

Research Note

Changes in the parasitic fauna of rudd *Scardinius erythrophthalmus* (L.) from Lake Warniak, Poland

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Summary

During the years 1998 – 1999 the fauna of helminthes of rudd from Warniak lake was studied. In total 87 specimens of fish were examined. Twelve species of parasites belonging to various systematic groups were found (Monogenea – 3, Digenea – 6 and Acanthocephala, Nematoda and Crustacea – 1 species each). *Diplostomum* sp. (mc) and *Ornithodiplostomum scardinii* (mc) (Schulman, 1952) were the dominating species. *Dactylogyrus difformis* (Wagener, 1857), *D. difformoides* (Gläser et Gusev, 1971) and *Neoechinorhynchus rutili* (Müller, 1780) were common. The other species: *Posthodiplostomum cuticola* (Nordmann, 1832) (mc) *Ergasilus sieboldi* (Nordmann, 1832), *Dactylogyrus fallax* (Wagener, 1857), *Tylodelphys clavata* (Nordmann, 1832) (mc), *Ichthyocotylurus* sp. (mc), *Phyllodistomum* sp. and *Raphidascaris acus* (L) (Bloch, 1779) were present rarely or sporadically. The presence of parasites of rudd from Lake Warniak during the years 1979 – 1984 and 1998 – 1999 was compared and the differences were discussed.

Key words: parasite; rudd; *Scardinius erythrophthalmus*; lake; Warniak; Poland

Introduction

Publications on the fauna of helminths of rudd *Scardinius erythrophthalmus* (L.) are rare to be found in literature. In Poland, the communities of helminths in rudd were investigated by Kozicka (1953, 1959) in case of lakes Tały and Drużno, while Prost (1957) investigated the communities of Monogenea in different sections of the Vistula. Additionally, Pojmańska *et al.* (1980) studied parasites of rudd in lakes in Konin area while Grabda-Kazubska *et al.* (1987) studied such parasites in lakes Dgał Wielki and Warniak. Papers concerning the composition of the changes in the community of parasites over extended time periods are few (Pojmańska & Dzika 1987; Dzika & Jeleń 2001; Dzika, 2002). This study aims at a comparison of the present day

composition of the parasitic fauna of rudd from Lake Warniak with data of the years 1979 – 1984.

Characteristics of the lake

Lake Warniak is situated in the Pregoła River basin in Mazury Lake District and macroregion of the Country of Great Lakes (Jańczak *et al.*, 1999). The lake has been strongly eutrophicated. Introduction of herbivorous fish, particularly grass carp (1973 – 1984), resulted in major changes in the biocenosis of the lake significantly reducing the development of vascular plants (Krzywosz & Bryliński 1975; Krzywosz, 1997). During the years 1976 – 1990, the biomass of native fish (pike, tench, bream and roach) was reduced by almost a half (Zdanowski *et al.*, 1999). Revival of the immersed vegetation during the later years, however, created favorable conditions of spawning for those species. During the years 1988 – 1995, the number of crustaceans in the water was small. Absence of larger cladocerans and adult forms of Copepoda indicates a high pressure from fish feeding on plankton. During the years 1997 – 1998, the biomass of Chironomidae and Oligochaeta doubled. Species that are not closely linked to bottom sediments were encountered frequently represented mainly by the following groups: Hirudinea, Nematoda and Arthropoda. Presence of 21 species of molluscs, including 11 species of snails (3 genus of *Prosobranchia* and 8 of *Pulmonata*) as well as 10 species of bivalves was recorded. That last group was dominated in numbers by *Anodonta cygnea*, *A. anatina* and *Unio pictorum* (Zdanowski *et al.*, 1999). Fish-eating birds such as gulls, herons, grebes and swans inhabited the lake while cormorants, mergansers and ducks are the migratory species. The birds are few.

