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Parasitology

**METAZOAN PARASITES OF THE EEL, *ANGUILLA ANGUILLA* (L.)  
IN THE SZCZECIN LAGOON AND RIVER Odra MOUTH AREA**

**PASOŻYTY Z GRUPY METAZOA U WĘGORZA, *ANGUILLA*  
*ANGUILLA* (L.) Z ZALEWU SZCZECIŃSKIEGO I UJŚCIA ODRY<sup>2</sup>**

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A total of 183 eel, *Anguilla anguilla* (L.), individuals (measuring 34 - 84 cm lt.) caught from five areas of the Szczecin Lagoon and the River Odra mouth area were examined. They were found to house 13 parasitic species, three of which (*Bothriocephalus claviceps*, *Protocephalus macrocephalus*, and *Ergasilus sieboldi*) being frequent. *Acanthocephalus lucii* was a relatively frequent parasite, too. The remaining 9 species, i.e., *Azygia lucii*, *Deropristis inflata*, *Ichthyocotylurus platycephalus* (metacercariae), *Raphidascaris acus*, *Camallanus lacustris*, *Eustrongylides excisus* (larva), *Acanthocephalus anguillae*, *Ergasilus gibbus*, and *Argulus foliaceus* were rather rare. The areas the fish were obtained from differed to some extent in the degree of infection. The lowest number of parasites was found off Lubin (5 species) and in the Odra mouth area (6 species), while fishing grounds off Trzebież yielded the highest number of parasitic species (12). The differences are related to environmental conditions being different in the individual areas.

INTRODUCTION

Metazoan parasites of the eel, *Anguilla anguilla* (L.) were treated by many authors, e.g., Kennedy (1974), Moravec (1985), Koie (1988), Saraiva and Chubb (1989). In Poland, the role of eel as a host for parasites was studied by, i.a., Markowski (1933), Jarecka (1959), Kozikowska (1961), J. Grabda (1962, 1971), Seyda (1973), Wierzbicka and Orecka-Grabda (1987), and Własow et al. (1991). Most of those works concerned usually the total extent of infestation or dealt with individual species; few papers only considered

the seasonal aspect of infection (Moravec 1985; Conneelly and McCarthy 1986) host's size (Moravec 1985; Koie 1988), and environmental factors (Conneelly and McCarthy 1986).

Data from the Szczecin Lagoon and the River Odra mouth, presented in this paper, will make it possible to compare the metazoan parasitic fauna in eels from the ecologically different areas of the water body in question. The protozoan parasites of the eel from the same water body, described elsewhere (Wierzbicka and Orecka-Grabda 1994), were worked out with a similar purpose in mind. The present paper is a continuation of studies on environmental effects on the parasitic fauna of the eel.

### MATERIALS AND METHODS

A total of 183 individuals of eel, *Anguilla anguilla* (L.), measuring 34 - 84 cm l.t., weighing 70 - 1200 g, and aged 1+ to 11+. The fish to be examined were sampled from commercial catches made in five areas of the Szczecin Lagoon: the Piastowski Canal (20 individuals), off Lubin (25), off Trzebież (71), off Stepnica (30), off Nowe Warpno (13), and in the Skolwin Canal (River Odra mouth area) (24). The fish were examined in August 1982 (41 individuals caught off Trzebież) and in July and August 1983 (142 individuals caught in areas listed above). Wierzbicka and Orecka-Grabda (1994) published a map showing the areas of capture and described their environmental situation.

Detailed anatomopathological and parasitological examinations were made on the fish immediately after they were sacrificed. The widely used parasitological techniques were applied to study the skin, eyes, gills, body cavity, intestine, and other internal organs of the fish. The parasites found were fixed in 5% formalin-physiological salt solution or in 75% ethyl alcohol. Some observations on the taxonomic position of parasites were made also on fresh materials.

### RESULTS

The data on metazoan infestation of the eel in different areas of the Szczecin Lagoon and River Odra mouth are given in Table 1. Invasion incidence and intensity differed between the parasites and the areas.

Two cestode species were found. They were frequent in the study. *Bothriocephalus claviceps* was most scarce in the intestine of eels caught near the Piastowski Canal (15% incidence), the incidence in the remaining areas ranging within 26.7 - 61.5%. *Proteocephalus macrocephalus* showed the highest incidence (70%) in the Piastowski Canal, the lowest incidence (6.7%) being recorded off Stepnica. Intensity of the parasites' invasion was most often relatively low (Tab. 1).

Table 1

Parasitic metazoan infection of *Anguilla anguilla* (L.)

