

## Helminths of the lumpsucker (*Cyclopterus lumpus*) from the Gulf of Gdańsk and Vistula Lagoon (Poland)

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### Abstract

The lumpsucker (*Cyclopterus lumpus* Linnaeus, 1758) is a marine fish inhabiting shallow coastal areas of North Atlantic. In 1996-2006, 224 lumpsucker individuals caught in the Gulf of Gdańsk and Vistula Lagoon (Poland) were examined for metazoan parasites. The fish were found to support the cestode *Eubothrium crassum* (Bloch, 1779), the nematodes *Contracaecum osculatum* (Rudolphi, 1802) L3, *Dichelyne minutus* (Rudolphi, 1819), and *Hysterothylacium aduncum* (Rudolphi, 1802) L3, L4, ad. as well as the acanthocephalans *Corynosoma strumosum* (Rudolphi, 1802) cyst., *Echinorhynchus gadi* Zoega in Müller, 1776, and *Pomphorhynchus laevis* (Müller, 1776). The total (both areas) prevalence of parasites was 63.4% at a mean intensity of 2.1 inds. In the Gulf of Gdańsk, 66.3% of all the lumpsucker examined were infected (intensity 2 inds), the level of infection in the Vistula Lagoon being 46.5% of the fish (intensity 2.3 inds). The Gulf of Gdańsk lumpsucker supported all the parasitic species listed, while 4 species only (*E. crassum*, *H. aduncum*, *E. gadi*, and *P. laevis*) were recorded in the Vistula Lagoon. The dominant parasites were *H. aduncum* (43.3%, 2.1 inds) and *E. gadi* (21.0%, 1.2 inds). All the parasitic species, except *C. strumosum*, are being reported from the southern Baltic lumpsucker for the first time.

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## INTRODUCTION

The lumpsucker (*Cyclopterus lumpus*) is a marine fish species inhabiting shallow coastal areas of North Atlantic. European waters support dwarfed forms of the lumpsucker that grow to the maximum length of 30 cm and occur as far east as the Bothnian Bay in the Baltic Sea. The lumpsucker is rather sedentary and feeds on arthropods, small fish, and coelenterates (Froese and Pauly 2008).

The knowledge of parasitic fauna of the lumpsucker occurring in the southern Baltic is fragmentary only: there is only one record, dating back to the 1930s, on the presence of the acanthocephalan *Corynosoma strumosum* (Markowski 1933).

This paper presents a comparative analysis of helminths found in the lumpsucker caught in two different areas: the Gulf of Gdańsk in the southern Baltic and the Vistula Lagoon, a southern Baltic coastal water body. With its 838 km<sup>2</sup> area (of which 328 km<sup>2</sup> belong to Poland), the Vistula Lagoon is one of the largest southern Baltic lagoons; its mean and maximum depth are 2.6 and 5.1 m, respectively. The Gulf of Gdańsk covers 115 km<sup>2</sup>; its mean and maximum depths are 15.5 and 54 m, respectively (Konracki 2000). Both areas are affected, on the one hand, by riverine runoff (the Vistula Lagoon by the Vistula via Nogat and the Elbląg, Pasłęka, and Pregoła; the Gulf by the Reda) and by the brackish Baltic water on the other. As a result, salinity in both areas varies: the Vistula Lagoon salinity ranges within 2-3.5 PSU (maximum 7 PSU), salinity in the Gulf of Gdańsk averaging 7 PSU (Łonniewski 1958, Kamińska 2004).

## MATERIALS AND METHODS

In 1996-2006, a total of 224 lumpsucker individuals (90-390 g, 14-25 cm) caught in the Gulf of Gdańsk (n=181) and in the Vistula Lagoon (n=43) were examined for the presence of parasites. Gills, body cavity, viscera, and eyes were studied. The helminths collected were fixed in a 95:5 mixture of glacial acetic acid and formalin, and stored in 70% ethanol. For identification, nematodes were cleared in lactophenol, while acanthocephalans were stained with borax carmine, dehydrated in glacial acetic acid, and cleared in benzyl alcohol. Some of the nematodes were embedded in glycerol-gelatine, while some acanthocephalans were mounted in Canada balsam.

## RESULTS

The total (both areas) prevalence of infection was 63.4% at the mean intensity of 2.1; infection intensity ranged from 1 to 6 inds.

