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**8th INTERNATIONAL CONFERENCE  
“WATER & FISH”**

**CONFERENCE PROCEEDINGS**

**Faculty of Agriculture, Belgrade-Zemun, Serbia  
June, 13 – 15. 2018.**

PUBLISHER  
University of Belgrade - Faculty of Agriculture

FOR THE PUBLISHER:  
Prof. Dr. Milica Petrović

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GRAPHIC, Novi Sad

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PRINTED BY  
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NUMBER OF COPIES PRINTED  
400 COPIES

ORGANIZATION OF THE CONFERENCE SUPPORTED BY:  
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## PARASITIC INFESTATIONS OF THE COMMON CARP (*CYPRINUS CARPIO*) IN FISH FARMS OF VOJVODINA REGION, SERBIA

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## PARAZITSKE INFESTACIJE ŠARANA (*CYPRINUS CARPIO*) NA RIBNJACIMA U VOJVODINI, SRBIJA

### Apstrakt

Ciprinidne ribe predstavljaju najbrojniju familiju slatkovodnih riba. Šaran (*Cyprinus carpio* Linnaeus, 1758) je jedna od najčešće gajenih ribljih vrsta u svetu, uključujući i Srbiju koja tradicionalno proizvodi šarana. Zbog svog širokog areala rasprostranjenosti i adaptacije na različite klimatske i geografske uslove brojni paraziti predstavljaju pretnju po zdravlje i produktivnost ove vrste. Prilikom procene da li je neki parazit samo prisutan na ribi ili izaziva bolest treba biti veoma obazriv. Paraziti mogu izazivati različite simptome od smanjenja telesne mase i slabljenja kondicije do slepila, respiratornih smetnji, intestinalnih simptoma, anemije, lezija kože, peraja i dr. Dovode i do pada imuniteta riba i stvaranja lezija koje predstavljaju ulazna vrata za delovanje bakterija, virusa i gljivica. Neki paraziti mogu biti i vektori i mehanički prenosioci određenih bolesti. Cilj ovog rada je da se da pregled najznačajnijih i najčešćih parazitskih infestacija prisutnih poslednjih godina na šaranskim ribnjacima u Vojvodini. Istraživanja su sprovedena na 18 šaranskih ribnjaka u Srbiji, od 2010-2016. godine a u sklopu sistemskog monitoringa najznačajnijih parazitoza šarana. Ukupno je pregledano 450 jedinki. Ribe su pregledane tokom čitavog vegetacionog perioda. Praćene su kliničke promene i uzimani su uzorci za nativnu mikroskopiju koja je rađena pomoću svetlosnog mikroskopa. Uzorci su najčešće uzimani sa kože i škrge za preglede na protozoe, ali su pregledani i svi unutrašnji organi. Spore su pregledane takođe nativnom mikroskopijom. Od inficiranih jedinki uzimana su i različita tkiva u zavisnosti od patoloških promena za patohistološku analizu koja je sprovedena klasičnom metodologijom, fiksiranjem u 10% formalinu, sečenjem 5 µm velikih isečaka koji su kalupljeni u parafin i bojenjem isečaka pomoću H&E. Nađene su različite vrste parazita od kojih su

najdominantniji bili sledeći paraziti: *Ichthyophthirius multifiliis*, *Trichodina* i *Chilodonella piscicola* kao predstavnici protozoa trepljaša, te *Ichthyobodo necator*, jedan od najsitnijih bičara. Među detektovanim miksosporidijama treba istaći *Telohanellus nikolski* koji je bio prisutan tokom svih godina istraživanja u formi telohaneloze na perajima i telohaneloze na krljušti. Metilj *Dactylogyrus vastator* često je izolovan sa škrga, dok je *Diplostomum spathaceum* detektovan sporadično. Pantljičara *Bothriocephalus acheilognathi* i artropode *Lernaea cyprinacea* i *Argulus foliaceus* takođe su često dijagnostikovani kod šarana na našim ribnjacima. S obzirom na prisustvo velikog broja parazita i značajnih patoloških promena do kojih dovode kod šaranskih mladunaca treba stalno raditi na njihovom smanjenju i eradikaciji. Ključne mere za kontrolu parazitskih infestacija kod šarana su pravilno gajenje, isušivanje objekata, izmrzavanje, mehanička obrada tla i dezinfekcija krečom koja ima za cilj smanjivanje broja različitih prelaznih domaćina za parazite.

