

A CONTRIBUTION TO STUDIES ON FISH PARASITES OF LAKE REVA – PANČEVO
SWAMP REGION DURING 1992

CAKIĆ, P.* and SAVIN, Ž.**

*Institute for Biological Research "Siniša Stanković, 29. novembra 142, Belgrade

**Faculty of Veterinary Medicine, Bulevar JNA 18, Belgrade, University of Belgrade

(Received 8. July 1993)

The purpose of our study was to determine fish parasite species and their prevalence in the natural lake Reva, frequently visited by sports fishermen from Belgrade. Lake Reva receives industrial and communal waste water from the nearby industrial centre and from communities in the Pančevo Swamp region. During 1992, 384 fish specimens belonging to the families Esocidae, Cyprinidae, Percidae and Centrarchidae were examined. We detected 27 parasite species in total, belonging to 12 classes. Most of the species observed (23) are already well-known and widespread fish parasites in the area of former Yugoslavia. However, 4 parasite species (Scyphidia sp., Dactylogyrus anchoratus, Clinostomum complanatum and Diplostomum helveticum) are new in the ichthyoparasite fauna of Serbia, as well as of former Yugoslavia. The spread of infection with ectro- and endoparasites (excluding protozoans) in specimens belonging to 7 fish species in June and September in 1992 was within the limits of 40%, on average. According to our results we can conclude that Lake Reva is "polluted" with parasites.

Key words: Fish; Parasites; Natural lake

INTRODUCTION

Water is a very suitable environment for the development of different fish diseases and for their pestilence. Bioecological studies of fish parasites have theoretical and practical importance, especially when natural ecosystems with developed commercial and sports fishing are concerned. This study is a part of strategical project on comparative hydroecological and cytological analysis of the influence of pollutants on aquatic ecosystems. The purpose of our study was to detect and classify fish parasite species in the natural lake Reva, frequently visited by sports fishermen from Belgrade. This lake is situated in the south part of the Pančevo swamp near the Danube embankment (Fig. 1). Its total length is 2,6 km and the average depth is 1,5 m with an area of 406000 m². One part of this lake is connected to the Krnjača colony with a channel system, and the other part with Kalovita Channel. Through this system of chan-

nels Lake Reva is exposed to waste waters of the Krnjača sewerage system and industrial waters from Kalovita Channel, which receive water from an industrial zone (G. P. "Trudbenik" – construction company, "Beograd", refinery, "Balkan", "Automobilsko" Belgrade – transportation company, the printing firm "Politika", etc.). From these facts we can conclude that this aquatic ecosystem is most probably extensively degraded.

MATERIAL AND METHODS

During 1992, 384 fish specimens from Lake Reva in the Pančevo swamp were examined. They were collected by the electric fishing device "Honda" (12A – 220V) during June and September. Ten years ago Lake Reva rich in fish species and also in fish biomass. Today its ichthyofauna consists of only 7 species belonging to the families Esocidae, Cyprinidae, Percidae and Centrarchidae. The following species were examined:

— pike – <i>Esox lucius</i> Linnaeus 1758	60 spc.
— tench – <i>Tinca tinca</i> (Linnaeus 1758)	60 spc.
— crucian carp – <i>Carassius carassius</i> (Linnaeus 1758)	72 spc.
— prussian carp – <i>Carassius auratus gibelio</i> (Bloch 1783)	96 spc.
— Amur's chobocheck – <i>Pseudorasbora parva</i> (Schlegel 1842)	30 spc.
— perch – <i>Perca fluviatilis</i> Linnaeus 1758	33 spc.
— sunfish – <i>Lepomis gibbosus</i> (Linnaeus 1758)	33 spc.

Specimens were transported alive to the "Siniša Stanković" Institute for Biological Research and then transferred to aquariums in the cold chamber at 7°C, according to species. Material was examined by the standard parasitological technique. Parasites found were bleached, stained and prepared for classification and collection. This was done at the Department of Parasitology, Faculty of Veterinary Medicine, Belgrade. A part of the material was fixed in 4% formaldehyde. Parasites were analyzed under an "Olympus CO 1" microscope and drawn by AB machine.

