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Fish parasitology

PARASITIC PROTOZOA OF A GREENLAND HALIBUT  
*REINHARDTIUS HIPPOGLOSSOIDES* (WALBAUM, 1792)

PASOŻYTNICZE PIERWOTNIAKI HALIBUTA NIEBIESKIEGO,  
*REINHARDTIUS HIPPOGLOSSOIDES* (WALBAUM, 1792)

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A detailed description of morphology of three protozoan species found in the gall bladder and urinary bladder of the Greenland halibut is given. The fishes were caught in the North Atlantic and the Pacific. Drawings of spores and their dimensions are also given. One of the four found species is described for the first time in the Greenland halibut.

INTRODUCTION

So far, parasitic Protozoa of the Greenland halibut have been studied relatively rarely. Poljanskij (1955) mentioned them in this host from the Barents Sea. Wierzbicka (1987) mentioned parasites from this group off the Labrador. According to Šulman's (1966) elaboration the Greenland halibut is parasiting only by one species *Ceratomyxa drepanopsettae*. Lately Kovaleva's et al. (1983) paper has been published on protozoans of *Myxoproteidae* fam. nov. parasiting on marine fish. Among others species, the authors described a new genus and species—*Schulmania quadrilobata* found in the gall bladder of *Reinhardtius hippoglossoides* and *Atheresthes evermani*. The fish they investigated came from the Atlantic and the Pacific Ocean. In 1986 Wierzbicka also described a new genus and species—*Paramyxoproteus reinhardti* in the gall bladder of this host.

The protozoans discovered during my investigations of the Greenland halibut differ slightly morphologically from so far described and require further more precise descriptions or some supplements and comments.

## MATERIAL AND METHODS

The fish examined came mainly from the North Atlantic. Individuals from off the Labrador and the Barents Sea were caught on June 6.1976 and May 26.1977, respectively and frozen to below  $-20^{\circ}\text{C}$  on board. 155 specimens of the Greenland halibut, *Reinhardtius hippoglossoides* (Walbaum, 1792) from off the Labrador were studied, and 106 specimens from the Barents Sea. The total length (longitudo totalis) and weight of the fish examined were found to range within 24.2–77.5 cm, and 75–5140 g, respectively.

In addition seven Greenland halibute specimens from the North Pacific were examined. The North Pacific sample was obtained in spring 1981 from the eastern Bering Sea. Their total length (longitudo totalis) and weight ranged within 55.5–82.5 cm and 1530–6200 g, respectively.

Skin, fins, nostrils, gall bladder, kidney and urinary bladder were examined. Muscles were checked for the presence of protozoans as well. When stronger infection was observed, parts or scrapes of infected organ and the content of gall bladder was preserved in 5% formalin for further study. Some observations referred to protozoans were also made on unstained samples (immediately after thawing). Spores were measured according to Šulman's (1966, 1984) outline. All measurements are given in micrometers.

## RESULTS

In the examined specimens of the Greenland halibut were found to harbour four protozoan species belonging to the order *Bivalvulida*.

*Ceratomyxa drepanopsettae*, Awerinzew, 1908

Location in hos: gall bladder

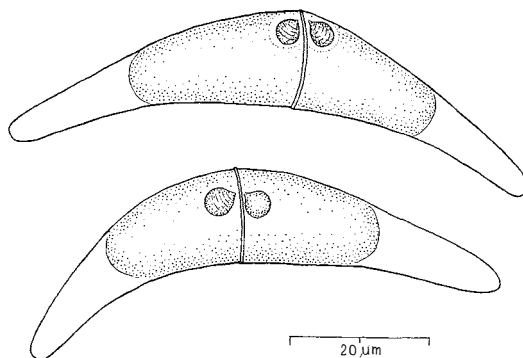


Fig. 1. Spores of *Ceratomyxa drepanopsettae* (from the Atlantic off the Labrador)

