

## THE RECENT STATE OF DISTRIBUTION OF ENDEMIC FISH SPECIES IN EASTERN HERZEGOVINA

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### SADAŠNJE STANJE RASPROSTRANJENJA ENDEMIČNIH VRSTA RIBA ISTOČNE HERCEGOVINE

#### *Apstrakt*

Sadašnje stanje rasprostranjenja endemičnih vrsta riba Istočne Hercegovine. U radu je dat pregled istraživanja endemičnih vrsta riba na području Istočne Hercegovine na više lokaliteta. Prema ranijoj sistematici gaovice sa ovog područja su bile predstavljene vrstama: *Phoxynellus metohiensis*, *Phoxynellus pstrossi* i *Phoxynellus ghetaldii*, dok novija sistematika gaovice sa ovog područja svrstava u dvije vrste: *Telestes metohiensis* i *Delminichthys ghetaldii*. Pored najnovije promjene u sistematskom polazaju gaovica i u ranijem periodu bilo je promjena u nazivu roda. Tako je prvobitni naziv za gaovice bio je *Paraphoxinus*, potom *Phoxinellus*, a prema najnovijoj sistematici gatačka gaovica nosi naziv *Telestes metohiensis*, dok su trebinjska i popovska gaovica svrstane u rod *Delminichthys* i označene jednom vrstom *Delminichthys ghetaldii*. Naša istraživanja gaovice na području Istočne Hercegovine obuhvatala su više lokaliteta: Bilečko jezero, rijeke Mušnica, Vrijeka, Opačica, te Suški potok, Ljubomirski potok i Fatničko polje. U okviru istraživanja praćene su i određene ekofiziološke karakteristike gaovice, a u ovom radu dati su rezultati istraživanja o prisustvu ovih vrsta u pojedinim vodama, s obzirom da se u literaturi susreću različiti podaci o njihovoj rasprostranjenosti i prisutvu u određenim vodama. Neka ranija istraživanja navode da je po biomasi gaovica bila najzastupljenija vrsta Popova polja i da je imala veliki značaj za svakodnevni život ljudi. U okviru naših istraživanja praćeno je prisustvo gaovica na navedenim lokalitetima. Istraživanjem je konstatovano da nema pravilnosti u vremenu pojavljivanja i prisustvu određene na vrste na datom lokalitetu, što je vjerovatno uslovljeno vodnim režimom u ovom području i specifičnostima ekoloških uslova na malom prostoru. Rezultati poka-

zuju da je gatačka gaovica u značajnijem broju zastupljena u rijeci Vrijeci, Bilećkom jezeru, Suškom potoku i rijekama Mušnici i Opačici, dok je trebinjska gaovica konstatovana u Fatničkom polju nakon izlivanja vode i Ljubomirskom potoku.

*Ključne riječi: gaovice, rasprostranjenje, vode*

## INTRODUCTION

Fish, the most numerous group of Vertebrates, have significant role in aquatic environment. They are indispensable part of all biological variety and one of the best indicators of ecological state of aquatic habitats. Also, they are irreplaceable link in aquatic ecosystems food chains, but in the same time a link to terrestrial ecosystems food chains so, in that way, they are so valuable for humans (Jelić et al., 2008). Special group of them represent endemic fish species that usually have small and limited range of distribution, and sometimes they are found just in some specific regions. These species, in the same time, represent a specific genetic resource. Their research is very significant, because with adequate knowledge it is simpler to preserve them. Official scientific data about freshwater endemic fish species in Bosnia and Herzegovina were given at the end of the 90-is in several publications by Steindachner (Kähsbauer, 1959). More intense researches dating back to 1951 (Taler, 1951), and in the later period Sofradzija i Berberovic (1972) researched karyotype of freshwater fishes, and Ivanc et al. (1981; 1989; 1989a) their biochemistry and physiology. These researches are specially significant in endemic species studies, because with it a new perspectives were brought in to perceive their taxonomy.

The earlier used systematics is about species: striped pajor (*Paraphoxinus metohiensis*, Steindachner, 1901), trebinje minnow (*Paraphoxinus pstrossi* Steindachner, 1882) i popovo minnow (*Paraphoxinus ghetaldii* Steindachner, 1882), that are then classified in order *Phoxinellus*, and had scientific names *Phoxynellus metohiensis* (Steindachner, 1901), *Phoxynellus pstrossi* (Steindachner, 1882), *Phoxynellus ghetaldii* (Steindachner, 1882).

Recent systematics classify minnows from this area in two separate orders. *Telestes*, with species *Telestes metohiensis* – striped pajor and *Delminichthys*, with species *Delminichthys ghetaldii* – trebinje and popovo minnow (Freyhof et al, 2006; Kottelat and Freyhof, 2007). It is significant that Freyhof and al. (2006), based on morphometric researches done by Zupančić and Bogutskaya (2003) and their own molecular-genetics research come to conclusion that separation of trebinje and popovo minnow in different species is not justified and that they represent just one species.

