Vol. 5: 107–110, 1988 | DISEASES OF AQUATIC ORGANISMS
Dis. aquat. Org. | Published October 18

Myxosporidian parasite in the isopod *Mesidotea entomon*

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ABSTRACT: The isopod *Mesidotea entomon* (Linnaeus), infected by a myxosporidian parasite tentatively identified as *Myxidium* Butschli, was examined microscopically for histopathological effects and host response. Reproductive organs, digestive system, salivary glands, all tissues except those of the integument, and body cavities were invaded; tissues were displaced and compacted but there was little necrosis. The host response consisted of hemocytic infiltration, phagocytosis, and encapsulation. This is the first report of a myxosporidian parasite occurring in this species.

INTRODUCTION

Protozoan infections are uncommon in populations of feral isopods representing the genus *Mesidotea* Richardson. This report documents the first record of a myxosporidian parasite, tentatively identified as *Myxidium* Butschli, infecting a population of *Mesidotea entomon* (Linnaeus) in the southern Beaufort Sea. Since the isopod is an important component of the benthic fauna of this region, acting as a highly efficient scavenger (Bray 1962, McCrimmon & Bray 1962, Wacasey 1975, Wacasey et al. 1977, Percy & Fife 1980, Korczynski 1983), its parasitization was considered an important problem to investigate.

MATERIAL AND METHODS

Isopods *Mesidotea entomon* (L.) were collected during the ice-free period at 5 to 10 m water depths in Pauline Cove, Herschel Island, Yukon Territory (69°33′ N, 138°58′ W), over a 4 yr period to examine the life history of the species (Korczynski 1983). I selected at random 140 specimens – juveniles, sexually immature and mature females and males – for analyses. Infected isopods in the collection did not exhibit gross pathological signs to indicate infection, although biochemical analyses of the body tissues of isopods did exhibit skewed carbohydrate and lipid levels (Korczynski 1983). This prompted a histopathological analysis to assess the overall health of the animals. Tissues were decalcified, embedded, and sectioned by standard histotechniques, and stained in hematoxylin and eosin (Luna 1968). The fixed tissues were examined using light microscopy.

RESULTS

Thirty-four (24.3 %) of the 140 isopods examined were parasitized by the myxosporidian. Within the individual life stages, the percentages infected were 10.0 % of the juveniles (2/20), 3.3 % of the sexually immature females (1/30), 16.7 % of the sexually immature males (5/30), 36.7 % of the sexually mature females (11/30), and 50.0 % of the sexually mature males (15/30). Several parasitized isopods (10 %) had missing pereopods, but there was no scarring or open wounds on body surfaces.

Description of the protozoon

The myxosporidian was tentatively identified as *Myxidium* sp. based on the morphology of the spore. The mature spore (Fig. 1a) is ellipsoid and the sporoplasm is binucleated and enclosed by 2 valves. The shape of the spore and polar capsules were, however, distorted by preservation; unfortunately, no live material was available. The distortion caused by the preservative may in fact be responsible for the low number of spores (n = 4) observed. Spore dimensions were as follows: mean length 13.3 + 1.4 µm (n = 4); mean width 3.4 + 0.7 µm (n = 4). The young

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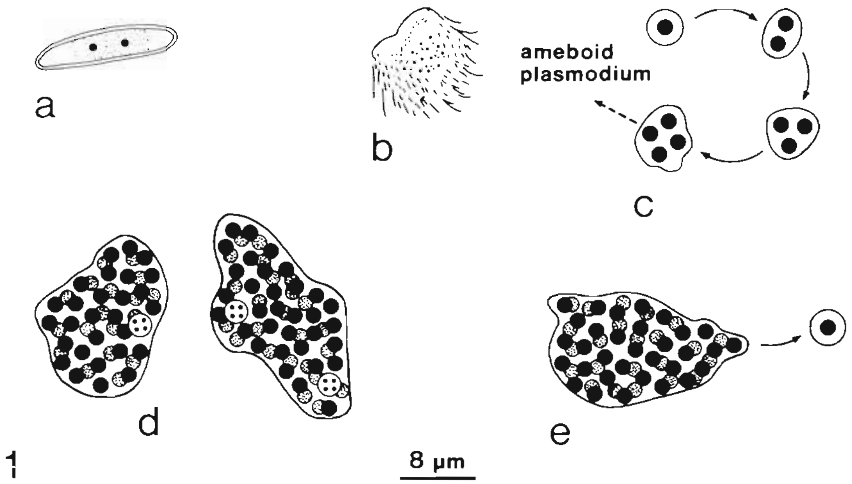


Fig. 1. *Myxidium* sp. (?) (a) Mature spore, (b) young trophozoite, (c) schizogony, (d) ameboid plasmodia showing reduction division, (e) external budding of a plasmodium

trophozoite (Fig. 1b) is rounded with slender pseudopodia and several nuclei. Trophozoite dimensions were 10.7 + 0.4 µm (n = 2) in mean length and 8.1 + 0.7 µm (n = 2) in mean width. The zygote undergoes schizogony (Fig. 1c), resulting in large irregularly shaped ameboid plasmodia (Fig. 1d). Also, large numbers of uninucleated buds resulted from the external budding of the plasmodia (Fig. 1e). Sporogony was not evident, although the process of reduction division occurred in several plasmodia (Fig. 1d).