RESULTS

In 384 Fish specimens from lake Reva we determined 27 parasite species in total, belonging to 12 classes:

Class I – Oomycetes, species *Saprolegnia* sp.

Class II – Kinetoplastomonada Honigberg 1963, species *Costia necatrix* (Henneguy 1884).

Class III – Myxosporidia Butschli 1881, species *Myxobolus cyprini* Doflein 1898.

Class IV – Cyrtostomata Jankowski 1978, species *Chilodonella piscicola* (Zacharias 1894) Jankowski 1980.

Class V – Hymenostomata Delage and Heronard 1896, species *Ichthyophthirius multifiliis* Fouquet 1876.

Class VI – Peritricha Stein 1859, species *Scyphidia* sp. Dujardin 1841 and *Trichodina* sp. Ehrenberg 1830.

Class VII – Trematoda Rudolphi 1808, species *Dactylogyrus anchoratus* (Dujardin 1845); *D. vastator* Nybelin 1924; *Allocreadium isoporum* (Looss 1894) Looss 1900; *Asymphylodora tincae* (Modler 1790); *Clinostomum complanatum* (Rudolphi 1819); *Diplostomum spathaceum* (Rudolphi 1819); *D. helveticum* Dubois 1929 and *Posthodiplostomum cuticola* (Nordmann 1832) Dubois 1936. Class VIII – Cestoda Rudolphi 1808, species *Triaenophorus nodulosus* (Palls 1781); *Bothriocephalus opsariichthydis* Yamaguti 1934 and *Proteocephalus torulosus* Batsch 1786.

Class IX – Nematoda Rudolphi 1808, species larvae *Raphidascaris acus* (Bloch 1779) Raaij et al. 1915 and *Capilaria tomentosa* Dujardin 1843.

Class X – Acanthocephala (Rudolphi 1808), species *Acanthocephalus lucii* (Muller 1776) Luhe 1911; *A. anguillae* (Muller 1780) Luhe 1911 and *Pseudoechinorhynchus borealis* (Linstow 1901).

Class XI – Hirudinea Lamarck 1818, species *Piscicola geometra* (Linnaeus 1761).

Class XII – Crustacea Lamarck 1801, species *Ergasilus sieboldi* Nordmann 1832; *Lernaea cyprinacea* Linnaeus 1758 and *Argulus foliaceus* (Linnaeus 1758) Muller 1785.

Most of the species found (23) are already well-known and widespread fish parasites in Slovenia (Brglez 1973), Croatia (Stossich 1890, Fijan 1974, Tomašec 1953, Babić 1935, Babić and Richer 1970, Hribar 1933), Bosnia and Herzegovina (Senk 1953, Čanković et al. 1968, Kiškarolj 1964), Montenegro (Kažić 1970) and Serbia (Radočević, Sofrenović, Petrović 1978, Đanić 1979, Andrić 1984, Čirković 1986, Čakić 1986, 1992). However, 4 parasite species (*Scyphidia* sp., *Dactylogyrus anchoratus*, *Clinostomum complanatum* and *Diplostomum helveticum*) were observed the first time among the fauna of Serbian ichthyoparasites, as well as of some other parts of former Yugoslavia stated above.

The intensity and extent of infestation by ecto- and endoparasites (without protozoans) in the stated months of 1992, were the largest with crucian carp (49 specimens or 68,0% out of 72 captured were infected). Prussian carp followed (42 or 43,7% infected out of 96), then tench (60 specimens caught, 25 or 41,7% infected), perch (33 caught, 11 or 33,3% infected), pike (60 specimens caught, 19 specimens or 31,7% infected) and sunfish (6 specimens or 18,2% infected out of 33 specimens caught). *Pseudorasbora parva* was not infected, except with protozoans.

