of all fish examined were found to harbour this species of the Acanthocephala. The numbers present varied from 1 to 26, 78% of which were females.

Figure XV.

Proboscis of Echinorhynchus gadi.

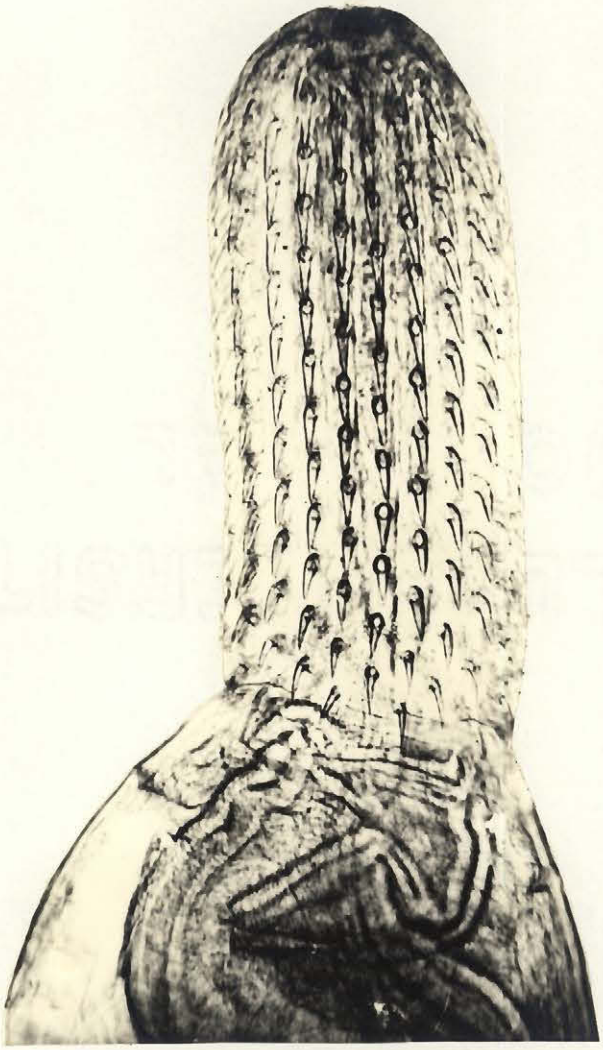


Figure XV.

Echinorhynchus laurentianus n. sp.

Hosts: Hippoglossoides platessoides; Hippoglossus hippoglossus; Pseudopleuronectes americanus; Scophthalmus aquosus.

Location: Digestive tract.

Locality: Gulf of St. Lawrence.

This new parasite was often found in the presence of E. gadi, upon cursory examination no significant morphological difference could be seen. The principle criterion lies in the hook count; E. gadi has 18 to 22 longitudinal rows of hooks, the new species differs radically as is shown in the description that follows.

Description: The body of the living worm is pink or white in colour. Sexual dimorphism is fairly well marked, the female being the larger. Female -- the length is from 10 to 15 mm., with a width of 0.80 to 1.40 mm. The body is usually curved ventrally with the proboscis appearing to extrude from the ventral surface, owing to this curvature of the body. The length of the extended proboscis is from 0.350 to 0.65 mm., the width from 0.11 to 0.15 mm. The proboscis bears 14 to 16 longitudinal rows of hooks set in 11 to 13 transverse rows. The hooks of the first two proximal rows are smaller and simple. The larger hooks measure 0.038 to 0.048 mm. in blade (thorn) length, 0.020 to 0.025 mm. in height. The root of the hook measures 0.024 to 0.029 mm. in length. The hooks are curved and conical in shape, except the smaller proximal

Figure XVI .

A. Male of Echinorhynchus laurentianus

B. Hooks of the proboscis of E. laurentianus

C. Ova of E. laurentianus

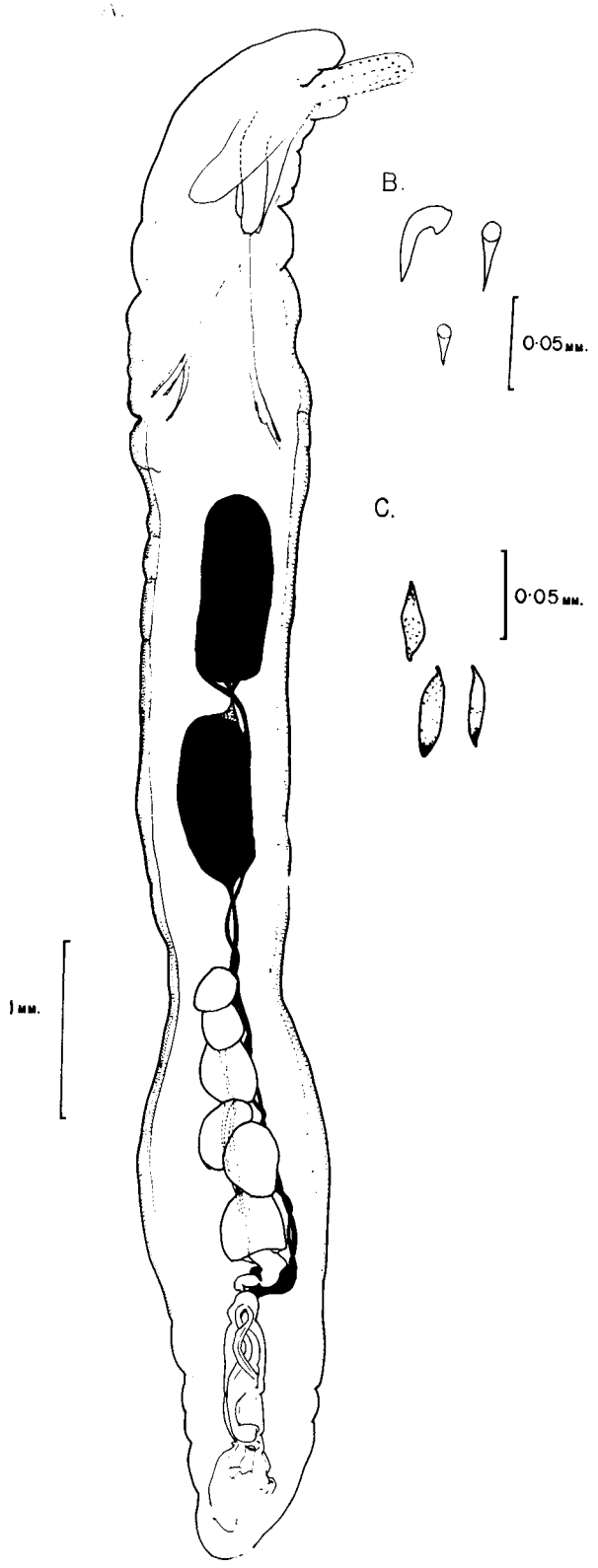


Figure XVI.

hooks which are triangular in shape.

The lemnisci are broadly elongated measuring from 0.80 to 1.10 mm. in length and with a width of 0.180 to 0.320 mm., one lying each side of the proboscis sac. The proboscis sac is slightly shorter than the lemnisci and more tubular in shape, with a length of 0.55 to 0.70 mm., and a width of 0.32 to 0.40 mm.

The neural ganglion is situated posteriorly in the proboscis sac with the two retinacula passing backwards from the posterior extremity of the ganglion, 1 mm. in length, the root of the dorsal retractor is triradiate, while that of the ventral is weakly biradiate.

In the juvenile worm, the ovarian balls almost fill the entire body cavity. The ova, when formed, have one end pointed, the other stalked, terminating in a knob. Male -- it is shorter, and usually less curved, than the female. It measures 5 to 11 mm. in length and 0.55 to 0.72 mm. in width. The proboscis resembles that of the female, both in shape and armature. The testes are tandem, bluntly elliptical in shape, measuring 0.60 to 0.95 mm. in length and 0.28 to 0.35 mm. in width. A testicular ligament is present between the two testes. The sperm ducts leave the posterior end of each testis, twist together and join before entering the pouch of the urogenital canal. The cement glands are six in number, intermixed and superimposed, roughly globular in shape.

Figure XVII.

Female reproductive system of Echinorhynchus laurentianus.

Figure XVIII.

Uterine bell of reproductive system of E. laurentianus.

Figure XVII.

Figure XVIII.

The cement ducts empty into the common sperm duct. The copulatory bursa is bean shaped when everted, and closely folded within the bursa capsule when introverted. The gonopore is situated dorso-medially and is poorly defined when the copulatory bursa is introverted.

This parasite was present in 46% of the fish examined, 61% of which were females, 29% were immature specimens of the both sexes.

Family POLYMORPHIDAE Meyer, 1931

Genus Corynosoma Lühe, 1904

Corynosoma sp.

Hosts: Glyptocephalus cynoglossus;
Hippoglossoides platessoides;
Hippoglossus hippoglossus;
Limanda ferruginea;
Pseudopleuronectes americanus.

Location: Encysted in mesentery and on the outside of internal organs.

Locality: H. platessoides, P. americanus from Grande-Riviere;
G. cynoglossus, L. ferruginea from Miscou Bank;
H. hippoglossus from East Point, Anticosti Island.

The specimens were classified by reference to the works of Lühe (1905) and Montreuil (1955). Montreuil (1955) was the first author to record Corynosoma sp. from flatfish in eastern Canada. The material described here increases from three to six the number of pleuronectid

hosts; the new hosts records are for G. cynoglossus, H. platessoides and L. ferruginea.

The yellowtail flounder was heavily parasitized, 49% of the fish were found to carry from one to nine encysted acanthocephalids in the mesenteries. Seven per cent of the halibut had from three to five parasites present. Twenty per cent of the witch were carrying a single encysted acanthocephalan parasite. Only 2% of the plaice were infected and in both cases by a single worm. The winter flounder had the lowest parasitic incidence with a single specimen in the mesentery of the pyloric caeca.

DISCUSSION AND SUMMARY

A survey has been made of the parasitic fauna of the Heterosomata of the Gulf of St. Lawrence, the parasites included six species of Copepoda, six species of Cestoda, twenty-six species of Trematoda, five species of Nematoda and three species of Acanthocephala.

The host-parasite list that follows the summary shows that the halibut, Hippoglossus hippoglossus carried thirty species of parasites. The voracious feeding habits of this fish would account for some of the unusual records of parasitic infection, mention of this is made in the body of the text. The yellowtail flounder, Limanda ferruginea was found to harbour twenty-four species of parasites, the winter flounder, Pseudopleuronectes americanus nineteen, the plaice, Hippoglossoides platessoides sixteen, the witch, Glyptocephalus cynoglossus eleven, the smooth flounder, Liopsetta putnami ten, and the sand flounder, Scophthalmus aquosus only eight.

A new species of monogenetic trematode was found on the halibut, Hippoglossus hippoglossus, this is described and named Entobdella curvunca sp. n. The halibut Hippoglossus hippoglossus, plaice Hippoglossoides platessoides, winter flounder Pseudopleuronectes americanus and the sand flounder Scophthalmus aquosus were also parasitized by a species of Acanthocephala previously undescribed in the literature; this is described and named Echinorhynchus laurentianus n. sp.

The metazoan parasites found in, or on, the 660 specimens of the Heterosomata of the Gulf of St. Lawrence are listed on the following pages. They are shown, firstly as host-parasite records, secondly as parasite-host records. The single # indicates that the record is new for the geographical limitations of the Gulf of St. Lawrence. The presence of a double ## indicates a new host record for the parasite concerned. The parasitic species shown in the lists following are not arranged in their correct taxonomic position; they follow an order of alphabetical listing so as to facilitate the finding of any one species.

HOST - PARASITE LIST

HOST	PARASITE	PARASITE GROUP
Glyptocephalus cynoglossus (Linne, 1758)	Cryptocotyle lingua	Trematoda
	Otodistomum veliporum	
	Plagioporus varia	
	Stephanostomum baccatum	
	Steringophorus furciger	
	Anisakinae, larva	Nematoda
	Contracaecum gadi	
	Contracaecum sp.	
	Porrocaecum sp.	
	Corynosoma sp.	Acanthocephala
	Echinorhynchus gadi	
Hippoglossoides platessoides (Fabricius, 1780)	Acanthochondria flurae	Copepoda
	Diplocotyle olrikii	Cestoda
	Scolex pleuronectis	
	Aporocotyle simplex	Trematoda
	Cryptocotyle lingua	
	Derogenes varicus	
	Hemiuris sp.	
	Podocotyle atomon	
	Stephanostomum baccatum	

	Anisakinae, larva	Nematoda
	Contracaecum gadi	
	Contracaecum sp.	
	Porrocaecum sp.	
	Corynosoma sp.	Acanthocephala
	Echinorhynchus gadi	
	Echinorhynchus laurentianus	
Hippoglossus hippoglossus (Linne, 1758)	Hatschekia hippoglossi	Copepoda
	Lepeophtheirus hippoglossi	
	Parabrachiella rostrata	
	Clestobothrium crassiceps	Cestoda
	Scolex pleuronectis	
	Brachyphallus crenatus	Trematoda
	Cryptocotyle lingua	
	Derogenes varicus	
	Entobdella curvunca	
	Entobdella hippoglossi	
	Genolinea laticauda	
	Hemiuris appendiculatus	
	Hemiuris communis	
	Hemiuris levinseni	
	Plagioporus varia	
	Podocotyle atomon	

	Prosorhynchus squamatus	
	Steganoderma formosum	
	Stephanostomum baccatum	
	Steringophorus furciger	
	Steringotrema cluthense	
	Udonella caligorum on Lepeophtheirus hippoglossi	
	Anisakinae, larva	Nematoda
	Contracaecum gadi	
	Contracaecum sp.	
	Porrocaecum sp.	
	Corynosoma sp.	Acanthocephala
	Echinorhynchus gadi	
	Echinorhynchus laurentianus	
Limanda ferruginea (Storer, 1839)	Bothriocephalus scorpii	Cestoda
	Diplocotyle olrikii	
	Phyllobothrium sp.	
	Tetraphyllidea, plerocercoid	
	Scolex pleuronectis	
	Cryptocotyle lingua	Trematoda
	Derogenes varicus	
	Gonocerca crassa	

	Hemiuris sp.	
	Otodistomum veliporum	
	Peracreadium commune	
	Plagioporus varia	
	Podocotyle atomon	
	Podocotyle olssoni	
	Stenakron vetustum	
	Stephanostomum baccatum	
	Steringophorus furciger	
	Anisakinae, larva	Nematoda
	Contracaecum gadi	
	Contracaecum sp.	
	Cucullanus heterochrous	
	Porrocaecum sp.	
	Corynosoma sp.	Acanthocephala
	Echinorhynchus gadi	
Liopsetta putnami (Gill, 1864)	Bothriocephalus scorpii	Cestoda
	Cryptocotyle lingua	Trematoda
	Derogenes varicus	
	Hemiuris communis	
	Podocotyle atomon	
	Stephanostomum baccatum	
	Steringophorus furciger	

	Anisakinae, larva	Nematoda
	Porrocaecum sp.	
	Echinorhynchus gadi	Acanthocephala
Pseudopleuronectes americanus (Walbaum, 1792)	Argulus megalops	Copepoda
	Argulus megalops spinosus	
	Cryptocotyle lingua	Trematoda
	Derogenes varicus	
	Hemiuris sp.	
	Plagioporus varia	
	Podocotyle atomon	
	Stephanostomum baccatum	
	Steringophorus furciger	
	Anisakinae, larva	Nematoda
	Contracaecum gadi	
	Contracaecum sp.	
	Cucullanus heterochrous	
	Porrocaecum sp.	
	Corynosoma sp.	Acanthocephala
	Echinorhynchus gadi	
	Echinorhynchus laurentianus	

Scophthalmus aquosus (Mitchill, 1815)	Bothriocephalus scorpii	Copepoda
	Cryptocotyle lingua	Trematoda
	Lepidapedon clavatum	
	Anisakinae, larva	Nematoda
	Contracaecum sp.	
	Porrocaecum sp.	
	Echinorhynchus gadi	Acanthocephala
	Echinorhynchus laurentianus	