A total of 7 parasitic species were identified. Cestodes were represented by the juvenile *Eubothrium crassum*. Nematodes were represented by *Contracaecum osculatum* (L3), *Dichelyne minutus* (males), and *Hysterothylacium aduncum* (11 L3 in the abdominal cavity, 20 L4 in the abdominal cavity and 14 L4 also in the intestinal lumen, 59 adult males, and 99 adult females in the intestinal lumen). Acanthocephalans were represented by *Corynosoma strumosum* cyst., *Echinorhynchus gadi* (12 females, 43 males), and *Pomphorhynchus laevis* (1 females, 20 males). The dominant species were *H. aduncum* (43.3%, 2.1 inds) and *E. gadi* (21.0%, 1.2 inds). *E. gadi* did not co-occur with other parasites.

The parasitic fauna of the lumpsucker caught in the Gulf of Gdańsk showed a higher species diversity and a higher prevalence (7 species, 66.3%, 2.0 inds) than the helminth fauna of the Vistula Lagoon lumpsucker (4 species, 46.5%, 2.3 inds), the infection intensity in both areas being similar (Table 1).

**Table 1**

Prevalence (%), mean intensity (ind.) and range of intensity (ind.) of metazoan parasites of lumpsucker from the Gulf of Gdańsk and Vistula Lagoon.

Parasites	Gulf of Gdańsk	Vistula Lagoon	Total Gulf of Gdańsk and Vistula Lagoon
<b>Cestoda</b>			
<i>Eubothrium crassum</i>	1.1 / 2.0 / 2	2.3 / 1.0 / 1	1.3 / 1.6 / 1-2
<b>Nematoda</b>			
<i>Contracaecum osculatum</i> , L3	1.6 / 1.3 / 1-2	-	1.3 / 1.3 / 1-2
<i>Dichelyne minutus</i>	0.5 / 2.0 / 2	-	0.4 / 2.0 / 2
<i>Hysterothylacium aduncum</i> , L3, L4, ad	45.3 / 2.1 / 1-4	39.5 / 2.0 / 1-4	43.3 / 2.1 / 1-4
<b>Acanthocephala</b>			
<i>Corynosoma strumosum</i> , cyst.	1.1 / 4.0 / 2-6	-	0.9 / 4.0 / 2-6
<i>Echinorhynchus gadi</i>	23.7 / 1.1 / 1-3	9.3 / 1.5 / 1-2	21.0 / 1.2 / 1-3
<i>Pomphorhynchus laevis</i>	7.2 / 1.2 / 1-6	9.3 / 2.3 / 1-4	8.3 / 1.2 / 1-3
<b>Total</b>	<b>66.3 / 2.0 / 1-6</b>	<b>46.5 / 2.3 / 1-4</b>	<b>63.4 / 2.1 / 1-6</b>

-: not found

## DISCUSSION

The parasites that were found in *Cyclopterus lumpus* in this study had been reported from other fish species in the southern Baltic. Except for the freshwater cestode *Eubothrium crassum* and the acanthocephalan *Pomphorhynchus laevis*, the remaining parasites (*Contracaecum osculatum*, *Dichelyne minutus*, *Hysterothylacium aduncum*, *Corynosoma strumosum*, and *Echinorhynchus*

*gadi*) are all marine species. This study provides the first record of all the parasitic species, except *C. strumosum*, in the lumpsucker from the southern Baltic and the Vistula Lagoon. In the southern Baltic estuaries, the parasites are frequently dispersed via the fish migrating from the Vistula Lagoon to the Gulf of Gdańsk and to the Baltic proper (Rolbiecki 2003).

The Gulf of Gdańsk lumpsucker were found to support all the seven parasitic species, four of them only (*Eubothrium crassum*, *Hysterothylacium aduncum*, *Echinorhynchus gadi*, *Pomphorhynchus laevis*) being found in the Vistula Lagoon. The absence of *Contraecaecum osculatum*, *Dicheline minutus*, and *Corynosoma strumosum* in the Vistula Lagoon lumpsucker could have resulted from the Lagoon water being less saline than that of the Gulf of Gdańsk. The lower salinity must have prevented marine parasites from persisting in the Lagoon, and must have affected also their intermediate and definitive hosts. The outcome of this study might have been affected by the different sample sizes: less fish were studied from the Vistula Lagoon than from the Gulf of Gdańsk. It is worth mentioning that single occurrences of *Contraecaecum* sp. and *Dicheline minutus* in the round goby *Neogobius melanostomus*, and of *Corynosoma strumosum* in the zander (*Sander lucioperca*) had been reported from the Lagoon earlier (Rolbiecki 2003, 2006). It has to be added that the large zander migrate between the Gulf of Gdańsk and the Vistula Lagoon, the migrations having a potential of dispersing the parasites.