DISCUSSION

Lake Reva, appeared to be an interesting biotope because its flora and fauna is endangered with waste materials from industrial and urban regions. Our results, regarding fish parasites, can be used for comparative analysis with the fauna of ichthyoparasites of other water basins in Yugoslavia and other

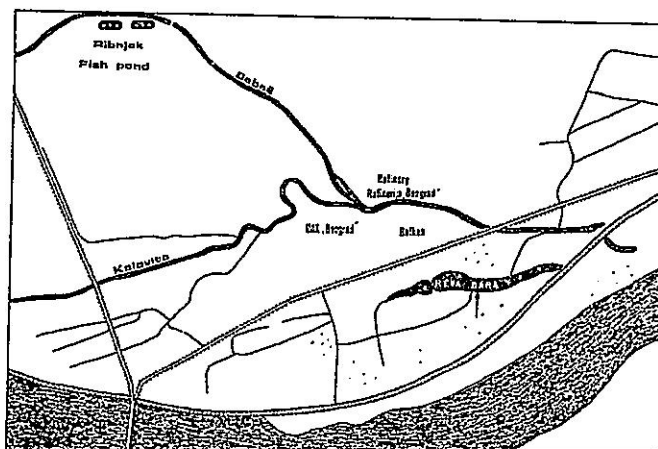
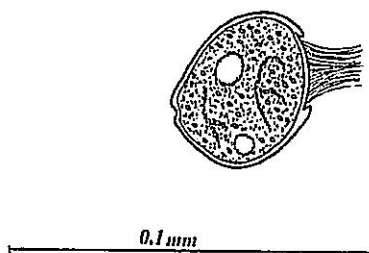
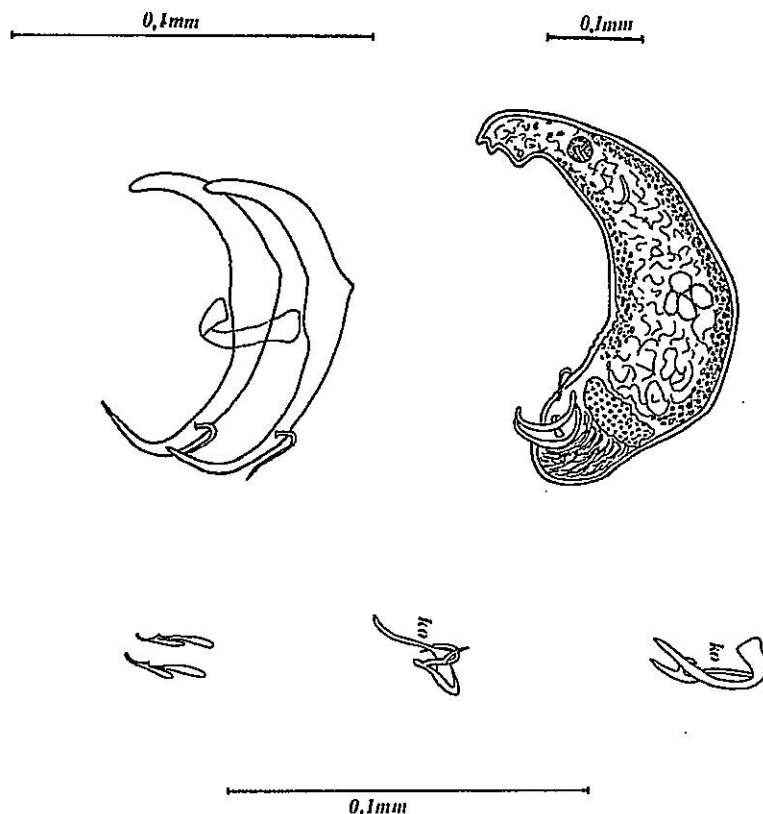


Figure 1. Lake Reva

countries, as well as making a contribution to the zoogeographic spread of species found.

