# MONOGENEAN TREMATODS OF CARP (*CYPRINUS CARPIO* L.) FROM LAKE DOJRAN, MACEDONIA

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*Abstract:* During the parasitological investigations on the of carp from Macedonian part of Lake Dojran, three parasite species of the class Monogenea are found, as follows: *Dactylogyrus extensus* and *Eudiplozoon nipponicum* - in 32,0% each, and *Dactylogyrus minutus* - in 24,0% of carps. Prevalence of infestation in carp is 64,0%, and average intensity of infestation is 2,17. These parasites found have expressive impact on the health and conditional state of the carp. *Dactylogyrus extensus* and *Dactylogyrus minutus* belong to the group specialists (which are met only in one host species), while *Eudiplozoon nipponicum* is generalist (met in many species of hosts - fishes). All found species of monogenean trematods are new to the parasite fauna of the fishes from Lake Dojran and Macedonia.

*Key words: Monogenean, carp, Lake Dojran.*

## Introduction

Lake Dojran is situated in the south-east part of Macedonia. The surface of the lake is 42.5 $km^2$, of which 26.58 $km^2$ belongs to Macedonia, and 15.92 $km^2$ to Greece. Maximum depth is 10 m. The lake is expressively eutrophic, with a big amount of phyto- and zooplankton. In the last 20 years, the level of the water had tendency of continual lowering, due to the drought years and the excessive use of water. In such a way, depth is reduced to less than five meters. Because of this, a total destruction of habitats is found out, particularly in the littoral region. An appearance of strange and mainly ubiquitous species for the lake is found out, representatives of muddy fauna, and characteristic for the polisaprobic level of pollution. In the recent years, a drop in annual fish catch is observed, of the previous 250 tons, to less than 100 t, first of all as a consequence of the changed fish habitats and excessive catchment. In the fish population dominates cyprinid fishes, represented by eight species, and other species are: perch, eel and wells. Particularly great market value has: roach, bleak, carp, perch and wells.

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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 specialty 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 subjected 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.

## Materials and Methods

Fish material was sampled seasonally, from the Macedonian part of Lake Dojran.

Only fresh fishes were subjected of routine identification, dissection and observation methods. Cleaned parasites were separated and put in certain fixatives, prepared for determination with determined techniques of staining and clearing (VASILJKOV, 1983; GUSSEV, 1983; STOJANOVSKI, 1997, 2003).

For identification of the parasite species we used the following keys: BAUER (1985, 1987) and GUSSEV (1983). The most successful preparations for every parasite species were photographed and are displayed.

## Results and Discussion

During the parasitological investigations on *Cyprinus carpio* from Lake Dojran (Macedonia), three parasite species of the class Monogenea are found, as follows: *Dactylogyrus extensus, D. minutus* and *Eudiplozoon nipponicum*.

The total prevalence of infestation is 64,0%, i.e. 16 infested fishes of 25 examined. Prevalence with *Dactylogyrus extensus* and *Eudiplozoon nipponicum* is 32,0% each, and *Dactylogyrus minutus* - in 24,0% of carps (Table 1).

Table 1. Prevalence and intensity of infestation with Monogenean trematods in Cyprinus carpio from Lake Dojran.

| Parasite species | Season | Prevalence f infestation | | | Average intensity of infestation by seasons |
|---|---|---|---|---|---|
| | | No. of examined fish | No. of infested fish | % of infested fish by seasons | (regarding the number of infested fish) |
| Dactylogyrus | Spring | 7 | 3 | 42.86 | 1.0 |
| minutus | Summer | 10 | 3 | 30.0 | 1.0 |
| | Autumn | 8 | 0 | 0 | 0 |
| **In total - Dactylogyrus minutus** | | **25** | **6** | **24.0** | **1.0** |
| Dactylogyrus | Spring | 7 | 3 | 42.86 | 5.0 |
| extensus | Summer | 10 | 3 | 30.0 | 3.0 |
| | Autumn | 8 | 2 | 25.0 | 1.0 |
| **In total - Dactylogyrus extensus** | | **25** | **8** | **32.0** | **3.0** |
| Eudiplozoon | Spring | 7 | 5 | 71.43 | 1.50 |
| nipponicum | Summer | 10 | 0 | 0 | 0 |
| | Autumn | 8 | 3 | 37.50 | 1.0 |
| **In total - Eudiplozoon nipponicum** | | **25** | **8** | **32.0** | **1.31** |
| **Totally infested** | | **25** | **16** | **64.0** | **2.17** |

The average intensity of infestation is 2,17, and the highest level is that of *Dactylogyrus extensus* (3,0), followed by *Eudiplozoon nipponicum* (4,90) and the lowest intensity of infestation was with *Dactylogyrus minutus* (1,0%).

