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Parasitology

**PARASITE FAUNA OF THE GREENLAND HALIBUT,  
*REINHARDTIUS HIPPOGLOSSOIDES* (WALBAUM, 1792) FROM LABRADOR AREA**

**FAUNA PASOŻYTNICZA HALIBUTA NIEBIESKIEGO  
*REINHARDTIUS HIPPOGLOSSOIDES* (WALBAUM, 1792) Z REJONU LABRADORU**

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Nineteen parasite species, belonging to: *Protozoa*, *Monogenea*, *Cestoda*, *Trematoda*, *Nematoda*, *Acanthocephala* and *Crustacea*, were recovered from the examined specimens of Greenland halibut from Labrador fishing grounds. Prevalence and intensity of infection of particular parasites as well as their location in or on the host were determined. Attention was given to parasites harmful for humans.

**INTRODUCTION**

Parasite fauna of Greenland halibut *Reinhardtius hippoglossoides* (Walbaum, 1792), one of the most demanded commercial species in the world's catches is relatively poorly known. Hitherto existing reports on the subject are based mainly on the small number of the fish examined and therefore are not very representative.

One of the earliest data on the host's parasites was from the Barents Sea (Poljanskij 1955). During his study on fish parasites in the above mentioned sea area the author, found only 6 parasite species in two individuals of Greenland halibut (1 *Protozoa*, 1 *Cestoda*, 2 *Trematoda* and 2 *Nematoda*). The Greenland halibut was also an object of study in Mamaev et al. (1963) work dealing with fishes of the family *Pleuronectidae* from the North Pacific. The authors necropsied 13 fishes of the species, caught in Kamtchatka Bay and 7 fishes from Avacinski Bay. They recovered a total of 21 parasite species from the material studied. Most of them belonged to the class *Trematoda* (11 species). Additionally the authors stated occurrence of 5 *Cestoda*, 3 *Nematoda* and 2 *Acanthocephala* species.

A list of the Greenland halibut's parasites from Atlantic coast of Canada, based on the other publications was prepared by Margolis and Arthur (1979). It contained data on three *Trematoda* species and one *Nematoda* gen. sp. only.

A review of the parasitic fauna of the Greenland halibut from the North Atlantic was published by Zubchenko (1980) and subsequently by Reimer (1981). The principal aim of Zubchenko's study was to compare parasite faunas of *Pleuronectidae* and *Anarhichadidae* from the fishing grounds situated between Newfoundland coast and Baffin Land. The material of the Greenland halibut was limited here to 20 individuals only, in which the author stated occurrence of 16 parasitic species of different higher taxa (from *Protozoa* to *Crustacea* inclusively).

More detailed study on the Greenland halibut, based on quantitatively more abundant material was presented by Reimer (1981). Within 1973–1977 he examined 55 fishes from Davis Strait and 73 individuals caught near the Bear Island. The author found 23 parasitic species in Davis Strait and 9 near the Bear Island. *Protozoa* were not included however in Reimer's publication.

The results of preliminary survey concerning parasite fauna of the Greenland halibut from Labrador fishing grounds were presented by Wierzbicka (1987) as a short report.

Apart from the above mentioned works, covering in general the parasite fauna of Greenland halibut, some more detailed papers exist. Among them Rokicki's (1982) work dealing with parasitic crustaceans of the host from Labrador fishing grounds. Furthermore Wierzbicka (1989) described new species of crustacean *Hatschekia reinhardtii* from the North Pacific. The description of the new genus and the new species of protozoan *Schulmania quadricola* gave Kovaleva et al. (1983). The works of Wierzbicka (1986, 1990) were devoted to the morphology of protozoans of the Greenland halibut.

The aim of this study is to know in detail the parasite fauna of the Greenland halibut from the North-West Atlantic and in particular Labrador area, with taking into consideration all higher taxa of parasites. The estimation of the infection rate and especially the occurrence of the pathogenic to man parasites in the Greenland halibut as well as their location in the host may be useful for processing of the fish and may have a practical aspect.