Minnows used to be the most numerous species in fields Dabarsko, Fatničko and Popovo by its biomass and also in freshwater in the area. They had big significance for daily lives of people (Glamuzina et al, 2007) and at the beginning was associated with underground fauna (Čurčić 1913; Absolon 1916; Glamuzina et al, 2007).

Until the hydropower system on Trebišnjica was done, minnows had significant economic values. In recent time significance of this species is very small, but its biological value is exceptional.

Before accumulations and system of canals and tunnels were made, minnows spent the biggest part of the year in underground water. In surface water they used to show out in the spring, in the period when fields of Eastern Herzegovina are flooded with

underground water. As the rest of the species that inhabit karst water and have similar life cycle, minnows have specific complex of physiological and adaptive mechanisms that provide such way of survival (Ivanc et al, 1989; Lučić, 2009).

About global importance talks the fact that both of this species that inhabit water in Eastern Herzegovina are presented in red book of endangered species. Two greatest base of this data, WCMC and IUCN classify them in first category, species that are data deficient and threatened with disappearance, because of the changes in living conditions caused by anthropogenic influence.

In this research is given a review of recent state of distribution of minnows in Eastern Herzegovina.

## MATERIAL AND METHODS

State of distribution of endemic species in Eastern Herzegovina was monitored in a several watercourses and accumulations in this area. For this research was used interviewing local fishermen about their observation and also our own fish collecting. For collecting was used transportable electroshocker IG 600. With power 1.2 kW and nets with different diameters. Fish collecting and monitoring of their distribution was done from year 2004 to 2010 in periods of year when individuals come out into surface waters. Beside determination of minnow presence in tested waters, eco-physiological researches were also done. Researches were done in Lake Bileća and in Rivers: Vrijeka, Opačica, Mušnica, also in streams Suško and Ljubomirsko, and in Fatničko field after water flood.

## RESULTS AND DISCUSSION

Research of presence of certain fish species in karst regions depend on several factors, from which at first must be considered period of year and water level during research. The fact that minnows were found in certain area, while in another collecting their presence was not recorded, indicates previous statement.

These researches were conducted in periods from 2004 to 2010. During the entire researched period a presence of striped pijač was established (*Telestes metohiensis*, previous name *Phoxinellus metohiensis*).

Its presence was recorded in several researched regions in every trial catching. So, in this way, presence of numerous individuals of this species was determined in River Vrijeka, in lower part of its course, directly before the abyss. Striped pijač was also recorded in River Opačica during research in 2010, and in significant number in stream Suško, watercourse that is tributary of River Vrijeka in Dabar filed. Researches in River Mušnica during 2009 also showed presence of this species in significant number. Presence of striped pijač, based on many collected individuals, was recorded in accumulation Bileća during years 2004, 2006 and 2007.

There are still a massive appears of this species in spring in most of wells in Fatničko filed, but it certainly that big part of the population stays in accumulation Bileća throughout the year. The reason that is little known about minnow biology in the lake, in new environment, is its retention in the deepest parts of the lake, were it is not collected for obvious reasons – traditional way of fishing is unmanageable, and net collecting in the lake is forbidden. Beside that, based on data from survey, sporadic minnow catching in the lake show that it moves in shoals and choose certain zones. Significant means are

necessary for minnow research in lake biotope, both in terms of equipment and methods of migration monitoring in the lake. Meanwhile, as the significance of this fish species is rising in the global scale, it is obvious that its research deserve full attention. This will enable our country to improve its status in scientific world, and beside that it can be valorized throughout scientific and educative tourism.

According to Vuković and Ivanović (1971) striped pijor is distributed in karst rivers and springs in regions of Gacko, Navesinje field, region of Cavtat and in some other waters in Herzegovina and Dalmatia.

In the same time Kottelat and Freyhof (2007) quote that striped pijor is presented in water in Nevesinje and Gacko, Carničko, Dabarsko and Lukovac fields in Bosnia and Herzegovina, and in River Ljuta in Croatia. Old findings in River Ljuta were not confirmed so it is consider regionally extinct (Jelic et al,2008).

Trebinje and popovo minnow according to new systematics are consolidated in one species *Delminichthys ghetaldii*, and in our research was recorded presence of trebinje minnow (previous name *Phoxinellus pstrossi*) in some of the researched water. A number of large specimens of trebinje minnow was collected in region of Fatničko filed after its outflow, and in significant number in Ljubomir stream.

Vuković and Ivanović (1971) quote that population of trebinje minnow is declining, and that was significantly present in lower water course of River Trebišnjica in recent period, while popovo minnow was distributed in waters in Herzegovina, Dalmatia and Bosnia. These authors quote that this species was also recorded in River Kasindolka which flows in River Željeznica, tributary of River Bosna.

