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INTESTINAL PARASITES OF THE HADDOCK IN CANADIAN WATERS 1937

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INTESTINAL PARASITES OF THE HADDOCK IN CANADIAN WATERS.

by

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The intestinal parasites of the haddock, Melanogrammus aeglefinus L. have been studied in Great Britain by Cobbold (1938), and Nicoll (1907) and individual species have been described by Lebour (1908, 1914) and others.

A few species infecting the fish caught in North-East American waters have also been described by Linton (1900 - 1933), Cooper (1918) and Stafford (1904), but no attempt has been made hitherto to give an account of the intestinal parasitic fauna of fish caught off the Atlantic coast of Canada. This attempt is made in the present paper, but it is realised that some of the smaller and rarer species may easily have been overlooked in making the collections owing to their difficulty of detection.

The collections were made by Dr. V.D. Vladykov of the Atlantic Biological Station, St. Andrews, N.B., from fish caught at various localities off the east coast of Canada and off Newfoundland. Dr. Vladykov very kindly separated the various parasites from the fish and preserved them by prescribed methods. I am much indebted to him for the care he took in doing this, for his exhaustive notes on the various times and places at which the fish were taken, and for other assistance. Thanks are also due to Dr. K.M. Levander, Helsingfors, Finland, for lending the specimens of C. clavatum and C. aduncum.

TABLE I

No. of fish examined	Date	Locality	Cestoda		Trematoda	Nematoda		Acanthocephala	
			A. gadi	R. imperi-spine	L. rachion	C. clavatum	C. cirratus	E. gadi	C. strumosum
1	21-6-34	NEWFOUNDLAND, St.336 NOVA SCOTIA	-	-	-	2	-	-	-
5	1-1-35	Emerald Bank	-	-	-	-	-	138	-
5	16-1-35	" "	1	-	-	-	-	ca.620	-
1	16-1-35	" "	6	-	-	28	-	7	-
4	15-2-35	" "	7	-	-	12	-	-	-
1	15-2-35	" "	6	-	-	-	-	-	-
1	22-2-35	" "	2	-	-	-	-	-	-
2	22-2-35	" "	-	-	-	-	-	43	-
1	14-3-35	" "	-	-	-	-	-	32	-
2	14-3-35	" "	-	-	-	-	-	85	-
1	25-8-32	Half Island Reef	3	-	2	3	-	118	-
7	19-8-32	Jeddore Harbour	4	-	-	7	-	68	-
12	20-7-32	Devils Island	-	4	-	6	-	98	-

1	27-6-33	HALIFAX HARBOUR	-	-	-	-	-	-	-
1	3-9-32	" "	-	-	-	-	-	7	-
4	12-2-34	" "	-	-	3	2	-	65	-
1	3-8-32	Head Rock Shoal	6	-	-	2	-	-	-
1	3-8-32	" " "	-	-	-	-	-	20	-
1	7-7-32	Eastern Passage	-	-	-	4	-	84	2
4	12-7-32	North West Arm	-	-	-	3	-	24	-
15	13-7-32	Eastern Passage	2	-	-	46	2	230	-
15	13-7-32	" "	3	-	3	32	-	28	-
1	20-6-33	Station 63	4	-	-	-	-	-	-
1	5-8-32	Pennant Harbour	7	-	-	5	-	-	-
6	29-7-32	Eastern Passage	-	-	-	10	-	33	-
9	2-8-32	" "	2	-	1	6	-	184	-
2	23-8-32	" "	2	-	-	18	-	8	-
3	25-8-32	" "	7	-	-	-	-	-	-
3	6-9-32	Bedford Basin	1	-	-	18	-	-	-
4	19-9-32	" "	1	-	-	2	-	124	-
		BAY OF FUNDY							
42	9-12-33	Digby	2	-	-	6	-	ca.550	-
1	17-10-34	"	-	3	-	4	-	96	-
4	17-10-34	"	-	-	-	-	-	124	-
5	17-10-34	"	12	-	-	38	-	ca.800	-

3	10-2-34	St. Andrews	2	-	-	2	-	83	-
1	25-6-35	GEORGES BANK	-	2	-	-	-	-	-
1	25-6-35	Georges Bank	-	-	-	2	-	16	-

Parasites from 172 fish are recorded. Two species of Cestoda, one of Trematoda, two of Nematoda and two of Acanthocephala were found in the material. The following table shows the number of fish examined from the various localities on the dates specified and the number of individual parasites of each species found in the combined material of each day's collections. Where more than one fish is involved the table, therefore, gives no information as to the number of each parasite present in each fish.

CESTODA.

The only species of cestode found in the adult form was Abothrium gadi v. Beneden. This occurs quite commonly. Encysted larvae of Rhynchobothrium imparispine Linton were also present in a few cases.

Abothrium gadi v. Beneden.

For synonymy see Nybelin (1922).