**Ključne reči:** paraziti, šaran, Srbija

**Keywords:** parasites, common carp, Serbia

## INTRODUCTION

Carp of the family Cyprinidae, are the largest family of freshwater fishes in the world, that have been introduced beyond their native ranges (Nelson, 1994§). Cyprinids are also among the most frequently farmed fishes in the world, as well as in Central Europe. Serbia is country with a traditional production of common carp. Due to common carp's adaptation to a wide range of climatic and geographical condition, many of parasites have been found in wild and domestic carp (Tekin-Özan et al., 2008). When defining the relationship between parasites and the fish host it is often difficult to decide whether the present parasite caused a disease or they did not damage to the health of the host. Parasites are among the important causative agents of diseases in fish responsible for manifestation of various symptoms of the disease as weight loss, gill damages, blindness, abnormal behavior, epithelial lesions, as well as increased sensitivity to other causes of the disease leading to the secondary fungal, bacterial and viral infections. Some external parasites may act as carriers of other pathogens being significant vectors of many diseases (Ćirković and Novakov, 2013).

The present paper is the part of a large study concerning parasites infected *Cyprinus carpio* from fish ponds in Vojvodina region, Serbia and give an overview of the most common and most important parasitic species and diseases present in recent years on our fish farms.

## MATERIALS AND METHODS

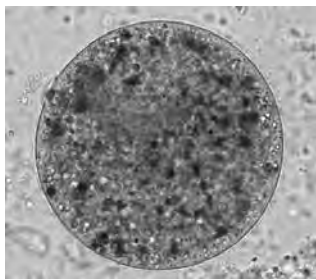
Investigation was carried out in the northern Serbia (Vojvodina province) in 18 fish ponds, until 2010 to 2016 during a systematic survey of parasites of carp. 450 fishes were included in study. Common carps *Cyprinus carpio* L. 1758 were examined during the whole growing season. After clinical observations, fish were examined externally and internally for parasites. Skin, fins, gills and abdominal cavity smear were prepared by slight scraping and examined under a light compound microscope. Lens was dissected and removed from each eye then inspected under dissecting microscope for parasites. For the study of the internal parasites, the fishes were dissected from the ventral side. The body cavity, stomach, intestine, spleen, liver, kidneys, heart, muscles, swim bladder and gonads were separated and examined carefully under a dissecting microscope for the presence of parasites or cysts. Most of parasites were identified in a direct way by preparing smears of mucus which



was scraped from the skin, fins and gills, onto a slide covered by slip and examined. Spores were studied fresh. Samples for pathohistology were fixed in 10% neutral formalin, were processed, sliced to 5- $\mu$ m-thick paraffin-wax embedded tissue sections, mounted and stained in haematoxylin and eozine. The detected parasites were identified according to their morphology using the reference keys of Bykhovskaya-Pavlovskaya et al. (1964), Gussev (1985), Bauer (1987), Hoffman (1999) and Pugachev et al. (2010).

## RESULTS AND DISCUSSION

The present study showed the existence of numerous parasites. The most dominant protozoans including ciliats and flagellats were *Ichthyophthirius multifiliis* (Figure 1), *Trichodina* sp. (Figure 2), *Chilodonella piscicola* and *Ichthyobodo necator* (Figure 3).



**Figure 1.** *Ichthyophthirius multifiliis*

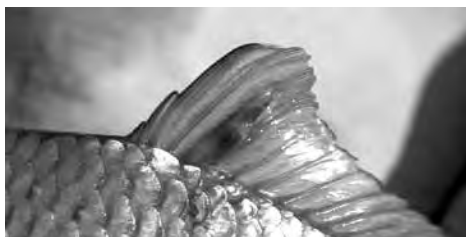


**Figure 2.** *Trichodina* sp.

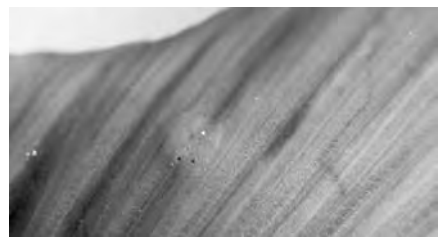


**Figure 3.** *Ichthyobodo necator*

Myxosporidians were also present in carp fingerlings where the most abundant species was *Thelohanellus nikolskii*. Trematode *Dactylogyrus vastator* was a frequent parasite of the common carp gills, while the *Diplostomum spathaceum* were detected occasionally. Cestoda *Bothriocephalus acheilognathi*, and crustaceans *Lernaea cyprinacea* (Figure 4) and *Argulus foliaceus* (Figure 5) represented important pathogens often diagnosed.



