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Fauna of MONOGENEAN TREMATODS - PARASITES of EEL (*ANGUILLA ANGUILLA* LINNAEUS, 1758) from Lake Ohrid, Macedonia

Stojmir Stojanovski (1), D. Blazekovic, N. Hristovski, P. Cakic, V. Dukoska, A. Cvetkovic

(1) PSI Hydrobiological Institute

Ohrid, Macedonia

ABSTRACT

*Parasitological examination from the Macedonian part of the Lake Ohrid showed that of 191 specimens of eel (*Anguilla anguilla* Linnaeus, 1758) 98 fishes (51.31%) were infested with gill monogeneans.*

*In our case study the presence of 2 dactylogyrid species was found: *Pseudodactylogyrus anguillae* (Yin & Sproston, 1948) and *Pseudodactylogyrus bini* (Kikuchi, 1929). Both species are rather pathogenic to their hosts and can cause mortality of heavily infected eels in ell farms in both Asia and Europe.*

*Pseudodactylogyrus species have hitherto been reported from eels in Central and North European countries. This is the first record of *Pseudodactylogyrus anguillae* and *Pseudodactylogyrus bini* for the fishes from Macedonia.*

Keywords: Monogenea, eel, Lake Ohrid.

INTRODUCTION

Lake Ohrid is among the oldest and deepest lakes in the world. At an altitude of 693 m, the carstic tectonic and oligotrophic Lake Ohrid has a residence time of around 80 years. The lake is probably the unique one in the world whose water supplying is mainly by spring water from a numerous surface and sublacustrine springs, mostly located on the east and south part of the lake. Due to its high biodiversity and unique cultural heritage, Lake Ohrid is a lake of tremendous local and international significance. Many species in Lake Ohrid are endemic, meaning they are only found in this lake. In the Lake Ohrid live 17 native fish species belonging to the Salmonidae (2 species), Cyprinidae (12 species), Cobitidae (2 species) and Anguillidae (1 species). Ten of these fish are endemic. Fish - predators are represented in high percentage and with species with high market value: Ohrid trout, belvica and eel. Portion of eel caught in total fish caught is 4,34% (S p i r k o v s k i , 2001).

The lake has one outlet the River Crn Drim (22.24 m³/sec), which belongs to the Adriatic drainage area. This outlet is a man controlled one, and the releasing of the lake water can be done maximum up to the level of -54 cm.

In last 30-40 years, natural ways for migration of eel in Macedonia are interrupted, by building of dams for hydroelectric power stations on the river Crn Drim. The dams impede the eels in their leaving from Lake Ohrid to the sea, where they spawns naturally. This problem is partially solved by import and introduction of imported young eels within the Ohrid Lake. Therefore, Macedonian, or more exactly Ohrid eel, from common visitor, becomes practically fish in aquarium, which owes its existence to continued human intervention. In this way, the parasite *Anguillicola crassus* was probably introduced within the lake.

In last decades, priority in eel diseases has been taken by nematod *Anguillicola crassus*. Native host is Japanese eel (*Anguilla japonica*), and in Japan parasite is wide-spread within open waters and fish farms, but causes a small damages, because the parasite is almost non-pathogen for Japanese eel. In Europe is introduced in early 80's, by import of infested eels from East and South-East Asia. It is spread very soon in many European countries, in open waters and fish farms and causes big damages. It is found at almost half (39.71%) of the eel population in Ohrid Lake and it is probably introduced by import of young eels for stocking (S t o j a n o v s k i e t a l . , 2002).

Monogenean trematods have a great importance in the fish pathology. Certain species cause very serious diseases of fishes, particularly in the young ones. A great number of monogenean species has very clear speciality to a respective host - fish or a narrow circle of related hosts. Monogenean trematods are presented in a vast number in the environment, because of their being ectoparasites, they are even more subject to changes of the physical-chemical characteristics of the aquatic habitat, which they have to adjust to. Monogenean trematods could be a sensitive indicator for the changes of the lake' ecosystems, because the data about their prevalence and intensity of infestation, together with the knowledge of the biology of parasites reveal on the health of the environment.

Monogeneans *Pseudodactylogyus anguillae* and *P. bini* are usually met on the gills of the fish from the genus *Anguilla*, widely spread in the waters of Europe, Asia and Australia. It is considered that the native host is a Japanese eel (*Anguilla japonica*), and from the Far East is introduced into Europe. European eel is more susceptible. Diseases with *Pseudodactylogyus anguillae* and *P. bini* are registered within eel farms in Europe and Asia (S l o t v e d and B u c h m a n n , 1993). They are not found in any Balkan country so far.