Only spores were found (Fig. 1,2,3). According to my observations spores are lightly arcuately curved and a little assymetrical in shape. The foremost margin of spore, by which lie polar capsules, is more curved than the posterior one. Ends of the spore are somewhat narrowed and bluntly pointed. The suture line-straight and rather well-visible, shell thin and delicate. Two polar capsules, almost spherical shaped with short narrowed

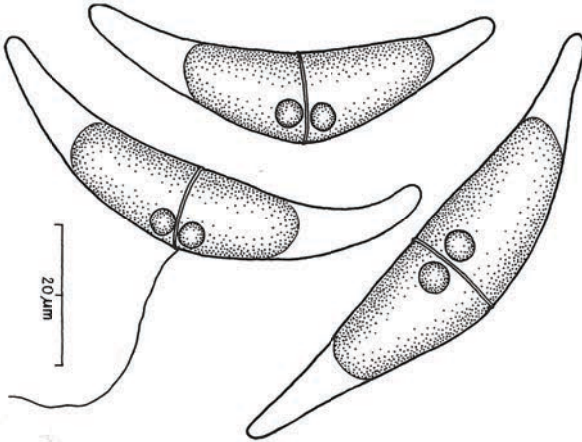


Fig. 2. Spores of *Ceratomyxa depanopsettae* (from the Pacific- the Bering Sea)



Fig. 3. Spores of *Ceratomyxa drepanopsettae* from fish heavily infected (from the Barents Sea)

outlet canals are situated close one to another, in the anterior part of spore, very close to suture line. The sporoplasm does not fill the narrowed ends of spore. A thin membrane can be seen in some spores, separating polar capsules from sporoplasm (Fig. 1).

Dimensions of spores (preserved sample)

	Off the Labrador (26 spores measured)	The Bering Sea (26 spores measured)
Length of spore	12.4–15.0(13.62±0.80)μ*	12.0–13.2(12.57±0.51)μ
Width of spore	56.0–79.0(69.71±5.72)μ	54.0–70.0(64.60±4.14)μ
Width of polar capsules	3.6–4.4 (3.96±0.27) μ	3.6–4.4 (3.79±0.24) μ

*Myxidium incurvatum* Thélohan, 1892

Location in host: gall bladder

According to my observations the parasite spores are elongated, rather strongly s-shaped, with sharply pointed ends (Fig. 4). Margins of the spore between polar capsules

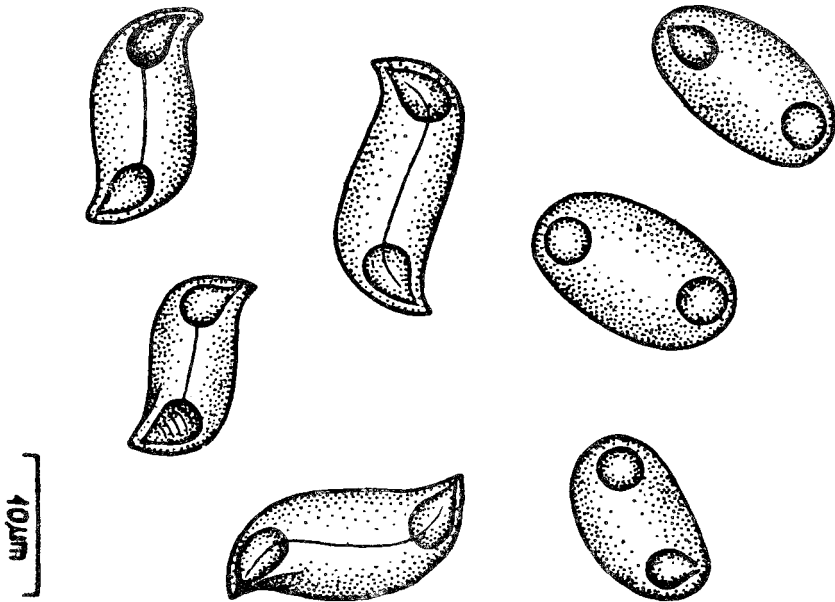


Fig. 4. Spores of *Myxidium incurvatum* (from the Atlantic-off the Labrador)

\* Arithmetical mean and standard deviation of the sample are given in brackets, respectively. This explanation refers to all dimensions given.

are parallel to each other. Polar capsules are pyriform, with sharply pointed ends. Suture line faint, extends parallel to the lateral margins, then turns to the narrowed ends of spore. Surface of the spore is smooth, without striae. The sporoplasm is placed between polar capsules.