PARASITE - HOST LIST

PARASITE	HOST
COPEPODA	
Acanthochondria flurae (Krøyer, 1863)	# Hippoglossoides platessoides
Argulus megalops (Smith, 1873)	# Pseudopleuronectes americanus
Argulus megalops spinosus Wilson, 1944	# Pseudopleuronectes americanus
Hatschekia hippoglossi (Krøyer, 1837)	# Hippoglossus hippoglossus
Lepeophtheirus hippoglossi (Krøyer, 1837)	# Hippoglossus hippoglossus
Parabrachiella rostrata (Krøyer, 1837)	## Hippoglossus hippoglossus
CESTODA	
Bothriocephalus claviceps (Goeze, 1782)	Pseudopleuronectes americanus
Bothriocephalus scorpii Müller, 1776	# Limanda ferruginea
	## Liopsetta putnami
	# Scophthalmus aquosus

Clestobothrium crassiceps (Rudolphi, 1808)	# Hippoglossus hippoglossus
Diplocotyle olrikii Krabbe, 1874	## Hippoglossoides platessoides
	## Limanda ferruginea
	# Pseudopleuronectes americanus
Phyllobothrium sp.	## Limanda ferruginea
Tetraphyllidea, plerocercoid	## Limanda ferruginea
Scolex pleuronectis Müller, 1788	# Hippoglossoides platessoides
	# Hippoglossus hippoglossus
	# Limanda ferruginea

TREMATODA

Aporocotyle simplex Odhner, 1900	## Hippoglossoides platessoides
Brachyphallus crenatus (Rudolphi, 1802)	# Hippoglossus hippoglossus
Cryptocotyle lingua (Creplin, 1825)	## Glyptocephalus cynoglossus
	## Hippoglossoides platessoides
	## Hippoglossus hippoglossus
	## Limanda ferruginea

	## Liopsetta putnami
	# Pseudopleuronectes americanus
	# Scophthalmus aquosus
Derogenes varicus (Müller, 1784)	# Hippoglossoides platessoides
	# Hippoglossus hippoglossus
	# Limanda ferruginea
	## Liopsetta putnami
	Pseudopleuronectes americanus
Entobdella curvunca n. sp.	## Hippoglossus hippoglossus
Entobdella hippoglossi (Müller, 1776)	# Hippoglossus hippoglossus
Genolinea laticauda Manter, 1925	# Hippoglossus hippoglossus
Gonocerca crassa Manter, 1934	## Limanda ferruginea
Hemiuris appendiculatus (Rudolphi, 1802)	# Hippoglossus hippoglossus
Hemiuris communis Odhner, 1905	# Hippoglossus hippoglossus
	## Liopsetta putnami

Hemiuris levinseni Odhner, 1905	## Hippoglossus hippoglossus
Hemiuris sp.	## Hippoglossoides platessoides
	## Limanda ferruginea
	## Pseudopleuronectes americanus
Lepidapedon rachion (Cobbold, 1858)	## Scophthalmus aquosus
Otodistomum veliporum (Creplin, 1837)	# Glyptocephalus cynoglossus
	## Limanda ferruginea
Peracreadium commune (Olsson, 1867)	## Limanda ferruginea
Plagioporus varia (Nicoll, 1910)	## Glyptocephalus cynoglossus
	## Hippoglossus hippoglossus
	## Limanda ferruginea
	## Pseudopleuronectes americanus
Podocotyle atomon (Rudolphi, 1802)	## Hippoglossoides platessoides
	# Hippoglossus hippoglossus
	# Limanda ferruginea
	## Liopsetta putnami
	Pseudopleuronectes americanus

Podocotyle olssoni Odhner, 1905	# Limanda ferruginea
Prosorhynchus squamatus Odhner, 1905	## Hippoglossus hippoglossus
Stenakron vetustum Stafford, 1904	## Limanda ferruginea
Steganoderma formosum Stafford, 1904	# Hippoglossus hippoglossus
Stephanostomum baccatum (Nicoll, 1907)	Glyptocephalus cynoglossus
	Hippoglossoides platessoides
	Hippoglossus hippoglossus
	Limanda ferruginea
	Liopsetta putnami
	Pseudopleuronectes americanus
Steringophorus furciger (Olsson, 1868)	# Glyptocephalus cynoglossus
	# Hippoglossus hippoglossus
	# Limanda ferruginea
	## Liopsetta putnami
	# Pseudopleuronectes americanus
Steringotrema cluthense (Nicoll, 1909)	## Hippoglossus hippoglossus

Steringotrema pagelli (van Beneden, 1870)	## Hippoglossus hippoglossus
Udonella caligorum (on L. hippoglossi) Johnston, 1835	# Hippoglossus hippoglossus

NEMATODA

Anisakinae, larva	## Glyptocephalus cynoglossus
	## Hippoglossoides platessoides
	## Hippoglossus hippoglossus
	## Limanda ferruginea
	## Liopsetta putnami
	## Pseudopleuronectes americanus
	## Scophthalmus aquosus
Contracaecum gadi (Müller, 1776)	# Glyptocephalus cynoglossus
	# Hippoglossoides platessoides
	# Hippoglossus hippoglossus
	## Limanda ferruginea
	Pseudopleuronectes americanus
Contracaecum sp.	## Glyptocephalus cynoglossus
	## Hippoglossoides platessoides
	## Hippoglossus hippoglossus
	## Limanda ferruginea

	## Pseudopleuronectes americanus
	## Scophthalmus aquosus
Cucullanus heterochrous Rudolphi, 1802	## Limanda ferruginea
	## Pseudopleuronectes americanus
Porrocaecum sp.	## Glyptocephalus cynoglossus
	Hippoglossoides platessoides
	## Hippoglossus hippoglossus
	## Limanda ferruginea
	## Liopsetta putnami
	## Pseudopleuronectes americanus
	## Scophthalmus aquosus

ACANTHOCEPHALA

Corynosoma sp.	## Glyptocephalus cynoglossus
	## Hippoglossoides platessoides
	Hippoglossus hippoglossus
	## Limanda ferruginea
	Pseudopleuronectes americanus
Echinorhynchus gadi Müller, 1776	## Glyptocephalus cynoglossus
	## Hippoglossoides platessoides
	# Hippoglossus hippoglossus
	# Limanda ferruginea

Liopsetta putnami

Pseudopleuronectes americanus

Scophthalmus aquosus

Echinorhynchus laurentianus
n. sp.

Hippoglossoides platessoides

Hippoglossus hippoglossus

Pseudopleuronectes americanus

Scophthalmus aquosus

Figure XIX.

Metacercariae of Otodistomum veliporum encysted on the outside of the pyloric caeca of Limanda ferruginea.

Figure XX.

Cysts of O. veliporum , in the bottom cyst can be seen the young trematode.

Figure XIX.

Figure XX.

Figure XXI.

The anterior extremity of Echinorhynchus laurentianus.

Figure XXI.

Figure XXII.

Testes and seminal duct of Echinorhynchus laurentianus.

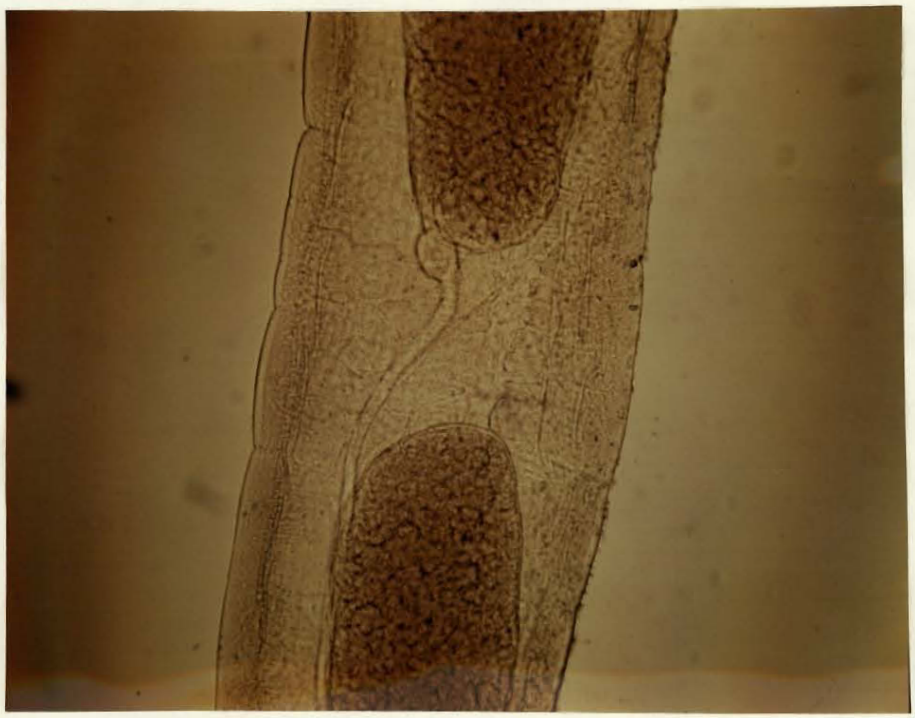


Figure XXII.

Figure XXIII.

Cement glands of Echinorhynchus laurentianus

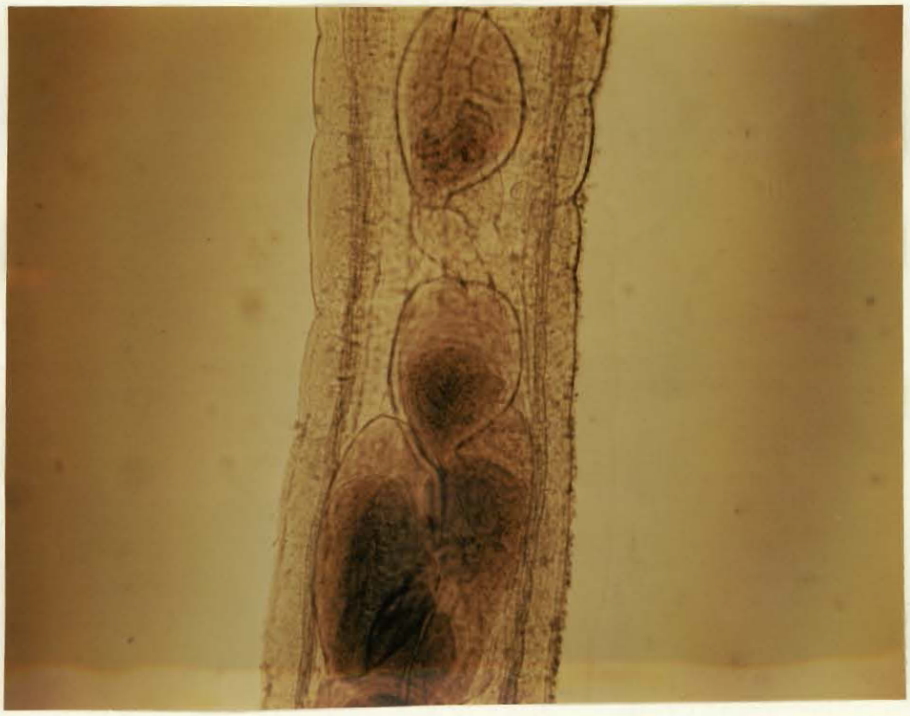


Figure XXIII.

Figure XXIV.

The posterior cement gland and the introverted copulatory bursa of Echinorhynchus laurentianus

Figure XXIV.

APPENDIX TO THE BIBLIOGRAPHY

The references that are listed here are supplementary to those of the check list bibliography and together with the latter cover all references made in the body of the text concerning the parasites found in the Heterosomata of the Gulf of the St. Lawrence.

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A CHECK LIST OF THE METAZOAN PARASITES OF THE HETEROSOMATA .

The order Heterosomata is comprised of a great number of species , many of which have been studied in parasitological surveys. An attempt has been made here to list all the species of flatfish studied , together with their parasitic fauna . Included are one hundred and sixteen hosts and four hundred and fourteen parasites.

The check list is composed of two parts, firstly the fish are listed by specific name , followed by the names of all parasites recorded from that species . Secondly the parasites themselves are listed by specific name , and these in turn are followed by the name of the host , or hosts that they parasitize .

The host classification follows approximately the outline drawn up by Berg (1940) , as far as family status . The specific classification for the families , Psettodidae , Bothidae and Pleuronectidae is taken from the work of Norman (1934) . Whilst the specific classification of the superfamily Soleoidae comprises a useful adjustment of four major works , Faune Ichthyologique de l'Atlantique Nord (1938) , Jordan and Goss (1889) , Günther (1862) and Jordan , Evermann and Clark (1930) .

Synonymy has been reduced to a minimum in both the recordings of the parasites and the hosts . This was impossible in a few cases of the parasitic listings , and unadvisable when dealing with some of the Nematoda and Trematoda , as further confusion would arise in those groups awaiting revision .

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TABLE OF CONTENTS

SUBORDER - Psettodoidea

FAMILY - Psettodidae .

HOST .	PARASITE .	PARASITIC GROUP .
Psettodes erumei (Schneider , 1801) .	Chondracanthus alatus	Copepoda
	Protochondracanthus psettodes	
	Enispa irregularis	Isopoda
	Rhynchobothrium sp.	Cestoda
	Tentacularia macfie	
	Neidhartia microrhyncha	Trematoda

SUBORDER - Pleuronectoidea

SUPERFAMILY - Pleuronectoidae

FAMILY - Bothidae

SUBFAMILY - Paralichthinae .

HOST.	PARASITE.	PARASITIC GROUP .
Hippoglossina macrops Steindachner , 1876 .	Entobdella squamula	Trematoda
Paralichthys sp.	Gonocerca crassa	Trematoda
	Heterobothrium affine	
	Monorcheides cumingiae	
	Sterrhurus floridensis	
Paralichthys dentatus (Linné , 1766) .	Acanthochondria galerita	Copepoda
	Argulus alosae	
	Argulus laticauda	
	Argulus megalops	
	Lepeophtheirus edwardsi	
	Nesippus alatus	
	Bothriocephalus scorpii	Cestoda
	Callitetrarhynchus gracilis	
	Grillotia erinaceus	
	Gymnorhynchus (Gymnorhynchus) gigas	
	Lacistorhynchus tenuis	

Nybelinia (Nybelinia) bisulcata

Nybelinia (Nybelinia) robusta

Otobothrium (Otobothrium) crenacolle

Phyllobothrium loliginis

Pterobothrium heteracanthum

Rhynchobothrium sp.

Scolex pleuronectis

Tentacularia coryphaenae

Anisoporus manteri Trematoda

Cercariaeum lintoni

Cymbephallus vitellosus

Deropristis inflata

Dinurus pinguis

Distoma rudens

Distoma sp.