Histopathology

The spore was found only in the digestive tract, suggesting that it enters the host by ingestion. Once the animal becomes infected, feeding does not appear to be sustained at regular intervals as shown in most parasitized isopods (55 %) which had an empty or partially empty digestive tract. Zygotes were also observed in the gut remains of the digestive tract.

Using light microscopy, observations indicated the protozoon invaded the body cavities and all tissues except those of the integument. In particular, muscle (Fig. 2) and connective tissues (Fig. 3) were infected at all levels of intensity. Penetration into the tissues resulted in some displacement and compaction of normal tissue. Some degeneration and necrosis of tissue was evident in heavily parasitized isopods.

Of the parasitized hosts 17 (50 %) had massive systemic infections in which the ovaries or testes were infected. Ovaries, although infected, were not ruptured, and development of the female gonads is not believed to have been inhibited. Testes were also infected, but no halt in the production of spermatozoa was evident.

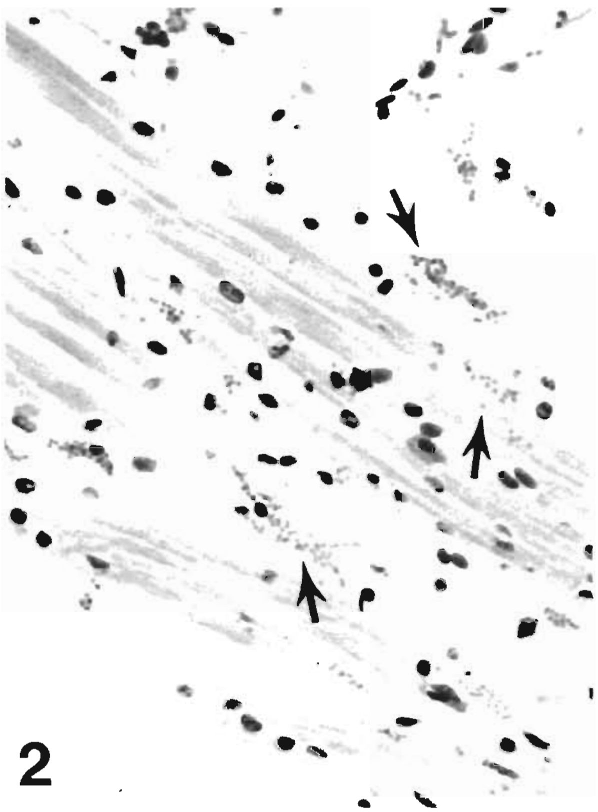
Host response

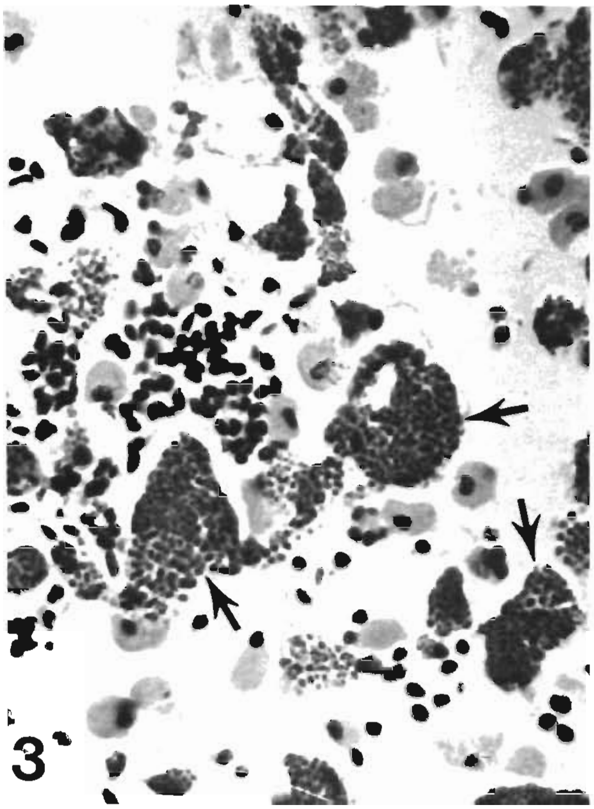
The isopod elicited several responses towards the invading protozoon. Most apparent was hemocytic infiltration of agranulocytes and granulocytes, and phagocytosis of the uninucleated buds. In addition, hemocytic encapsulation of the protozoon was observed but melanization was not seen. Capsules were apparent in early and intermediate infections. The capsules (Fig. 4) measured from 55 to 80 µm (n = 4) in diameter.