S l o t v e d and B u c h m a n n (1993) reported about the existence of acquired immunity at eel against infestations with gill monogeneans (*Pseudodactylogyus anguillae* and *P. bini*). The immunity against monogeneans is not completed, and the defense mechanisms involved in the reduction of the parasites are a result of specific and non-specific factors: hiperplasia and tissue reaction; certain elements of serum and mucous. The mucous represents a resource, which protects the fish against attachment and penetration of parasites. Fish with insufficient or with shortage of mucous are more easily susceptible to infestations.

MATERIALS AND METHODS

Fish material was sampled over several years from the Lake Ohrid. 191 specimens of eel (*Anguilla anguilla* Linnaeus, 1758) were examined.

Fish were subjected to routine methods of identification, dissection and observation (Gusev, 1983; Hotenovsky, 1985, Stojanovski, 2003). It is important that fish for investigations should be freshly

caught and examined. Cleaned parasites were separated and put in fixatives, prepared for identification using techniques of staining and clearing.

For identification of the parasite species we used the key B a u e r , (1985). The most successful preparations for every parasite species were photographed and are displayed.

R E S U L T S A N D D I S C U S S I O N

Parasitological examination from the Macedonian part of the Lake Ohrid showed that of 191 specimens of eel (*Anguilla anguilla* Linnaeus, 1758) 98 fishes (51.31%) were infested with gill monogeneans.

In our case study the presence of 2 dactylogyrid species was found: *Pseudodactylogyrus anguillae* (Yin & Sproston, 1948) and *Pseudodactylogyrus bini* (Kikuchi, 1929).

In the Lake Ohrid, 46 specimens of eel examined (24.08%) were infested with *Pseudodactylogyrus bini* and 62 eels (32.46%) were infested with *Pseudodactylogyrus anguillae*. Mean intensity of infestation with *Pseudodactylogyrus bini* was 2.54 and with *Pseudodactylogyrus anguillae* was 1.90.

Both species are rather pathogenic to their hosts and can cause mortality of heavily infected eels in eel farms in both Asia and Europe.

Pseudodactylogyrus species have hitherto been reported from eels in Central and North European countries. This is the first record of *Pseudodactylogyrus anguillae* and *Pseudodactylogyrus bini* for the fishes from Macedonia, and with regard of available data first record for Balkan Peninsula.

