Morphometric characteristics of *Delminichthys ghetaldii* (Steindachner, 1882) from different habitats

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Abstract

Ichthyofauna of Bosnia and Herzegovina is portrayed by considerable species diversity, especially by numerous endemic species. Popovo minnow (*Delminichthys ghetaldii*) is an endemic species which inhabits springs and streams in eastern Herzegovina. The life cycle of these endemic fishes is connected to the karst habitats characterized by significant fluctuation of the water level regime. Analysis of the physiological and morphometric characteristic of endemic species is important because it gives valuable information on the current status of individuals and populations, and indirectly of the environment. In this research we measured the parameters of total and standard body length, weight and Fulton's condition factor in popovo minnows from two different habitats. Samples were collected in field Fatnica during the flooding and in the river Brova. Comparison of the obtained results showed higher values of length and weight in individuals gathered in Fatnica field, while no significant differences in Fulton's condition factor were noticed.

Keywords: *Delminichthys ghetaldii*, ichthyofauna, diversity, morphometry

Introduction

Ichthyofauna of Bosnia and Herzegovina is portrayed by considerable species diversity, especially by numerous endemic species. They usually have narrow and limited distribution, or inhabit only few localities. Minnows which inhabit karst water streams are representatives of endemic ichthyofauna. During autumn and spring flooding, they emerge from the underground waters to surface estaveles, and one part of the life cycle they spend in underground karst water streams (Ivanc i Dekić, 2015). Popovo minnow (*Delminichthys ghetaldii)* can only be found in springs and

streams in fields in eastern Herzegovina, and earlier studies report its presence in Fatnica field and water stream Brova (Dekić i sar., 2011). According to formerly used systematics, following minnow species inhabited rivers in eastern Herzegovina: *Paraphoxinus metohiensis*, (Steindachner, 1901), *Paraphoxinus pstrossi* (Steindachner, 1882) and *Paraphoxinus ghetaldii* (Steindachner, 1882). These species were afterwards classified in genus Phoxinellus (Dekić i sar., 2011). Recent systematics divides minnows into two genera: Telestes including species *Telestes metohiensis* and Delminichthys including species *Delminichthys ghetaldii* (Freyhof i sar., 2006; Kottelat i Freyhof, 2007). According to Bogutskaya et al. (2012) genus Telestes includes following species: *Telestes metohiensis*, *Telestes dabar* i *Telestes miloradi*. The aim of this study is to analyze main morphometric paramerers, body mass and Fulton's condition factor of species *Delminichthys ghetaldii* inhabiting different localities.

Material and Methods

Analysis of the morphometric charactersitics of *Delminichthys ghetaldii* was performed on individuals collected at Brova waterstream in and in Fatnica field during the flooding. Electrofishing was done in October in 2015 using impulse fishing device IG 600 with 1.2 KW power and nets with different mesh size. electrofishing is based on creating temporary stress by galvanotaxis and galvano-narcosis, and fishes return to their natural state in several minutes after being caught (Dekić, 2006). Collected fishes were used for the determination of basic morphometric parameters-total and standard length, body mass and Fulton's condition factor. Obtained data were statistically analyzed and interpreted.

Results

Results of analyzed morphometric characteristics are presented in Table 1. We have analyzed 20 fishes per locality. Females were more abundant at both waterstream Brova and Fatnica field sampling localities.

Discussion

Analysis of the morphometric characteristics of Popovo minnow from different habitats showed statistically significant differences in body mass ($p = 0.000$) and total and standard length ($p = 0.000$). Higher values were observed in fishes captured at Fatnica field. Values of Fulton's condition factor were also higher in specimens collected at Fatnica field. Similar pattern was determined when parameters were evaluated when gender was taked into account. Captured females had higher values of morphometric parameters at both sampling sites in comparison to males. Obtained results show that values of morphometric parameters of Popovo minnow are significantly lower in comparison to previous studies (Dekić i sar., 2014), while Fulton's condition factor has increased. There are reports about *Phoxinellus pstrossii* length (12 – 15 cm) by Sofradžija (2009), while for *Phoxinellus ghethaldii* maximum length of 12 cm was recorded and body mass of 15 g.

Table 1. Total length, standard lengths, mass and Fulton coefficient of *Delminichthys ghetaldii* from river Brova and Fatnica field

Locality		Statistical Parameters	Total lengths cm	Standard lengths cm	Mass (g)	Fulton coefficient
Brova	Total					
		Mean	**11.12**	**9.53**	**13.15**	**1.49**
		Standard deviation	1.19	1.17	4.64	0.35
		Minimum	9.10	7.42	5.63	1.01
		Maximum	13.64	11.89	20.83	2.76
		Coefficient of variation - %	10.72	12.31	35.30	23.64
	Males					
		Mean	**10.80**	**9.34**	**11.75**	**1.41**
		Standard deviation	1.20	1.09	4.29	0.23
		Minimum	9.10	7.62	7.93	1.01
		Maximum	12.48	10.78	18.59	1.79
		Coefficient of variation - %	11.13	11.67	36.54	16.47
	Females					
		Mean	**11.39**	**9.69**	**14.30**	**1.55**
		Standard deviation	1.17	1.27	4.80	0.43
		Minimum	9.68	7.42	5.63	1.10
		Maximum	13.64	11.89	20.83	2.76
		Coefficient of variation - %	10.30	13.08	33.55	27.42
Fatnica field	Total					
		Mean	**13.54**	**11.70**	**25.56**	**1.57**
		Standard deviation	1.23	1.08	6.177	0.11
		Minimum	11.41	9.68	14.53	1.34
		Maximum	15.13	13.50	35.86	1.75
		Coefficient of variation - %	9.09	9.20	24.17	7.13
	Males					
		Mean	**12.55**	**10.83**	**20.47**	**1.60**
		Standard deviation	0.74	0.68	3.88	0.11
		Minimum	11.41	9.68	14.53	1.37
		Maximum	13.83	12.11	27.94	1.74
		Coefficient of variation - %	5.86	6.24	18.95	7.06
	Females					
		Mean	**14.20**	**12.28**	**28.95**	**1.56**
		Standard deviation	1.04	0.89	4.99	0.11
		Minimum	12.22	10.73	20.23	1.34
		Maximum	15.13	13.50	35.86	1.75
		Coefficient of variation - %	7.34	7.25	17.25	7.27

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