

**THE WEIGHT STRUCTURE OF *PHOXINELLUS PSEUDALEPIDOTUS*  
(CYPRINIDAE) FROM THE MOSTARSKO BLATO (NERETVA RIVER BASIN,  
BOSNIA AND HERZEGOVINA)**

Ivana MARKOTI<sup>1\*</sup>, Marko ALETA<sup>2</sup>, Milorad MRAKOV I<sup>3</sup>, Branko GLAMUZINA<sup>4</sup>

<sup>1</sup>University of Mostar, Faculty of Science, Mostar, Bosnia and Herzegovina

<sup>2</sup>University of Zagreb, Faculty of Teacher Education, Zagreb, Croatia

<sup>3</sup>University of Zagreb, Faculty of Science, Zagreb, Croatia

<sup>4</sup>University of Dubrovnik, Department of Aquaculture, Dubrovnik, Croatia

\*(Corresponding author: [ivana.markotic@sve-mo.ba](mailto:ivana.markotic@sve-mo.ba))

**Abstract**

In this paper, the weight structure of endemic fish species *Phoxinellus pseudalepidotus* from the Mostarsko blato (Neretva River basin, Bosnia and Herzegovina) is presented. Specimens were collected monthly from January to December 2009 by gill nets (7 m length and 0.7 m height, with a 7 mm mesh size). The minimum recorded body weight was 0.1 g and maximum recorded weight was 15.0 g. The average of the total weight for the population was  $3.1 \pm 1.2$  g. Maximum and minimum weight was recorded for females. The average weight for females was  $3.3 \pm 1.4$  and for males  $2.9 \pm 0.9$ , and the range between the minimum and maximum values was higher in females (0.1 to 15.0 g) than in males (0.2 to 8.0 g). It was found that females had a higher body weight than males.

**Key words:** *endemic species, Phoxinellus pseudalepidotus, weight structure, Mostarsko blato*

**Introduction**

There have been recorded 40 endemic species, mostly native to particular localities, in the waters of BiH so far. The species richness, especially endemic species, classified Bosnia and Herzegovina in the group of the ichthyologically most diverse European countries. This can be attributed primarily to geographic location and isolation from other European river systems, as well as to complex geological history and characteristics of climate (Glamuzina et al., 2010).

*Phoxinellus pseudalepidotus* (Bogutskaya & Zupan i , 2003) is an endemic species that inhabits the Mostarsko blato, and is considered to be present in the wider area of the Neretva river basin (Bogutskaya & Zupan i , 2003). In the earlier literature (Heckel & Kner, 1858; Seeley, 1886; Kolombatovi , 1886; Trgov evi , 1905; ur i , 1913; Vukovi & Ivanovi , 1971; Vukovi , 1977b; Povž et al., 1990) the species was identified as *Phoxinellus alepidotus*, which is morphologically quite similar (Bogutskaya & Zupan i , 2003).

There are limited quantitative information available on the life history of *Phoxinellus pseudalepidotus*. This species inhabits shallow channels with little current and clean water (Bogutskaya & Zupan i , 2003). Like all other *Phoxinellus* species, this species withdraws during unfavorable periods to the groundwater, as well. The sex ratio of the population of *Phoxinellus pseudallepidotus* in the area of Mostarsko blato was 1:1.185 in the favour to females (Markoti et al., 2012). It is a relatively small cyprinid whose total lengths (TL) ranged from 2.7 to 11.5 cm (mean  $6.4 \pm 0.8$  cm). Female size ranged between 2.7-11.5 cm (mean  $6.5 \pm 0.9$ ), while in the males from 3.3 to 8.5 cm (mean  $6.4 \pm 0.6$  cm) (Markoti et al., 2013). The smallest ripe female measures 5.11 cm SL, and the smallest ripe male 4.87 cm SL (Bogutskaya & Zupan i , 2003). Seasonal diet of *Phoxinellus pseudalepidotus* consisted

mainly of insects, but gastropods, plant material and amorphous mass were also included (Markoti et al., 2013).

IUCN Red List Status of *Phoxinellus pseudalepidotus* is Vulnerable (VU D2) (IUCN, 2013).