## MATERIAL AND METHODS

Fishes for the present study were taken from the North-West Atlantic. Detailed coordinates were: 53 20 N and 52 20 W. The material was caught on 26 June 1976 and was subsequently frozen below  $-20^{\circ}\text{C}$ . A total of 155 individuals of the Greenland halibut, *Reinhardtius hippoglossoides* (Walbaum, 1792) was examined. The dimensions

(longitudo totalis) and the weights of necropsied fishes ranged from 24.4 to 73.3 cm and from 75 to 4030 g respectively.

Fishes were put through detailed parasitological examination. The following tissues and organs were examined at necropsy: skin, fins, eyes, nostrils, gills, mouth cavity, body cavity, stomach, intestine, liver, gall bladder, heart, kidney, urinary bladder, spleen, gonads and musculature. Temporary mounts of the eye lenses and vitreous humours as well as all gill arches were observed under the stereoscopic microscope. Digestive tract was studied using the sedimentation technique. Muscles, liver and gonads were comminuted and then checked microscopically. Suspended matter from the gall-bladder, smears of urinary bladder, nostrils and gills as well as the tissue sample squashes taken from visceral organs and from muscles were additionally checked under compound microscope.

In the case of: *Monogenea*, *Cestoda*, *Trematoda* and *Acanthocephala*, all parasites found were fixed in 75% ethanol, usually after being slightly flattened. Then they were stained in carmine alum or carmine borax and after being dehydrated in alcohol series, mounted in Canada balsam. Isolated *Nematoda* specimens were preserved in 5% formalin solution in physiological liquid. Parasites of the group as well as some acanthocephalans (not flattened) were cleared with glycerol and identified without making permanent mounts. Collected *Crustacea* were fixed in 5% formalin solution. The method for studying parasitic protozoans was given by Wierzbicka (1990).

## RESULTS

Nineteen parasite species were found in the examined Greenland halibut from Labrador area. There were: 4 *Protozoa*, 1 *Monogenea*, 2 *Cestoda*, 7 *Trematoda*, 2 *Nematoda*, 2 *Acanthocephala* and 1 *Crustacea* among them. The prevalence and the intensity of infection varied among parasite species (Tab. 1).

The most prevailing protozoan species was *Ceratomyxa drepanopsettae*, found in the gall-bladder of all fish specimens studied (Tab. 1). The intensity of infection for this parasite was also high; 20.1% of fishes harboured spores occurring very numerously or in masses; 34.2% of hosts -spores occurring numerously. *Paramyxoproteus reinhardti* found in the urinary bladder and *Myxidium incurvatum* parazitizing gall bladder turned out to be common parasites of the fish population studied (Tab. 1). The fourth species: *Ortholinea divergens* occurring in the urinary bladder appeared to be moderately prevalent (41.9%) parasite of the Greenland halibut in the area studied. The intensity of infection of the above mentioned parasites was, like the prevalence, relatively high (Tab. 1). Very numerous and occurring in masses spores of *P. reinhardti*, *O. divergens* and *M. incurvatum* were found in 19.5%, 18.5%, and 5% of the fishes respectively. Intensity of infection in the remaining infected fishes varied from single to numerously occurring spores.

Table 1

Infection details for the Greenland halibut *Reinhardtius hippoglossoides*  
from Labrador area