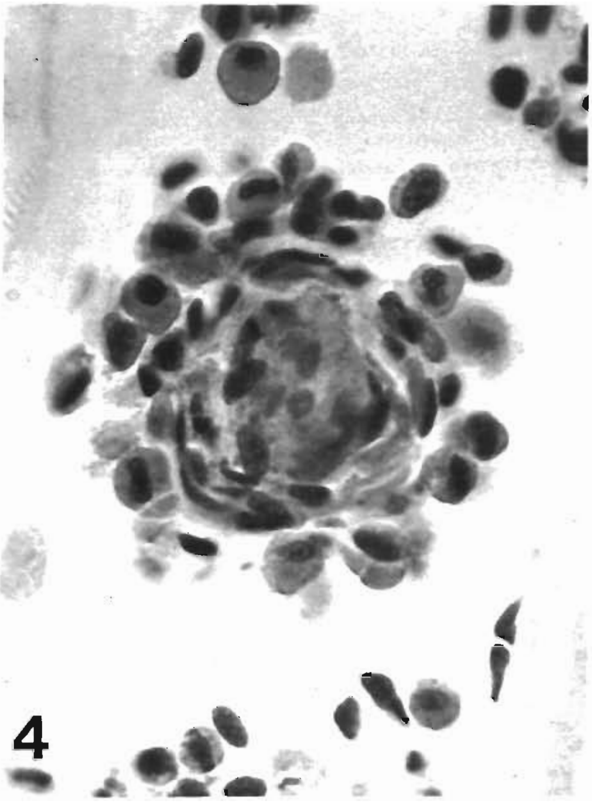
DISCUSSION

The myxosporidian parasite is a systemic pathogen. Fifty percent of the isopods collected had systemic infections, suggesting an epizootic occurred in the Pauline Cove population at the time of sampling. An age-susceptibility relationship is also evident. Myxosporidian infections were more prevalent among the adults (36.7 % of mature females and 50 % of mature males) than among juveniles (10 %), suggestive of adults having a longer exposure period as a result of intensive feeding during the growing stages and an accumulation of parasites over time.

A fisheries survey of Herschel Island waters recorded 10 fish species; 50 % being anadromous of which 84 % consisted primarily of Arctic cisco (*Coregonus autumnalis* (Pallas)) (Baker 1985). Gillnetting in these waters showed large numbers of isopods were scavenging on the captured fish (R. Baker pers. comm.). Although the histology of the fish inhabiting these waters has not been examined, it is hypothesized that transference of the spore occurs directly from the definitive host (fish) to the incidental host (isopod) via the act of scavenging.







Figs. 2 to 4. *Mesidotea entomon*. Fig. 2. Invasion of the myxosporidian (arrows) in the muscle tissue; hematoxylin and eosin, 220×. Fig. 3. Ameboid plasmodia (arrows) of the myxosporidian and granulomatous infiltration in the connective tissue; hematoxylin and eosin, 320×. Fig. 4. Hemocytic encapsulation of the myxosporidian; hematoxylin and eosin, 520×

Myxosporidian parasites are usually found in muscles, gills, urinary bladder, gall bladder, or in other hollow organs of both freshwater and marine fish (Noble & Noble 1973).

Unfortunately only fixed specimens were available for microscopical examination, precluding the viewing of live spores to determine a positive identification of the myxosporidian. Based on the similarities in morphology of the spore and pattern of infection, it is believed that the protozoon is a myxosporidian of the genus *Myxidium* (Polyanskii 1955, Barysheva & Bauer 1957, Nagibina 1957, Noble 1957, 1966, Lom 1970, van Duijn 1972, Li & Desser 1985, Khan et al. 1986). Representatives of the genus *Myxidium* are widely distributed with one of the most common species, *Myxidium incurvatum* Thelohan, invading more than 20 fish hosts belonging to different orders (Laird 1953) from both pelagic and littoral zones and in various climatic and geographic zones (Lom 1970). It would be premature to speculate on the positive identification of the myxosporidian until the spore has been isolated live and studied in more detail.

Acknowledgements. I thank Arctic Laboratories Limited, Inuvik, NWT, for access to the histopathology facilities, and Drs N. D. Levine, E. Porchet, J. Vavra, and V Sprague for viewing and commenting on the protozoon. Special thanks to V. de Jong for preparation of the illustrations.

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Responsible Subject Editor: Dr J. E. Stewart; accepted for printing on July 28, 1988