Hemiuris appendiculatus

Heterobothrium affine

Lecithochirium synodi

Lepidapedon elongatum

Podocotyle atomon

Podocotyle olssoni

Siphodera vinaledwardsii

Stephanostomum dentatum

Stephanostomum japonicum

Trematoda

	Ascaris sp.	Nematoda
	Dichelyne fastigatus	
	Philometra sanguinea	
	Acanthocephaloides incrassatus	Acanthocephala
	Echinorhynchus gadi	
	Echinorhynchus sagittifer	
	Pomphorhynchus laevis	
	Serrasentis socialis	
Paralichthys lethostigma Jordan and Gilbert , 1885 .	Lepeophtheirus edwardsi	Copepoda
	Bucephalopsis bennetti	Trematoda
	Heterobothrium affine	
	Contracaecum collieri	Nematoda
	Dichelyne fastigatus	
	Arhythmorhynchus duocinctus	Acanthocephala
	Nybelinia (Nybelinia) bisulcata	Cestoda
Paralichthys albigutta Jordan and Gilbert , 1883.	Otobothrium (Otobothrium) crenacolle	
	Pterobothrium heteracanthum	
	Bucephalopsis haimeanus	Trematoda

	Distoma pudens	
	Stephanostomum imparispine	
	Sterrhurus monticelli	
	Stephanostomum dentatum	
	Ascaris sp.	Nematoda
	Cucullanus lintoni	
	Heterakis sp.	
	Philometra globiceps	
	Echinorhynchus sagittifer	Acanthocephala
	Echinorhynchus sp.	
	Rhadinorhynchus pristis	
	Serrasentis socialis	
Paralichthys squamilentus	Taeniacanthodes gracilis	Copepoda
Jordan and Gilbert , 1883 .	Gonocerca crassa	Trematoda
Paralichthys oblongus	Caligus rapax	Copepoda
(Mitchill , 1815) .	Lepeoptheirus edwardsi	
	Bothriocephalus scorpii	Cestoda
	Grillotia erinaceus	
	Nybelinia (Nybelinia) bisulcata	

	Phyllobothrium loliginis	
	Rhynchobothrium sp.	
	Scolex pleuronectis	
	Adinosoma robustum	Trematoda
	Distoma fenestratum	
	Gonocerca crassa	
	Steganoderma formosum	
	Steringophorus furciger	
	Sterrhurus robustus	
	Ascaris sp.	Nematoda
	Echinorhynchus gadi	Acanthocephala
Paralichthys californicus (Ayres , 1862-3 ?) .	Trebius latifurcatus	Copepoda
	Bucephalopsis labiatus	Trematoda
	Distoma fenestratum	
	Entobdella squamula	
	Hemiuris appendiculatus	
	Immature hemiurid	
	Stephanostomum dentatum	
Paralichthys adspersus (Steindachner , 1867) .	Entobdella brattströmi	Trematoda

Paralichthys olivaceus	Acanthochondria sixteni	Copepoda
(Temminck and Schlegel , 1846) .	Chondracanthus grandigenitalus	
	Callitetrarhynchus gracilis	Cestoda
	Nybelinia sp.	
	Nybelinia (Nybelinia) pintneri	
	Nybelinia (Nybelinia) surmenicola	
	Ectenurus paralichthydis	Trematoda
	Pseudolepidapedon kobayashi	
	Pseudolepidapedon paralichthydis	
	Torticaecum nipponicum	
	Anisakis simplex	Nematoda
	Anisakis sp.	
	Contracaecum paralichthydis	
	Cucullanus pleuronectidis	
Pseudorhombus oligodon	Chondracanthus brevicollis	Copepoda
(Bleeker , 1854) .		
Pseudorhombus arsius	Chondracanthus brevicollis	Copepoda
(Hamilton , 1822) .	Chondracanthus longicephalus	

Pseudorhombus pentophthalmus	Pseudochondracanthus pseudorhombi	Copepoda
Günther , 1862 .	Nybelinia nipponica	Cestoda
	Derogenes varicus	Trematoda
	Pseudopecoelus japonicus	
	Stephanostomum hispidum	
	Tubulovesicula pseudorhombi	
Pseudorhombus cinnamoneus	Parataeiniacanthus pseudorhombi	Copepoda
(Temminck and Schlegel , 1846) .	Lepocreadium clavatum	Trematoda
	Contracaecum sp.	Nematoda
	Cucullanus pleuronectidis	
Ancylopsetta dilecta	Cymbephallus vulgaris	Trematoda
(Goode and Bean , 1883) .	Gonocerca crassa	
	Lecithochirium microstomum	
	Sterrhurus floridensis	
Syacium papillosum	Helicometrina nimia	Trematoda
(Linné , 1758) .	Sterrhurus floridensis	

Syacium micrurum Ranzani , 1840 .	Sterrhurus floridensis	Trematoda
Cyclopsetta fimbriata (Goode and Bean , 1886) .	Distoma fenestratum	Trematoda
	Sterrhurus floridensis	
Citharichthys sordidus (Girard , 1856) .	Cymothoa exigua	Isopoda
	Brachiella nitida	Copepoda
Citharichthys stigmaeus Jordan and Gilbert , 1883 .	Gilquinia squali	Cestoda
	Anisakis sp.	Nematoda
	Contracaecum sp.	
Citharichthys cornutus (Günther , 1880) .	Dolichoenterum sp.	Trematoda
Citharichthys sp.	Phrixocephalus cincinnatus	Copepoda

Etropus microstomus (Gill , 1864) .	Cymothoa excisa	Isopoda
	Nerocila acuminata	
Trichopsetta ventralis (Goode and Bean , 1886) .	Sterrhurus floridensis	Trematoda
Engyophrys sentus Ginsburg , 1933 .	Lepidapedon nicolli	Trematoda
Monolene antillarum Norman , 1933	Lomasoma monolenei	Trematoda
Eucitharus linguatula (Linné , 1758) .	Acanthochondria cornuta	Copepoda
	Lepeoptheirus pectoralis	
	Bothriocephalus andresi	Cestoda
	Scolex pleuronectis	
	Scolex quadrilobus	
	Distoma appendiculatum	Trematoda
	Hemiuris appendiculatus	

Ascaris capsularia	Nematoda
Contracaecum aduncum	
Acanthocephaloides propinquus	Acanthocephala
Echinorhynchus globulosus	

SUBORDER - Pleuronectoidea

SUPERFAMILY - Pleuronectoidae

FAMILY - Bothidae

SUBFAMILY - Bothinae

Arnoglossus grohmanni (Bonaparte , 1837) .	Lepeophtheirus grohmanni	Copepoda
	Scolex pleuronectis	Cestoda
Arnoglossus laterna (Walbaum , 1792) .	Bothriocephalus clavibothrium	Cestoda
	Bothriocephalus rhombi	
	Bothriocephalus scorpii	
	Grillotia erinaceus	
	Scolex pleuronectis	
	Brachyphallus crenatus	Trematoda
	Lecithochirium caudiporum	
	Ascaris capsularia	Nematoda
	Contracaecum gadi	
Arnoglossus pegosa [1] (Walbaum , 1792) .	Bothriocephalus scorpii	Cestoda
	Tetrarhynchus tenuicollis	
Arnoglossus rueppellii (Cocco , 1844) .	Pharodes clini	Copepoda

1. Arnoglossus pegosa is probably synonymous with Arnoglossus laterna .

Arnoglossus scapha ((Forster) Schneider , 1801) .	Derogenes varicus	Trematoda
	Opegaster caulopsettae	
Arnoglossus sp.	Scolex pleuronectis	Cestoda
	Derogenes varicus	Trematoda
Crossorhombus azureus (Alcook , 1889) .	Chondracanthus similis	Copepoda
Bothus ocellatus (Agassiz , 1831) .	Ectenurus virgula	Trematoda
Bothus podas (Delaroche , 1809) .	Bothriocephalus rhombi	Cestoda
	Bothriocephalus scorpii	
	Scolex pleuronectis	
	Distoma areolatum	Trematoda
	Lecithochirium gravidum	
	Lecithocladium excisum	

	Ascaris collaris	Nematoda
	Philometra fusca	
	Rhabditis sp.	
	Acanthocephaloides propinquus	Acanthocephala
Bothus mancus (Broussonet , 1782) .	Ascaris collaris	Nematoda
Chascanopsetta lugubris Alcock , 1894 .	Dinosoma tortum	Trematoda
Laeops variegata Franz , 1910 .	Distoma appendiculatum	Trematoda
Scophthalmus maximus (Linné , 1758) .	Caligus curtus	Copepoda
	Caligus diaphanus	
	Caligus sp.	
	Cecrops latreilli	
	Lepeophtheirus pectoralis	
	Lepeophtheirus thompsoni	

Lernaeocera branchialis

Parabrachiella rostrata

Bothriocephalus scorpii Cestoda

Gilquinia squali

Grillotia erinaceus

Lacistorhynchus tenuis

Nybelinia (Nybelinia) lingualis

Scolex pleuronectis

Scolex sp.

Brachyphallus crenatus Trematoda

Calicotyle kröveri

Cryptocotyle concava

Derogenes varicus

Distoma appendiculatum

Distoma areolatum

Distoma microcotyle

Distoma rhombi

Echinostoma revolutum

Hemiuris appendiculatus

Hemiuris rugosus

Lecithochirium caudiporum

Lecithochirium gravidum

Lecithochirium rufoviride

Megalocotyle rhombi

Monostoma rhombi-laevis

Podocotyle aeglefini

Podocotyle atomon

Stephanostomum hystrix

Steringophorus furciger

Sterrhurus musculus

Zoogonoides viviparus

Ascaris acuta — Nematoda

Ascaris capsularia

Ascaris collaris

Camallanus lacustris

Contracaecum aduncum

Contracaecum auctum

Cucullanus alatus

Cucullanus cirratus

Cucullanus heterochrous

Nematoideum

Acanthocephala

Acanthocephaloides propinquus

Acanthocephalus lucii

Corynosoma semerme

Corynosoma strumosum

Echinorhynchus gadi

	Echinorhynchus pleuronectes	
	Echinorhynchus salmonis	
	Echinorhynchus sp.	
	Neoechinorhynchus rutili	
	Neoechinorhynchus tuberosus	
	Pomphorhynchus laevis	
Scophthalmus maeoticus	Bothriocephalus scorpii	Cestoda
(Pallas , 1814) .	Diphyllobothrium punctatum	
	Scolex pleuronectis	
	Aponurus tschugunovi	Trematoda
Scophthalmus rhombus	Caligus rapax	Copepoda
(Linné , 1758) .	Cecrops latreilli	
	Lepeophtheirus hippoglossi	
	Lepeophtheirus thompsoni	
	Lernaeocera branchialis	
	Abothrium gadi	Cestoda
	Bothriocephalus scorpii	
	Cestoidea	
	Grillotia erinaceus	

	Nybelinia (Nybelinia) lingualis	
	Scolex pleuronectis	
	Scolex quadrilobus	
	Ichthyobdella sp.	Hirudinea
	Cainocreadium labracis	Trematoda
	Derogenes varicus	
	Distoma appendiculatum	
	Distoma sp.	
	Hemiuris appendiculatus	
	Lecithochirium caudiporum	
	Lecithochirium gravidum	
	Monostoma rhombi-laevis	
	Opechona bacillaris	
	Stephanostomum bicoronatum	
	Ascaris acuta	Nematoda
	Ascaris collaris	
	Contracaecum aduncum	
	Contracaecum auctum	
Scophthalmus aquosus	Argulus megalops	Copepoda
(Mitchill , 1815) .		
	Bothriocephalus scorpii	Cestoda
	Grillotia erinaceus	

	Lacistorhynchus tenuis	
	Nybelinia (Nybelinia) bisulcata	
	Pterobothrium heteracanthum	
	Asymphylodora tincae	Trematoda
	Bothitrema bothi	
	Cryptocotyle lingua	
	Cymbephallus vitellosus	
	Lepidapedon clavatum	
	Stephanostomum baccantum	
	Stephanostomum dentatum	
	Ascaris sp.	Nematoda
	Cucullanus lintoni	
	Heterakis sp.	
	Corynosoma sp.	Acanthocephala
	Rhadinorhynchus pristis	
Lepidorhombus whiff-iagonis	Acanthochondria cornuta	Copepoda
(Walbaum, 1792) .	Trematoda	Trematoda
	Cucullanus cirratus	Nematoda
Lepidorhombus boscii	Bothriocephalus rhombi	Cestoda
(Risso , 1810) .	Bothriocephalus scorpii	

	Lecithocladium excisum	Trematoda
	Agamonema rhombi-boscii	Nematoda
Phrynorhombus norvegicus (Günther , 1862) .	Bothriocephalus scorpii	Cestoda
	Derogenes varicus	Trematoda
	Lecithaster gibbosus	
	Podocotyle atomon	
Zeugopterus punctatus (Bloch , 1787) .	Anchistrotos zeugopteri	Copepoda
	Helicometra pulchella	Trematoda
	Hemiuris communis	
	Contracaecum auctum	Nematoda

SUBORDER - Pleuronectoidea

FAMILY - Pleuronectidae

SUBFAMILY - Pleuronectinae .

Atheresthes stomias	Phrixocephalus cincinnatus	Copepoda
(Jordan and Gilbert , 1881) .	Anisakis sp.	Nematoda
	Corynosoma strumosum	Acanthocephala
Reinhardtius hippoglossoides	Lepeophtheirus hippoglossi	Copepoda
(Walbaum , 1792) .	Parabrachiella rostrata	
	Aega psora	Isopoda
	Brachyphallus crenatus	Trematoda
	Derogenes varicus	
	Steringophorus furciger	
	Ascaris capsularia	Nematoda
	Filaria piscium	
Hippoglossus hippoglossus	Acanthochondria cornuta	Copepoda
(Linné , 1758) .	Caligus curtus	
	Caligus rapax	
	Hatschekia hippoglossi	
	Lepeophtheirus appendiculatus	
	Lepeophtheirus hippoglossi	
	Lepeophtheirus parviventris	

Lepeophtheirus pectoralis	
Lepeophtheirus thompsoni	
Medesicaste asellinum	
Parabrachiella rostrata	
Aega psora	Isopoda
Aega ventrosa	
Callobdella nodulifera	Hirudinea
Ichthyobdella sp.	
Bothriocephalus scorpii	Cestoda
Cestoda	
Clestobothrium crassiceps	
Grillotia erinaceus	
Hepatoxylon abditus	
Hepatoxylon trichiuri	
Lacistorhynchus tenuis	
Phyllobothrium rudicornis	
Plerocercoides sp.	
Scolex pleuronectis	
Scolex sp.	
Tentacularia coryphaenae	
Tetrarhynchus sp.	
Anisocoelium hippoglossi	Trematoda
Brachyphallus crenatus	

Derogenes varicus

Diclidophora palmata

Distoma sp.

Entobdella hippoglossi

Entobdella squamula

Genolinea laticauda

Gonocerca phycidis

Hemiuris appendiculatus

Hemirius communis

Lecithaster confusus

Lecithaster gibbosus

Lepidapedon rachion

Megalocotyle rhombi

Otodistomum veliporum

Podocotyle atomon

Prosorhynchus crucibulum

Steganoderma formosum

Stenakron vetustum

Stephanostomum baccatum

Steringophorus furciger

Tristoma uncinatum

Udonella caligorum on Caligus sp.

Ascaris capsularia Nematoda

Ascaris collaris

	Ascaris sp.	
	Ascaropsis morrhuae	
	Contracaecum clavatum	
	Contracaecum hippoglossi	
	Cucullanus cirratus	
	Cucullanus heterochrous	
	Spinitectus echinatus	
	Corynosoma sp.	Acanthocephala
	Echinorhynchus gadi	
Hippoglossus stenolepis	Entobdella hippoglossi	Trematoda
Schmidt , 1904 .	Entobdella squamula	
Hippoglossus sp.	Grillotia hippoglossi	Cestoda
	Tentacularia coryphaenae	
Hippoglossoides platessoides	Acanthochondria cornuta	Copepoda
(Fabricius , 1780) .	Acanthochondria flurae	
	Argulus megalops	
	Anthobothrium hippoglossoides	Cestoda
	Bothriocephalus scorpii	

Scolex pleuronectis

Anisoporus manteri	Trematoda
Bothitrema bothi	
Derogenes varicus	
Distoma appendiculatum	
Distoma sp.	
Eurycreadium problematicum	
Hemiuris communis	
Lecithaster gibbosus	
Lepocreadium setiferoides	
Rhodotrema ovacutum	
Rhodotrema quadrilobata	
Rhodotrema problematicum	
Steganoderma messiatzevi	
Stephanostomum baccatum	
Steringophorus furciger	
Zoogonoides viviparus	
Ascaris capsularia	Nematoda
Ascaris drepanopsettae	
Ascaris incurva	
Ascaris sp.	
Contracaecum aduncum	
Contracaecum auctum	
Contracaecum gadi	

	Cucullanus heterochrous	
	Filaria piscium	
	Philometra sp.	
	Porrocaecum sp.	
	Porrocaecum (Terranova) decipiens	
	Acanthocephaloides propinquus	Acanthocephala
	Acanthocephalus lucii	
	Echinorhynchus platessoidae	
	Echinorhynchus pleuronectis-platessoides	
Hippoglossoides elassodon Jordan and Gilbert , 1881 .	Naobranchia occidentalis	Copepoda
	Phyllobothrium sp.	Cestoda
	Contracaecum aduncum	Nematoda
	Contracaecum sp.	
Hippoglossoides robustus Gill and Townsend , 1897 .	Plerocercoides sp.	Cestoda
Cleisthenes herzensteini (Schmidt , 1904) .	Plerocercoides sp.	Cestoda

	Bucephalopsis pleuronectis	Trematoda
	Derogenes varicus	
	Derogenes sp.	
	Lecithaster gibbosus	
	Rhodotrema quinquelobata	
	Tubulovesicula lindbergi	
	Philometra mariae	Nematoda
Lyopsetta exilis	Nybelinia sp.	Cestoda
(Jordan and Gilbert , 1881) .	Cymbephallus vitellosus	Trematoda
	Parahemiuris merus	
	Anisakis sp.	Nematoda
	Contracaecum sp.	
Eopsetta jordani	Phyllobothrium ketae	Cestoda
(Lockington , 1880) .	Entobdella sqamula	Trematoda
	Lecithochirium exodicum	
	Otodistomum sp.	
	Otodistomum veliporum	
	Parahemiuris merus	
	Podocotyle sp.	