Species	Prevalence	Intensity	Mean
Protozoa — Myxosporidia			
<i>Ceratomyxa drepanopsettae</i> Awerinzew, 1908	100.0	single — mass <sup>x</sup>	
<i>Myxidium incurvatum</i> Thélohan, 1892	66.7	single — very numerous	
<i>Ortholinea divergens</i> (Thélohan, 1895)	41.9	single — mass	
<i>Paramyxoproteus reinhardti</i> Wierzbicka, 1986	79.35	single — mass	
Monogenea			
<i>Entobdella</i> sp.	0.6	1	1
Cestoda			
<i>Grillotia erinaceus</i> (van Beneden, 1858), pl.	0.6	1	1
<i>Scolex pleuronectis</i> Müller, 1788, pl.	76.8	1–57	8.55
Trematoda			
<i>Fellodistomum furcigerum</i> (Olsson, 1867)	9.0	1–69	7.21
Yamaguti, 1954			
<i>Stenacron vetustum</i> Stafford, 1904	78.1	1–30	4.02
<i>Steganoderma formosum</i> Stafford, 1904	12.3	1–8	2.84
<i>Hemiurus leviseni</i> Odhner, 1905	1.3	1–25	13.00
<i>Derogenes varicus</i> (Müller, 1784) Looss, 1901	52.3	1–23	2.34
<i>Genarchopsis mülleri</i> (Levinson, 1881)	0.6	1	1
Yamaguti, 1954			
<i>Lecithaster gibbosus</i> (Rudolphi, 1802), Lühe, 1901	35.5	1–7	1.56
Nematoda			
<i>Anisakis simplex</i> (Rudolphi, 1809), Dujardin, 1845, larva	37.4	1–6	1.83
<i>Thynnascaris adunca</i> (Rudolphi, 1802), larva III st.	91.0	1–42	4.14
Acanthocephala			
<i>Echinorhynchus gadi</i> Zoega in Müller, 1776	7.7	1–48	1.08
<i>Corynosoma strumosum</i> (Rudolphi, 1802), larva	0.6	1	1
Crustacea			
<i>Neobrachiella rostrata</i> (Krøyer, 1837)	23.2	1–4	1.17

prevalence — % of fishes infected

intensity — intensity of infection (number of parasites in a particular host specimen studied)

mean — average number of parasites per infected fish in the studied population

<sup>x</sup>levels of intensity for protozoans: single — single spores (in suspension or smear) under the coverslip, not numerous — spores occurring in small numbers, up to 10 spores per 30 high power (x 400) fields, numerous — about 50 spores per 30 high power fields, very numerous — 5 to 10 spores per 1 high power field, mass — mass occurring spores, more than 10 spores per 1 high power field.

*Monogenea* was represented by one specimen assigned to the genus *Entobdella* Blainville in Lamarck, 1818. This is a parasite sporadically found on the gills of the Greenland halibut. The only one individual was found in the sample studied (Tab. 1). Obscure position of the hooks of the opisthaptor made the identification to species level impossible.

There were two *Cestoda* species recovered (Tab. 1). One of them – *Scolex pleuronectis* appeared to be a common parasite of the Greenland halibut from Labrador area (Fig. 1). The tapeworm's larvae occurred in the intestine of the fishes examined. The second species – *Grilolia erinaceus* was very rare parasite of the host studied. There was found only one larva encysted in the stomach wall.

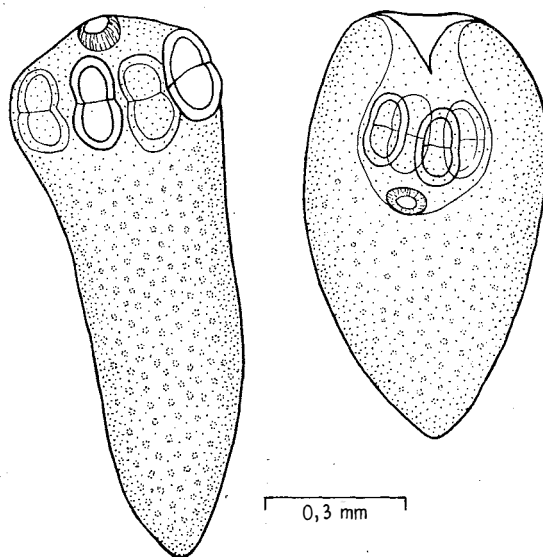


Fig. 1. *Scolex pleuronectis* plerocercoids from the intestine of the Greenland halibut

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The most numerous represented flatworm group was *Trematoda*. Seven parasite species of the class were separated from the collected material. They were exclusively adult forms inhabiting digestive tract. The most prevalent was *Stenacron vetustum* parasitizing intestine and *Derogenes varicus* from the stomach (Tab. 1). Moderately prevalent (35.5%) was intestinal fluke *Lecithaster gibbosus*. Other intestinal flukes: *Steganoderma formosum* and *Fellodistomum furcigerum* were being less frequently found in the material studied. *Hemiurus levinsemi* and *Genarchopsis müll-*

*leri* found in the stomach of two and one fishes respectively turned out to be the rarest parasites. Systematic position of the above mentioned parasites have been adopted after Yamaguti (1971).