Beside mentioned species in researches was recorded a presence of species *Phoxinellus alepidotus* in River Vrijeka during research conducted in March 2011, which presents a first finding of this species in this area. According to literature data this species is widespread in waters from Lavanjsko, Duvanjsko and Glamočko fields, lake Buško and Blidinje and in River Korana in Bosnia and Herzegovina, while in Croatia was recorded in River Cetina, in Sinjsko field and in lake Stipačevo (Jelić et al, 2008).

Also Vuković and Ivanović (1971) quote that this species is widespread in Duvanjsko, Sinjsko, Glamčoko and Livanjsko fields, in Buško and Mostarsko mud, in lake Blidinje and in River Neretva.

Our results indicate appearance of relative wide distribution of striped pijor (*Telestes metohiensis* (Steindachner, 1901) and a very narrow range of *Delminthis ghetaldii* (Steindachner, 1882) with sporadic appearance closely related with hydrological characteristics of groundwater.

## CONCLUSIONS

Based on recorded data during the research, and comparison with literature data, it can be concluded that minnows are presented in researched areas in significant number, but with different distribution and specific phenology.

More complex eco-physiological and eco-biochemical researches are necessary for detailed insight in state and characteristic of minnows in Eastern Herzegovina waters.

## REFERENCES

*Absolon, Karel* (1916): *Z výzkumných cest po krásech Balkánu*. Zlatá Praha, 1916, XXXIII.

Ćurčić, Vejsil (1913): Narodno ribarstvo u Bosni i Hercegovini. II. Hercegovina. Glasnik Zemaljskog muzeja BiH, 3-4, Sarajevo.

Freyhof, J., D. Lieckfeldt, Nina G. Bogutskaya, C. Pitra, A. Ludwig (2006): Phylogenetic position of the Dalmatian genus *Phoxinellus* and description of the newly proposed genus *Delminichthys* (Teleostei: Cyprinidae). *Molecular Phylogenetics and Evolution* 38 416–425

Ivanc, A., H. Kekić, V. Pavlović, O. Gvozdenović, K. Pejić, N. Mijatović (1981): Serum lipids in some endemic Cyprinidae species from Yugoslavia. I *Jornadas de ictiologia*, Barcelona (España).

Ivanc, A., H. Kekić, Lj. Lazarević-Ivanc, O. Gvozdenović, V. Pavlović, K. Pejić, N. Mijatović (1989): Serumski lipidi oštrulja (*Aulopyge huegeli* Heckel) u toku totalnog gladovanja. *Godišnjak Biol. inst. Univ. Sarajevo*, 42: 29-44.

Ivanc, A., H. Kekić, K. Pejić, V. Pavlović, O. Gvozdenović, N. Mijatović (1989): Hematologija nekih endemičnih vrsta riba kraškog područja BiH. "Savjetovanje o ribarstvu na hidroakumulacijama", Mostar. *Zbornik radova, prilog*, 4 strane.

Glamuzina, B. Dulčić, J., Ivanc, A., Mandić, S., Mrdak, D., Skaramuca, B. (2007): Ugrožene i endemske vrste riba u slivovima rijeka Neretve, Trebišnjice i Morače (Endangered and endemic fish species in watershed of rivers Neretva, Trebišnjica and Morača) Međunarodni skup: *Ugrožene i endemske vrste riba u slivovima rijeka Neretve, Trebišnjice i Morače*. Čapljina, Bosna i Hercegovina, 14-15.12.2007

Jelić D., Duplić A., Čaleta M., Žutinić P. (2008): Endemske vrste riba Jadranskog sliva, Agencija za zaštitu okoliša, Zagreb.

Kähsbauer, P. (1959): Intendant Dr. Franz Steindachner, sein Leben und Werk. *Ann. Naturhist. Mus. Wien*, Bd. 63

Kottelat, M. and Freyhof, J. (2007): *Handbook of European freshwater fishes*. Publications.

Lučić, I. (2009): Povijest Dinarskog krša na primjeru Popova polja. Doktorska disertacija, Univerza v Novi Gorici.

Sofradzija, A. and L. Berberovic (1972): Usporedna karioloska istraživanja vrsta *Paraphoxininus alepidotus*, *P. adspersus*, *P. pstrossi*, *P. metohiesis* i *P. croaticus*. *Godisnjak biol. Inst. Sarajevo*. 25:135-173.

Taler, Z. (1951): Podzemne ribe u našem kršu. *Rib. Jug*, 6 (4), str. 107–109.

Vuković, T., Ivanović, B. (1971): *Slatkovodne ribe Jugoslavije*. Zemaljski muzej BiH, Sarajevo.

Zupančić, P. and Nina G. Bogutskaya (2002): Description of two new species, *Phoxinellus krbavensis* and *P. jadovensis*, re-description of *P. fontinalis* Karaman, 1972, and discussion of the distribution of *Phoxinellus* species (Teleostei: Cyprinidae) in Croatia and in Bosnia and Herzegovina. *Nat. Croat.*, 11, 4: 411 – 437.