The marine species: *Contraecaecum osculatum* and *Corynosoma strumosum* were relatively rare in the lumpsucker, both in the Gulf of Gdańsk and in the Vistula Lagoon, and – when found - were represented by single individual each. The rare occurrence could, as already mentioned, be related to the sporadic occurrence of their definitive hosts, marine mammals, in the areas of study. Besides, *D. minutus* was rare as well. In addition to its being a marine species, an important factor restricting its dispersal is its narrow host specificity, the Pleuronectidae. The major definitive host in the southern Baltic is the flounder (*Platichthys flesus*), other fish species serving the accidental hosts (Moravec 1994). The narrow host specificity must have been important also for the freshwater *E. crassum*, although the species is very common in its definitive hosts, the salmonids, in the Baltic (including the Vistula Lagoon) (Rokicki 1975, Andersen and Valtonen 1990, Rolbiecki 2001).

Dominant among the parasites were *Hysterothylacium aduncum* and *Echinorhynchus gadi*; in addition, *Pomphorhynchus laevis* was recorded in more than 8% of the fish examined. Although *H. aduncum* and *E. gadi* are both marine species, they were dominants in the parasitic fauna of both the Gulf of Gdańsk and the Vistula Lagoon lumpsucker. These parasites belong to the most common nematodes and acanthocephalans, respectively, in the southern Baltic.

*E. gadi* was reported, in addition to its typical host - the cod (*Gadus morhua*) (e.g., Rokicki 1995, Pilecka-Rapacz and Sobecka 2004), from other species as well, including the round goby, shorthorn sculpin (*Myoxocephalus scorpius*), longspined bullhead (*Taurulus bubalis*), burbot (*Lota lota*), flounder, herring (*Clupea harengus*), snakeblenny (*Lumpenus lampretaeformis*), lesser sandeel (*Ammodytes tobianus*), eel (*Anguilla anguilla*), eelpout (*Zoarces viviparus*), and dab (*Limanda liganda*) (e.g., Markowski 1933, Koter 1962, Rokicki 1975, Rokicki and Rolbiecki 2002, Bystydzieńska et al. 2005, Rolbiecki 2006). On the other hand, *P. laevis*, while being a freshwater species, is a common parasite of flounder in the southern Baltic and Vistula Lagoon (e.g., Rokicki and Morozińska-Gogol 1994, Kjøie 1999, Rolbiecki unpublished). In addition, the acanthocephalan in question was reported from the three-spined stickleback (*Gasterosteus aculeatus*), round goby, black goby (*Gobis niger*), sand goby (*Pomatoschistus minutus*), cod, shorthorn sculpin, zander, eel, and eelpout (e.g., Markowski 1933, Koter 1962, Rolbiecki and Rokicki 1996, Bystydzieńska et al. 2005, Rokicki 1995, Morozińska-Gogol 2006, Rolbiecki 2006).

A particular attention should be paid to *Hysterothylacium aduncum*, a representative of the family Raphidascarididae. *H. aduncum* is a nematode present in teleost fish mainly in the sea, although it is also found in fresh and brackish waters as a result of fish migrations. North Atlantic, including the North and Baltic Seas, supports mainly one *Hysterothylacium* species, *H. aduncum* (species status remains to be settled), although two other species (*H. auctum* and *H. gadi*) were reported as well (Hartwich 1975). The range of *H. aduncum* hosts – intermediate, paratenic, and definitive - is very wide (e.g., Zander and Reimer 2002, Moravec 1994), which facilitates dispersal of the parasite. In the southern Baltic and Vistula Lagoon, *H. aduncum* had been found in most fish species examined (except for cyprinids); the main hosts were the cod, the eelpout, and the flounder (e.g., Sulgostowska et al. 1990, Rokicki 1995, Kjøie 1999, Chibani and Rokicki 2004, Rolbiecki and Rokicki unpublished). Due to the relatively high frequency of *H. aduncum* occurrence in the lump sucker, the species has to be regarded as an important agent in maintaining the nematode's population in the southern Baltic.

To conclude, it should be pointed out that the parasitic fauna of the lump sucker inhabiting the Gulf of Gdańsk differs in its composition and prevalence from that found in the fish in the Vistula Lagoon, the infection intensity being similar. Despite their lower prevalence, the marine helminth parasites found in the Gulf of Gdańsk lump sucker showed a higher diversity, compared to those recorded in the Vistula Lagoon lump sucker.

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