Two nematode species were found in the studied material. *Tynnascaris adunca* larvae were the most common parasites of the Greenland halibut in the area (Tab. 1). They occurred encysted in various organs of the body cavity. Most of the nematodes were observed on the intestine walls and between the pyloric caeca (39.6% \*), on the stomach (26.5%) and on the liver (21.7%). Other species *Anisakis simplex* moderately high prevalent (37.4%) parasite of the fish necropsied. Encysted larvae, likewise those of *Th. adunca*, settled mainly in the body cavity on the same organs. Their distribution, however was slightly different. The majority of the parasites were recovered from the liver (45.3%) and from the stomach (28.3%). One larva was found in the muscles on the dorsal side, near the head. The larval forms of both species were in the third developmental stage.

There were also two *Acanthocephala* species recorded. The prevalence of *Echinorhynchus gadi* infection of the Greenland halibut was relatively low (7.7%). The parasite was being found in the intestine of the fishes necropsied. *Corynosoma strumosum* was a sporadically recorded parasite of the host studied. The only one encysted larva was recovered from the body cavity.

Recorded crustaceans *Neobrachiella rostrata* can be count among slightly more prevalent parasite (23.2%) of the fishes surveyed. Females of the species occurred along interbranchial septum (52.5% of the recorded individuals), on gill arches and gill filaments (19%), on the skin (19%) and on the inner side of the gill cover, attached to the pseudobranchs (9.5%).

## DISCUSSION

The survey conducted on the Greenland halibut revealed that parasite fauna of the host from the North West Atlantic was marked by relatively ample species composition and very variable prevalence of the particular parasites. The number of parasites recovered from my material (19 species) was slightly higher compare with the bibliographic data dealing with the host. According to the other authors, from 6 species in the Barents Sea (Poljanskij 1955) to 16 species in the North-West area (Zubchenko 1980) were recorded from the Greenland halibut in the North Atlantic. The more scanty parasite set reported by those authors resulted probably from relatively small number of the fish examined especially referring to the Barents Sea.

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\* total number of parasites of a taxon have been assumed as 100%.

The Greenland halibut parasite fauna from Labrador area described by myself, approximates, to a certain degree Zubchenko's (1980) data. The fishes examined by him came from the North-West Atlantic waters, between Newfoundland and Baffin Land. It could be easily concluded that it came also from Labrador fishing grounds. Certain similarities between Zubchenko's results and mine data lies in similar infection rates for the following parasites: *Scolex pleuronectis*, *Derogenes varicus*, *Lecithaster gibbosus* and *Anisakis* sp. *Grilotia erinaceus* and *Corynosoma strumosum* larvae were the parasites unfrequently recorded by Zubchenko and also occurred occasionally in my own material from Labrador area. Infection with protozoans and *Tynnascaris adunca* larvae was generally lower in Zubchenko's material than it was in mine. Certain differences in the protozoan species composition, compare with the quoted author's results were discussed in Wierzbicka (1990) work. As a proof of individual character of my results, compare with the Zubchenko's data can be considered lack in his records trematode *Stenacron vetustum*, a common parasite on the Labrador fishing grounds. He recorded very often however the species' occurrence in the North West Atlantic in the Atlantic halibut *Hippoglossus hippoglossus* and other representatives of *Pleuronectidae*. Observed dissimilarity in the Greenland halibut infection with this parasite my result from the small number of the fishes examined by Zubchenko, or from collecting the material from the other fishing ground of slightly different ecological conditions.