### Materials and methods

Mostarsko blato area, through which the river Lištica flows, is the closed karst field in western Herzegovina. It is surrounded by limestone hills: Orlovac, Mikulja a, Vira a, Trtla and Varda. The field is flooded on average 5-6 months during the year. In addition to permanent water sources in Mostarsko blato, significant amount of periodic water of rivers Ugrova a, Orovnik, Mokašnica and a number of small flows, are active during the major rainfall seasons. In order to reduce the floods, the tunnel Varda was built in the year 1947. Except for the Varda tunnel, water from Mostarsko blato is managed also by the following sink holes: Krenica, Košina, Renkova a, Kruševo, and the Great Hole (Velika jama). These sink holes are important for *Phoxinellus pseudalepidotus* life cycle (Bogut et al., 2007).

The study was conducted at three stations in the area of Mostarsko blato from January to December 2009: Station 1 (Pisak, 43°19'52.9"N; 17°41'08.4"E), Station 2 (Me uri , 43°20'04"N; 17°41'04.3"E) and Station 3 (Pološki gaz, 43°20'36.2"N; 17°41'36.4"E) (Figure 1). Specimens were collected monthly (100 specimens) by gill nets (7 m length and 0.7 m height, with a 7 mm mesh size), and total of 1200 specimens of *P. pseudalepidotus* was analyzed. The weight of specimens was measured at the technical scale "Sartorius" type PT 1200 with an accuracy of 0.1 g. Given that this is an endemic species, most of the specimens were taken back into the water after the weight measurements.

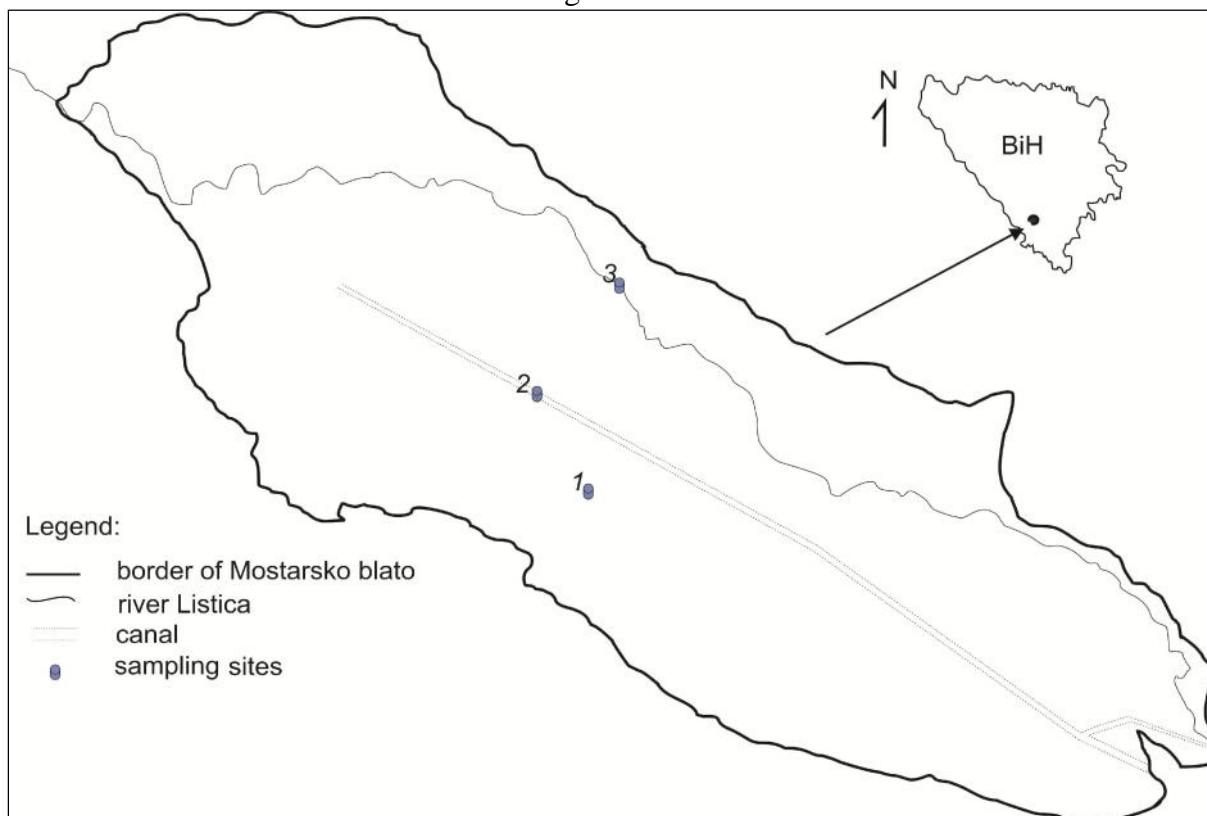


Figure 1. Map of sampling sites: Station 1 (Pisak), Station 2 (Me uri ) and Station 3 (Pološki gaz)