	Anisakis sp.	Nematoda
	Contracaecum aduncum	
	Contracaecum sp.	
	Porrocaecum sp.	
	Corynosoma strumosum	Acanthocephala
	Echinorhynchus clavula	
Eopsetta grigoriewi (Herzenstein , 1891) .	Sterrhurus musigarei	Trematoda
Psettichthys melanostictus Girard , 1854 .	Lepeophtheirus bifurcatus	Copepoda
Verasper variegatus (Temminck & Schlegel , 1846).	Acanthochondria briani	Copepoda
	Anchistrotos pleuronichthydis	
	Lepeophtheirus longiventralis	
Verasper moseri (Jordan and Gilbert) Jordan and Evermann , 1898 .	Plerocercoides sp.	Cestoda
	Echinorhynchus kushiroensis	Acanthocephala

Pleuronichthys cornutus	Anchistrotos pleuronichthydis	Copepoda
(Temminck and Schlegel , 1846) .	Contracaecum sp.	Nematoda
	Cucullanus pleuronectidis	
Parophrys vetula	Naobranchia occidentalis	Copepoda
Girard , 1856 .	Dinurus panaimoensis	Trematoda
	Lepidapedon calli	
	Otodistomum veliporum	
	Anisakis sp.	Nematoda
	Capillaria sp.	
	Contracaecum aduncum	
	Contracaecum sp.	
	Cucullanus sp.	
	Philometra americana	
	Echinorhynchus lageniformis	Acanthocephala
Lepidopsetta bilineata	Argulus borealis	Copepoda
(Ayres , 1854) .	Lepeophtheirus parviventris	
	Pseudophyllidean plerocercoid	Cestoda
	Otodistomum veliporum	Trematoda

	Anisakis sp.	Nematoda
	Capillaria sp.	
	Philometra americana	
	Philometra sanguinea	
	Corynosoma strumosum	Acanthocephala
	Echinorhynchus gadi	
	Echinorhynchus lageniformis	
Lepidopsetta mochigarei Snyder , 1911 .	Plerocercoides sp.	Cestoda
Lepidopsetta sp.	Lepeophtheirus parviventris	Copepoda
Limanda limanda (Linné , 1758) .	Acanthochondria cornuta	Copepoda
	Acanthochondria limandae	
	Acanthochondria solea	
	Caligus rapax	
	Caligus sp.	
	Lepeophtheirus pectoralis	
	Aega rosacea	Isopoda

Diplocotyle olrikii	Cestoda
Grillotia erinaceus	
Scolex pleuronectis	
Scolex sp.	
Aporocotyle simplex	Trematoda
Brachyphallus crenatus	
Derogenes varicus	
Distoma appendiculatum	
Distoma sp.	
Genarches müllerii	
Haplocladus minor	
Hemiuris communis	
Lecithaster confusus	
Lecithaster gibbosus	
Podocotyle atomon	
Rhodotrema quadrilobata	
Stephanostomum baccatum	
Stephanostomum hystrix	
Steringophorus furciger	
Steringotrema cluthense	
Zoogonoides viviparus	
Zoogonus rubellus	
Anisakis simplex	Nematoda
Anisakis sp.	

	Ascaris capsularia	
	Ascaris collaris	
	Ascaris constricta	
	Ascaris sp.	
	Contracaecum aduncum	
	Contracaecum auctum	
	Contracaecum gadi	
	Cucullanus heterochrous	
	Cucullanus sp.	
	Nematode sp.	
	Echinorhynchus gadi	Acanthocephala
	Pomphorhynchus laevis	
Limanda ferruginea	Bothriocephalus claviceps	Cestoda
(Storer , 1839) .	Bothriocephalus scorpii	
	Echeneibothrium sp.	
	Grillotia erinaceus	
	Scolex pleuronectis	
	Cymbephallus vitellosus	Trematoda
	Derogenes varicus	
	Homalometron pallidum	
	Podocotyle atomon	
	Podocotyle olssoni	

	Stephanostomum baccatum	
	Stephanostomum hystrix	
	Ascaris sp.	Nematoda
	Echinorhynchus gadi	Acanthocephala
Limanda proboscidea	Lepeophtheirus kareii	Copepoda
Gilbert , 1895 .		
Pseudopleuronectes herzensteini		
(Jordan and Snyder , 1901) .	Echeneibothrium sp.	Cestoda
	Nybelinia sp.	
	Nybelinia (Nybelinia) surmenicola	
	Scolex pleuronectis	
	Echinorhynchus gadi	Acanthocephala
Pseudopleuronectes yokohamae	Lepeophtheirus kareii	Copepoda
(Günther , 1877) .	Brachyphallus anurus	Trematoda
	Tubulovesicula lindbergi	
	Capillaria helenae	Nematoda
	Philometra mariae	

Pseudopleuronectes americanus	Acanthochondria cornuta	Copepoda
(Walbaum , 1792) .	Acanthochondria depressa	
	Argulus funduli	
	Argulus laticauda	
	Argulus megalops	
	Caligus rapax	
	Gnathia elongata	Isopoda
	Bothriocephalus claviceps	Cestoda
	Bothriocephalus scorpii	
	Diplocotyle olrikii	
	Grillotia erinaceus	
	Lacistorhynchus tenuis	
	Nybelinia (Nybelinia) bisulcata	
	Scolex pleuronectis	
	Cryptocotyle lingua	Trematoda
	Cymbephallus vitellosus	
	Distoma areolatum	
	Distoma sp.	
	Hemiuris appendiculatus	
	Homalometron pallidum	
	Lepocreadium trullaforme	
	Metacercariae	
	Peracreadium commune	

	Plagioporus sp.	
	Podocotyle atomon	
	Sphaerostoma bramae	
	Stephanostomum baccatum	
	Stephanostomum hystrix	
	Steringophorus furciger	
	Sterrhurus grandiporus	
	Ascaris acuta	Nematoda
	Ascaris sp.	
	Contracaecum aduncum	
	Contracaecum auctum	
	Corynosoma hadweni	Acanthocephala
	Corynosoma semerme	
	Corynosoma sp.	
	Echinorhynchus gadi	
Pleuronectes pallasii Steindachner , 1880 .	Lepeophtheirus marcepes	Copepoda
Pleuronectes platessa Linné , 1758 .	Acanthochondria cornuta	Copepoda
	Acanthochondria solea	
	Bomolochus soleae	

Caligus curtus	
Caligus rapax	
Lepeophtheirus pectoralis	
Lernaeocera branchialis	
Lernaeocera sp.	
Medesicaste asellinum	
Anilocra frontalis	Isopoda
Bothriocephalus scorpii	Cestoda
Diplocotyle olrikii	
Grillotia erinaceus	
Lacistorhynchus tenuis	
Nybelinia (Nybelinia) lingualis	
Scolex pleuronectis	
Scolex quadrilobus	
Cryptocotyle concava	Trematoda
Cryptocotyle lingua	
Derogenes varicus	
Distoma appendiculatum	
Distoma areolatum	
Echinostoma revolutum	
Fasciola platessae	
Genarches müllerii	
Gyrodactylus elegans	
Gyrodactylus sp. (? n.sp.)	

Hemiuris communis	
Lecithaster gibbosus	
Lecithochirium caudiporum	
Plagioporus varia	
Podocotyle atomon	
Podocotyle levinseni	
Pygidiopsis genata	
Rhodotrema quadrilobata	
Stephanostomum hystrix	
Steringophorus furciger	
Zoogonoides viviparus	
Ascaris capsularia	Nematoda
Ascaris collaris	
Capillaria sp.	
Contracaecum aduncum	
Cucullanus cirratus	
Cucullanus fusiformis	
Cucullanus heterochrous	
Cucullanus minutus	
Cucullanus platessae	
Heligmus longicirrus	
Nematode sp.	
Spirurida gen. and sp. ?	
Acanthocephalus lucii	Acanthocephala

	Corynosoma strumosum	
	Pomphorhynchus laevis	
		Cestoda
Pleuronectes gen., and sp.	Nybelinia (Nybelinia) lingualis	
Pleuronectes sp.	Acanthochondria cornuta	Copepoda
	Caligus rapax	
	Chondracanthus nodosus	
	Chondracanthus psetti	
	Lepeophtheirus pectoralis	
	Bothriocephalus scorpii	Cestoda
	Spelotrema sp.	Trematoda
	Tristoma uncinatum	
	Tubulovesicula lindbergi	
	Cucullanus cirratus	Nematoda
	Cucullanus fusiformis	
	Cucullanus platessae	
	Acanthocephaloides propinquus	Acanthocephala
	Echinorhynchus clavula	
	Echinorhynchus pleuronectis-platessoides	

	Echinorhynchus tumidus	
	Neoechinorhynchus variabilis	
Pleuronectidae	Centrocestus longus	Trematoda
	Paradiscogaster piriformis	
Pleuronectids	Cucullanus cirratus	Nematoda
Microstomus kitt	Acanthochondria clavata	Copepoda
(Walbaum , 1792) .	Grillotia erinaceus	Cestoda
	Derogenes varicus	Trematoda
	Diplostomum spathaceum	
	Podocotyle atomon	
	Stephanostomum baccatum	
	Steringophorus furciger	
	Steringotrema cluthense	
	Zoogonoides viviparus	
	Ascaris sp.	Nematoda
	Ascarophis sp.	
	Cucullanus heterochrous	

	Eustoma rotundata	
Microstomus pacificus	Nybelinia sp.	Cestoda
(Lockington , 1878-9) .	Anisakis sp.	Nematoda
Glyptocephalus cynoglossus	Acanthochondria flurae	Copepoda
(Linné , 1758) .	Grillotia erinaceus	Cestoda
	Diclidophora merlangi	Trematoda
	Opechona retractilis	
	Otodistomum veliporum	
	Stephanostomum baccatum	
	Steringophorus furciger	
	Zoogonoides viviparus	
	Ascaris sp.	Nematoda
	Contracaecum clavatum	
	Contracaecum gadi	
	Eustoma rotundata	
	Porrocaecum (Terranova) decipiens	
Glyptocephalus stelleri	Nectobrachia wilsoni	Copepoda
(Schmidt , 1903) .		

Glyptocephalus zachirus Lockington , 1878-9 .	Contracaecum aduncum	Nematoda
Liopsetta obscura (Herzenstein , 1891) .	Lepeophtheirus kareii	Copepoda
	Opegaster ozakii	Trematoda
	Tubulovesicula lindbergi	
Liopsetta putnami (Gill, 1864) .	Argulus megalops spinosus	Copepoda
	Stephanostomum baccatum	Trematoda
Platichthys flesus (Linné , 1758) .	Acanthochondria cornuta	Copepoda
	Acanthochondria depressa	
	Acanthochondria limandae	
	Acanthochondria solea	
	Bomolochus soleae	
	Caligus diaphanus	
	Caligus rapax	
	Caligus sp.	
	Lepeophtheirus pectoralis	
	Lernaeocera branchialis	

Paragnathia formica	Isopoda
Bothriocephalus occidentalis	Cestoda
Bothriocephalus scorpii	
Caryophyllaeus sp.	
Diplocotyle olrikii	
Triaenophorus nodulosus	
Piscicola geometra	Hirudinea
Aponurus tschugunovi	Trematoda
Aporocotyle simplex	
Cainocreadium labracis	
Cryptocotyle concava	
Cryptocotyle lingua	
Derogenes varicus	
Diplostomum cuticola	
Diplostomum spathaceum	
Diplozoon paradoxum	
Distoma appendiculatum	
Gyrodactylus elegans	
Hemiuris appendiculatus	
Hemiuris communis	
Lecithaster gibbosus	
Lecithochirium caudiporum	
Lecithochirium gravidum	

Plagioporus varia

Podocotyle atomon

Pygidiopsis genata

Rhodotrema quadrilobata

Steringophorus furciger

Udonella caligorum on Caligus sp.

Agamonema commune — Nematoda

Ascaris capsularia

Ascaris collaris

Ascaris flesi

Ascaris minuta

Ascaris sp.

Contracaecum aduncum

Contracaecum gadi

Contracaecum rigidum

Cucullanus fusiformis

Cucullanus heterochrous

Cucullanus minutus

Porrocaecum (Terranova) decipiens

Rhaphidascaris sp.

Spirurida gen. and sp. ?

Acanthocephalus lucii — Acanthocephala

Arhythmorhynchus roseus

Corynosoma semerme

	Corynosoma strumosum	
	Echinorhynchus clavula	
	Echinorhynchus gadi	
	Echinorhynchus pleuronectis-platessoides	
	Echinorhynchus salmonis	
	Polymorphus boschadis	
	Polymorphus minutus	
	Pomphorhynchus laevis	
Platichthys stellatus	Lepeophtheirus septentrionalis	Copepoda
(Pallas , 1787) .	Naobranchia occidentalis	
	Livoneca vulgaris	Isopoda
	Lacistorhynchus tenuis	Cestoda
	Bucephalopsis basaringi	Trematoda
	Parahemiuris merus	
	Parahemiuris platichthyi	
	Philometra americana	Nematoda
	Philometra sanguinea	
	Corynosoma strumosum	Acanthocephala
	Corynosoma sp.	
	Echinorhynchus lageniformis	

Platichthys bicoloratus (Basilewsky , 1855) .

Lepeophtheirus kareii

Copepoda

SUBORDER - Pleuronectoidea

FAMILY - Pleuronectidae

SUBFAMILY - Poecilopsettinae

Poecilopsetta plinthus	Prochondracanthus alaeopii	Copepoda
(Jordan and Starks , 1904) .		
	Diphtherostomum magnacetabulum	Trematoda
	Hypoechinorhynchus alaeopis	Acanthocephala
Samaris cristatus	Gnathia rhinobatis	Isopoda
Gray , 1831 .		

SUBORDER - Pleuronectoidea

FAMILY - Pleuronectidae

SUBFAMILY - Rhombosoleinae .

Pelotretis flavilatus Waite , 1911 .	Benthotrema richardsoni	Trematoda
Peltorhampus novae-zeelandiae Günther , 1862 .	Rhadinorhynchus peltorhamphi	Acanthocephala
Rhombosolea retiaria Hutton , 1873 .	Eustrongylides sp. Hedruris spinigera	Nematoda
Rhombosolea plebeia (Richardson , 1843) .	Hedruris spinigera	Nematoda
Rhombosolea tapirina Gunther , 1862 .	Hedruris spinigera Porrocaecum (Terranova) decipiens	Nematoda
Rhombosolea sp.	Cucullanus antipodeus Hedruris spinigera	Nematoda

SUBORDER - Pleuronectoidea

INCERTAE SEDIS .

Platessa sp.	Cymothoa januari	Isopoda
	Fasciola platessae	Trematoda
Rhombus sp.	Caligus sp.	Copepoda
	Ascaris acuta	Nematoda
	Echinorhynchus salmonis	Acanthocephala

SUBORDER - Pleuronectoidea

SUPERFAMILY - Soleoidae

FAMILY - Soleidae

SUBFAMILY - Acharinae .

