PARASITE FAUNA IN COMMON CARP (*CYPRINUS CARPIO* L., 1758) FROM CYPRINID FISH FARM IN PELAGONIA REGION (BITOLA, MACEDONIA)

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Abstract: Aquaculture is one of the fastest growing food producing sectors and play a key role in meeting the rising demand for fishery products. Intensive aquaculture supply the ever growing population with highly nutritious protein, but also comes with problems which include more frequent outbreaks of parasitic diseases in fish farms and transmission of diseases between different farms or countries.
Cyprinid fish farms usually have an area of 10-100 ha, with water depth of 1-2 m. The optimal water temperature is 25°C, the amount of dissolved oxygen is 7-9 mg/l and the pH range from 7 - 8. The most common fish that are grown here are those from the family Cyprinidae, such as common carp, grass carp, bighead carp and silver carp.
Cyprinid fish farm Bukri is located in the southeastern part of Pelagonia (Bitola, Macedonia). It was built in 1960/61, with the enclosure of part of the Crna River old bed with two embankments and occupies an area of 55 ha.
The aim of this study was to determine the parasite fauna in common carp (*Cyprinus carpio*, L. 1758) from cyprinid fish farm located in Pelagonia region (Bitola, Macedonia) by seasons, as well as, percent of infestation with parasites. Fish were caught by net and fish species were determined according key of Kottelat & Freyhof (2007). Fish samples were examined by standard parasitological methods. Fish gills, fins, body cavity, intestine and eyes were studied. Collected, cleaned parasites were separated and put in certain fixatives, prepared with determined techniques of staining and clearing (Vasiljkov 1983, Gussev 1983). The remaining parasites were fixed with 19:1 glacial acetic acid-formalin. Keys of Bauer (1985, 1987) were used for parasite determination. During the investigations, stereomicroscopes „Zeiss”- Stemi DV4 and „MBS 10”, as well as light microscope „Reichart” with magnifications of 40 - 100 X were used.
Total, 157 specimens of common carp (*Cyprinus carpio*, L. 1758) from cyprinid fish farm Bukri located in Pelagonia region (Bitola, Macedonia) were examined and 112 fishes (71.34%) were infected with parasites. In common carp from this cyprinid fish farm the presence of 5 parasite species was established: *Trichodina* sp., *Dactylogyrus extensus*, *Dactylogyrus minutus*, *Eudoplozoon nipponicum* and *Raphidascaris acus*.
Keywords: parasite, common carp, cyprinid fish farm

1. INTRODUCTION

Aquaculture is one of the fastest growing food producing sectors and play a key role in meeting the rising demand for fishery products.
Intensive aquaculture supply the ever growing population with highly nutritious protein, but also comes with problems which include more frequent outbreaks of parasitic diseases in fish farms and transmission of diseases between different farms or countries.
Cyprinid fish farms usually have an area of 10-100 ha, with water depth of 1-2 m. The optimal water temperature is 25°C, the amount of dissolved oxygen is 7-9 mg/l and the pH range from 7 - 8. The most common fish that are grown here are those from the family Cyprinidae, such as common carp, grass carp, bighead carp and silver carp.
The aim of this study was to determine the parasite fauna in common carp (*Cyprinus carpio*, L. 1758) from cyprinid fish farm located in Pelagonia region (Bitola, Macedonia) by seasons, as well as, percent of infestation with parasites.

2. MATERIALS AND METHODS

The parasitological investigations were carried out from the period of autumn 2009 to summer 2012, by seasons, and a total of 157 specimens of common carp (*Cyprinus carpio*, L. 1758) from cyprinid fish farm Bukri were examined.
Cyprinid fish farm Bukri is located in the southeastern part of Pelagonia (Bitola, Macedonia). It was built in 1960/61, with the enclosure of part of the Crna River old bed with two embankments and occupies an area of 55 ha.
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Keys of Bauer (1985, 1987) were used for parasite determination.
During the investigations, stereomicroscopes „Zeiss"- Stemi DV4 and „MBS 10", as well as light microscope „Reichart" with magnifications of 40 - 100 X were used.