These parasites found have expressive impact on the health and conditional state of the carp, especially *Dactylogyrus extensus* and *Eudiplozoon nipponicum.*

Fauna of monogenean trematods of *Cyprinus carpio* from the Lake Dojran is in common with that of the fishes of the family Cyprinidae from the Balkan Peninsula and more widely (Ergens, 1960, 1970; Chankovic et al., 1968; Kakacheva-Avramova, 1983; Hristovski, 1983; Bauer, 1985, 1987; Dupont & Lambert, 1986 ; Nedeva-Lebenova, 1991; Cakic, 1992; Stojanovski, 1997, 2003), etc.).

Monogenean trematods of *Cyprinus carpio* from the Lake Dojran are entirely freshwater.

Established parasites is with wide area of distribution. *Dactylogyrus extensus* and *Dactylogyrus minutus* belong to the group specialists (which are met only in one host species), while *Eudiplozoon nipponicum* is generalist (met in many species of hosts - fishes).

Findings of *Dactylogyrus extensus, D. minutus* and *Eudiplozoon nipponicum* represent first record for *Cyprinus carpio* from Lake Dojran.

Figure 1. *Dactylogyrus extensus* - adhesive disk (original), x 252
Figure 2. *Dactylogyrus extensus* - copulatory organ (original), x 288

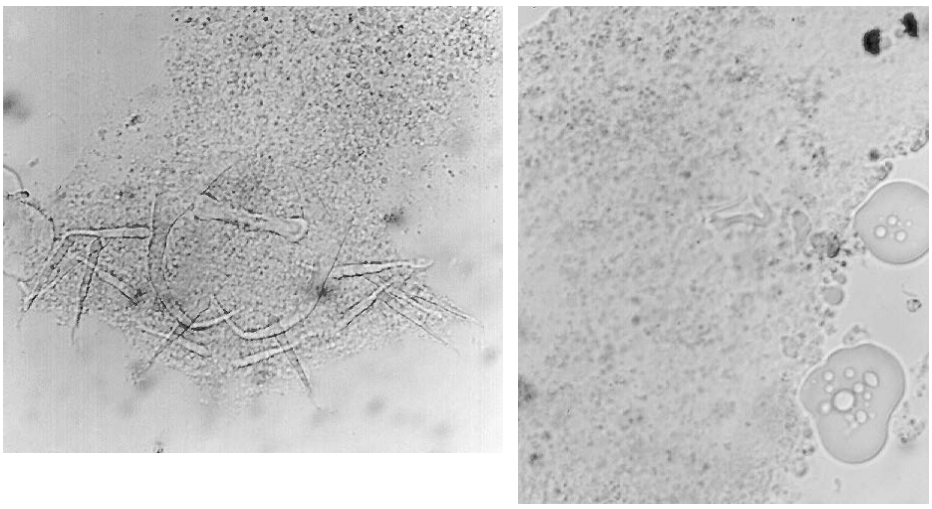

Figure 3. *Dactylogyrus minutus* - adhesive disk (original), x 300
Figure 4. *Dactylogyrus minutus* - copulatory organ (original), x 320

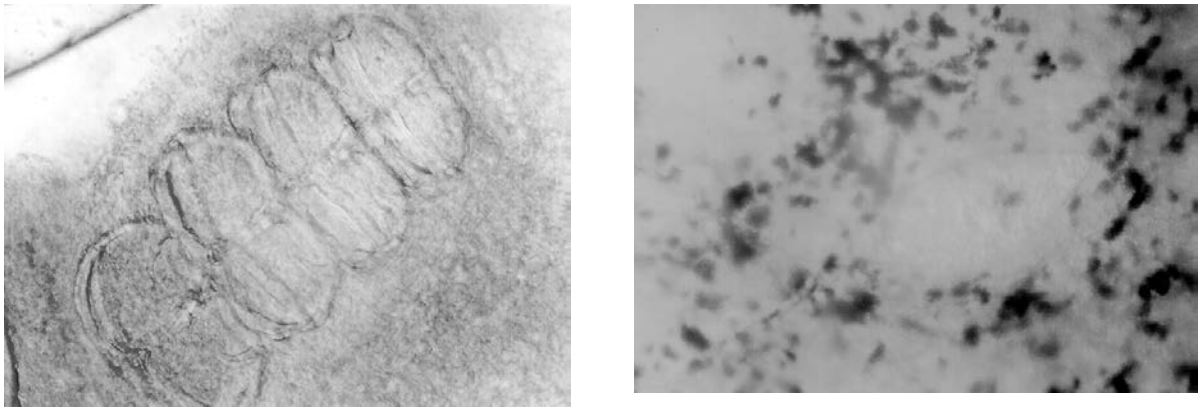

Figure 5. *Eudiplozoon nipponicum* - clamps (original), x 126
Figure 6. *Eudiplozoon nipponicum* - egg (original), x 80

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