Achirus lineatus	Neoechinorhynchus variabilis	Acanthocephala
(Linné , 1758) .		
Achirus fasciatus	Hemiuris appendiculatus	Trematoda
Lacépède , 1803 .	Lepocreadium trullaforme	
	Podocotyle olssoni	
Achirus sp.	Livoneca methepia	Isopoda
	Spirocamallanus spiralis	Nematoda

SUBORDER - Pleuronectoidea

SUPERFAMILY - Soleoidae

FAMILY - Soleidae

SUBFAMILY - Monochirinae

Monochirus luteus	Contracaecum aduncum	Nematoda
(Risso , 1810) .		
Monochirus variegatus	Derogenes varicus	Trematoda
(Donovan , 1801) .	Zoogonoides viviparus	
Monochirus hispidus	Bothriocephalus scorpii	Cestoda
Rafinesque , 1814 .	Gymnorhynchus (Molicola) horridus	
	Lacistorhynchus tenuis	
	Tetrarhynchus tenuicollis	
	Ascaris capsularia	Nematoda

SUBORDER - Pleuronectoidea

SUPERFAMILY - Soleoidae

FAMILY - Soleidae

SUBFAMILY - Soleinae .

Solea solea	Acanthochondria cornuta	Copepoda
(Linné , 1758) .	Acanthochondria solea	
	Bomolochus soleae	
	Caligus sp.	
	Lernaeocera lusci	
	Bothriocephalus scorpii	Cestoda
	Cestoda	
	Cyathocephalus catinatus	
	Didymobothrium rudolphi	
	Diplocotyle olrikii	
	Nybelinia (Nybelinia) lingualis	
	Scolex pleuronectis	
	Scolex quadrilobus	
	Trachelobdella lubrica	Hirudinea
	Brachylaimus soleae	Trematoda
	Derogenes varicus	
	Distoma appendiculatum	
	Distoma microstomum	
	Distoma soleae	
	Entobdella diadema	
	Entobdella soleae	
	Hemiuris appendiculatus	
	Lecithaster gibbosus	

	Podocotyle aeglefini	
	Podocotyle atomon	
	Podocotyle furcata	
	Zoogonoides viviparus	
	Ascaris capsularia	Nematoda
	Ascaris collaris	
	Ascaris soleae	
	Ascaris sp.	
	Contracaecum aduncum	
	Cucullanus cirratus	
	Cucullanus heterochrous	
	Cucullanus sp.	
	Cucullanus tripapsllatus	
		Acanthocephala
	Acanthocephaloides incrassatus	
	Acanthocephaloides propinquus	
	Acanthocephalus lucii	
	Bolbosoma vasculosum	
	Echinorhynchus urniger	
	Pomphorhynchus laevis	
Solea kleini	Distoma teretiusculum	Trematoda
(Risso , 1826) .		

Solea lascaris	Diplocotyle olrikii	Cestoda
(Risso , 1810) .	Lacistorhynchus tenuis	
	Entobdella soleae	Trematoda
	Contracaecum sp.	Nematoda
	Cucullanus heterochrous	
	Acanthocephaloides kostylewi	Acanthocephala
	Acanthocephaloides propinquus	
	Bolbosoma aurantiacum	
Solea theophila	Bothriocephalus rhombi	Cestoda
(Risso , 1810) .	Bothriocephalus scorpii	
	Didymobothrium rudolphi	
	Diplocotyle olrikii	
	Distoma appendiculatum	Trematoda
	Ascaris seta	Nematoda
	Acanthocephaloides propinquus	Acanthocephala
	Acanthocephalus lucii	
	Echinorhynchus rhytidodes	
	Echinorhynchus soleae	

Solea sp.	Chondracanthus elongatus	Copepoda
	Hemibdella soleae	Hirudinea
	Aponurus intermedius	Trematoda
	Entobdella soleae	

SUBORDER - Pleuronectoidea

SUPERFAMILY - Soleoidae

FAMILY - Cynoglossidae .

Symphurus atramentatus Jordan and Bollman , 1889 .	Paramonorcheides bivitellosus	Trematoda
Symphurus elongatus (Günther , 1869) .	Scheherazade scheherazade	Copepoda
Symphurus plagusia (Bloch and Schneider , 1801) .	Nybelinia (Nybelinia) bisulcata	Cestoda
Symphurus plagiusa (Linné , 1766) .	Paramonorcheides bivitellosus	Trematoda
	Rhadinorhynchus pristis	Acanthocephala
Symphurus sp.	Idusa plagusiae	Isopoda
Cynoglossus abbreviatus (Gray , 1833) .	Chondracanthus pingi longicorpus	Copepoda
Cynoglossus goreensis Steindachner , 1882 .	Ergasilus monodi	Copepoda

Cynoglossus purpureomaculatus Regan , 1905 .	Chondracanthus pingi	Copepoda
Cynoglossus semilaevis Günther , 1873 .	Chondracanthus pingi	Copepoda
Cynoglossus (Trulla) zanzibarensis Norman , 1939 .	Acanthocephaloides chabanaudi	Acanthocephala
Cynoglossus sp.	Caligus mauritanicus	Copepoda
	Thysanote longimana exornata	
	Neoechinorhynchus longilemniscus	Acanthocephala

COPEPODA

PARASITE.	HOST.	BIBLIOGRAPHIC REFERENCE.
Acanthochondria briani (Yü and Wu , 1932) .	Verasper variegatus	536 .
Acanthochondria clavata (Bassett-Smith , 1896) .	Microstomus kitt	10; 196; 197; 329; 416; 425; 443 .
Acanthochondria cornuta (Müller , 1777) .	Eucitharus linguatula	30; 311 .
	Hippoglossoides platessoides	444 .
	Hippoglossus hippoglossus	511 .
	Lepidorhombus whiff-iagonis	196; 197 .
	Limanda limanda	338 .
	Platichthys flesus	196; 279; 338; 392.
	Pleuronectes platessa	30; 196; 197; 311; 329; 338; 416; 425.
	Pleuronectes sp.	165; 244; 448 .
	Pseudopleuronectes americanus	27; 446.
	Solea solea	382 .

Acanthochondria depressa	Platichthys flesus	197; 393; 411; 422; 425.
(Scott , T., 1905) .	Pseudopleuronectes americanus	510.
Acanthochondria flurae	Glyptocephalus cynoglossus	510 .
(Krøyer , 1863) .	Hippoglossoides platessoides	197; 425; 510.
Acanthochondria galerita	Paralichthys dentatus	377; 510 .
(Rathbun , 1886) .		
Acanthochondria limandae	Limanda limanda	10; 125; 176; 197; 417; 420; 425; 443 .
(Krøyer , 1863) .	Platichthys flesus	125; 443 .
Acanthochondria sixteni	Paralichthys olivaceus	528 .
Wilson , 1922 .		
Acanthochondria solea	Limanda limanda	411 .
(Krøyer , 1838) .	Platichthys flesus	411 .
	Pleuronectes platessa	408; 411 .
	Solea solea	196; 197; 329; 425.
Anchistrotos pleuronichthydis	Pleuronichthys cornutus	528 .
Yamaguti , 1939 .	Verasper variegatus	528 .

Bomolochus soleae Claus , 1864 .	Platichthys flesus	425 .
	Pleuronectes platessa	197; 416; 425.
	Solea solea	10; 63; 197; 416; 422; 425.
Brachiella nitida Wilson , 1915 .	Citharichthys sordidus	511 .
Caligus curtus Müller , 1785 .	Hippoglossus hippoglossus	444; 478; 499; 502; 510 .
	Pleuronectes platessa	416 .
	Scophthalmus maximus	10; 354; 411 .
Caligus diaphanus Nordmann , 1832 .	Platichthys flesus	44 .
	Scophthalmus maximus	465 .
Caligus mauritanicus Brian , 1924 .	Cynoglossus sp.	45 .
Caligus rapax Milne-Edwards , 1840 .	Hippoglossus hippoglossus	125; 201; 444; 470; 510.
	Limanda limanda	40; 42 .
	Paralichthys oblongus	503; 510 .
	Platichthys flesus	408 .

	Pleuronectes platessa	354 .
	Pleuronectes sp.	10 .
	Pseudopleuronectes americanus	503 .
	Scophthalmus rhombus	40; 42 .
Caligus sp.	Limanda limanda	174 .
	Platichthys flesus	251 .
	Rhombus sp.	391 .
	Scophthalmus maximus	174 .
	Solea solea	174 .
Cecrops latreilli	Scophthalmus maximus	42 .
Leach , 1816 .	Scophthalmus rhombus	42 .
Chondracanthus alatus	Psettodes erumei	10 .
Bassett-Smith , 1899 .		
Chondracanthus brevicollis	Pseudorhombus arsius	536 .
Kollar , 1835 .	Pseudorhombus oligodon	536 .
Chondracanthus elongatus	Solea sp.	10 .
Bassett-Smith , 1899 .		

Chondracanthus grandigenitalus Yü and Wu , 1932 .	Paralichthys olivaceus	536 .
Chondracanthus longicephalus Yü and Wu , 1932 .	Pseudorhombus arsius	536 .
Chondracanthus nodosus (Müller , 1777) .	Pleuronectes sp.	10 .
Chondracanthus pingi Yü and Wu , 1932 .	Cynoglossus purpureomaculatus	536 .
	Cynoglossus semilaevis	536 .
Chondracanthus pingi longicorpus Yü and Wu , 1932 .	Cynoglossus abbreviatus	536 .
Chondracanthus psetti Krøyer , 1863 .	Pleuronectes sp.	10 .
Chondracanthus similis Yü and Wu , 1932 .	Crossorhombus azureus	536 .
Ergasilus monodi Brian , 1927 .	Cynoglossus goreensis	43 .

Hatschekia hippoglossi (Krøyer , 1837) .	Hippoglossus hippoglossus	41; 197; 338; 425; 507; 510 .
Lepeophtheirus appendiculatus Yü and Wu , 1932 .	Hippoglossus hippoglossus	511 .
Lepeophtheirus bifurcatus Krøyer , 1863 .	Psettichthys melanostictus	502; 505 .
Lepeophtheirus edwardsi Wilson , 1905 .	Paralichthys dentatus	502; 510 .
	Paralichthys lethostigma	504 .
	Paralichthys oblongus	502; 510 .
Lepeophtheirus grohmanni Krøyer , 1863 .	Arnoglossus grohmanni	10; 176 .
Lepeophtheirus hippoglossi (Krøyer , 1837) .	Hippoglossus hippoglossus	10; 40; 49; 125; 196; 197; 201; 232; 244; 338; 416; 420; 425; 443; 444; 502.
	Reinhardtius hippoglossoides	125 .
	Scophthalmus rhombus	49; 196; 197.
Lepeophtheirus kareii Yamaguti , 1936 .	Limanda proboscidea	123 .
	Liopsetta obscura	123 .

	Platichthys bicoloratus	525.
	Pseudopleuronectes yokohamae	525 .
Lepeophtheirus longiventralis Yü and Wu , 1932 .	Verasper variegatus	536 .
Lepeophtheirus marcepes Wilson , 1944 .	Pleuronectes pallasii	513 .
Lepeophtheirus parviventris Wilson , 1905 .	Hippoglossus hippoglossus	502 .
	Lepidopsetta bilineata	506 .
	Lepidopsetta sp.	504 .
Lepeophtheirus pectoralis (Müller , 1777) .	Eucitharus linguatula	311 .
	Hippoglossus hippoglossus	125 .
	Limanda limanda	10; 125; 196; 197.
	Platichthys flesus	75; 117; 125; 196; 311; 338; 408; 411; 417; 472 .
	Pleuronectes platessa	125; 133; 196; 197; 311; 411; 425; 443.
	Pleuronectes sp.	10; 411 .
	Scophthalmus maximus	117; 409; 472.
Lepeophtheirus septentrionalis Townsend , 1938 .	Platichthys stellatus	467 .

Lepeophtheirus thompsoni	Hippoglossus hippoglossus	125; 443 .
Baird , 1850 .	Scophthalmus maximus	7; 10; 40; 196; 411; 425; 502 .
	Scophthalmus rhombus	10; 125; 176; 196; 197; 354; 416.
Lernaeocera branchialis	Platichthys flesus	75; 197; 411; 416; 425 .
(Linné , 1767) .	Pleuronectes platessa	423 .
	Scophthalmus maximus	10; 338 .
	Scophthalmus rhombus	338 .
Lernaeocera lusci	Solea solea	411 .
(Bassett - Smith , 1896) .		
Lernaeocera sp.	Pleuronectes platessa	408 .
Medesicaste asellinum	Hippoglossus hippoglossus	416 .
(Linné , 1761) .	Pleuronectes platessa	416; 425 .
Naobranchia occidentalis	Hippoglossoides elassodon	479 .
Wilson , 1915 .	Parophrys vetula	479 .
	Platichthys stellatus	479 .

Nectobrachia wilsoni	Glyptocephalus stelleri	536 .
Yü and Wu , 1932 .		
Nesippus alatus	Paralichthys dentatus	510 .
Wilson , 1907 .		
Parabrachiella rostrata	Hippoglossus hippoglossus	176; 244; 338; 425; 507; 510 .
(Krøyer , 1837) .	Reinhardtius hippoglossoides	10; 125; 244.
	Scophthalmus maximus	10 .
Parataeiniacanthus pseudorhombi	Pseudorhombus cinnamoneus	528 .
Yamaguti , 1939 .		
Pharodes clini	Arnoglossus rueppellii	490 .
Walters , 1953 .		
Phrixocephalus cincinnatus	Atheresthes stomias	263 .
Wilson , 1908 .	Citharichthys sp.	505 .
Prochondracanthus alaeopii	Poecilopsetta plinthus	528 .
Yamaguti , 1939 .		

Protochondracanthus psettodes Kirtsinghe , 1950 .	Psettodes erumei	164 .
Pseudochondracanthus pseudorhombi Yamaguti , 1939 .	Pseudorhombus pentophthalmus	528 .
Scheherazade scheherazade Leigh-Sharpe , 1934 .	Symphurus elongatus	198 .
Taeniacanthodes gracilis Wilson , 1936 .	Paralichthys squamilentus	510 .
Thysanote longimana exornata Brian , 1939 .	Cynoglossus sp.	45 .
Trebius latifurcatus Wilson , 1921 .	Paralichthys californicus	508 .

ISOPODA

PARASITE.	HOST.	BIBLIOGRAPHIC REFERENCE.
Aega psora	Hippoglossus hippoglossus	124; 126; 443 .
(Linné , 1758) .	Reinhardtius hippoglossoides	124 .
Aega rosacea	Limanda limanda	275 .
(Risso , 1810) .		
Aega ventrosa	Hippoglossus hippoglossus	124; 443 .
Sars , 1858-59 .		
Anilocra frontalis	Pleuronectes platessa	285 .
Milne-Edwards , 1840 .		
Cymothoa excisa	Etropus microstomus	67 .
Perty , 1830-34 .		
Cymothoa exigua	Citharichthys sordidus	397; 426; 476 .
Schioedte and Meinert , 1883 .		

Cymothoa januari	Platessa sp.	397 .
Schioedte and Meinert , 1883 .		
Enispa irregularis	Psettodes erumei	397 .
(Bleeker , 1857) .		
Gnathia elongata	Pseudopleuronectes americanus	489 .
(Krøyer , 1847) .		
Gnathia rhinobatis	Samaris cristatus	294 .
(Kossman , 1880) .		
Idusa plagusiae	Symphurus sp.	397 .
Schioedte and Meinert , 1883 .		
Livoneca methepia	Achirus sp.	397 .
Schioedte and Meinert , 1884 .		
Livoneca vulgaris	Platichthys stellatus	343 .
Stimpson , 1857 .		
Nerocila acuminata	Etropus microstomus	67 .
Schioedte and Meinert , 1883 .		

Paragnathia formica Platichthys flesus 111 .

Hesse , 1928 .

CESTODA

PARASITE.	HOST.	BIBLIOGRAPHIC REFERENCE.
Abothrium gadi van Beneden , 1871 .	Scophthalmus rhombus	24; 267 .
Anthobothrium hippoglossoides	Hippoglossoides platessoides	406 .
Bothriocephalus andresi Porta , 1911 .	Eucitharus linguatula	276; 362 .
Bothriocephalus clavibothrium Ariola , 1899 .	Arnoglossus laterna	4; 362 .
Bothriocephalus claviceps	Limanda ferruginea	227 .
(Goeze , 1782) .	Pseudopleuronectes americanus	227 .
Bothriocephalus occidentalis (Linton , 1897) .	Platichthys flesus	287 .