3. RESULTS AND DISCUSSION

In our examinations, a total 157 specimens of common carp (*Cyprinus carpio*, L. 1758) from cyprinid fish farm Bukri (Bitola, Macedonia) were examined and 112 fishes (71.34%) were infected with parasites. In common carp from this cyprinid fish farm the presence of 5 parasite species was established. These are the following results:

1. *Trichodina* sp. on gills, fins and liver in common carp (*Cyprinus carpio*, L. 1758) in spring and summer;
2. *Dactylogyrus extensus* on gills in common carp (*Cyprinus carpio*, L. 1758) in winter;
3. *Dactylogyrus minutus* on gills in common carp (*Cyprinus carpio*, L. 1758) in summer;
4. *Eudiplozoon nipponicum* on gills in common carp (*Cyprinus carpio*, L. 1758) in summer and autumn;
5. *Raphidascaris acus* in the intestines in common carp (*Cyprinus carpio*, L. 1758) in summer.

Kingdom: PROTOZOA
Phylum: CILIOPHORA (Doflein, 1901) Copeland, 1956
Subphylum: INTRAMACRONUCLEATA Lynn, 1996
Class: OLIGOHYMENOPHOREA de Puytorac et al. 1974
Subclass: PERITRICHIA Stein, 1859
Order: MOBILIDA Kahl, 1933
Family: TRICHODINIDAE Claus, 1874
Genus: TRICHODINA Ehrenberg, 1830
Species: *TRICHODINA SP.*
Hosts: *CYPRINUS CARPIO*
Localization: gills, fins, liver
Place: cyprinid fish farm Bukri (Bitola, Macedonia)
Seasons: spring, summer, autumn and winter

Kingdom: ANIMALIA Linnaeus, 1758
Phylum: PLATYHELMINTHES Gegenbaur, 1859
Subphylum: NEODERMATA (Ehlers, 1985) Cavalier-Smith, 1998
Class: MONOGENEA Carus, 1863
Subclass: MONOPISTHOCOTYLEA
Order: DACTYLOGYRIDEA Bychowsky, 1937
Family: DACTYLOGYRIDAE Bychowsky, 1933
Genus: DACTYLOGYRUS Diesing, 1850
Species: *DACTYLOGYRUS EXTENSUS* Müeller & Van Cleave, 1932
Hosts: *CYPRINUS CARPIO*
Localization: gills
Place: cyprinid fish farm Bukri (Bitola, Macedonia)
Seasons: spring, summer, autumn and winter

Kingdom: ANIMALIA Linnaeus, 1758
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Class: MONOGENEA Carus, 1863
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Order: DACTYLOGYRIDEA Bychowsky, 1937
Family: DACTYLOGYRIDAE Bychowsky, 1933
Genus: DACTYLOGYRUS Diesing, 1850
Species: *DACTYLOGYRUS MINUTUS Kulwiec, 1927*
Hosts: *CYPRINUS CARPIO*
Localization: gills
Place: cyprinid fish farm Bukri (Bitola, Macedonia)
Seasons: spring, summer, autumn and winter

Kingdom: ANIMALIA Linnaeus, 1758
Phylum: PLATYHELMINTHES Gegenbaur, 1859
Subphylum: NEODERMATA (Ehlers, 1985) Cavalier-Smith, 1998
Class: MONOGENEA Carus, 1863
Subclass: POLYOPISTHOCOTYLEA
Order: MAZOCREAIDEA Bychowsky, 1957
Family: DIPLOZOIDAE Palombi, 1949
Genus: EUDIPLOZOON Khotenovsky, 1984
Species: *EUDIPLOZOON NIPPONICUM Goto, 1891*
Hosts: *CYPRINUS CARPIO*
Localization: gills
Place: cyprinid fish farm Bukri (Bitola, Macedonia)
Seasons: spring, summer and autumn

Kingdom: ANIMALIA Linnaeus, 1758
Phylum: NEMATODA (Rudolphi, 1808) Lankester, 1877
Class: SECERNENTEA Von Linstow, 1905
Subclass: RHABDITIA
Order: ASCARIDIDA Skrjabin & Karokhin, 1945
Family: ANISAKIDAE Skrjabin & Karokhin, 1945
Genus: RAPHIDASCARIS Railliet & Henry, 1915
Species: *RAPHIDASCARIS ACUS Bloch, 1779*
Hosts: *CYPRINUS CARPIO*
Localization: intestines
Place: cyprinid fish farm Bukri (Bitola, Macedonia)
Seasons: summer

The results from Table 1 shown the number of examined and infected fish, as well as percent of infestation with parasites in common carp from cyprinid fish farm Bukri (Bitola, Macedonia), by seasons.