This species has been reported from the haddock in Europe by Cobbold (1858) and Nicoll (1907, 1927). Cooper (1918) records what is apparently this species, under the name A. rugosum (see Nybelin) from haddock caught off the Atlantic coast of Canada. Linton (1900 - 1933) reports it from various marine fishes under the name Dibothrium rugosum. Nybelin (1922) gives a good description of the species with sectional figures of the mature proglottid. Cooper (1918, Pl. 1, Figs. 32 - 36) gives figures of the normal - pseudoscolex.

Nybelin (1922) describes a species of Pseudophyllidean cestode, Parabothrium bulbiferum, from haddock and other gadids in Sweden and Norway which resembles A. gadi very closely in external characteristics and can be differentiated from the latter with certainty only by the examination of

sections. In addition, therefore, to comparing the specimens attained from the Canadian haddock with the published description and with the authentic specimens from Europe sections were cut of all available strobilae. Both external and internal characters agreed closely with those of A. gadi.

Observations made on the condition of maturity (Table II) of the specimens of A. gadi examined indicated that the parasite reaches maturity at any time during the summer and autumn months. Immature forms were found only during December, January and February, indicating that infection mainly takes place late in the fall or early in the winter.

Rhynchobothrium imparispine Linton

An encysted larva agreeing with the descriptions of that of this species given by Linton (1891) was found in the Peritoneum, and viscera in a few cases. It was never present in any numbers. It is included among the ingestinal parasites, because, although it was actually found only in the body cavity there can be no doubt it reaches the peritoneum by penetrating the intestinal wall. Linton records this larva from haddock taken at Woods Hole, Mass., U. S. A.

TREMATODA.

Lepidapedon rachion (Cobbold):

Syn.: Distoma rachion Cobbold

Lepodora rachion Odhner

This is the only species of Trematode which occurs in this collection. The individuals found vary in length from 1.5 mm. to 4 mm. A single specimen was exceptionally extended and measured 5.5 mm.

TABLE II

Seasonal occurrence of *Abothrium gadi* and *Echinorhynchus gadi* in haddock

Date	Locality	Condition of maturity A. gadi	E. gadi
1-1-35	Emerald Bank	-	Mature and numerous young recently liberated
16-1-35	" "	Immature	Mature and young
16-1-35	" "	Immature	Mature and young
10-2-34	St. Andrews	Mature	Mature
12-2-34	Halifax Harbour	-	Mature
15-2-35	Emerald Bank	Mature and Immature	-
15-2-35	" "	Mature	-
22-2-35	" "	Mature	Mature and young
14-3-35	" "	-	Several mature and numerous young
14-3-35	" "	?	Mature and few with egg-clusters
20-6-33	Station 63	Mature and gravid	-
25-6-35	Georges Bank	-	Mature
27-6-35	Halifax Harbour	Gravid	-
7-7-32	Eastern Passage	-	Mature
12-7-32	North West Arm	-	Mature
13-7-32	Eastern Passage	Mature and gravid	Mature and some with egg-clusters.
13-7-32	" "	Gravid	Mature and some with egg-clusters.

20-7-32	Devils Island	-	Mature
29-7-32	Eastern Passage	-	Mature
2-8-32	" "	Gravid	Mature
3-8-32	Head Rock Shoal	Gravid	Mature
5-8-32	Pennant Harbour	Gravid	-
19-8-32	Jeddore Harbour	Gravid	Mature
23-8-32	Eastern Passage	Gravid	Mature
25-8-32	Half Island Reef	Gravid	Mature and a few immature
3-9-32	Halifax Harbour	-	Mature
6-9-32	Bedford Basin	Gravid	-
19-9-32	" "	Gravid	Mature
17-10-34	Digby	Gravid	Mature
17-10-34	"	-	Mature and several with egg-clusters
9-12-34	"	Immature	Mature and numerous young

The species has been recorded by Cobbold (1858) and Nicoll (1907, 1927) from the haddock in Great Britain, and by Stafford (1904) from the Atlantic coast of Canada. Odhner (1905), who proposed the generic name, Lepodora, for this species, gives the most complete account of it. The specimens in this collection agree in all particulars with the description.

NEMATODA

Two species of adult Nematoda occur in the collection, Contracaecum clavatum (Rudolphi) and Cucullanus cirratus Müller. The first species was found in a large number of fishes and in some cases was rather numerous; the other was found in only a single case and only two individuals were secured. In addition to these adult forms a species of Contracaecum was frequently found in the larval stage. It cannot be identified with certainty from the larval characters, but is probably C. clavatum.

Contracaecum clavatum (Rud.).

Syn.: Ascaris clavata Bud.

Contracaecum melanogrammi Smedley.

This species has been reported and described by various authors as a common parasite of gadids. Nicoll (1907, 1927) reports it from haddock, in England. Linton (1901) from the Atlantic coast of North America. Smedley (1934) describes a species under the name Contracaecum melanogrammi, from haddock taken at St. Andrews, New Brunswick, the characters of which seem to agree in all particulars with C. clavatum as described by Jägerskiöld (1894), Schneider (1903), Linstow (1880), Lühe (1911) and others, except that "Post-anal papillae could not be demonstrated" - It seems unlikely that these were actually absent, and I regard C. melanogrammi as a synonym of C. clavatum.