Bothriocephalus rhombi	Arnoglossus laterna	287 .
(Leeuwenhoek , 1722) .	Bothus podas	67 .
	Lepidorhombus boscii	287 .
	Solea theophila	287 .
Bothriocephalus scorpii	Arnoglossus laterna	15; 17; 69; 267 .
Müller , 1776 .	Arnoglossus pegosa	69; 390 .
	Bothus podas	265; 287 .
	Hippoglossoides platessoides	227 .
	Hippoglossus hippoglossus	68; 160; 318; 462.
	Lepidorhombus boscii	5; 69; 161; 205; 390[1].
	Limanda ferruginea	68; 212; 213; 216.
	Monochirus hispidus	5; 82; 89 .
	Paralichthys dentatus	69; 227; 462 .
	Paralichthys oblongus	69; 216; 227 .
	Phrynorhombus norvegicus	17 .
	Platichthys flesus	5; 69; 120; 146; 205; 242; 265; 267; 287; 406; 456 .
	Pleuronectes platessa	183; 267 .
	Pleuronectes sp.	390 .
	Pseudopleuronectes americanus	69; 193; 462 .
	Scophthalmus aquosus	69; 211; 213; 227 .

[1] Rudolphi (1819) lists the host under the name of Pleuronectes boscius , taken here as a synonym of Lepidorhombus boscii .

	Scophthalmus maximus	5; 7; 15; 20; 54; 69; 97; 104; 144; 155; 181; 242; 264; 265; 267; 274; 289; 293; 307; 313; 315; 316; 317; 337; 389; 390; 400; 403; 406; 449; 453; 456; 457.
	Scophthalmus maeoticus	69; 206; 471 .
	Scophthalmus rhombus	15; 20; 69; 155; 205; 232; 267; 337; 341; 390; 483 .
	Solea solea	69; 161; 267; 390.
	Solea theophila	265; 287 .
Callitetrarhynchus gracilis (Rudolphi , 1819) .	Paralichthys dentatus	212; 216; 462.
	Paralichthys olivaceus	522 .
Caryophyllaeus sp.	Platichthys flesus	267 .
Cestoda	Hippoglossus hippoglossus	244 .
	Solea solea	390 .
Cestoidea	Scophthalmus rhombus	415 .
Clestobothrium crassiceps (Rudolphi , 1808) .	Hippoglossus hippoglossus	227 .

Cyathocephalus catinatus	Solea solea	383 .
Riggenbach , 1899 .		
Didymobothrium rudolphi	Solea solea	299 .
(Monticelli , 1890) .	Solea theophila	299 .
Diphyllobothrium punctatum	Scophthalmus maeoticus	33 .
(Rudolphi , 1802) .		
Diplocotyle olrikii	Limanda limanda	328 .
Krabbe , 1874 .	Platichthys flesus	143; 207; 328; 400 .
	Pleuronectes platessa	18; 328 .
	Pseudopleuronectes americanus	69; 130; 493 .
	Solea lascaris	349 .
	Solea solea	237; 299 .
	Solea theophila	237; 299 .
Echeneibothrium sp.	Limanda ferruginea	212 .
	Pseudopleuronectes herzensteini	522 .
Gilquinia squali	Citharichthys stigmaeus	177 .
(Fabricius , 1794) .	Scophthalmus maximus	89 .

Grillotia erinaceus	Arnoglossus laterna	161 .
(van Beneden , 1858) .	Glyptocephalus cynoglossus	381 .
	Hippoglossus hippoglossus	20: 81; 95; 156; 158; 161; 205 .
	Limanda ferruginea	216; 462 .
	Limanda limanda	82; 205; 339; 381 .
	Microstomus kitt	205; 339 .
	Paralichthys dentatus	212; 216; 223; 462.
	Paralichthys oblongus	223 .
	Pleuronectes platessa	155; 161; 381 .
	Pseudopleuronectes americanus	223; 462 .
	Scophthalmus aquosus	212; 216; 223; 462.
	Scophthalmus maximus	20; 81; 95; 159; 205; 337 .
	Scophthalmus rhombus	15 .
Grillotia hippoglossi	Hippoglossus sp.	337 .
(Olsson , 1869) .		
Gymnorhynchus (Gymnorhynchus) gigas		
	Paralichthys dentatus	434 .
(Cuvier , 1817) .		
Gymnorhynchus (Molicola) horridus		
	Monochirus hispidus	349 .
Goodsir , 1841 .		

Hepatoxylon abditus Leidy , 1856 .	Hippoglossus hippoglossus	193 .
Hepatoxylon trichiuri (Holten , 1802) .	Hippoglossus hippoglossus	134; 205; 337 .
Lacistorhynchus tenuis (van Beneden , 1858) .	Hippoglossus hippoglossus	81 .
	Monochirus hispidus	82; 89; 205 .
	Paralichthys dentatus	215; 216; 223; 462.
	Platichthys stellatus	343 .
	Pleuronectes platessa	337 .
	Pseudopleuronectes americanus	223 .
	Scophthalmus aquosus	223 .
	Scophthalmus maximus	81; 205.
	Solea lascaris	7 .
Nybelinia nipponica Yamaguti , 1952 .	Pseudorhombus pentophthalmus	532 .
Nybelinia sp.	Lyopsetta exilis	263 .
	Microstomus pacificus	263 .
	Paralichthys olivaceus	522 .
	Pseudopleuronectes herzensteini	522 .

Nybelinia (Nybelinia) bisulcata
(Linton , 1889) .

Paralichthys albigutta 217 .
Paralichthys dentatus 212; 216; 223; 462 .
Paralichthys oblongus 216; 462 .
Pseudopleuronectes americanus 216; 462 .
Scophthalmus aquosus 217; 223 .
Symphurus plagusia 217 .

Nybelinia (Nybelinia) lingualis
Cuvier , 1817 .

Pleuronectes platessa 89 .
Pleuronectes gen., and sp. 21; 97 .
Scophthalmus maximus 21; 24; 77; 78; 97; 161; 390 .
Scophthalmus rhombus 21; 390 .
Solea solea 21; 72; 161; 477.

Nybelinia (Nybelinia) pintneri
Yamaguti , 1934 .

Paralichthys olivaceus 143; 522 .

Nybelinia (Nybelinia) robusta
(Linton , 1890) .

Paralichthys dentatus 216; 462 .

Nybelinia (Nybelinia) surmenicola
Okada , 1929 .

Paralichthys olivaceus 522 .
Pseudopleuronectes herzensteini 522 .

Otobothrium (Otobothrium) crenacolle (Linton , 1890) .	Paralichthys albigutta	217 .
	Paralichthys dentatus	223 ; 462 .
Phyllobothrium ketae Canavan , 1928 .	Eopsetta jordani	263 .
Phyllobothrium loliginis (Leidy , 1887) .	Paralichthys dentatus	122 .
	Paralichthys oblongus	122 .
Phyllobothrium rudicornis Drummond , 1838 .	Hippoglossus hippoglossus	173; 205 .
Phyllobothrium sp.	Hippoglossoides elassodon	263 .
Plerocercoides sp.	Cleisthenes herzensteini	107 .
	Hippoglossoides robustus	107 .
	Hippoglossus hippoglossus	107 .
	Lepidopsetta mochigarei	107 .
	Verasper moseri	107 .
Pseudophyllidean plerocercoid	Lepidopsetta bilineata	263 .

Pterobothrium heteracanthum Diesing , 1850 .	Paralichthys albigutta	217 .
	Paralichthys dentatus	212; 216; 223; 462.
	Scophthalmus aquosus	217 .
Rhynchobothrium sp.	Paralichthys dentatus	212.
	Paralichthys oblongus	212; 216.
	Psettodes erumei	431; 432.
Scolex pleuronectis Müller , 1788 .	Arnoglossus grohmanni	161 .
	Arnoglossus laterna	17; 56; 267; 295.
	Arnoglossus sp.	433 .
	Bothus podas	205; 349 .
	Eucitharus linguatula	312; 390 .
	Hippoglossoides platessoides	82; 161; 205; 223; 232; 312; 316; 320.
	Hippoglossus hippoglossus	64; 66; 317 .
	Limanda ferruginea	216.
	Limanda limanda	82; 161; 205; 232; 317; 381.
	Paralichthys dentatus	56; 216; 223.
	Paralichthys oblongus	216; 223 .
	Pleuronectes platessa	18; 205; 312; 316; 317; 390.
	Pseudopleuronectes americanus	223.
	Pseudopleuronectes herzensteini	522 .

	Scophthalmus maeoticus	482 .
	Scophthalmus maximus	161; 205; 317; 456.
	Scophthalmus rhombus	312; 316.
	Solea solea	72; 99; 161; 232; 456 .
Scolex quadrilobus Rudolphi , 1810 .	Eucitharus linguatula	389 .
	Pleuronectes platessa	389 .
	Scophthalmus rhombus	389 .
	Solea solea	389 .
Scolex sp.	Hippoglossus hippoglossus	337 .
	Limanda limanda	205.
	Scophthalmus maximus	205 .
Tentacularia coryphaenae Bosc , 1802 .	Hippoglossus hippoglossus	161 .
	Hippoglossus sp.	359 .
	Paralichthys dentatus	216; 462 .
Tentacularia macfie Southwell , 1929 .	Psettodes erumei	435 .
Tetrarhynchus tenuicollis Rudolphi , 1819 .	Arnoglossus pegosa	390 .
	Monochirus hispidus	349 .

Tetrarhynchus sp.	Hippoglossus hippoglossus	337 .
Triaenophorus nodulosus Pallas , 1760 .	Platichthys flesus	83; 129; 205.

HIRUDINEA

PARASITE.	HOST.	BIBLIOGRAPHIC REFERENCE.
Callobdella nodulifera (Malm , 1863) .	Hippoglossus hippoglossus	148 .
Hemibdella soleae van Beneden and Hesse , 1864 .	Solea sp.	6; 394 .
Ichthyobdella sp.	Hippoglossus hippoglossus	394 .
	Scophthalmus rhombus	394 .
Piscicola geometra (Linné , 1758) .	Platichthys flesus	496 .
Trachelobdella lubrica Grube , 1844 .	Solea solea	132 .

TREMATODA

PARASITE.	HOST.	BIBLIOGRAPHIC REFERENCE.
Adinosoma robustum (Manter , 1934) .	Paralichthys oblongus	259 .
Anisocoelium hippoglossi MacCallum , 1921 .	Hippoglossus hippoglossus	248 .
Anisoporus manteri	Hippoglossoides platessoides	138 .
Hunninen and Cable , 1940 .	Paralichthys dentatus	136 .
Aponurus intermedius Manter , 1934 .	Solea sp.	256; 259 .
Aponurus tschugunovi	Platichthys flesus	140 .
Isaichikov , 1927 .	Scophthalmus maeoticus	140 .

Aporocotyle simplex	Limanda limanda	330 .
Odhner , 1900 .	Platichthys flesus	330 .
Asymphylodora tincae	Scophthalmus aquosus	213 .
(Modeer , 1790) .		
Benthotrema richardsoni	Pelotretis flavilatus	46.
Manter , 1954 .		
Bothitrema bothi	Hippoglossoides platessoides	142 .
(MacCallum , 1913) .	Scophthalmus aquosus	247 .
Brachylaimus soleae	Solea solea	97; 172 .
(Dujardin , 1845) .		
Brachyphallus anurus	Pseudopleuronectes yokohamae	184 .
Layman , 1930 .		
Brachyphallus crenatus	Arnoglossus laterna	287 .
(Rudolphi , 1802) .	Hippoglossus hippoglossus	284; 441 .
	Limanda limanda	18; 188; 317; 322; 333 .

	Reinhardtius hippoglossoides	284; 441 .
	Scophthalmus maximus	284; 388 .
Bucephalopsis basaringi Layman , 1930 .	Platichthys stellatus	184 .
Bucephalopsis "bennetti" Melugin , 1940 .	Paralichthys lethostigma	259; 277 .
Bucephalopsis haimeanus (Lacaze-Duthiers , 1854) .	Paralichthys albigutta	217 .
Bucephalopsis labiatus Manter and Van Cleave, 1951 .	Paralichthys californicus	261 .
Bucephalopsis pleuronectis Layman , 1930 .	Cleisthenes herzensteini	184 .
Cainocreadium labracis (Dujardin , 1845) .	Platichthys flesus	458 .
	Scophthalmus rhombus	458 .
Calicotyle kröyeri (Diesing , 1850) .	Scophthalmus maximus	86; 205; 439 .

Centrocestus longus	Pleuronectidae	165; 342 .
(Onji and Nishio , 1924) .		
Cercariaeum lintoni	Paralichthys dentatus	459 .
Miller and Northup , 1926 .		
Cryptocotyle concava	Platichthys flesus	62 .
(Creplin , 1825) .	Pleuronectes platessa	59; 62; 320 .
	Scophthalmus maximus	266 .
Cryptocotyle lingua	Platichthys flesus	59 .
(Creplin , 1825) .	Pleuronectes platessa	59 .
	Pseudopleuronectes americanus	226; 429[1] .
	Scophthalmus aquosus	226 .
Cymbephallus vitellosus	Limanda ferruginea	226 .
Linton , 1900 .	Lyopsetta exilis	262 .
	Paralichthys dentatus	226 .
	Pseudopleuronectes americanus	226 .
	Scophthalmus aquosus	226 .

[1] Smith (1935) states that Cryptocotyle lingua is probably to be found in Pseudopleuronectes americanus .

Cymbephallus vulgaris Manter , 1934 .	Ancylopsetta dilecta	259 .
Derogenes varicus (Müller , 1784) .	Arnoglossus scapha	259 .
	Arnoglossus sp.	189 .
	Cleisthenes herzensteini	184 .
	Hippoglossoides platessoides	141; 185; 188; 205; 318; 323; 441; 442.
	Hippoglossus hippoglossus	83; 252; 253; 317; 323; 324; 337; 441; 442.
	Limanda ferruginea	441; 442 .
	Limanda limanda	191; 229; 317; 323; 324; 333.
	Microstomus kitt	191; 321; 323.
	Monochirus variegatus	191 .
	Phrynorhombus norvegicus	191 .
	Platichthys flesus	322; 333; 380 .
	Pleuronectes platessa	80; 320; 323.
	Pseudorhombus pentophthalmus	527.
	Reinhardtius hippoglossoides	284; 441; 442 .
	Scophthalmus maximus	317; 321; 322; 323; 324 .
	Scophthalmus rhombus	229; 232; 317; 324; 340 .
	Solea solea	229; 232; 322; 323.

Derogenes sp.	Cleisthenes herzensteini	184 .
Deropristis inflata (Molin , 1858) .	Paralichthys dentatus	53[1] .
Diclidophora merlangi (Kuhn , in Nordmann , 1832) .	Glyptocephalus cynoglossus	80 .
Diclidophora palmata (Leuckart , 1930) .	Hippoglossus hippoglossus	205; 378 .
Dinosoma tortum Yamaguti , 1938 .	Chascanopsetta lugubris	527 .
Dinurus nanaimoensis McFarlane , 1936 .	Parophrys vetula	250 .
Dinurus pinguis Linton , 1940 .	Paralichthys dentatus	226 .

[1] An artificial infection .

Diphtherostomum magnacetabulum Yamaguti , 1938 .	Poecilopsetta plinthus	527 .
Diplostomum cuticola Nordmann , 1832 .	Platichthys flesus	101 .
Diplostomum spathaceum (Rudolphi , 1819) .	Microstomus kitt	317 .
	Platichthys flesus	357 .
Diplozoon paradoxum Nordmann , 1832 .	Platichthys flesus	251 .
Distoma appendiculatum Leidy , 1887 .	Eucitharus linguatula	390 .
	Hippoglossoides platessoides	205.
	Laeops variegata	287 .
	Limanda limanda	155 .
	Platichthys flesus	390 .
	Pleuronectes platessa	155 .
	Pseudopleuronectes americanus	216 .
	Scophthalmus maximus	205; 390; 450.
	Scophthalmus rhombus	450 .
	Solea solea	205; 287 .
	Solea theophila	287 .

