

FISH POPULATION IN THE BELČIŠTA WETLAND – RISK ASSESSMENT, PREVENTION AND MANAGEMENT

Lidija VELKOVA-JORDANOSKA ^{*(c.a.)}, Stojmir STOJANOVSKI *,
Dijana BLAZEKOVIKJ-DIMOVSKA ** and Kristijan VELJANOVSKI **

* Hidrobiological Institute, Naum Ohridski Street 50, Ohrid, N. Macedonia, NM-6000, lidvejo@yahoo.com, ORCID: 0000-0002-8065-9379, stojstoi@gmail.com, ORCID: 0000-0003-4704-4820.

** University "St. Kliment Ohridski", Faculty of Biotechnical Sciences, Partizanska b. b., Bitola, N. Macedonia, NM-7000, dijanablazekovic@yahoo.com, ORCID: 0000-0001-5912-9093, kristijan.veljanovski@uklo.edu.mk, ORCID: 0009-0008-3814-7119.

DOI: 10.2478/trser-2023-0020

KEYWORDS: Belčišta wetland, fish population, ohrid minnows (*Pelagus minutus*).

ABSTRACT

Belčišta wetland is the largest wetland habitat in R. of North Macedonia, located 20 km distance from Ohrid Lake and it is a relict remnant of the ancient Desaret Lake, which existed in this area since the Pliocene. This region hosts an endemic freshwater species of the Balcan Peninsula, *Pelagus minutus*, which is threatened by habitat loss.

There are intentions of artificial introduction of salmonid fishes in Belčišta wetland to develop the recreative fishery and tourism in this area. Introduction and spread of salmonids is a great risk factor to the survival of the ohrid minnows (*Pelagus minutus*).

RÉSUMÉ: Population de poissons dans la zone humide de Belčišta – évaluation des risques, prévention et gestion.

La zone humide de Belčišta est le plus grand habitat de zone humide de la République de Macédoine du Nord, située à 20 km du lac d'Ohrid et constitue un vestige de l'ancien lac Desaret, qui existait dans cette zone depuis le Pliocène. Cette région abrite une espèce d'eau douce endémique de la péninsule des Balkans, le vairon d'Ohrid (*Pelagus minutus*), qui est menacée par la perte d'habitat.

Il est prévu d'introduire artificiellement des salmonidés dans la zone humide de Belčišta pour développer la pêche récréative et le tourisme dans cette zone. L'introduction et la propagation des salmonidés constituent un facteur de risque important pour la survie des ménés d'Ohrid (*Pelagus minutus*).

REZUMAT: Populația de pești din zona umedă Belčišta – evaluarea, prevenirea și managementul riscurilor.

Zona umedă Belčišta este cel mai întins habitat de zone umede din Republica Macedonia de Nord, situat la 20 km distanță de lacul Ohrid și este o rămășiță relictă a lacului antic Desaret, care a existat în această zonă încă din Pliocen. Această regiune găzduiește o specie endemică de apă dulce a Peninsulei Balcanice, *Pelagus minutus*, care este amenințată prin pierderea habitatului.

Se intenționează introducerea artificială a salmonidelor în zona umedă Belčišta pentru a dezvolta pescuitul recreativ și turismul în această zonă. Introducerea și răspândirea salmonidelor este un mare factor de risc pentru supraviețuirea lui *Pelagus minutus*.

INTRODUCTION

Belčišta wetland (Blue swamps) (Figs. 1-2) is the largest remaining wetland in R. of North Macedonia. Data on the surface of the wetland varies between 137 ha (Golceva, 2019) and 400 ha (Simovski et al., 2019; Bogner, 2022). It has an altitude of about 760 m and is fed by several springs. The marsh is fed by a few cold springs such as St. Anna, St. John and several others on the eastern edge near the church St. Petka (St. Paraskeva). At the confluence of all these sources the River Matica is formed (Simovski et al., 2019). River Matica is the inflow to River Sateska, the biggest tributary of Lake Ohrid, and the wetland belongs to Lake Ohrid basin. The total amount of water flowing out of the swamps is 5 m³/sec (Bogner, 2022).