### Results and Discussion

All collected specimens of *Phoxinellus pseudalepidotus* were divided by the weight of the body into 13 classes. The classes within the population studied were formed 1.0 g body weight each, separately for the whole population, and for males and for females, respectively. Figure 2 shows that the predominant class is the one from 2.0 to 3.0 g weight with 492 specimens out of 1200, representing 41% of the population. The lowest prevalence was observed in the classes weighting from 9.0 to 10.0 g, than 11.0 to 12.0 g, and 12.0 to 13.0 g with just one specimen each.

The minimum recorded body weight is 0.1 g, and maximum recorded weight is 15.0 g. The average of the total weight for the population is  $3.1 \pm 1.2$  g. Maximum and minimum weight was recorded for females. The average weight for females was  $3.3 \pm 1.4$ , and for males  $2.9 \pm 0.9$ , and the range between the minimum and maximum values was higher in females (0.1 to 15.0 g) than in males (0.2 to 8.0 g).

The histogram of female weight (Figure 3) shows that females are also found in thirteen classes. The most prevalence was observed in the class from 3.0 to 4.0 g with 234 out of 651 specimens, representing 35.94 % of all the females. The following class is the one from 2.0 to 3.0 g consisted of 198 specimens, representing 30.41% of the total female sample. Males were distributed into eight classes. The histogram of male weight (Figure 4) shows that the most prevalence class is the one from 2.0 to 3.0 g with 294 out of 549 specimens, representing 53.55 % of all the males.

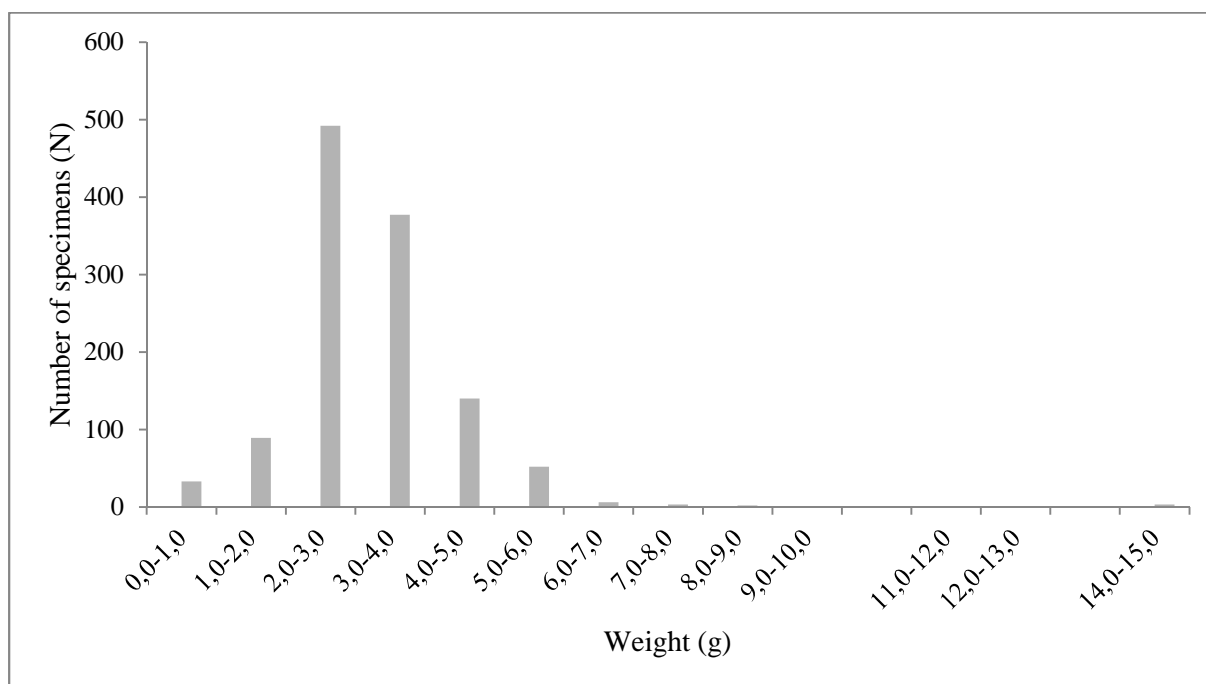


Figure 2. The weight structure of population of *Phoxinellus pseudalepidotus* in the Mostarsko blato