#### Dimensions of spores (preserved sample)

	Off the Labrador (30 spores measured)	The Bering Sea (22 spores measured)
Length of spore	12.0–16.8 (14.47±1.23)μ	13.6–16.4 (15.07±0.99) μ
Width of spore	7.2–8.8 (8.23±0.41) μ	7.6–8.8 (8.16±0.40) μ
Thickness of spore	5.6–7.6 (6.77±0.55)μ	7.2–8.0 (7.54±0.36) μ
Length of polar capsules	3.6–4.8 (4.21±0.35)μ	4.0–4.8 (4.45±0.28)μ
Width of polar capsules	2.4–3.2 (2.67±0.27)μ	2.4–3.2 (2.75±0.25)μ

#### *Ortholinea divergens* (Thélohan, 1895)

Location in host: urinary bladder

The spores found in examined material are nearly spherical in the suture line plane, and flattened in the perpendicular plane (Fig. 5). The thickness of spore is much smaller

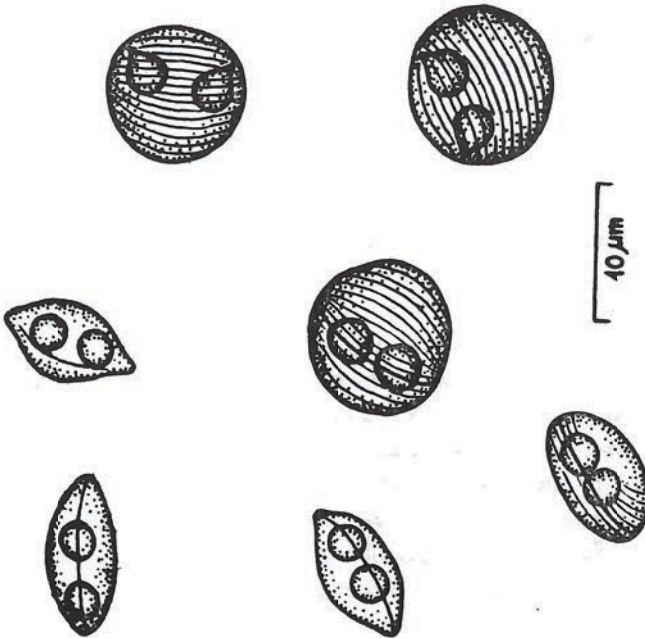


Fig. 5. Spores of *Ortholinea divergens* (from the Barents Sea, unpreserved sample)

than the width. All surface is covered by subtle striae. Two pyriform-spherically shaped polar capsules are placed close to the frontal margin in the suture line plane. Polar capsules with short and sharply pointed outlets are situated in long distance from each other, nearly on opposite sides of spore. The sporoplasm is situated below polar capsules.

#### Dimensions of spores from the Barents Sea

	(unpreserved sample, 10 spores measured)	(preserved sample, 25 spores measured)
Length of spore	8.0–10.0 (9.17±0.78) μ	8.0–8.8 (8.34±0.36) μ
Width of spore	8.8–10.0 (9.44±0.39) μ	8.0–9.2 (8.37±0.34) μ
Thickness of spore	4.8–5.4 (5.12±0.30) μ	4.8–6.8 (5.90±0.57) μ
Width of polar capsules	—	2.4–3.2 (2.62±0.26) μ
Length of polar filaments	about 20.0 μ	—

Vegetative stages of the three previous described species were difficult to identify since the examinations were made on frozen material.

#### *Paramyxoproteus reinhardti* Wierzbicka, 1986

Location in host: urinary bladder

The precise description of spores of this species and characterization of a new found genus *Paramyxoproteus* was given in Wierzbicka's (1986) work.