Material and Methods

Autopsies of fish were carried out during the following months: September 1998 – 27 specimens, April, June and

September 1999 – 1 specimen each month, May 1999 – 52 specimens and November 1999 – 5 specimens. The rudd specimens were caught using gill-nets located in different parts of the lake. In total 87 specimens were collected weighing from 23.3 g to 230 g (average weight 124.5g) and length (*longitudo totalis*) from 10.5 cm to 24 cm (average length 19.68 m). Parasitological examinations were carried out after catching the specimens and transporting them to the laboratory. The specimens of rudd were kept in a refrigerator and autopsies were performed not later than 48 hours after catching the fish. Parasites were preserved and fixed preparations were made according to methods generally applied in parasitology while species were identified according to Gusev's (1985) and Bauer's (1987) keys.

Results

Twelve species of parasites belonging to various systematic groups were found in Lake Warniak - Monogenea – 3, Digenea – 6 and Acanthocephala, Nematoda and Crustacea – 1 species each (Tab. 1). Monogenea group was represented by rudd specific species of genus *Dactylogyrus*. All parasites were found in gills. *Dactylogyrus difformis* and *D. difformoides* were common in Lake Warniak while

D. fallax was present sporadically. *Diplostomum* sp. and *Ornithodiplostomum scardinii* metacercariae dominated in Lake Warniak infecting 56.32 % and 55.17 % of fish respectively (Tab. 1). *Posthodiplostomum cuticola* was found rarely infecting 9.19 % of fish while *Ichthyocotylurus* sp., *Phyllodistomum* sp. and *Tylodelphys clavata* were found sporadically infecting 2.29 % and 1.14 % of fish respectively (Tab. 1). Acanthocephala was represented only by one species - *Neoechinorhynchus rutili*, commonly found in fish infecting 25.28 % of them. On the other hand *Ergasilus sieboldi* and *Raphidascaris acus* larvae were found rarely or sporadically infecting 8.0 % and 1.15 % of fish respectively (Tab. 1).

Discussion

Comparison of the present composition of the parasite fauna of rudd from Lake Warniak and those recorded during the years 1978 – 84 shows that the number of species and structure of parasite communities in a given ecosystem may undergo serious changes influenced by the changes in that environment.

Out of 20 parasite species which were found in Lake Warniak during the years 1979 – 1984 only, 9 species were recorded during the present study. Additionally, 3 new spe-

Table 1. Changes in occurrence of rudd parasites in Warniak Lake during 1979 – 1984 and 1998 – 1999

Parasite species	Warniak *n=57 1978 – 84		Warniak n=87 1998 – 99	
	Prevalence (%)	Mean abundance	Prevalence (%)	Mean abundance
<i>Dactylogyrus fallax</i>	3.51	0.09	2.29	0.022
<i>Dactylogyrus difformis</i>	56.14	5.72	22.98	0.90
<i>Dactylogyrus difformoides</i>	61.40	9.70	20.68	0.87
<i>Paradiplozoon homoion</i>	1.75	0.02	-	-
<i>Rhipidocotyle campanula</i> (mc)	1.75	0.02	-	-
<i>Apharyngostrigea cornu</i> (mc)	8.77	20.16	-	-
<i>Ichthyocotylurus</i> sp. (mc)	-	-	2.29	0.15
<i>Diplostomum</i> sp. (mc)	45.61	1.16	56.32	5.70
<i>Tylodelphys clavata</i> (mc)	28.07	1.28	1.14	0.18
<i>Posthodiplostomum brevicaudatum</i> (mc)	63.16	3.63	-	-
<i>Posthodiplostomum cuticola</i> (mc)	91.23	22.84	9.19	0.10
<i>Ornithodiplostomum scardinii</i> (mc)	96.49	7.72	55.17	5.85
<i>Echinochasmus</i> sp. (mc)	1.75	0.02	-	-
<i>Phyllodistomum macrocotyle</i>	8.77	0.40	-	-
<i>Phyllodistomum</i> sp.	-	-	1.14	0.02
<i>Caryophyllaeides fennica</i>	7.02	0.17	-	-
<i>Skrjabillanus scardinii</i>	77.19	7.32	-	-
<i>Philometra ovata</i>	3.51	0.03	-	-
<i>Raphidascaris acus</i> (l)	-	-	1.14	0.02
<i>Neoechinorhynchus rutili</i>	10.53	0.16	25.28	0.82
<i>Ergasilus sieboldi</i>	14.03	0.42	8.0	0.10
<i>Caligus lacustris</i>	1.75	0.02	-	-
<i>Glochidium</i>	3.51	0.09	-	-

*- number of examined fish

cies were found (Tab. 1). The prevalence of infection with *Dactylogyrus difformis* decreased by twofold and with *Dactylogyrus difformoides* by threefold, while the prevalence of infection with *D. fallax* decreased only slightly.

