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Research Article

Parasite Fauna of the Prespa Roach *Rutilus prespensis* (Karaman, 1924) (Cyprinidae) in Lake Prespa, Republic of North Macedonia

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Abstract: Eight out of the eleven indigenous fish species of Prespa Lake are endemic. One of these endemic fish species is Prespa roach *Rutilus prespensis.* The parasitological examination from the North-Macedonian part of the Lake Prespa showed that 175 specimens out of 183 examined specimens (95.63%) are infected with parasites. Fourteen parasite species were identified: three protozoans (*Myxobolus cyprini, M. dispar* and *Chilodonella piscicola*), three monogeneans (*Dactylogyrus sphyrna, D. erhardovae* and *Paradiplozoon zeller*), two trematodes (*Nicolla testiobliquum* and metacercariae of *Posthodiplostomum cuticola*), two cestodes (*Caryophyllaeus laticeps* and plerocercoids of *Ligula intestinalis*), two nematodes (*Philometra ovata* and larvae of *Contracaecum microcephalum*), one acanthocephalan (*Metechinorhynchus truttae*) and one crustacean (*Ergasilus sieboldi*). The most prevalent parasite species were *Posthodiplostomum cuticola* (84.70%), *Ligula intestinalis* (77.04%) and *Dactylogyrus sphyrna* (38.80%).

Key words: Protozoa, Trematoda, Cestoda, Monogenea, Nematoda, Acanthocephala, parasitic crustaceans

Introduction

Lake Prespa is situated in south-western part of the Republic of North Macedonia. It consists of two parts: Macro Prespa and Micro Prespa. Its maximum depth is 54.2 m and the average depth is 18.74 m. The lake has several small rivers as tributaries. According to its trophic state, it is on the border between oligotrophic and mesotrophic (Naumovski et al. 1997). The surface level of the lake is significantly decreased in the last decade due the long-term dry period, which has also resulted into eutrophication. The lake is formed in Pliocene and is at the same age as Lake Ohrid. Considering the fish fauna, this lake is typical cyprinid lake, although the trout (*Salmo peristericus*) lives in the rivers on the side of the Pelister Mountain and penetrates into the lake waters, particularly in summer.

Fish parasites are either causative agents of diseases or factors leading to disorder or decrease of fish resistance. Certain species of parasites cause serious diseases resulting of massive fish mortality, particularly of young fishes. In this context, it is also important that fish species can appear carriers or hosts of certain parasite species, which may infect humans. Parasites are also recognised as sensitive indicators of environmental health, i.e. data of their prevalence and intensity of infection as well as knowledge of parasite biology can indicate the health of ecosystems (Dušek et al. 1998, Overstreet 1997).

The first survey of helminth parasites in fishes in Lake Prespa (Hristovski 1975) found nine spe-

Fig. 1. Lake Prespa, Republic of North Macedonia, general view.

cies of parasitic worms. Further investigations were carried out by Hristovski (1983), Hristovski et al. (1997, 2000, 2001, 2006), Stojanovski (1997, 2003) and Stojanovski et al. (2003, 2004, 2006). Dupont & Lambert (1986) studied fishes from Lake Mikro Prespa (Greece) and found the following dactylogyrid species: *Dactylogyrus alatus, D. anchoratus, D. balkanicus, D. caucasicus, D. chondrostomi, D. crivellius, D. dyki, D. elegantis, D. erhardovae, D. ergensi, D. extensus, D. folkmanovae, D. minor, D. prespensis, D. prostae, D. sphyrna* and *D. vistulae.* Three of these species (*D. balkanicus, D. crivellius* and *D. prespensis*) parasitic in *Barbus cyclolepis prespensis* have been described as new to science.

Materials and Methods

Fish material was sampled over several years, from the Macedonian part of Lake Prespa. Fishing was carried out by seasons, in the period from spring to autumn 2014. Only fresh fish specimes were subjected of routine identification, dissection and observation methods. Cleaned parasites were separated and put in fixatives, prepared for identification with techniques of staining and clearing (Vasiljkov 1983, Gussev 1983, Stojanovski 1997, 2003). For identification of the parasite species, we used the keys by Bauer (1985, 1987) and Gussev (1983). The most successful preparations for each parasite species was photographed and used as an illustration in the present article.