The parasitological survey was done on 384 fish specimens belonging to the families: Esocidae, Cyprinidae, Percidae and Centrarchidae. Protozoans were found in the mucus of fish bodies and on the gills of every specimen as follows; *Costia necatrix*, *Myxobolus cyprini*, *Chilodonella piscicola*, *Ichthyophthirius multifiliis* and *Trichodina* sp. together with the parasitic fungus *Saprolegnia* sp. According to data from the literature the area of occurrence of these parasitic protozoans and fungi is extremely wide. In the mucus of the prussian carp the protozoa *Scyphidia* sp. (Figure 2) were found, also. This record of this parasitic sessile protozoa is the first one concerning Yugoslavian ichthyoparasite

Figure 2. *Scyphidia* sp.-original

Figure 3. *Dactylogyrus anchoratus*-original

fauna. The similar sessile form of *Sessilina gen. sp.* was found by Čakić (1992) in the mucus of *Cobitis* spined Loach and *Cottus gobio* miller's-thumb in the Uvac river basin on Sjenica-Pešter Plateau and by Bihovskaja - Pavlovskaja et al. (1962) and Bauer (1984) in Russian water basins in the mucus and on the gills of several freshwater species. The trematode (monogenea) *Dactylogyrus anchoratus* (Figure 3), the first record in present and former Yugoslavia, was found on the gills of prussian carp and crucian carp. This parasite is widespread in Bulgarian rivers, according to Kakačeva-Avramova (1983). These parasites were detected on the gills of carp, crucian carp and prussian carp, and, according to Bauer (1985), these small and middle - sized worms (up to 0,74 mm) invade the gills of prussian carp and carp. The species is widespread in European and Asian waters and it has been introduced to the fresh waters of North America. The other monogenea, *D. vastator* found on the gills of crucian carp, is a well-known species of former Yugoslavia and other countries. Metacercariae of *Diplostomum helveticum* (Figure 4) were found in the eye lens of crucian carp. This is the first record of this digenea trematode in our country.

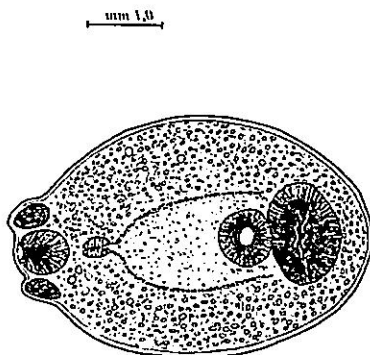


Figure 4. *Diplostomum helveticum*-original

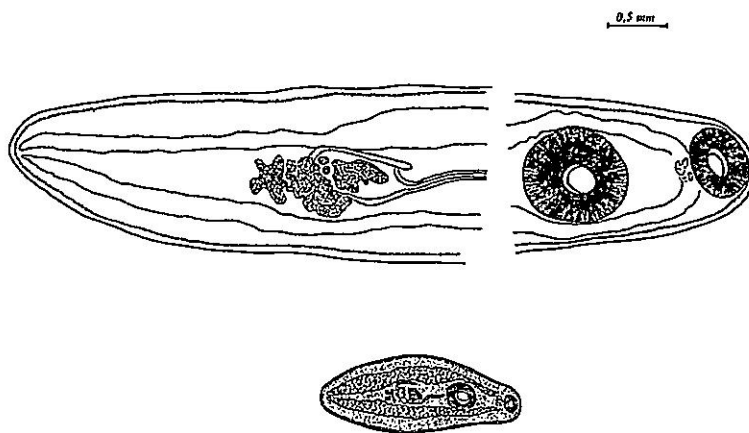


Figure 5. *Clinostomum complanatum*-original (Metacerkary)

Bauer (1987) detected this parasite in eye lenses of a lot of fishes of the USSR. The first record for Serbian fauna also concerns metacercariae of the liver fluke *Clinostomum complanatum* (Figure 5). They were found on the gill branchyospines and in the basal part of the gill arches of the crucian carp. Kažić (1970) described it previously in Montenegro. The following parasites found on fishes from Lake Reva are already well-known and have been described in our domestic and foreign literature: the liver fluke species *Allocreadium isoporum* on perch, *Asymphyiodora tincae* on tench and metacercaria of *Diplostomum spathaceum* on prussian carp and of *Posthodiplostomum cuticola* on crucian carp; the tapeworm species *Trienophorus nodulosus* on pike, *Bothriocephalus opsarichthydis* on crucian carp and *Proteocephalus torulosus* on crucian carp; the nematodes *Raphidascaris acus* (larvae) on prussian carp, *Capillaria tomentosa* on crucian carp; acanthocephales *Acanthocephalus lucii* on perch, *A. anguillae* on crucian carp, *Pseudoechinorhynchus borealis* on crucian carp and perch; the leech *Piscicola geometra* on pike and parasitic crustaceans *Ergasilus sieboldi* on tench and crucian carp, *Lernaea cyprinacea* on sunfish and *Argulus foliaceus* on the pike.