One can find certain similarity in parasite fauna of the Greenland halibut from Davis Strait and the Labrador fishing ground, if compare my results with those of Reimer (1981). The latter referred, mainly to the species composition of the metazoan parasites. Interesting feature of the Reimer's work was reporting, among the others, a trematode *Bucephalopsis gracilensis* (Rudolphi, 1819) and cestode larva *Bothriocephalus* sp. in the specimens from the Davis Strait exclusively. It indicates the individual character of the Greenland halibut parasite fauna in this area. It is also important to pay attention to the trematode *Lecithaster confusus* Odhner, 1905 and nematode larvae *Phocascaris* sp. recorded by Reimer in the Greenland halibut specimens from Davis Strait and Bear Island. I haven't observed those parasites in my own material. I found however, the other trematode of the same genus: *L. gibbosus*. It's prevalence in the Greenland halibut from Labrador fishing grounds approximates those of *L. confusus* from Davis Strait. The cestode larvae: *Scolex pleuronectis* Müller, 1788 (= *S. polymorphus* Rudolphi, 1819), were recorded in the Greenland halibut by many investigators (Poljanskij 1955, Mamaev et al. 1963, Zubchenko 1980, Reimer 1981). Those authors gave neither description nor drawing of the parasites found. *S. pleuronectis* is probably a collective name for the larvae of various species of the *Tetraphyllidea* order (Strelkov 1960, Žukov 1960, Dubinina 1962, Grabda J. 1981). Žukov (1960), while being studying fishes from the Sea of Japan and from the waters from South Kurilien shelf, found in the digestive tract of 35 host species and in the gall bladder

of 21 species, as many as four kinds of those larvae which differed from each other in their attachment organs. One of the forms from the gall bladder of *Hemitripterus villosus* (Cottidae) resembled the prerocercoids observed in my material. I found only one form of the larva in the individuals of the Greenland halibut from the fishing grounds of the North Atlantic and Bering Sea (unpublished material) (Fig. 1). They are very close morphologically to the plerocercoids described from the digestive tract of capelin *Mallotus villosus* (Osmeridae) of the North Atlantic (Palsson, Beverley-Burton 1984). Also the ranges of their attachment organs dimensions match each other. Only the length and width of the larvae from the Greenland halibut were slightly greater compare with the Palsson's and Beverley-Burton's data.

Among the parasites found, the nematode larvae *Anisakis simplex*, deserved attention. This is a species pathogenic for man, and it was highly prevalent in the studied population of the Greenland halibut from the Labrador area (Tab. 1). The intensity of infection, however, was relatively low. Up to 6 larvae were observed, an average being 0.68 nematodes per fish for the whole population studied. The parasites settled mainly in the body cavity, whereas very seldom in the muscles (0.9%). Nevertheless it is necessary to use the processing technologies which kill *A. simplex* larvae to prevent human infections. One of the basic methods is deep freezing.

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FAUNA PASOŻYTNICZA HALIBUTA NIEBIESKIEGO, *REINHARDTIUS HIPPOGLOSSOIDES*  
(WALBAUM, 1792) Z REJONU LABRADORU

STRESZCZENIE

Szczegółowym badaniom parazytologicznym poddano 155 osobników halibuta niebieskiego. Materiał był złowiony 26 czerwca 1976 r. Wymiary sekcjonowanych ryb wynosiły 24,2–73,3 cm (longitudo totalis), masa 75–4030 g.

W badanych halibutach niebieskich z łowiska Labradoru znaleziono 19 gatunków pasożytów należących do: Protozoa (4 gatunki), Monogenea (1), Cestoda (2), Trematoda (7), Nematoda (2), Acanthocephala (2) i Crustacea (1). Zarażenie poszczególnymi pasożytami było bardzo zróżnicowane i wynosiło od 0,6 do 100% (tab. 1). Występowały one w różnych narządach, najczęściej osiedlały się w jamie ciała. W mięśniach znaleziono tylko pojedyncze larwy nicienia *Anisakis simplex*. Jest to gatunek chorobotwórczy dla człowieka, który w badanej populacji halibuta niebieskiego stwierdzano dość często (37,4% zarażenia). W związku z tym należy stosować obowiązujące metody w przetwórstwie rybnym, które zabezpieczają człowieka przed zarażeniem.

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