Results

During the parasitological investigations of *Rutilus prespensis* from Lake Prespa (Republic of North Macedonia), 14 parasite species were found (Table 1). These were three 3 species of protozoans – *Myxobolus cyprini, M. dispar* and *Chilodonella piscicola*; three species of monogeneans – *Dactylogyrus sphyrna* (Fig. 2), *D. erhardovae* (Fig. 3) and *Paradiplozoon zeller*; two species of trematodes – *Nicolla testiobliquum* (Fig. 4) and *Posthodiplostomum cuticola* (metacercariae); two species of cestodes – *Caryophyllaeus laticeps* (Fig. 5) and *Ligula intestinalis* (plerocercoids) (Fig. 6); two species of nematodes – *Philometra ovata* (Fig. 7) and *Contracaecum microcephalum* (larva); one species of acanthocephalans – *Metechinorhynchus truttae* (Fig. 8); and one species of crustaceans – *Ergasilus sieboldi* (Fig. 9).

The total parasite prevalence was 95.63%, i.e. 175 infected fish specimens out of 186 examined specimens. The highest prevalence was that of *Posthodiplostomum cuticola* (metacercariae) (84.70%), *Ligula intestinalis* (plerocercoid) (77.04%) and *Dactylogyrus sphyrna* (38.80%) (Table 1). The average intensity of infection with helminth parasites was 4.45. The highest average values of intensity were those for *Dactylogyrus sphyrna* (6.62), followed by *Posthodiplostomum cuticola* (larva) (6.45). The lowest values of the intensity of infection were those for *Caryophyllaeus laticeps* (1.50) and *Ligula intestinalis* (plerocercoid) (1.40). The greatest pathological effects were observed associated with *Myxobolus cyprini, M. dispar, Chilodonella piscicola, Dactylogyrus sphyrna, Ligula intestinalis* (plerocercoid), *Philometra ovata, Metechinorhynchus truttae* and *Ergasilus sieboldi*.

Discussion

The parasites of the Prespa roach are mostly freshwater forms. There is only one species, the acanthocephalan *Metechinorhynchus truttae*, which is both marine and freshwater.

The majority of the parasite species found from the Prespa roach are characterised by their wide

Fig. 2. *Dactylogyrus sphyrna*, adhesive disk, x300 (original).

Fig. 3. *Dactylogyrus erhardovae*, adhesive disk, x300 (original).

Fig. 4. *Nicolla testiobliquus* (original).

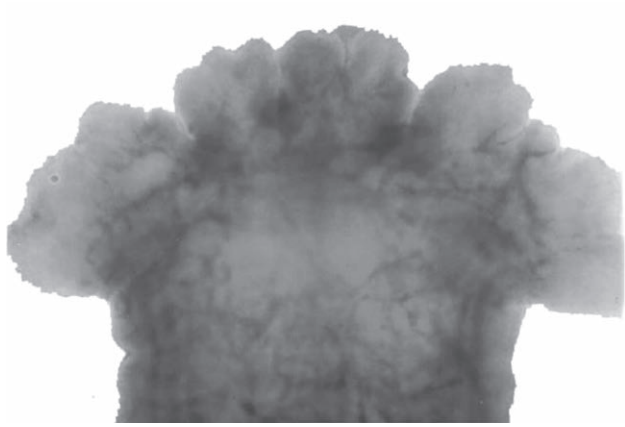

Fig. 5. *Caryophyllaeus laticeps*, scolex (original).

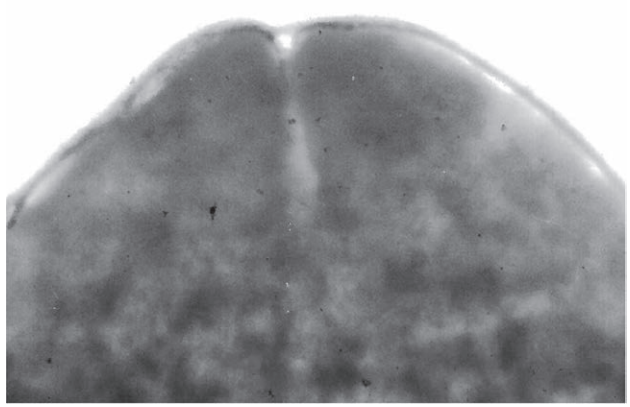

Fig. 6. *Ligula intestinalis*, anterior part (original).