Table 1. Infestation with parasites in common carp (*Cyprinus carpio*, L. 1758) from cyprinid fish farm Bukri (Bitola, Macedonia), by seasons

Seasons	Number of examined fish	Number of infected fish	Percent of infestation (%)
Spring	41	34	82,93
Summer	39	29	74,36
Autumn	37	31	83,78
Winter	40	18	45,00
TOTAL	157	112	71,34

Parasitic diseases of fish are very common all over the world. According Tonguthai (1997), parasites commonly found in freshwater fishes primarily belong to Protozoa, Platyhelminthes, Acanthocephala, Nematoda, Hirudinea and Crustacea. Most of these parasites are external parasites of the skin, fins or gills, while few are internal parasites living in the intestine or intramuscular tissues.
Trihodinas (*Trichodina* sp.) are protozoa from phylum Ciliophora, family Trichodinidae, that cause parasitic disease in fish called Trichodiniasis, manifesting whitish deposits on the fish skin and gills. The genus Trichodina is represented by over 30 species. This protozoan is probably the most frequently encountered external obligate parasite in cultured freshwater fish worldwide.
The family Dactylogyridae includes a number of parasitic species that parasitize the gills, mainly in freshwater fish. Dove & Ernst (1998) state that *Dactylogyrus* is one of the largest genera of parasitic helminthes, of which 95% are parasites on the gills in fish family Cyprinidae.
Vasiljkov (1983) considered that *Dactylogyrus minutus* causes pathological changes on gills tissue in severely infected carp offspring.
There are around 18 parasites species belonging to 2 genus, Diplozoon and Paradiplozoon in Europe (Matejusova *et al.* 2004) and is it well known that *Eudiplozoon nipponicum* is introduced through imports of carp from Asia to Europe (Denis *et al.* 1983).
Raphidascaris acus is nematode with a spindle-shaped and narrow front and rear parts of the body. The length of the male ranged of 16.5 – 20.5 mm and the female of 25-30 mm. The width of the male body was 0.483 (0.430 – 0.535) mm, while the female 0.813 (0.735 – 0.890) mm.

4. CONCLUSION

Dactylogyrus minutus and *Raphidascaris acus* have been detected in common carp (*Cyprinus carpio*, L. 1758) from fish farm Bukri (Bitola, Macedonia) for the first time.
Eudiplozoon nipponicum has been detected in common carp (*Cyprinus carpio*, L. 1758) from cyprinid fish farms on Macedonian territory for the first time and the results are first recorded in this paper.
For further researches, it is very important to examine factors which influence the population dynamics of parasites in common carp in cyprinid fish farms in Macedonia.
In order to take certain preventive measures, it is necessary to know the composition of parasite fauna in economically most important fish species, as common carp is, especially in Macedonia cuisine, their seasonal dynamics as well as prevalence and mean intensity of certain parasites in different fish age.

5. REFERENCES

Bauer, O.N. (1985). Opredelitelj parazitov presnovodnih ryb fauni SSSR. Tom II (Parazitičeskie mnogokletočnie. Pervaja čast). Akademia Nauk SSSR. Izdateljstvo “Nauka”, Leningrad.
Bauer, O.N. (1987). Opredelitelj parazitov presnovodnih ryb fauni SSSR. Tom III (Parazitičeskie mnogokletočnie. Vtoraja čast). Akademia Nauk SSSR. Izdateljstvo "Nauka", Leningrad.

Denis A., Gabrion C., Lambert A. (1983): "Presence en France de deux parasites d'origine est-asiatique: Diplozoon nipponicum Goto, 1891 (Monogenea) et Bothriocephalus acheilognathi Yamaguti, 1934 (Cestoda) chez Cyprinus carpio (Teleostei, Cyprinidae)". Bulletin Franc¸ais de Pisciculture 289, 128–134.

Dove D.M.A. and Ernst I. (1998): "Concurrent invades-four exotic species of monogenea now established on exotic freshwater fishes in Australia". Int. J. Parasitol., 28: 1755-1764.

Gussev A. V. (1983): "The methods of collection and processing of fish parasitic monogenean materials" (In Russian). Nauka. Leningrad. USSR. pp. 25 – 45.

Kottelat M., Freyhof J. (2007). Handbook of European freshwater fish.

Matejusova I., Koubkova B., Cunningham C. O. (2004): "Identification of European diplozoids (Monogenea, Diplozoinae) by restriction digestion of the ribosomal RNA internal transcribed spacer". Journal of Parasitology 90, 817–822.

Tonguthai K. (1997): Control of freshwater fish parasites: a Southeast Asian perspective. Int. J Parasitol.(10):1185-91.

Vasiljkov G.V. (1983): Gelmintozi ryb. Izdateljstvo "Kolos", Moskva, 45-50.