In the case of *Ergasilus sieboldi* the decrease of infected fish by almost 2-fold was observed in Lake Warniak. No *Caligus lacustris* or larvae of glochidia were found. It seems that the decrease in infections with *Ergasilus sieboldi* in the lake results from the decrease in the numbers of tench (the main host of that parasite) (Zdanowski *et al.*, 1999), despite the revival of vascular vegetation, which supports spreading of the invasive forms of that parasite.

Prevalence of fish infection with *Diplostomum* sp. in Lake Warniak increased slightly, while infection with *Tyloodelphys clavata* in that lake decreased 28-fold. A drastic decrease in infections with *Posthodiplostomum cuticola* and less with *Ornithodiplostomum scardinii* was also observed by 10-fold and by almost 2-fold respectively. During the current study no *Paradiplozoon homoion*, *Rhipidocotyle campanula* (= *Rhipidocotyle illense* Grabda-Kazubska *et al.*, 1987), *Apharyngostrirea cornu*, *Posthodiplostomum brevicaudatum* or *Echinochasmus* sp. were found. On the other hand, metacercariae of *Ichthyocotylurus* sp. appeared. Among Cestoda, no *Caryophyllaeides fennica* were found again. As concerns Nematoda, no *Skrjabillanus rutili* or *Philometra ovata* were found while *Raphidascaris acus* appeared. As concerns Acanthocephala, an almost 2.5-fold increase in prevalence and almost 6-fold increase in intensity of *Neoechinorhynchus rutili* were recorded.

One of the major factors regulating the presence and numbers of Monogenea is temperature (Prost, 1963; Hanzelová & Žitňan, 1985; Gelnar, 1987; Dzika, 1987; Pojmańska & Dzika, 1987). Additionally, Pojmańska and Dzika (1987) also link the changes in numbers of those parasites with their simple development cycle and short life span as well as with their narrow host specificity (the possibility of colonization one or two host species only).

It seems that the decrease in fish infections with metacercariae of *Tyloodelphys clavata*, *P. cuticola*, *O. scardinii*, probably results from lower numbers of the intermediate and definitive hosts resulting from quite recent devastation of the reservoir resulting in limiting the fauna of invertebrates and limiting the nesting and feeding grounds of birds, which are additionally threatened by abundance of American mink present in the area.

Appearance of metacercariae of *Ichthyocotylurus* in Lake Warniak as well as the increase of prevalence and abundance of *Neoechinorhynchus rutili* can be explained by slow reconstruction of the numbers and variety of flora and fauna of invertebrates, particularly Crustacea of plankton and Oligochaeta of benthos (Zdanowski *et al.*, 1999). Absence of *Caryophyllaeides fennica* and *Philometra ovata* may indicate absence of invertebrates that earlier were present in the biocenosis.

In conclusion, it can be stated that during the studies carried out recently an increase or a decrease in the frequency of rudd infections with parasites as well as appearance of new species and total disappearance of some other species

of parasites in the biocenosis of the lake were observed. That results from changes that occurred in the biocenosis of that lake as a consequence of human pressure. Following the fishing-out of the herbivorous fish the density of vegetation increased creating favorable conditions for restoration of the composition of the fauna of invertebrates that are intermediate hosts for numerous parasites.