The most infested fish species (without protozoans) were crucian carp (68.05%), followed by prussian carp (43.75%), tench (41.67%), perch (33.33%), pike (31.67%) and sunfish (18.18%). No ecto- or endoparasites were detected on *Pseudorasbora parva*.

According to our results we can conclude that Lake Reva is "polluted" with parasites, and the spread of infection in the specimens examined belonging to 7 fish species was within the limits of 40% in June and September in 1992.

Acknowledgement

This study is a part of the strategic project for Technological Development supported by the Ministry of Science of Serbia: "Comparative hydroecological and cytological analysis of the influence of pollutants on aquatic ecosystems: optimization, preservation and protection of water resources".

REFERENCES

1. Andrić, M. 1984. Endohelminthi riba Obodske bare. *Republička zajednica nauke Srbije, Monografija*, 1-225, Beograd.
2. Babić, I. 1935. O nalazima endoparazitskih crva kod slatkovodnih riba. *Veterinarski arhiv*, V (8): 356-367, Zagreb.
3. Babić, I., Richer, B. 1970. Razvoj i stanje istraživanja helmintata i bolesti izazvanih helmintima u Jugoslaviji. *Acta parasitologica*, vol. 1-2, 37-45, Zagreb.
4. Bauer, O. N. 1984. Opređelitelj parazita presnovodnih ryb fauny SSSR. Tom I, *Paraziticheskie prostejšie, Akademija nauk SSSR, Zoologičeskij institut, "Nauka", Leningradskoe otdelenie, Leningrad*.
5. Bauer, O. N. 1985. Opređelitelj parazitov presnovodnih ryb fauny SSSR. Tom II, *Paraziticheskie prostejšie, Akademija nauk SSSR, Zoologičeskij institut, "Nauka", Leningradskoe otdelenie, Leningrad*.
6. Bauer, O. N. 1987. Opređelitelj parazitov presnovodnih ryb fauny SSSR. Tom III, *Paraziticheskie prostejšie, Akademija nauk SSSR, Zoologičeskij institut, "Nauka", Leningradskoe otdelenie, Leningrad*.