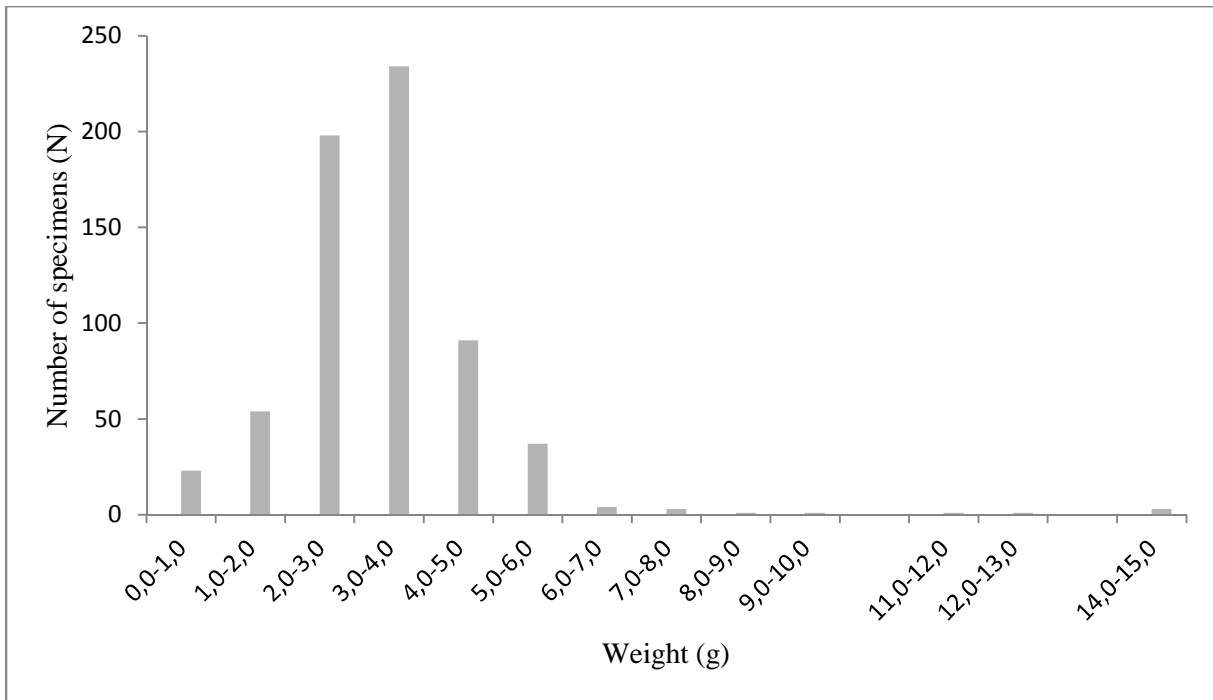


Figure 3. The weight structure of females of *Phoxinellus pseudalepidotus* in the Mostarsko blato