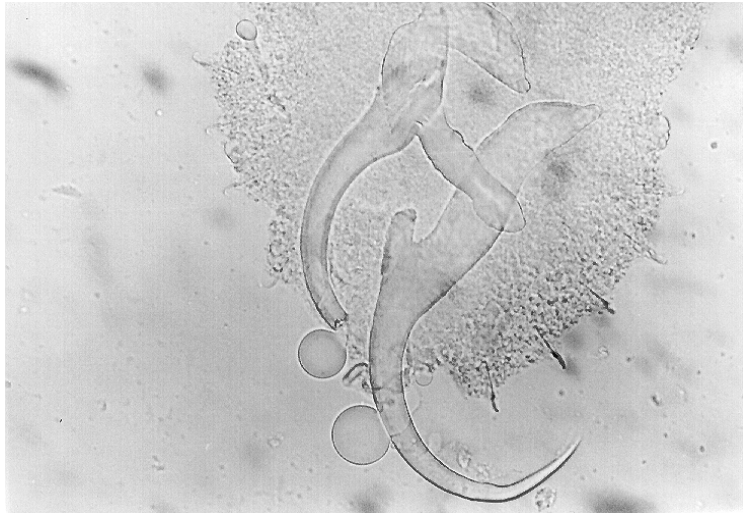


Figure 1. *Pseudodactylogyrus anguillae* - adhesive disc (original), x 252

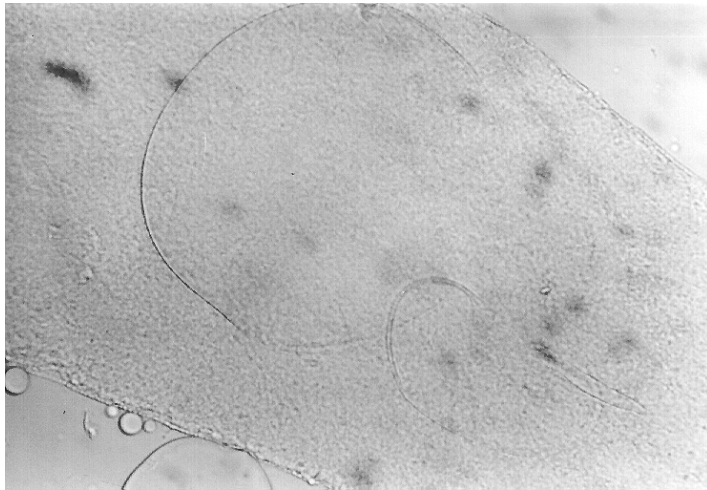


Figure 2. *Pseudodactylogyrus anguillae* - copulatory organ (original), x 300

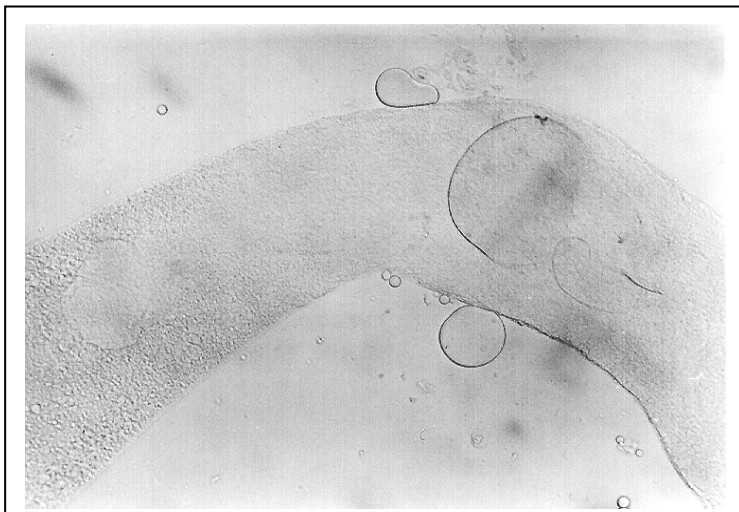


Figure 3. *Pseudodactylogyrus anguillae* - relationship between ovary and testis (original), x 126

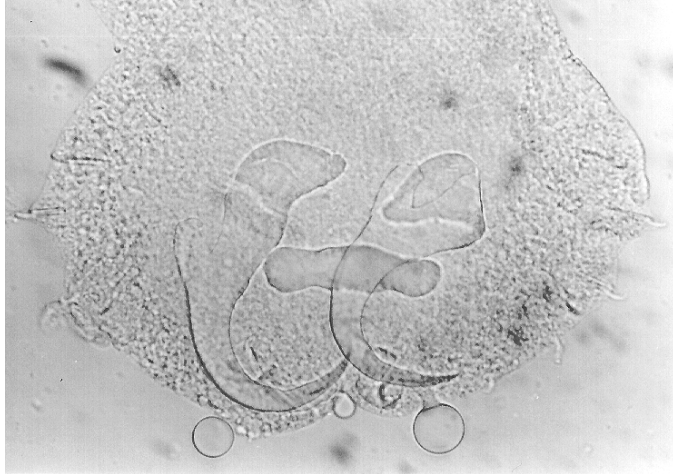


Figure 4. *Pseudodactylogyus bini* - adhesive disc (original), x 328

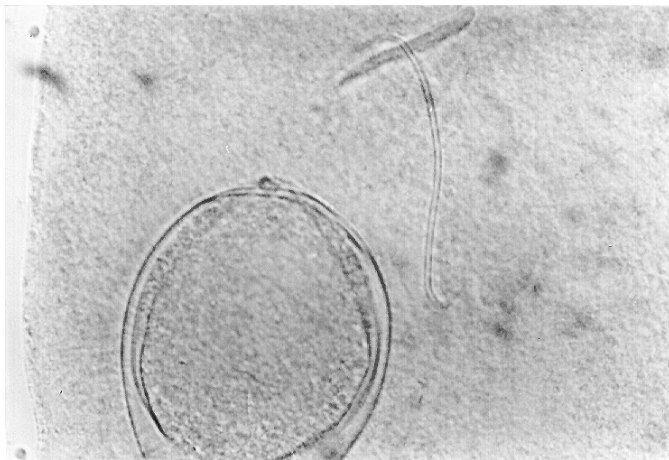


Figure 5. *Pseudodactylogyus bini* - copulatory organ (original), x 280



Figure 6. *Pseudodactylogyus bini* - relationship between ovarium and testis (original), x 63

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