Above-mentioned protozoan species were frequent parasites of the Greenland halibut. They were observed, with the exception of *Ortholinea divergens*, in all studied areas. This species was not found in individuals from the Bering Sea only.

## DISCUSSION

The previous available works described two protozoan species of the genus *Ceratomyxa* in the gall bladder of the Greenland halibut. *Ceratomyxa drepanopsettae* has been the most frequently described species (Poljanskij 1955, Šulman 1966, Zubchenko 1980). The second species *C. ramosa* Awerinzew, 1907 is rather typical for the white halibut only (Kudo 1919, Šulman 1966). *C. ramosa* existing in the Greenland halibut was mentioned only by Zubchenko (1980). Presently found spores in specimens of the Greenland halibut from the Bering Sea, the Barents Sea and off the Labrador do not differ essentially from described earlier. The spores were most similar in dimensions and morphology to this of *C. drepanopsettae*. However hitherto descriptions are not very precise. The drawings by Kudo (1919) and Šulman (1966) describe the spores with distinctly elongated, pyriform polar capsules, while in examined material polar capsules were always almost spherical (Fig. 1, 2, 3).

The next parasite, *Myxidium sphaericum* Thélohan, 1895 was mentioned by Zubchenko (1980) in the gall bladder of the Greenland halibut from the North-West

Atlantic. However the author didn't affix neither description nor drawings of the found sporozoan. Earlier, these protozoans were observed only in fish of the genus *Belone* (Kudo 1919, Pogorelceva 1964, Šulman 1966). Present study based on a large amount of examined specimens, has showed occurrence of the different species.—*M.incurvatum* (Fig. 4). This species differs completely from the former with the shape of spore. Protozoans *M. incurvatum* are common parasites of many marine fishes, flatfish among them (Kudo 1919, Pogorelceva 1964, Šulman 1966). Presently this species has been described in the Greenland halibut for the first time.

*Ortholinea divergens* has been found in the urinary bladder of examined fishes. Zubchenko (1980) mentioned this species also in the Greenland halibut. Comparing morphology of the found spores with those previous described (Kudo 1919, Šulman 1966) some differences in the shape of polar capsules were observed. The former authors maintain that polar capsules are pyriform (considerably elongated). According to own observations they appeared to be pyriform-spherical-shaped (Fig. 5). Moreover, the thickness of spores is a little smaller (4.8–6.8  $\mu\text{m}$ ) than this described in pre-cited literature (8.0  $\mu\text{m}$ ). According to Moser and Noble (1977) the thickness of spores ranged from 6.5 to 8.0  $\mu\text{m}$ . The authors found this protozoan in the gall bladder of *Coelorhynchus coelorhynchus carminatus* (*Macrouridae*). It has been described only in renal tubules and the urinary bladder.

There are known two others sporozoan species parasiting on the urinary bladder of the Greenland halibut. The first-*Schulmania quadrilobata* was described as a new genus and species by Kovaleva et al. (1983), the second-*Paramyxoproteus reinhardti* by this article author. Features distinguishing these two protozoans were given in Wierzbicka (1986). It's suprising however that in relatively great studied material, spores morphologically adequate to these described as *S. quadrilobata* have not been found. Whereas spores described as *P. reinhardti* have been observed very often.

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*REINHARDTIUS HIPPOGLOSSOIDES* (WALBUM, 1792)

STRESZCZENIE

Badane ryby pochodziły z północnego Atlantyku (łowisko Labradoru i Morze Barentsa) oraz z północnego Pacyfiku (Morze Beringa). Łącznie zbadano 268 osobników halibuta niebieskiego. W materiale tym znaleziono cztery gatunki pierwotniaków. Należały one do rzędu *Bivalvulida*. Stwierdzone pasożyty występowały w woreczku żółciowym lub w pęcherzu moczowym.

W pracy podano szczegółowy opis morfologiczny trzech znalezionych gatunków pierwotniaków. Zamieszczono także wymiary i rysunki spor tych pasożytów.

Po raz pierwszy stwierdzono występowanie w halibucie niebieskim pierwotniaka *Myxidium incurvatum*.

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