The specimens in the present collection agree in all particulars with the descriptions given by the above-mentioned authors and with European material with which they have been compared. I have experienced no difficulty in demonstrating the postanal papillae when the specimens are examined from the ventral surface.

Cucullanus cirratus Müller.

For synonymy see Törnquist (1931)

Nicoll (1927) records this species from haddock, Tornquist (1921) describes it in detail from material collected from various marine fishes. It has not previously been recorded from N. America.

Two individuals, one of either sex, occur in the present collection and agree exactly with Törnquist's descriptions.

Contracaecum species larva

This larva occurred in many instances in the stomach, intestine and abdominal cavity of the fishes examined. In three cases they were found in the muscles only. They range in length from 10 mm., to 45 mm. The anterior end is provided with a larval tooth and the rudiments of three lips are present. The tail has a mucronate tip and the three anal glands are conspicuous. The oesophageal appendix and the intestinal caecum closely resemble those of the adult C. clavatum. For this reason these larvae are tentatively associated with that species. The larvae found in the muscles were frequently as long as the adult C. clavatum although possessing the larval characters.

ACANTHOCEPHALA.

Acanthocephala were found the most frequent parasites of haddock, although only two species were represented. Out of the 172 fish 154 (89.5%) were infected with Acanthocephala. Of these, Echinorhynchus gadi was frequently very numerous in the host. Corynosoma strumosum larvae were found in only two cases, in one a single and in the other a male and a female.

Echinorhynchus gadi (Zoega) Müller.

Syn: E. acus Rudolphi
E. socialis Leidy
E. hepaticola v. Linstow
E. arcticus v. Linstow

This is the most common fish acanthocephalan and also the most frequent parasite of haddock. It has been reported from haddock in Europe by several authors and Linton (1891 - 1933) reports it from the Atlantic coast of N. America. Between the years 1901 and 1933 it has been recorded from 54 species of fish at Woods Hole. It is well described by Lühe (1911) and by Meyer (1932).

Individuals in the present collection range from 18 mm. to 75 mm. in length. The largest males are 28 mm. long. Table III shows the great diversity of measurements of E. gadi as determined by Lühe, Markowski (1933) and myself. There is a great variation in the size of the various organs, such as the proboscis, receptaculum, lemnisci and eggs, and the number of longitudinal rows of hooks on the proboscis and the number of hooks in each row. The size size of the hooks also varies noticeably with the age of the parasite. The length of the lemnisci varies within wide limits according to the degree of extension; they may be shorter than the receptaculum when retracted, or longer when extended. The size of the egg varies in individuals from different hosts and even in individuals from the same host. Mature eggs taken at various

seasons were compared and measured, but no relation was found between the season and the size of the egg. In small individuals the eggs are smaller than in large ones and the average size of those from parasites taken from haddock is larger than those taken from individuals parasitising other fishes (unpublished data on Salvelinus fontinalis, Microgadus tomcod etc.).

The seasonal distribution of Acanthocephala in marine fishes has received very little attention from previous authors.- Linton (1914) says "There is practically no seasonal periodicity in the occurrence of cases of parasitism among marine fishes". He reports the presence of E. gadi in haddock in every month except January, February and March. Table II shows the date, number of fish examined, number of E. gadi found, and the approximate stage of maturity of these. Records for April, May and November are not available. This survey confirms Linton's observations since the parasite was present in my material in January, February and March. There seem to be more young individuals present in late winter and early spring than in the summer and autumn, although no marked periodicity can be shown. It is interesting to note in this connection that the same parasite has apparently a seasonal distribution in the Pacific salmon, in which the infection takes place in August and September (Notes on the occurrence of Acanthocephala in Pacific fishes - in the press).

The intermediate host of E. gadi on the Atlantic coast of Canada is unknown. Several species of Amphipoda have been found to serve in this capacity in European waters and, on the Pacific coast of Canada also an amphipod has recently been found to be an intermediary host (Notes on Acanthocephala in Pacific fishes - In the press).

The haddock is a bottom feeder and there is no doubt many species of Amphipoda contribute to its diet in Canadian waters. It is exceedingly probable, therefore, that the intermediary host of E. gadi will be found amongst these.

Corynosoma strumosum (Rudolphi).

Syn.: Echinorhynchus strumosus Rud.
" ventricosus Rud.
" gibbosus Rud.
" hystrix Bremser
" gibber Olsson
" striatus Villot.

Larval forms of this species were found encysted in the mesenteries of two haddock and altogether three individuals were found. The length of the body is 5 to 6 mm. and they are easily recognised by the swollen anterior region and slender posterior region of the body. The anterior region is covered with cuticular spines which reach farther posteriorly on the ventral surface than on the dorsal surface. Good descriptions of this species are given by Lühe (1911) and by Meyer (1932).

Fish serves for this parasite as the intermediary carried. When introduced into the fish by the first intermediary host, a crustacean, the parasite makes its way through the intestinal wall of the fish where it becomes encysted and remains without further development until it reaches its definitive host, a marine mammal or a fish-eating bird, in the intestine of which it becomes sexually mature.

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