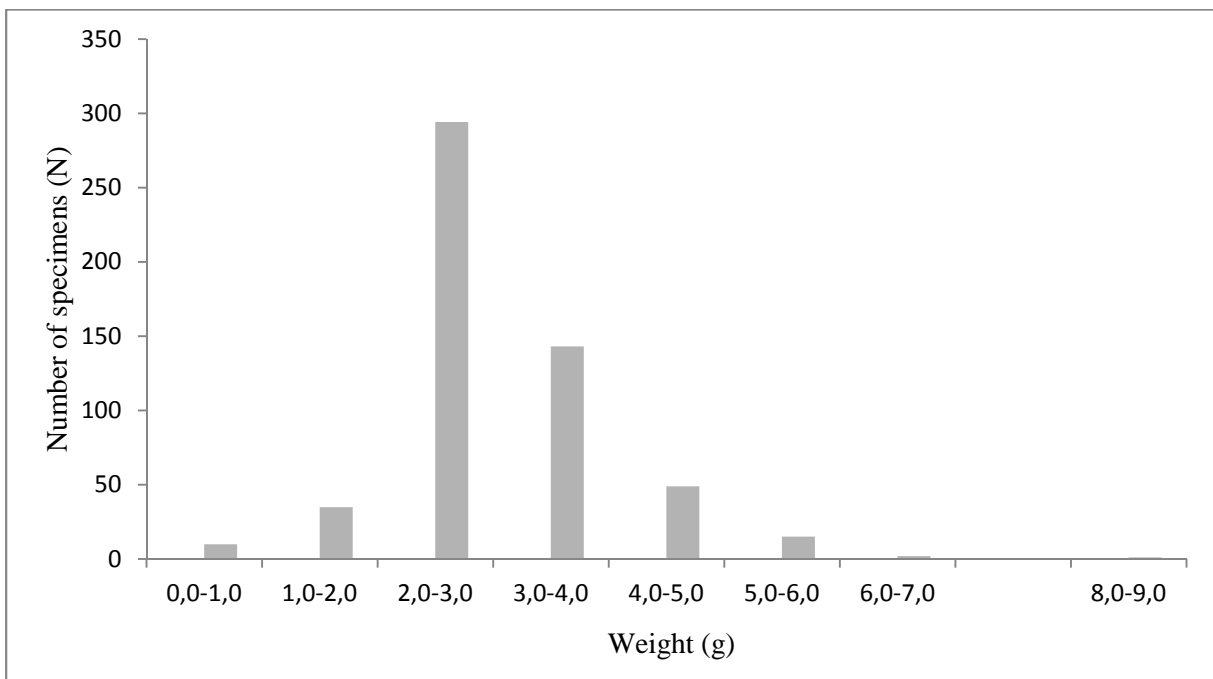


Figure 4. The weight structure of males of *Phoxinellus pseudalepidotus* in the Mostarsko blato

Females of *Telestes ukliwa*, endemic to the Cetina River in southern Croatia, ranged in weight from 3.2 to 28.1 g, and males from 1.3 to 25 g. Females of this species have a higher weight than males (Zanella et al., 2009). The minimum and the maximum recorded weight of

*Telestes ukliwa* are higher than the minimum and the maximum weight of *Phoxinellus pseudalepidotus*. It was also found that females of *Telestes montenegrinus* in the delta of Skadar Lake have a higher weight than males (Krivokapi , 2002b). Frani evi and Ti ina (2003) reported that the weight of the analyzed specimens of *Delminichthys adspersus*, widespread in Red Lake in Imotski, ranged from 4.36 to 18.79 g. The minimum and the maximum recorded weight of *Delminichthys adspersus* are also higher than the minimum and the maximum weight of *Phoxinellus pseudalepidotus*. The average of the total weight of *Delminichthys adspersus* was  $12.51 \pm 1.51$  g. *Telestes metohiensis* from Bile a Lake in Bosnia and Herzegovina ranged in weight from 16.1 to 41.4 g, and the average of the total weight for this species was 27.7 g (Haskovi et al., 2007).

### Conclusion

The results of this study show that the endemic fish species *Phoxinellus pseudalepidotus* from the Mostarsko blato ranged in weight from 0.1 to 15 g. The average of the total weight for the population is  $3.1 \pm 1.2$  g. Maximum and minimum weight was recorded for females. The average weight for females was  $3.3 \pm 1.4$ , and for males  $2.9 \pm 0.9$ , while the range between the minimum and maximum values was higher in females (0.1 to 15.0 g) than in males (0.2 to 8.0 g). It was found that females had a higher body weight than males.

### References

- Bogut, I., Pavli evi , J., Petrovi , D., Ivankovi , S., Ivankovi , M., Galovi , D. (2007). Assessment of the hydrological system regulation and its effect on fish population in the area of Mostarsko blato. In, Ugrožene i endemske vrste riba u slivovima rijeke Neretve, Trebišnjice i Mora e, Skaramuca B., Dul i J., Glamuzina B., Mrakov i M., Mandi S., Bartulovi V., Haskovi E., Zovko N. (eds.), The East West Institute i Sveu ilište u Dubrovniku, Dubrovnik, 129-135.
- Bogutskaya, N.G., Zupan i , P. (2003). *Phoxinellus pseudalepidotus* (Teleostei: Cyprinidae), a new species from the Neretva basin with an overview of the morphology of *Phoxinellus* species of Croatia and Bosnia-Herzegovina. Ichthyological Exploration of Freshwaters, Vol. (14(4)), 369-383.
- Crivelli, A.J. (2006). *Phoxinellus pseudalepidotus*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.1. <www.iucnredlist.org>. Downloaded on 30 July 2013.
- ur i , V. (1913). Narodno ribarstvo u Bosni i Hercegovini II. Hercegovina. Glasnik Zemaljskog Muzeja Bosne i Hercegovine, Vol. (25), 421-514.
- Frani evi , M., Ti ina, V. (2003). Biometric characteristics of a rare endemic fish, *Phoxinellus adspersus* (Heckel 1843), from Red Lake (Imotski, Croatia). Periodicum Biologorum, Vol. (105(4)), 453-460.
- Glamuzina, B., Tutman, P., Pavli evi , J., Bogut, I., Dul i , J. (2010). Bioraznolikost riba Hercegovine. Me unarodni kolokvij "2010. godina bioraznolikosti", Livno, 13-15.12.2010.
- Haskovi , E., Hamzi , A., Suvad, L., Suljevi , D., Glamuzina, B., Mitrašini , M., Skaramuca, B. (2007). Gaovice (*Phoxinellus*, *Telestes*, *Delminichthys*) sliva rijeke Trebišnjice (BiH). In, Ugrožene i endemske vrste riba u slivovima rijeke Neretve, Trebišnjice i Mora e, Skaramuca B., Dul i J., Glamuzina B., Mrakov i M., Mandi S., Bartulovi V., Haskovi E., Zovko N. (eds.), The East West Institute i Sveu ilište u Dubrovniku, Dubrovnik, 47-59.
- Heckel, J.J., Kner, R. (1858). Die Süßwasserfische der Österreichischen Monarchie. Engelmann, Leipzig.