References

- BAUER, O. N. (1987): *Keys to Parasites of Freshwater Fish of the USSR, Vol. 3. Parasitic Metazoa*. Nauka, Leningrad, (in Russian)
- DZIKA, E. (1987): Annual occurrence dynamics of common monogeneans on the gills of bream from the lake Gośląskie (Poland). *Acta Parasitol. Pol.*, 32: 121 – 137
- DZIKA, E. (2002): The parasites of bream *Abramis brama* (L.) from Lake Kortowskie. *Arch. Pol. Fish.*, 10: 85 – 96
- DZIKA, E., JELEŃ, I. (2001): The helminth fauna of bream *Abramis brama* (L.) from Lake Warniak. *Kom. Ryb.*, 5: 9 – 12 (in Polish)
- GELNAR, M. (1987): Experimental verification of the effect of water temperature on micropopulation growth of *Gyrodactylus katharineri* Malmberg, 1964 (Monogenea) parasitizing carp fry (*Cyprinus carpio* L.). *Folia Parasitol.*, 34: 19 – 23
- GRABDA-KAZUBSKA, B., BATURO-WARSZAWSKA, B., POJMAŃSKA, T. (1987): Dynamics of parasite infestation of fish in lakes Dgał Wielki and Warniak in connection with introduction of phytophagous species. *Acta Parasitol. Pol.*, 32: 1 – 28
- GUSEV, A. V. (1985): *Keys to Parasites of Freshwater Fish of the USSR, Vol. 2. Parasitic Metazoa*. Nauka, Leningrad, (in Russian)
- HANZELOVÁ, V., ŽITŇAN, R. (1985): Epizootiologic importance of the concurrent monogenean invasion in carp. *Helminthologia*, 22: 277 – 283
- JAŃCZAK, J., BRODZIŃSKA, B., KOWALIK, A., SZIWA, R. (1999): *Atlas of waters cleanliness in lakes of Poland III. IMGW*. Bogucki Wyd. Nauk. S.C., Poznań (in Polish)
- KOZICKA, J. (1953): Parasites of fishes of Tały Lake. *Rocz. Nauk Robn.*, 67 D: 171 – 186 (in Polish)
- KOZICKA, J. (1959): Parasitofauna of the biocenosis of Družno Lake-part VII. *Acta Parasitol. Pol.*, 7: 1 – 72
- KRZYWOSZ, T. (1997): The effect of grass carp (*Ctenopharyngodon idella* Valenciennes, 1844) on the environment of selected lakes. *Arch. Ryb. Pol.*, 5: 5 – 38 (in Polish)
- KRZYWOSZ, T., BRYLIŃSKI, E. (1975): Results of big head carp observations in Dgał Wielki lake. *Gosp. Ryb.*, 27: 3 – 5 (in Polish)
- POJMAŃSKA, T., GRABDA-KAZUBSKA, B., KAZUBSKI, S. L., MACHALSKA, J., NIEWIADOMSKA, K. (1980): Parasite fauna of five species from Konin lakes complex, artificially heated with thermal effluents, and from Gopło lake. *Acta Parasitol. Pol.*, 27: 319 – 357
- POJMAŃSKA, T., DZIKA, E. (1987): Parasites of bream *Abramis brama* (L.) from the lake Gośląskie (Poland)

effected by long-term thermal pollution. *Acta Parasitol. Pol.*, 32: 139 – 161

PROST, M. (1957): Monogenoidea of gills of fishes of Vistula. *Acta Parasitol. Pol.*, 5: 299 – 395 (in Polish)

PROST, M. (1963): Investigation on the development and pathogenicity of *Dactylogyrus anchoratus* (Duj. 1845) and *Dactylogyrus extensus* (Müller et v. Cleave 1932) for breeding carps. *Acta Parasitol. Pol.*, 11: 17 – 47

ZDANOWSKI, B., HUTOROWICZ, A., TUNOWSKI, J., ŚWIĄ-

TECKI, A., OLEJNIK, G., KRZYWOSZ, T., BIAŁOKOZ, W., CHYBOWSKI, Ł., KRZYWOSZ, W., BLOCKA, B., HUTOROWICZ, J., ROBAK, A., PRUSIK, S., KOPROWSKA, L., CIEMIŃSKI, J., WEGLEŃSKA, T., LEWANDOWSKI, K., JURKIEWICZ-KARNOWSKA, E. (1999): Ecological effects of long-term pressure of phytophagus and, seston-feeding fish on the structure and functioning of the shallow Lake Warniak (Mazurian Lakeland, Poland) *Acta Hydrobiol.*, 41, Suppl. 6: 29 – 47

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