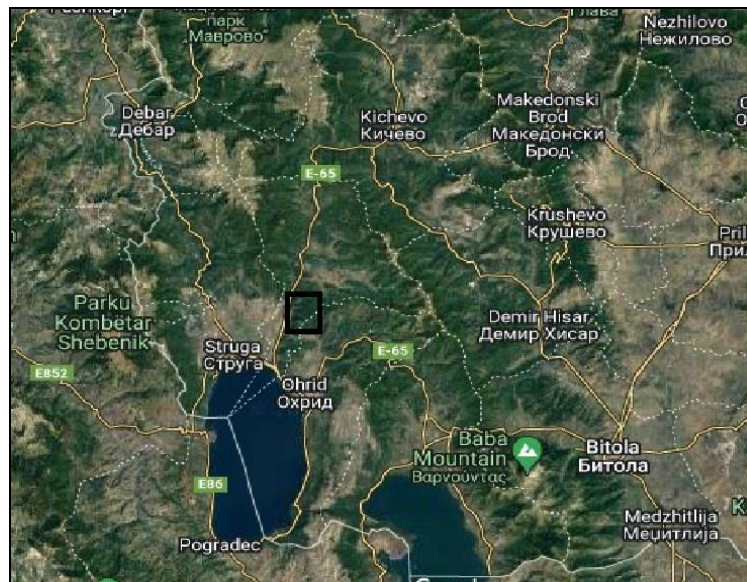


Figure 1: Satellite map – Lake Ohrid watershed (the black square – Belčišta wetland area).



Figure 2: Satellite map – Belčišta wetland.

National strategy for nature protection (2017-2027) recommends that this wetland to be declared as protected and lists it as a major natural heritage in the field of hydrology. The decision should be taken when the new spatial plan of R. of North Macedonia will be done.

MATERIAL AND METHODS

During the period of December 2021 to September 2022, in Belčišta wetland, there has been a total of 176 individuals caught, which were identified as three different species: chub (*Squalius cephalus*), minnow (*Phoxinus phoxinus*) and ohrid minnows (*Pelasgus minutus*) (Fig. 3). Specimens were collected using SAMUS 725 electro fishing device and hand nets, later preserved and stored in 70% ethanol. Identifications follow published morphological species identifications according Kottelat and Freyhof (2007).



Figure 3: Ohrid minnows (*Pelagius minutus*).

In addition to the small number of species, the fish fauna was also characterized by a small population density.

RESULTS AND DISCUSSION

Present results are a part of detailed study entitled "Ecological status of fish population in Belčišta wetland". During 2022, an investigation was provided on Belčišta wetland and they display as presence of only three fish species with low abundance and low population density. Our main goal on this investigation is to detect pressures and possible dangers of fish populations in the wetland.

Many major human induced activities have had indirect consequences for freshwater wetland, such as overuse of water supply for agriculture activities, the depletion of groundwater, the paving of ephemeral stream channels, deforestation, pollution, etc. (Bănăduc et al., 2022). In course to transform wetland into agriculture fields, in the last decades of 20th century, on Belčišta wetland more meliorative works have been carried out, so that the surface of the wetland has been significantly reduced.

Recently, there are many studies to valuate ecosystem services, sustainable tourism and recreation development in the Belčišta wetland, which proposed many activities based on segmentation and valorisation of factors for the development of several alternative forms of tourism in rural areas. Segmentation is based on the assumption that different types of natural and anthropogenic motifs can attract various types of tourists in the rural area.

The Belčišta wetland is a biodiversity hotspot, hosting endemic freshwater species, *Pelasgus minutus*, which is occurring exclusively here. The genus *Pelasgus* is one of the most ancient genera of the family Leuciscidae. The regions of the oldest colonisation by *Pelasgus* are the drainages of the ancient lakes Ohrid and Prespa and the southernmost part of the Peloponnese (Rodrigues et al., 2021).

Currently, 18 distinct molecular lineages are recognized within *Phoxinus* in Europe based on mitochondrial cytochrome c oxidase subunit I (COI) sequences, and at least nine of these molecular lineages can be found in the area of Western Balkans alone, making it one of the most important diversity hot spot for this genus (Vucic et al., 2018; Palandacic et al. 2020).

Apart from these facts, there are intentions of artificial introduction of salmonid fishes in Belčišta wetland to develop the recreative fishery and tourism in this area. Introduction of salmonid fishes is a direct threat to the survival of these small fishes, because they will provoke decreased populations of *Phoxinus lumaireul* and *Pelasgus minutus*.

The fact that until now predominant effort is dedicated to field activities strictly related to management of “charismatic species” for sport fishing, first salmonids. It is furthermore the fishery management focused on and linked to angling activities that seriously risks compromising the survival of these “minor” populations. Local, small and even endemic fish populations represent potential prey of salmonids, illegally released yearly in huge quantities to meet the expectations of anglers (Caputo Barucchi et al., 2022).

For successful protection of Belčišta wetland, it is necessary to reconcile biodiversity conservation and economic development. The biologic importance of the wetland consists of the conservation and increasing biodiversity of the richness of plant and animal species, their diversity and the dimensions of the populations, connected directly to the habitats resulted from the water and its interferences. The wetland supplies food resources that determine colonisation of some shelter habitats, the seasonal establishment and the reproduction of the species that depend of this environment (Costea, 2008).