Table 1. Parasite fauna of the Prespa roach *Rutilus prespensis* (N=183) from the Lake Prespa.

Parasite species	Prevalence		Intensity of infection
	No. of infected fishes	% of infected fishes	
Myxobolus cyprini Doflein, 1898	3	1.64	-
Myxobolus dispar Thélohan, 1895	2	1.09	-
Chilodonella piscicola (Zacharias, 1894)	2	1.09	-
Dactylogyrus sphyrna von Linstow, 1878	71	38.80	6.45
Dactylogyrus erhardovae Ergens, 1970	16	8.74	4.81
Paradiplozoon zeller (Gyntovt, 1967)	15	8.20	2.13
Nicolla testiobliquum (Wisniewski, 1932)	4	2.19	2.50
Posthodiplostomum cuticola (von Nordmann, 1832), larva	155	84.70	6.62
Caryophyllaeus laticeps Lühe, 1910	2	1.09	1.50
Ligula intestinalis Bloch, 1782, plerocercoid	141	77.04	1.40
Philometra ovata (Zeder, 1803)	1	0.55	2
Contracaecum microcephalum Rudolphi, 1819, larva	23	12.57	2.91
Metechinorhynchus truttae (Schrank, 1788)	3	1.64	2.67
Ergasilus sieboldi von Nordmann, 1832	65	35.52	5.09
Total	175	95.63	4.45

Fig. 7. *Philometra ovata,* anterior end (left) and posterior part (right) (original).

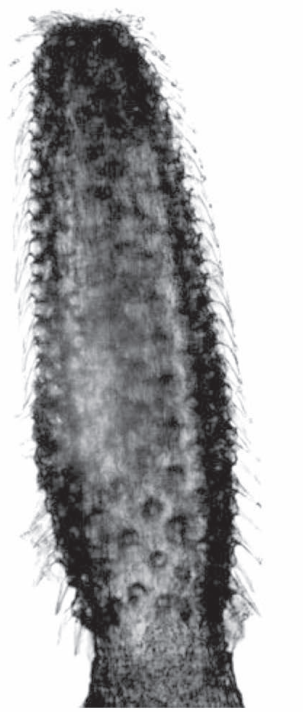

Fig. 8. *Metechinorhynchus truttae*, proboscis (original).

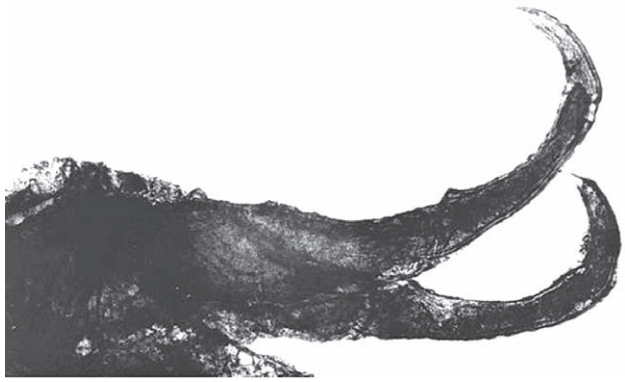

Fig. 9. *Ergasilus sieboldi,* hooks (original).

geographical range as well as by their wide host range. Species with wide geographical and host distribution are *Myxobolus cyprini, M. dispar, Chilodonella piscicola, Ligula intestinalis* (plerocercoid), *Philometra ovata, Contracaecum microcephalum* (larva)*, Metechinorhynchus truttae* and *Ergasilus sieboldi.* However, *Dactylogyrus erhardovae* is confined within the Balkan Peninsula, especially within its western part.

The parasite fauna of *Rutilus prespensis* from

Lake Prespa is similar with that of other fish species of the family Cyprinidae from the Balkan Peninsula and more widely (Ergens 1960, 1970, Čanković et al. 1968, Kakacheva-Avramova 1983, Nedeva 1991, Bauer 1985, 1987, Hristovski 1983, Hristovski & Stojanovski 1983, 1997, Kiškaroly 1982, 1987, Kiškaroly & Tafro 1988, Cakić 1992, Stojanovski 1997, 2003). An exception is *Metechinorhynchus truttae,* which has been found more frequently from salmonid fish.

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