**Figure 4.** *Lernaea cyprinacea* on common carp dorsal fin.



**Figure 5.** *Argulus foliaceus* on common carp fin.

Ciliated protozoan *Ichthyophthirius multifiliis* Fauquet, 1876, was found on the skin, fins and gills of *C. carpio* usually during the spring, causing necroses in the form of white prominent spots 0.1-1 mm in diameter. *Chilodonella piscicola* a ciliat, infected one-year-old fishes and provoked whitish opacity on the skin and gills what resulted in respiratory

difficulties. *Trichodina*, also ciliated protozoan was isolated from the skin and fins and in small numbers did not pose a important problem to fish. Only in big number of isolated parasites, especially in fry led to skin and gill lesions. *Ichthyobodo necator* a flagellate, known as one of the tinest parisites of fish, caused excessive mucus production in young categories of carps. Myxosporidia *Thelohanellus nikolskii* caused disease called thelohanellosis which appeared in two forms fin and scale. The fin thelohanellosis occurred during July and September in one-year-old carp fingerlings in the form of cysts on the fins and being present on our fish ponds from the eighties (Ćirković, 1986). The scale thelohanellosis was present during the April and May in two-years-old common carps in the form of cysts on the scales. The disease was described for the first time in our ponds 10 years ago (Novakov, 2013). Monogenean trematoda *Dactylogyrus vastator* led to swollen gills covered with increased amount of mucus, haemorrhages and the fusion of the gill arches and consequently breathing difficulties. *Diplostomum spathaceum* was isolated from eye lens and manifested as blindness and mortalities in young fish infested with metacercaria. *Bothriocephalus acheilognathi*, the most detected common carp cestoda usually was found in one-year fry in intestines. The symptoms included body-weight loss, anemia and mortalities. Arthropodes *Lernaea cyprinacea* and *Argulus foliaceus* are the ectoparasites very often present in common carp. Parasites are located in the skin and partly in the muscles, causing inflammation and ulcers at affected tissue. *A. foliaceus* penetrate the skin and suck blood after injecting anticoagulant toxins (Novakov et al., 2015). Those crustaceans are especially important in viral and bacterial diseases transmission.

## CONCLUSIONS

Results of this study of parasitic infections in common carps support that infestations of parasites including protozoa, metazoan, trematodes, cestodes and arthropods are widespread treat causing losses in fish farms in Serbia. It is therefore necessary to continuously work on reducing their prevalence. This is possible by improving of fish rearing conditions and usage of prophylactic measures such as drying of objects, freezing, mechanical cleaning and disinfection with lime.

## ACKNOWLEDGEMENTS

This study was supported by the Ministry of Education, Science and Technological Development, Republic of Serbia (grant number TR 31011).

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CIP - Каталогизација у публикацији  
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639.2/.3(082)

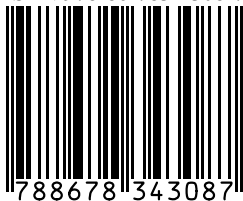
INTERNATIONAL Conference "Water & Fish" (8 ; 2018 ; Beograd)  
Conference Proceedings / 8th International Conference "Water & Fish",  
Faculty of Agriculture, Belgrade-Zemun, Serbia, June, 13-15. 2018. ;  
[editors in chief Vesna Poleksić, Božidar Rašković and Zoran Marković]. -  
Belgrade : University, Faculty of Agriculture, 2018 (Novi Sad : Graphic). -  
XII, 544 str. : ilustr. ; 23 cm

Tekst na engl. i srp. jeziku. - Na spor. nasl. str.: Zbornik predavanja. -  
Tiraž 400. - Bibliografija uz svaki rad. - Apstrakti ; Abstracts.

ISBN 978-86-7834-308-7

а) Рибарство - Зборници  
COBISS.SR-ID 264387852

ISBN 978-86-7834-308-7



9 788678 343087