Some view water as a hostile habitat stemming from our terrestrial way of life, and this is why our rather basic knowledge of these habitats has led to severe difficulties for humankind. This includes wetland vegetation destruction, reclamation, water overuse and pollution (Bănăduc et al., 2022). Wetland fragmentation, contraction, alteration, and loss represent significant stressors impacting aquatic environment abiotic and biotic elements (Bănăduc et al., 2022).

Also, restrictions on water availability are among the most important reasons for conjecturing about the future limit to the human activities and growth of the world population. Climate modification, which is very much tied to human population increase, will induce huge pressure on water resources (Bănăduc et al., 2022).

Protection of Belčišta wetland is the most important national priority in this respect, firstly because it is an important freshwater source in the Lake Ohrid watershed. Belčišta wetland ecosystem belongs to the EMERALD network and has already made an initiative to become a protected area and future NATURA 2000 site (Brajanoska et al., 2018).

CONCLUSIONS

Belčišta wetland is a home of the important and endemic fish species of the Balkan Peninsula, ohrid minnow (*Pelasgus minutes*). Protection of fish populations in Belčišta wetland needs balance between management issues of this ecosystem and its implication on human life, and freshwater conservations.

There are perspectives on Belčišta wetland as a protected area – or nature park in the future.

ACKNOWLEDGEMENTS

Project financed by Ministry of education and science of R. of North Macedonia (Contract No. 15-16035/1).

REFERENCES

1. Bănăduc D., Simic V., Cianfaglione K., Barinova S., Afansyev S., Oktener A., McCall G., Simic S. and Curtean-Bănăduc A., 2022 – Freshwater as a sustainable resource and generator of secondary resources in the 21-th century: stressors, threats, risks, management and protection strategies and conservation approaches, *International Journal of Environmental Research and Public Health*, 19, 16570.
2. Bogner D., 2022 – Valorization study of Belcista wetland – Park of nature, Ed. Critical Ecosystem Partnership Fund, 105.
3. Brajanoska R., Matevski V., Avramovski O., Veleviski M., Velkovski N., Kostadinovski M., Levkov Z., Melovski L. J., Melovska N., Slavevska Stamenkovik V. and Hristovski S., 2018 – National strategy of biodiversity with Action plan (2018-2023), Ministry of environment and planning of R. North Macedonia, 185.
4. Caputo Barucchi V., Marconi M., Splendiani A., Casari S., Girardi M. and Gandolfi A., 2022 – Mitochondrial DNA suggest uniqueness of a isolated population of the Italian minnow (*Phoxinus phoxinus* Schinz, 1840) (Teleostei: Cyprinidae) in central Apennines (Italy), *The European Zoological Journal*, 98, 1, 711-718.
5. Costea M., 2008 – Consideration concerning the wetland importance, protection and sustainable management (Romania), *Transylvanian Review of Systematical and Ecological Research*, 6, 155-164.
6. Golceva Z., 2019 – Socio-economic study of Belcista wetland, Ed. Society of ecology and tourism ECOTOURISM 2016 Ohrid, 57.
7. Kottelat M. and Freyhof J. 2007 – Handbook of European Freshwater Fishes, Publications Kottelat, Cornol, Switzerland, 646.
8. National strategy for nature protection (2017-2027), Ministry of environment and planning of R. North Macedonia.
9. Simovski B., Nikolov B. and Mincev I., 2019 – Establishing initial monitoring of the key forest habitat: alluvial forests with common alder (*Alnus glutinosa* L. Gaertn.) and ash (*Fraxinus excelsior* L.) in Belcista wetland, Final report, Project: Improving the management and sustainable use of the Belcisko blato (Sini viroj), 25.
10. Palandacic A., Kruckenhauser L., Ahnelt H. and Mikcshi E., 2020 – European minnows through time: museum collections aid genetic assessment of species introductions in freshwater fishes (Cyprinidae, *Phoxinus* species complex), *Heredity*, 124, 410-422.
11. Rodrigues N. V., Sanda R., Zogaris S. and Vukic J., 2021 – Evolutionary history of the *Pelasgus* minnow (Teleostei: Leuciscidae) an ancient endemic genus from the Balkan Peninsula, *Molecular phylogenetics and evolution*, 164.
12. Vucic M., Jelic D., Zutinic P., Grandjean F. and Jelic M., 2018 – Distribution of Eurasian minnow (*Phoxinus*, Cypriniformes) in Western Balkans, *Knowledge and management of aquatic ecosystems*, 419, 11.