7. Brglez, J. 1973. Zajedavci in zajedavske bolezni slatkovodnih rib v Sloveniji. *Zbornik Biotehniške fakultete Univerze v Ljubljani – Veterinarstvo, Supplement 1*.
8. Byhovskaja-Pavlovskaja, I. E., Gusev, A. V., Dubinina, M. N., Izjumova, N. A., Smirnova, T. S., Sokolovskaja, I. L., Štein, V. M., Šuljman, S. S., Epštejn, V. M. 1962. Opređelitelj parazita presnovodnih ryb SSSR. *Akademija nauk SSSR. Zoologičeski Institut. Izdateljstvo Akademij nauk SSSR, Moskva – Lenjingrad*.
9. Cakić, P. 1986. Prilog poznavanju faune ekto- i endoparazita riba voda kanala Pančevačkog rita. *Univerzitet u Beogradu, Centar za multidisciplinarnu nauku, Specijalistički rad*, 1–133, Beograd.
10. Cakić, P. 1992. Paraziti riba u vodama Sjeničko-Pešterske visoravni i mogućnosti njihovog suzbijanja. *Veterinarski fakultet Univerziteta u Beogradu, Doktorska disertacija*, 1–277, Beograd.
11. Čanković, M., Delić, S., Kiškarolić, M., Rukavina, J. 1968. Parazitofauna slatkovodnih vrsta riba Bosne i Hercegovine (Trematoda, Nematoda, Acanthocephala). *Akademija nauke i umetnosti Bosne i Hercegovine, Odelenje prirodnih i matematičkih nauka, XXXIII, 2*, 1–159, Sarajevo.
12. Čirković, M. 1986. Mlekosporidioze jednogodišnjih šaranskih mladunaca. *Veterinarski fakultet u Beogradu, Doktorski rad*, 1–145, Beograd.
13. Đanić, S. 1979. Nematodi i akantocefali ciprinidnih riba Dunava i sistema Dunav-Tisa-Dunav zapadne Bačke. *Biosistematika, Vol. 5, No. 1*, 57–60, Beograd.
14. Fijan, V. 1974. Bolesti riba i rakova. *Sveučilište u Zagrebu, Vet. fakultet, Zagreb*.
15. Hribar, L. 1933. Trinaenophorus nodulosus Pali. *Jug. vet. glasnik*, 12, 408–410, Zagreb.
16. Kakačeva-Avramova, D. 1983. Helminthi na slatkovodne ribe u Bugarskoj. *S., BAN*, 261 s.
17. Kažić, D. 1970. Endohelminthi ekonomski najvažnijih riba Skadarskog jezera. *Disertacija, Veterinarski fakultet Univerziteta u Titogradu*.
18. Kiškarolić, M. 1964. Cestodi i Nematodi salmonidnih i nekih drugih riba u Bosni i Hercegovini. *Disertacija, Veterinarski fakultet Univerziteta u Sarajevu*.
19. Radojčević, M., Sofrenović, Dž., Petrović, Z. 1978. Patologija riba, rakova i školjki. *Univerzitet u Beogradu, Naučna knjiga*, Beograd.
20. Stossich, M. 1890. Elminthi della Crozia. *Glasnik prirodoslovnog društva, V*, 129–135.
21. Šenk, O. 1953. Raphidascaris acus Bloch entoparazit Salmonida rijeke Zujevice (preliminarna zapažanja). *Veterinaria II, 2*, 311–316.
22. Tomašec, I. 1953. Bolesti slatkovodnih riba i rakova. *Jugoslavenska akademija znanosti i umjetnosti, Zagreb*.

PRILOG POZNAVANJU PARAZITA RIBA U JEZERU REVA – PODRUČJE PANČEVAČKOG RITA U PERIODU 1992. GODINE

P. CAKIĆ I Ž. SAVIN

SADRŽAJ

U okviru strateškog projekta za Tehnološki razvoj Ministarstva za nauku Srbije, pod nazivom: "Uporedna hidroekološka i citološka analiza uticaja polutanata na akvatične ekosisteme sa ciljem optimizacije, očuvanja i zaštite vodenih resursa", cilj naših istraživanja je bio da ustanovimo koje se vrste parazita kao i njihova zastupljenost, mogu naći u riba iz prirodnog jezera Reva koje je dobro posećeno od sportskih ribolovaca Beograda, a recipijent je industrijskim i urbanim vodama područja u kome se nalazi. U toku 1992. godine parazitološkim pregledom obrađeno je 384 ribe koje pripadaju familijama Esocidae, Cyprinidae, Percidae i Centrarchidae. Kod pretraženih riba deter-

minisano je ukupno 27 vrsta parazita iz 12 klasa. Veći broj vrsta (23) koje smo pronašli su poznati i rasprostranjeni riblji paraziti za područja bivše Jugoslavije, a 4 vrste parazita *Scyphidia* sp., *Dactylogyrus anchoratus*, *Clinostomum complanatum* i *Diplostomum helveticum* su novi nalazi za ihtioparazitofaunu Srbije i područja bivše Jugoslavije. Rasprostranjenost zaraženosti ekto- i endoparazitima (bez protozoa) kod pregledanih jedinki 7 vrsta riba u periodu istraživanja juni i septembar 1992. godine bio je u srednjim granicama i kretao se oko 40% pa možemo zaključiti da je jezero Reva "zagađeno" u parazitološkom smislu.