Distoma areolatum Rudolphi , 1809 .	Bothus podas	83; 316; 388; 390; 450 .
	Pleuronectes platessa	83 .
	Pseudopleuronectes americanus	205; 216.
	Scophthalmus maximus	450 .
Distoma fenestratum Manter , 1934 .	Cyclopsetta fimbriata	256 .
	Paralichthys californicus	261 .
	Paralichthys oblongus	256 .
Distoma microcotyle Diesing , 1858 .	Scophthalmus maximus	20; 86; 450 .
Distoma microstomum (Rudolphi, 1809) .	Solea solea	65; 82; 97; 174; 205; 336; 384; 388; 390; 450; 488.
Distoma pudens Linton , 1900 .	Paralichthys albigutta	216.
	Paralichthys dentatus	215; 216 .
Distoma rhombi van Beneden , 1870 .	Scophthalmus maximus	205 .
Distoma soleae Dujardin , 1845 .	Solea solea	205 .

Distoma sp.	Hippoglossoides platessoides	232 .
	Hippoglossus hippoglossus	442 .
	Limanda limanda	72 .
	Paralichthys dentatus	215; 216; 256; 445 .
	Pseudopleuronectes americanus	216 .
	Scophthalmus rhombus	173 .
Distoma teretiusculum Monticelli , 1893 .	Solea kleini	301 .
Dolichoenterum sp.	Citharichthys cornutus	256 .
Echinostoma revolutum (Frölich , 1802) .	Pleuronectes platessa	356 .
	Scophthalmus maximus	356 .
Ectenurus paralichthydis Yamaguti , 1934 .	Paralichthys olivaceus	521 .
Ectenurus virgula (Linton , 1910) .	Bothus ocellatus	80; 258; 259 .
Entobdella brattstromi Brinkmann , 1952 .	Paralichthys adspersus	48; 515 .

Entobdella diadema (Monticelli , 1902) .	Solea solea	278 .
Entobdella hippoglossi (Müller , 1776) .	Hippoglossus hippoglossus	7; 22; 25; 35; 41; 48; 70; 72; 80; 105; 205; 207; 226; 244; 286; 308; 312; 356; 368; 439; 441; 442.
	Hippoglossus stenolepis	150; 226; 263; 515 .
Entobdella soleae (van Beneden and Hesse , 1863) .	Solea lascaris	15; 439 .
	Solea solea	15; 17; 25; 76; 105; 132; 207; 228; 416; 424.
	Solea sp.	356 .
Entobdella squamula (Heath , 1902) .	Eopsetta jordani	263 .
	Hippoglossina macrops	48; 150; 515.
	Hippoglossus hippoglossus	439 .
	Hippoglossus stenolepis	121[1]; 150; 515 .
	Paralichthys californicus	121; 127; 150; 367; 515 .
Eurycreadium problematicum (Isaichikov , 1928) .	Hippoglossoides platessoides	141 .

[1] Reported by Guberlet as Epibdella squamata Heath, almost certainly a lapsus calami for (Epibdella squamula =) Entobdella squamula .

Fasciola platessae	Platessa sp.	312 .
Gmelin , 1790 .	Pleuronectes platessa	26 .
Genarches müllerí	Limanda limanda	18 .
(Levinsen , 1881) .	Pleuronectes platessa	18; 141 .
Genolinea laticauda	Hippoglossus hippoglossus	252 .
Manter , 1925 .		
Gonocerca crassa	Ancylopsetta dilecta	256 .
Manter , 1934 .	Paralichthys oblongus	256; 259 .
	Paralichthys sp.	256; 259 .
	Paralichthys squamilentus	256 .
Gonocerca phycidis	Hippoglossus hippoglossus	256 .
Manter , 1925 .		
Gyrodactylus elegans	Platichthys flesus	2 .
Nordmann , 1832 .	Pleuronectes platessa	158 .
Gyrodactylus sp. (? n. sp.)	Pleuronectes platessa	158; 439 .

Haplocladus minor Odhner , 1911 .	Limanda limanda	335 .
Helicometra pulchella (Rudolphi , 1819) .	Zeugopterus punctatus	322 .
Helicometrina nimia Linton , 1910 .	Syacium papillosum	255 .
Hemiuris appendiculatus (Rudolphi , 1802) .	Achirus fasciatus	216; 386 .
	Eucitharus linguatula	349 .
	Hippoglossus hippoglossus	24; 82 .
	Paralichthys californicus	427 .
	Paralichthys dentatus	215; 216; 226 .
	Platichthys flesus	205; 451; 456.
	Pseudopleuronectes americanus	226 .
	Scophthalmus maximus	456 .
	Scophthalmus rhombus	456 .
	Solea solea	24 .
Hemiuris communis Odhner , 1905 .	Hippoglossoides platessoides	320; 323.
	Hippoglossus hippoglossus	317; 318; 323; 324.
	Limanda limanda	155; 321; 323.

	Platichthys flesus	228 .
	Pleuronectes platessa	156; 160; 228.
	Zeugopterus punctatus	322; 323 .
Hemiuris rugosus Looss , 1907 .	Scophthalmus maximus	235 .
Heterobothrium affine (Linton , 1898) .	Paralichthys dentatus	47; 230; 214; 216; 226; 369 .
	Paralichthys lethostigma	277.
	Paralichthys sp.	277 .
Homalometron pallidum Stafford , 1904 .	Limanda ferruginea	216 .
	Pseudopleuronectes americanus	226 .
Immature hemiurid .	Paralichthys californicus	261 .
Lecithaster confusus Odhner , 1905 .	Hippoglossus hippoglossus	317 .
	Limanda limanda	317 .
Lecithaster gibbosus (Rudolphi , 1802) .	Cleisthenes herzensteini	184 .
	Hippoglossus hippoglossus	317 .

	Hippoglossoides platessoides	17; 320 .
	Limanda limanda	333 .
	Phrynorhombus norvegicus	17; 322 .
	Platichthys flesus	228 .
	Pleuronectes platessa	228 .
	Solea solea	79 .
Lecithochirium caudiporum	Arnoglossus laterna	209; 323; 333 .
(Rudolphi , 1819) .	Platichthys flesus	235 .
	Pleuronectes platessa	79; 80 .
	Scophthalmus maximus	15; 17; 235; 323.
	Scophthalmus rhombus	15; 17; 79; 229; 235; 320 .
Lecithochirium exodicum	Eopsetta jordani	119; 262 .
McFarlane , 1936 .		
Lecithochirium gravidum	Bothus podas	287 .
Looss , 1907 .	Platichthys flesus	234 .
	Scophthalmus maximus	234; 456 .
	Scophthalmus rhombus	351 .
Lecithochirium microstomum	Ancylopsetta dilecta	258 .
Chandler , 1935 .		

Lecithochirium rufoviride (Rudolphi , 1819) .	Scophthalmus maximus	205; 450 .
Lecithochirium synodi Manter , 1931 .	Paralichthys dentatus	254 .
Lecithocladium excisum (Rudolphi , 1819) .	Bothus podas	82; 349 .
	Lepidorhombus boscii	287 .
Lepidapedon calli Acena , 1947 .	Parophrys vetula	1 .
Lepidapedon clavatum Linton , 1940 .	Scophthalmus aquosus	226 .
Lepidapedon elongatum (Lebour , 1908) .	Paralichthys dentatus	226 .
Lepidapedon nicolli Manter , 1934 .	Engyophrys sentus	256 .
Lepidapedon rachion (Cobbold , 1858) .	Hippoglossus hippoglossus	205 .

Lepocreadium clavatum	Pseudorhombus cinnamoneus	521 .
(Ozaki , 1932) .		
Lepocreadium setiferoides	Hippoglossoides platessoides	270 .
(Miller and Northup, 1926).		
Lepocreadium trullaforme	Achirus fasciatus	226 .
Linton , 1940 .	Pseudopleuronectes americanus	226 .
Lomasoma monolenei	Monolene antillarum	258 .
(Manter , 1934) .		
Megalocotyle rhombi	Hippoglossus hippoglossus	35 .
(van Beneden and Hesse , 1863) .	Scophthalmus maximus	25; 205; 272; 352; 368 .
Metacercariae .	Pseudopleuronectes americanus	225 .
Monorcheides cumingiae	Paralichthys sp.	268 .
Martin , 1938 .		

Monostoma rhombi-laevis Diesing , 1858 .	Scophthalmus maximus	37; 86 .
	Scophthalmus rhombus	205; 349 .
Neidhartia microrhyncha Chauhan , 1943 .	Psettodes erumei	58 .
Opechona bacillaris (Molin , 1859) .	Scophthalmus rhombus	191; 491 .
Opechona retractilis (Lebour , 1908) .	Glyptocephalus cynoglossus	80 .
Opegaster caulopsettae Manter , 1954 .	Arnoglossus scapha	259 .
Opegaster ozakii Layman , 1930 .	Liopsetta obscura	184 .
Otodistomum veliporum (Creplin , 1837) .	Eopsetta jordani	263 .
	Glyptocephalus cynoglossus	91; 321 .
	Hippoglossus hippoglossus	340 .
	Lepidopsetta bilineata	263 .
	Parophrys vetula	263 .

Otodistomum sp.	Eopsetta jordani	263 .
Paradiscogaster piriformis Yamaguti , 1934 .	Pleuronectidae	521 .
Parahemiuris merus (Linton , 1910) .	Eopsetta jordani	263 .
	Lyopsetta exilis	263 .
	Platichthys stellatus	257 .
Parahemiuris platichthyi Lloyd , 1938 .	Platichthys stellatus	231 .
Paramonorcheides bivitellosus Manter , 1940 .	Symphurus atramentatus	257 .
	Symphurus plagiusa	353 .
Peracreadium commune (Olsson , 1867) .	Pseudopleuronectes americanus	216 .
Plagioporus sp.	Pseudopleuronectes americanus	226 .
Plagioporus varia (Nicoll , 1910) .	Platichthys flesus	229 .
	Pleuronectes platessa	320 .

Podocotyle aeglefini	Scophthalmus maximus	24; 205; 450.
(Müller , 1776) .	Solea solea	205; 450 .
Podocotyle atomon	Hippoglossus hippoglossus	64 .
(Rudolphi , 1802) .	Limanda ferruginea	216; 226 .
	Limanda limanda	320; 323 .
	Microstomus kitt	205; 323; 337 .
	Paralichthys dentatus	216 .
	Phrynorhombus norvegicus	322; 323 .
	Platichthys flesus	24; 156; 205; 241; 318; 322; 323; 331; 333; 337; 388; 406; 438; 451; 456; 458 .
	Pleuronectes platessa	189; 205; 318; 320; 323; 406; 438 .
	Pseudopleuronectes americanus	68; 130; 131; 216; 226 .
	Scophthalmus maximus	82; 323 .
	Solea solea	76; 229; 323; 438.
Podocotyle furcata	Solea solea	38; 205; 456.
(Bremser in Rudolphi , 1819) .		
Podocotyle levinseni	Pleuronectes platessa	18 .
Isaichikov , 1928 .		

Rhodotrema ovacutum (Lebour , 1908) .	Hippoglossoides platessoides	18; 188; 321; 335 .
Rhodotrema problematicum Isaichikov , 1928 .	Hippoglossoides platessoides	18; 141 .
Rhodotrema quadrilobata Bazikalova , 1932 .	Hippoglossoides platessoides	60 .
	Limanda limanda	60 .
	Platichthys flesus	60 .
	Pleuronectes platessa	18 .
Rhodotrema quinquelobata Layman , 1930 .	Cleisthenes hersensteini	184 .
Siphodera vinaledwardsii (Linton , 1901) .	Paralichthys dentatus	137 .
Spelotrema sp.	Pleuronectes sp .	325 .
Sphaerostoma bramae (Müller , 1776) .	Pseudopleuronectes americanus	216 .

Steganoderma formosum Stafford , 1904 .	Hippoglossus hippoglossus	79; 252; 284; 441.
	Paralichthys oblongus	226 .
Steganoderma messiatzevi (Isaichikov , 1928) .	Hippoglossoides platessoides	142; 256; 258; 521.
Stenakron vetustum Stafford , 1904 .	Hippoglossus hippoglossus	441 .
Stephanostomum baccatum (Nicoll , 1907) .	Glyptocephalus cynoglossus	52; 188; 516; 518.
	Hippoglossus hippoglossus	52; 252; 317; 321; 518 .
	Hippoglossoides platessoides	52; 323; 516; 518.
	Limanda ferruginea	188; 516.
	Limanda limanda	52; 154; 188.
	Liopsetta putnami	516; 518.
	Microstomus kitt	52 .
	Pseudopleuronectes americanus	516; 518 .
	Scophthalmus aquosus	516; 518.
Stephanostomum bicoronatum (Stossich , 1883) .	Scophthalmus rhombus	52 .

Stephanostomum dentatum Linton , 1900 .	Paralichthys albigutta	52 .
	Paralichthys californicus	261 .
	Paralichthys dentatus	215; 216; 226; 254; 353 .
	Scophthalmus aquosus	51 .
Stephanostomum hispidum (Yamaguti , 1934) .	Pseudorhombus pentophthalmus	52; 526 .
Stephanostomum hystrix (Dujardin , 1845) .	Limanda ferruginea	52 .
	Limanda limanda	52; 205 .
	Pleuronectes platessa	52; 205 .
	Pseudopleuronectes americanus	52; 441 .
	Scophthalmus maximus	52; 205; 450 .
Stephanostomum imparispine (Linton , 1905) .	Paralichthys albigutta	52 .
Stephanostomum japonicum (Yamaguti , 1934) .	Paralichthys dentatus	353 .
Steringophorus furciger (Olsson , 1868) .	Glyptocephalus cynoglossus	188; 321 .
	Hippoglossus hippoglossus	383 .

	Hippoglossoides platessoides	188; 321; 333; 335; 441; 442 .
	Limanda limanda	15; 17; 18; 189; 205; 229; 317; 333; 335 .
	Microstomus kitt	17; 188 .
	Paralichthys oblongus	226 .
	Platichthys flesus	205 .
	Pleuronectes platessa	18; 188 .
	Pseudopleuronectes americanus	130; 226; 441; 442.
	Reinhardtius hippoglossoides	284; 441; 442 .
	Scophthalmus maximus	284; 441 .
Steringotrema cluthense	Limanda limanda	15; 17; 322 .
(Nicoll , 1909) .	Microstomus kitt	15; 17; 229; 318; 322; 335 .
Sterrhurus floridensis	Ancylopsetta dilecta	256 .
Manter , 1934 .	Cyclopsetta fimbriata	256 .
	Paralichthys sp.	74; 256 .
	Syacium micrurum	256 .
	Syacium papillosum	256 .
	Trichopsetta ventralis	256 .
Sterrhurus grandiporus	Pseudopleuronectes americanus	216 .
(Rudolphi , 1819) .		

	Pleuronectes sp.	184 .
	Pseudopleuronectes yokohamae	184 .
Tubulovesicula pseudorhombi Yamaguti , 1938 .	Pseudorhombus pentophthalmus	527 .
Udonella caligorum Johnston , 1835 . on Caligus sp.	Hippoglossus hippoglossus	23; 35; 149 .
	Platichthys flesus	298 .
Zoogonoides viviparus (Olsson , 1868) .	Glyptocephalus cynoglossus	321; 335 .
	Hippoglossoides platessoides	188; 321 .
	Limanda limanda	188; 229; 317 .
	Microstomus kitt	15; 17; 24; 205 .
	Monochirus variegatus	322.
	Pleuronectes platessa	15; 17; 188; 229; 317; 320 .
	Scophthalmus maximus	317; 335 .
	Solea solea	322; 335 .
Zoogonus rubellus (Olsson , 1868) .	Limanda limanda	15; 17 .