- Kolombatovi , J. (1886). Imenik kralješnjaka Dalmacije. II. dio: Dvoživci, gmazovi i ribe. Godišnji izvještaj Velike realke u Splitu 1885/1886, Split.
- Krivokapi , M. (2002b). Mriješ enje podvrste *Leuciscus souffia montenegrinus* (Cyprinidae, Pisces) iz rijeke Mora e. *Natura montenegrina*, Podgorica, Vol. (1), 153-158.
- Markoti , I., Bartulovi , V., Glamuzina, B. (2012). Sex ratio of *Phoxinellus pseudalepidotus* Bogutskaya & Zupan i 2003 (Teleostei: Cyprinidae), from Mostarsko blato area. In, Animal farming and environmental interaction in the Mediterranean region, Casasús I., Rogoši J., Rosati A., Štokovi I., Gabiña D. (eds.), Wageningen Academic Publishers, Wageningen, 201-204.
- Markoti , I., Bartulovi , V., Dobroslavi , T., Suli Šprem, J., Glamuzina, B. (2013). Dužinski sastav populacije prikanca (*Phoxinellus pseudalepidotus* Bogutskaya i Zupan i , 2003) na podru ju Mostarskog blata (Bosna i Hercegovina). In, Zbornik radova 48. hrvatskog i 8. me unarodnog simpozija agronoma, Mari S i Lon ari Z. (eds.), Poljoprivredni fakultet Sveu ilišta Josipa Jurja Strossmayera u Osijeku, Dubrovnik, 647-651.
- Markoti , I., Mihaljevi , Z., Bartulovi , V., Dobroslavi , T., Suli Šprem, J., Glamuzina, B. (2013). Sezonska ishrana prikanca (*Phoxinellus pseudalepidotus* Bogutskaya i Zupan i , 2003) na podru ju Mostarskog blata (Bosna i Hercegovina). In, Zbornik radova 48. hrvatskog i 8. me unarodnog simpozija agronoma, Mari S. i Lon ari Z. (eds.), Poljoprivredni fakultet Sveu ilišta Josipa Jurja Strossmayera u Osijeku, Dubrovnik, 652-656.
- Povž, M., Leiner, S., Mrakov i , M., Popovi , J. (1990). Rare and endangered fishes from Yugoslavian Adriatic rivers. *Journal of Fish Biology*, Vol. (37(Suppl. A)), 247-249.
- Seeley, H.G. (1886). *The freshwater fishes of Europe*. Casell, London.
- Trgov evi , L. (1905). *Paraphoxinus* BLKR. i *Telestes* BONAP. u vodama Like i Krbave. *Nastavni vjesnik*, Zagreb, Vol. (14), 1-23.
- Vukovi , T., Ivanovi , B. (1971). *Slatkovodne ribe Jugoslavije*. Zemaljski muzej BiH, Sarajevo.
- Vukovi , T. (1977b). *Phoxinellus alepidotus* (Heckel, 1843). Novi podaci o rasprostranjenju u vodama Jugoslavije. *Ribarstvo Jugoslavije* Vol (1), 3-4.
- Zanella, D., Mihaljevi , Z., Mrakov i , M., aleta, M. (2009). Ecology and diet of the endemic *Telestes ukliwa* (Cyprinidae) in the Cetina River system, Croatia. *Cybium* Vol. (33(2)), 97-105.