Parasite species	Location in host		Piastowski Canal	Lubin	Trzebież	Stepnica	Nowe Warpno	Odra mouth
<i>Bothriocephalus claviceps</i> (Goeze, 1782)	intestine	inc. int. mean	15.0 1 0.15	52.0 1-3 0.84	33.8 1-5 0.75	26.7 1-2 0.37	61.5 1 0.61	29.2 1-3 0.42
<i>Protocephalus macrocephalus</i> (Creplin, 1825)	intestine	inc. int. mean	70.0 1-4 1.25	24.0 1-2 0.32	50.7 1-33 2.32	6.7 1 0.07	30.8 1-3 0.46	16.7 1-2 0.25
<i>Azygia luci</i> (Muller, 1776)	stomach	inc. int. mean	0	0	0	3.3 1 0.03	0	0
<i>Deropristis inflata</i> (Molin, 1859)	intestine	inc. int. mean	10.0 1-5 0.30	0	5.6 2-63 1.22	0	0	0
<i>Ichthyocotylurus platycephalus</i> (Creplin, 1825) (I.)	stomach	inc. int. mean	0	0	1.4 3 0.04	0	0	0
<i>Raphidascaris acus</i> (Bloch, 1779)	intestine	inc. int. mean	5.0 6 0.30	4.0 1 0.04	2.8 4-5 0.13	0	0	4.2 2 0.08
<i>Camallanus lacustris</i> (Zoega, 1776)	intestine	inc. int. mean	0	12.0 1-6 0.36	1.4 1 0.01	3.3 7 0.22	0	0
<i>Eustrongylides excisus</i> Jagerskiold, 1909) (I.)	stomach wall body cavity	inc. int. mean	0	0	2.8 1-2 0.04	0	15.4 3 0.46	0
<i>Acanthocephalus anguillae</i> (Muller, 1780)	intestine	inc. int. mean	0	0	1.4 1 0.01	6.7 1 0.07	7.7 2 0.15	4.2 17 0.71
<i>Acanthocephalus luci</i> (Muller, 1776)	intestine	inc. int. mean	5.0 3 0.15	0	12.7 1-4 0.25	16.7 1-7 0.53	7.7 2 0.15	16.7 1-11 0.62
<i>Ergasilus sieboldi</i> (Nordman, 1832)	gills	inc. int. mean	25.0 1-2 0.30	72.0 1-11 2.32	56.3 1-16 2.39	46.7 1-7 1.27	46.1 1-6 1.00	33.3 1-4 0.75
<i>Ergasilus gibbus</i> (Nordman, 1832)	gills	inc. int. mean	5.0 4 0.20	0	2.8 1-4 0.07	0	0	0
<i>Argulus foliaceus</i> (Linne, 1758)	gills	inc. int. mean	0	0	1.4 1 0.01	0	15.4 1 0.15	0

inc. - invasion incidence (%); int. - invasion intensity; mean - mean invasion intensity in population.

The *Trematoda* were represented by three species. The fluke *Azygia lucii* was present in a single eel caught off Stepnica, while unencysted, live metacercariae of *Ichthyocotylurus platycephalus* were found in the stomach of an eel caught off Trzebież. The third species, *Deropristis inflata*, was recorded, relatively seldom, off the Piastowski Canal and Trzebież only (Tab. 1), but the number of parasites per host off Trzebież was high and reached 63.

The presence of three nematode species was recorded in the fish individuals examined. Two nematodes, *Raphidascaris acus* and *Camallanus lacustris*, occurred in the intestine as mature forms, while encysted larvae of *Eustrongylides excisus* were most frequently located in the stomach wall. The nematode infestation was weak; invasion incidence of *R. acus* in the four areas ranged within 2.8 - 5.0%, while that of *C. lacustris* in three areas was 1.4 - 12.0%. Larvae of *E. excisus* were recorded off Trzebież and Nowe Warpno only (Tab. 1).

Two species belonging to the *Acanthocephala* were found. One of them, *Acanthocephalus anguillae*, was rare (1.4 - 7.7% incidence) and found in the southern part of the Lagoon and in the River Odra mouth area (Tab. 1). The other species, *A. lucii*, was more frequent (5.0 - 16.7% incidence), but was not recorded in the eel caught off Lubin (Tab. 1).

Among the crustaceans, *Ergasilus sieboldi* was a common parasite. The lowest infection incidence values were recorded in the Piastowski Canal (25%) and Odra mouth area (33.3%), the incidence ranging within 46.1 - 72% in the remaining areas (Tab. 1). Another species, *E. gibbus*, occurred in the eel caught in the Piastowski Canal and off Trzebież only, the respective incidence values being 5.0 and 2.8%. The crustacean *Argulus foliaceus* was rare in the materials studied, too. Single individuals were found off Trzebież and Nowe Warpno only (Tab. 1).

Apart from the parasites listed above, the gills of a single eel caught off Trzebież and two individuals from off Stepnica were found to house single monogeneans. The parasites were observed on AgNO<sub>3</sub> - treated mounts. The hook pattern on the attachment disc was not very clear, it can be supposed, however, that the parasites belonged to the genus *Pseudodactylogyrus* Gussev, 1965.