NEMATODA

PARASITE.	HOST.	BIBLIOGRAPHIC REFERENCE.
Agamonema commune Diesing , 1851 .	Platichthys flesus	205.
Agamonema rhombi-boscii Diesing, 1851 .	Lepidorhombus boscii	83 .
Anisakis simplex (Rudolphi , 1804) .	Limanda limanda	83 .
	Paralichthys olivaceus	524 .
Anisakis sp.	Atheresthes stomias	263 .
	Citharichthys stigmaeus	263 .
	Eopsetta jordani	119[1]; 263 .
	Lepidopsetta bilineata	263 .
	Limanda limanda	370 .
	Lyopsetta exilis	263 .
	Microstomus pacificus	263 .
	Paralichthys olivaceus	530 .
	Parophrys vetula	263 .

1 Gregoire and Pratt (1952) give the identification as Anisakis or Porrocaecum , this record is therefore to be found under both parasite names .

Ascaris acuta	Pseudopleuronectes americanus	129; 195 .
Müller , 1789 .	Rhombus sp.	129 .
	Scophthalmus maximus	129; 205; 287; 406 .
	Scophthalmus rhombus	129; 173; 205; 385 .
Ascaris capsularia	Arnoglossus laterna	287 .
Rudolphi , 1802 .	Eucitharus linguatula	287; 390 .
	Hippoglossus hippoglossus	83; 287; 317 .
	Hippoglossoides platessoides	406 .
	Limanda limanda	317 ; 406 .
	Monochirus hispidus	205; 287 .
	Platichthys flesus	406 .
	Pleuronectes platessa	406 .
	Reinhardtius hippoglossoides	207.
	Scophthalmus maximus	406 .
	Solea solea	55; 205 .
Ascaris collaris	Bothus mancus	7; 83; 455 .
Rudolphi , 1802 .	Bothus podas	83; 349; 390 .
	Hippoglossus hippoglossus	64; 83; 317; 455 .
	Limanda limanda	72 .
	Platichthys flesus	83; 144; 174; 205; 287; 390; 455 .
	Pleuronectes platessa	183 .

	Scophthalmus maximus	7; 83; 174; 205; 386; 388; 390; 403; 455 .
	Scophthalmus rhombus	317 .
	Solea solea	72; 83; 174; 205; 287; 455 .
Ascaris constricta Rudolphi , 1809 .	Limanda limanda	83; 205 .
Ascaris drepanopsettae von Linstow , 1901 .	Hippoglossoides platessoides	206; 207.
Ascaris flesi von Linstow , 1878 .	Platichthys flesus	205 .
Ascaris incurva Rudolphi , 1819 .	Hippoglossoides platessoides	14; 216 .
Ascaris minuta Molin , 1858 .	Platichthys flesus	290 .
Ascaris seta Müller , 1774 .	Solea theophila	287 .

Ascaris soleae Rudolphi , 1819 .	Solea solea	35; 173; 205; 390 .
Ascaris sp.	Glyptocephalus cynoglossus	216 .
	Hippoglossoides platessoides	174; 206.
	Hippoglossus hippoglossus	232; 317.
	Limanda ferruginea	216.
	Limanda limanda	317.
	Microstomus kitt	317.
	Paralichthys albigutta	217 .
	Paralichthys dentatus	216; 217 .
	Paralichthys oblongus	216 .
	Platichthys flesus	403 .
	Pseudopleuronectes americanus	216.
	Scophthalmus aquosus	216; 217 .
	Solea solea	174 .
Ascaropsis morrhuae van Beneden , 1870 .	Hippoglossus hippoglossus	317 .
Ascarophis sp.	Microstomus kitt	317 .
Camallanus lacustris (Zoega , 1776) .	Scophthalmus maximus	409 .

Capillaria helenae Layman , 1930 .	Pseudopleuronectes yokohamae	128; 464 .
Capillaria sp.	Lepidopsetta bilineata	263 .
	Parophrys vetula	263 .
	Pleuronectes platessa	17 .
Contracaecum aduncum (Rudolphi , 1802) .	Eopsetta jordani	263 .
	Eucitharus linguatula	455 .
	Glyptocephalus zachirus	263; 264.
	Hippoglossoides elassodon	263 .
	Hippoglossoides platessoides	406 .
	Limanda limanda	264; 370.
	Monochirus luteus	370 .
	Parophrys vetula	263 .
	Platichthys flesus	145; 264 .
	Pleuronectes platessa	370 .
	Pseudopleuronectes americanus	130 .
	Scophthalmus maximus	11; 406 .
	Scophthalmus rhombus	370 .
	Solea solea	370 .
Contracaecum auctum (Rudolphi , 1802) .	Hippoglossoides platessoides	406 .
	Limanda limanda	406 .

	Pseudopleuronectes americanus	83 .
	Scophthalmus maximus	11; 406.
	Scophthalmus rhombus	83 .
	Zeugopterus punctatus	12 .
Contracaecum clavatum	Glyptocephalus cynoglossus	236 .
(Rudolphi , 1809) .	Hippoglossus hippoglossus	12 .
Contracaecum collieri	Paralichthys lethostigma	56; 57 .
Chandler , 1935 .		
Contracaecum gadi	Arnoglossus laterna	370 .
(Müller , 1776) .	Glyptocephalus cynoglossus	370 .
	Hippoglossoides platessoides	370 .
	Limanda limanda	406 .
	Platichthys flesus	406 .
Contracaecum hippoglossi	Hippoglossus hippoglossus	108 .
Fujita , 1932 .		
Contracaecum paralichthydis	Paralichthys olivaceus	530 .
Yamaguti , 1941 .		

Contracaecum rigidum (Rudolphi , 1809)	Platichthys flesus	207 .
Contracaecum sp.	Citharichthys stigmaeus	428 .
	Eopsetta jordani	263 .
	Hippoglossoides elassodon	263 .
	Lyopsetta exilis	263 .
	Parophrys vetula	263 .
	Pleuronichthys cornutus	524 .
	Pseudorhombus cinnamoneus	524; 530 .
	Solea lascaris	61 .
Cucullanus alatus Rudolphi , 1808 .	Scophthalmus maximus	174; 386; 388.
Cucullanus antipodeus Baylis , 1932 .	Rhombosolea sp.	13 .
Cucullanus cirratus Müller , 1777 .	Hippoglossus hippoglossus	317 .
	Lepidorhombus whiff-iagonis	110; 409; 466.
	Pleuronectes platessa	12; 317; 466 .
	Pleuronectes sp.	373 .
	Pleuronectids	54 .

	Scophthalmus maximus	398.
	Solea solea	8 .
Cucullanus fusiformis	Platichthys flesus	205; 207; 264; 287; 456 .
(Molin , 1860) .	Pleuronectes platessa	264 .
	Pleuronectes sp.	373 .
Cucullanus heterochrous	Hippoglossoides platessoides	406; 466 .
Rudolphi , 1802 .	Hippoglossus hippoglossus	409; 466 .
	Limanda limanda	20; 466 .
	Microstomus kitt .	409; 466 .
	Platichthys flesus	386; 388; 398; 406; 466 .
	Pleuronectes platessa	12; 15; 17; 20; 110; 170; 205; 317; 372; 406; 409.
	Scophthalmus maximus	205; 406.
	Solea lascaris	61.
	Solea solea	15; 17; 287; 372; 388; 466 .
Cucullanus lintoni	Paralichthys albigutta	9 .
de Barros Barreto , 1922 .	Scophthalmus aquosus	9; 466 .
Cucullanus minutus	Platichthys flesus	146; 147; 287; 390; 466.
(Rudolphi , 1819) .	Pleuronectes platessa	146; 466 .

Cucullanus platessae	Pleuronectes platessa	205; 388 .
Rudolphi , 1809 .	Pleuronectes sp.	371 .
Cucullanus pleuronectidis	Paralichthys olivaceus	524 .
Yamaguti , 1935 .	Pleuronichthys cornutus	524 .
	Pseudorhombus cinnamoneus	524 .
Cucullanus sp.	Limanda limanda	379 .
	Parophrys vetula	263 .
	Solea solea	174 .
Cucullanus tripapsllatus	Solea solea	15 .
Gendre , 1927 .		
Dichelyne fastigatus	Paralichthys dentatus	56 .
Chandler , 1935 .	Paralichthys lethostigma	56 .
Eustoma rotundata	Glyptocephalus cynoglossus	162 .
(Rudolphi , 1819) .	Microstomus kitt	409 .
Eustrongylides sp.	Rhombosolea retiaria	447 .

Filaria piscium	Hippoglossoides platessoides	100; 390 .
Rudolphi , 1809 .	Reinhardtius hippoglossoides	100 .
Hedruris spinigera	Rhombosolea plebeia	447 .
Baylis , 1931 .	Rhombosolea retiaria	447 .
	Rhombosolea sp.	447 .
	Rhombosolea tapirina	447 .
Heligmus longicirrus	Pleuronectes platessa	83; 97; 173; 205.
Dujardin , 1845 .		
Heterakis sp.	Paralichthys albigutta	217 .
	Scophthalmus aquosus	217 .
Neidhartia microrhyncha	Psettodes erumei	58 .
Chauhan , 1943 .		
Nematode sp.	Limanda limanda	133 .
	Pleuronectes platessa	133 .
Nematoideum	Scophthalmus maximus	72 .

Philometra americana	Lepidopsetta bilineata	178 .
Kuitunen-Ekbaum , 1933 .	Parophrys vetula	263 .
	Platichthys stellatus	178; 262 .
Philometra fusca	Bothus podas	83; 87; 287; 349; 390 .
(Rudolphi , 1819) .		
Philometra globiceps	Paralichthys albigutta	217 .
(Rudolphi , 1819) .		
Philometra mariae	Cleisthenes herzensteini	184 .
Layman , 1930 .	Pseudopleuronectes yokohamae	184 .
Philometra sanguinea	Lepidopsetta bilineata	178 .
(Rudolphi , 1819) .	Paralichthys dentatus	215; 216 .
	Platichthys stellatus	178 .
Philometra sp.	Hippoglossoides platessoides	216 .
Porrocaecum sp.	Eopsetta jordani	119 .
	Hippoglossoides platessoides	185 .

Porrocaecum (Terranova) decipiens (Krabbe , 1878) .	Glyptocephalus cynoglossus	418 .
	Hippoglossoides platessoides	418; 419 .
	Platichthys flesus	409 .
	Rhombosolea tapirina	152 .
Rhabditis sp.	Bothus podas	363 .
Rhaphidascaris sp.	Platichthys flesus	147 .
Spinitectus echinatus (von Linstow , 1878) .	Hippoglossus hippoglossus	317 .
Spirocamallanus spiralis (Baylis , 1923) .	Achirus sp.	514 .
Spirurida gen. and sp. ?	Platichthys flesus	146 .
	Pleuronectes platessa	146 .

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Acanthocephaloides chabanaudi Dollfus , 1952 .	Cynoglossus (Trulla) zanzibarensis	93 .

Acanthocephaloides incrassatus (Molin , 1858) .	Paralichthys dentatus	211; 216 .
	Solea solea	281 .
Acanthocephaloides kostylewi Meyer , 1932 .	Solea lascaris	281 .
Acanthocephaloides propinquus (Dujardin , 1845) .	Bothus podas	349 .
	Eucitharus linguatula	281 .
	Hippoglossoides platessoides	8 .
	Pleuronectes sp.	281 .
	Scophthalmus maximus	8; 281; 457 .
	Solea lascaris	167 .
	Solea solea	8; 281; 450; 456.
	Solea theophila	50; 167 .
Acanthocephalus lucii (Müller , 1777) .	Hippoglossoides platessoides	207 .
	Platichthys flesus	50; 144; 195; 205; 207; 243; 287; 388 .
	Pleuronectes platessa	83; 205; 388.
	Scophthalmus maximus	50; 144; 264; 281; 287 .
	Solea solea	281 .
	Solea theophila	287 .

	Platichthys flesus	50; 144; 205; 243; 307; 406; 436.
	Platichthys stellatus	179; 262 .
	Pleuronectes platessa	406 .
	Scophthalmus maximus	50; 144; 243; 406; 436 .
Corynosoma sp.	Hippoglossus hippoglossus	305 .
	Platichthys stellatus	343 .
	Pseudopleuronectes americanus	305 .
	Scophthalmus aquosus	305 .
Echinorhynchus clavula Dujardin , 1845 .	Eopsetta jordani	263 .
	Platichthys flesus	50; 144; 243; 281.
	Pleuronectes sp.	282 .
Echinorhynchus gadi Zoega , 1776 .	Hippoglossus hippoglossus	50; 166; 234; 244; 280 .
	Lepidopsetta bilineata	263 .
	Limanda ferruginea	211; 281 .
	Limanda limanda	50; 166; 264; 406.
	Paralichthys dentatus	211; 216; 281 .
	Paralichthys oblongus	216; 225 .
	Platichthys flesus	50; 144; 203; 243 .
	Pseudopleuronectes americanus	210; 224; 445; 473.

	Pseudopleuronectes herzensteini	523 .
	Scophthalmus maximus	406 .
Echinorhynchus globulosus Rudolphi , 1802 .	Eucitharus linguatula	349; 390 .
Echinorhynchus kushiroensis Fujita , 1921 .	Verasper moseri	107 .
Echinorhynchus lageniformis Kuitunen-Ekbaum , 1938 .	Lepidopsetta bilineata	179 .
	Parophrys vetula	182 .
	Platichthys stellatus	179; 182 .
Echinorhynchus platessoidae Gmelin , 1790 .	Hippoglossoides platessoides	34; 50; 83; 280 .
Echinorhynchus pleuronectes Gmelin , 1790 .	Scophthalmus maximus	205; 388 .
Echinorhynchus pleuronectis-platessoides (Rudolphi , 1809) .	Hippoglossoides platessoides	100; 245; 388; 390 .
	Platichthys flesus	205 .
	Pleuronectes sp.	312 .

Echinorhynchus rhytidodes Monticelli , 1905 .	Solea theophila	205; 304 .
Echinorhynchus sagittifer Linton , 1889 .	Paralichthys albigutta	210; 217 .
	Paralichthys dentatus	211; 216 .
Echinorhynchus salmonis Müller , 1874 .	Platichthys flesus	50; 129; 144; 203; 243 .
	Rhombus sp.	282 .
	Scophthalmus maximus	50; 129; 144 .
Echinorhynchus soleae Porta , 1905 .	Solea theophila	281; 287; 361 .
Echinorhynchus sp.	Paralichthys albigutta	217 .
	Scophthalmus maximus	174; 361 .
Echinorhynchus tumidus Mehlis , 1846 .	Pleuronectes sp.	72 .
Echinorhynchus urniger Dujardin , 1845 .	Solea solea	205; 281 .

Hypoechinorhynchus alaeopis Yamaguti , 1939 .	Poecilopsetta plinthus	529 .
Neoechinorhynchus longilemniscus Yamaguti , 1954 .	Cynoglossus sp.	534 .
Neoechinorhynchus rutili (Müller , 1780) .	Scophthalmus maximus	72; 205 .
Neoechinorhynchus tuberosus (Zeder , 1803) .	Scophthalmus maximus	83; 87 .
Neoechinorhynchus variabilis (Diesing , 1851) .	Achirus lineatus	83; 281 .
	Pleuronectes sp.	205; 469 .
Polymorphus boschadis (Schrenk , 1788) .	Platichthys flesus	468 .
Polymorphus minutus (Goeze , 1782) .	Platichthys flesus	32; 39; 281; 282.

Pomphorhynchus laevis	Limanda limanda	309; 406 .
Zoega , 1776 .	Paralichthys dentatus	216 .
	Platichthys flesus	28; 144; 243; 281; 287; 406 .
	Pleuronectes platessa	72; 205; 281; 287.
	Scophthalmus maximus	205; 281; 287.
	Solea solea	205; 281 .
Rhadinorhynchus peltorhampi	Peltorhamphus novae-zeelandiae	16 .
Baylis , 1944 .		
Rhadinorhynchus pristis	Paralichthys albigutta	217 .
(Rudolphi , 1802) .	Scophthalmus aquosus	217; 281 .
	Symphurus plagiusa	281 .
Serrasentis socialis	Paralichthys albigutta	281 .
(Leidy , 1851) .	Paralichthys dentatus	281 .

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