## DISCUSSION

The metazoan parasitic fauna of the eel inhabiting the Szczecin Lagoon and the Odra mouth area was represented by a total of 13 species belonging to the *Cestoda*, *Trematoda*, *Nematoda*, *Acanthocephala*, and *Crustacea*. Of all the parasites found, only the tapeworms *Bothriocephalus claviceps* and *Proteocephalus macrocephalus* as well as the crustacean *Ergasilus sieboldii* occurred frequently. The acanthocephalan *Acanthocephalus lucii* (total invasion incidence of 10.9%) belonged to more common parasites as well. The remaining

9 species were recorded relatively seldom, one of them (*Ichthyocotylurus platycephalus*) being an accidental parasite of eel.

There is a considerable similarity between data provided by this study and those of Seyda (1973) who studied the eel from the Szczecin Lagoon (off Trzebież) and adjacent waters. Seyda found a total of 12 species (he disregarded gill parasites altogether). In the present study, no eye metacercariae, *Camallanus truncatus*, and *Pomphorhynchus laevis* were recorded, but three crustacean species, *Azygia lucii*, and metacercariae of *Ichthyocotylurus platycephalus*, absent from Seyda's materials, occurred. In his description of the helminth fauna in the Baltic (the Puck Bay, off Hel and Chłapów), Markowski (1933) mentioned the presence of 7 species in the eel. The inventory of parasites in Poland (J. Grabda 1971) lists 18 helminth species. Poorer metazoan parasitic faunas were found by Saraiva and Chubb (1989) in the eel of the River Este in northern Portugal (6 species) and by Moravec (1985) in the Lake Macha in the former Czechoslovakia (7 species). On the other hand, Koie (1988) found a much more diverse fauna in the eutrophic Lake Esrum (Denmark). She was able to identify as many as 22 species belonging to 8 higher taxa, including 3 introduced species: *Pseudodactylogyrus bini*, *P. anguillae*, and *Anguillicola* sp.

The degree of infestation, revealed by the Szczecin Lagoon eel, was in some instances close to the literature data.

Similarly to protozoan parasites (Wierzbicka and Orecka-Grabda 1994), the diversity of parasitic metazoans differed between the areas. The lowest number of species was found off Lubin (5) and in the Odra mouth area (6), while the most diverse were the parasites off Trzebież (12 species). The three remaining areas featured 7 species each. The most conspicuous were the parasites of the eel from the Piastowski Canal and off Trzebież in which *Deropristis inflata* and *Ergasilus gibbus* were recorded, the parasites being specific of the eel and occurring at certain salinity only. The presence of *D. inflata* in the Southern Baltic was recorded by Markowski (1933), while the crustacean *E. gibbus* occurred in brackish waters in the materials studied by, i.a., Kozikowska (1961), J. Grabda (1962), and Kabata (1979). The other crustacean, *E. sieboldi*, a typically freshwater species, occurred at the lowest incidence in the Piastowski Canal. The differences described are related to higher salinities prevailing in the northern part of the Lagoon (the Trzebież fishermen had ventured far into the northern part of the Lagoon to fish).

As opposed to the protozoan parasites of eel in the River Odra mouth area, showing the highest intensities there (Wierzbicka and Orecka-Grabda 1994), the intensity of occurrence of the metazoan parasites in the area was somewhat lower, compared to some regions. One may invoke the reduction in the number of some intermediate hosts as the direct cause. Environmental effects on parasitic metazoan fauna in eel were discussed by



Conneelly and McCarthy (1986) who demonstrated differences in infection of fishes caught in two rivers and a lake in the western part of Ireland.

The differences between infestation of the eel with protozoans and metazoans suggest that the fish inhabit, for some time, definite, ecologically different areas of the Szczecin Lagoon or the River Odra mouth area.

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STRESZCZENIE

Zbadano 183 węgorze, *Anguilla anguilla* (L.), o długości 34-84 cm l.t., wiek 1+ do 11+, ryby pochodziły z odłowów z pięciu rejonów Zalewu Szczecińskiego i ujścia Odry (w Kanale Skolwińskim). Badania prowadzono w okresie letnim 1982, głównie w 1983 roku. Łącznie znaleziono 13 gatunków należących do *Cestoda* (2), *Trematoda* (3), *Nematoda* (3), *Acanthocephala* (2) i *Crustacea* (3). Spośród stwierdzonych jedynie *Bothriocephalus claviceps*, *Proteocephalus macrocephalus* i *Ergasilus sieboldi* należały do często występujących u węgorzy. Nieco rzadziej notowano także *Acanthocephalus lucii*. Pozostałe 9 gatunków spotykano stosunkowo rzadko, a jeden z nich - *Ichthyocotylurus platycephalus* okazał się przypadkowym pasożytem tego żywiciela. Wykazano pewne zróżnicowanie zarażenia ryb z poszczególnych rejonów badań. Najmniej znaleziono w okolicy Lubina (5 gatunków) i w ujściu Odry (6), najwięcej na łowiskach Trzebieży (12). Dwa gatunki - *Deropristis inflata* i *Ergasilus gibbus* stwierdzono jedynie w okolicy północnej Zalewu Szczecińskiego, w rejonie Kanału Piastowskiego i nieco poniżej w Trzebieży. Różnice te są związane z odmiennymi warunkami środowiska w niektórych rejonach badań.

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