



MORPHOLOGICAL CHARACTERISTICS OF BARBELS (*BARBUS*, CYPRINIDAE) FROM THE WATERS OF MONTENEGRO

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SYNOPSIS

Key words:

Barbus balcanicus,
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Barbus barbus,
taxonomy,
morphology,
Montenegro,
Crna Gora.

Description of morphological characteristics of population of *Barbus* sp. from the waters of Montenegro is presented in this paper. The three examined species (*Barbus balcanicus*, *Barbus rebeli*, *Barbus barbus* - young fishes, size up to 200 mm) are morphologically similar to each other, but *B. barbus* can be distinguished by head shape, shape of the lower lip, last simple dorsal ray. *B. barbus* distinguished from other species of *Barbus* in waters of Montenegro by: last simple dorsal ray spinous, serrated along entire posterior edge; posterior margin of dorsal concave; lower lip thick, with a median swollen pad. *B. balcanicus* distinguished from other species of *Barbus* in waters of Montenegro by a combination of the following characters: lower lip thick, with a short median lobe, usually 55-62, lateral line scales, simple pelvic ray distinctly shorter than second branched ray. *B. rebeli* distinguished from other species of *Barbus* in waters of Montenegro by a combination of the following characters: lower lip with a small median lobe, simple pelvic ray about as long as second branched ray, usually 50-52 lateral line scales.

INTRODUCTION

The genus *Barbus* in Europe represents one of the genera with the largest number of species. According to the literature data, only a few species of the genus *Barbus* were mentioned in the European waters (Heckel. & Kner, 1858; Bănărescu, 1964; Berg, 1949; Nikolskii, 1971). Kottelat (1997) in European waters noted 20 species of the genus *Barbus*, and according to Kottelat & Freyhof (2007) in

European waters occur 23 species. Marić et al. (2010) listed three species from this genus (*Barbus barbus*, *B. balcanicus*, *B. rebeli*) for waters of Montenegro and presented the first precise information on their distribution. Data on the species of the genus *Barbus* in the waters of Montenegro can be found in about 30 papers (Maric, 2010) and in these papers is noted least their presence in Montenegrin waters. However, data on morphology are very scarce.

On the basis of the available literature morphological characteristics have been presented only for the species *B. rebeli*. Vuković and Ivanović (1971), presented short description and quoted the following meristic characters: D IV 8, A III 5, V II 8, P I 15-16, I.I. 49-53, 11-12 scale rows between lateral line and dorsal origin, 7-8 scale rows between lateral line and pelvic origin. A few years later, Ivanović (1973) studied in detail the morphology of *B. rebeli* from the Skadar Lake (17 specimens). He quoted the following meristic characters: D III 8, A III 5-6, I.I. 49-54, 10-12 scale rows between lateral line and dorsal origin, 7-8 scale rows between lateral line and pelvic origin and 2.3.5-5.3.2 pharyngeal teeth.

The aim of this work was to morphologically compare the populations of barbel from the waters of Montenegro in order to check the morphological differences between the selected species and to revise their taxonomic status in the waters of Montenegro.

MATERIAL AND METHOD OF WORK

Studied material: Material used in this paper was collected in period from 2003 to 2008. As many as 351 specimens of various size fish were collected. Part of the material was treated while still fresh, remaining one labeled, fixed in 5% formaldehyde and treated in laboratory (152 specimens). The specimens were collected by electrofishing from 6 localities belonging to 4 river systems and determined according to Vuković and Ivanović (1971) and Kottelat & Freyhof (2007).

Barbus balcanicus was collected from the rivers: Lim, Ćehotina and Tara. Total number of collected individuals was 184 (98 specimens from Lim watershed; 34 specimens from the watershed of Ćehotina and 52 specimens from the watershed of Tara). Morphological characters were examined on 76 specimens.

Barbus barbus was collected in river Lim (11 specimens, all was measured) and *Barbus rebeli* was collected in the river Morača and smaller tributaries (65 specimens). Morphological characters were examined on 61 specimens.

Validity of the *Barbus* spp. discussed in this paper is based on the approach by Kottelat (1997), Kottelat and Freyhof (2007).

Three types of morphological characters (meristic, morphometric, and phenotypic) were examined on specimens fixed in 5% formaldehyde and preserved in 70% ethanol. Meristic characters (8) included the number of unbranched and

branched fin rays in dorsal, anal, pelvic (ventral) and pectoral fin. The last two branched rays in dorsal and anal fins, that are articulating on a single pterygiophore, are noted (were counted) as one. The number of gill rakers was counted on the first gill arch. The number of scales in the lateral line was counted in the complete lateral line, from the anterior scale next to the operculum to the posterior one on the caudal fin. The total vertebrae including four Weberian vertebrae and the last hypural complex centrum were examined on cooked specimens and counting was performed on purged skeleton.

A total of 24 morphometric characters were measured using an electronic caliper to the nearest 0.1 mm. Measurements were done point to point following Kottelat and Freyhof (2007). The percentage ratios of morphometric characters are expressed in relation to standard length (SL). The standard length is measured from the tip of the snout to the end of the hypural complex.

Abbreviations used: \bar{x} - average value, \pm SE - error of average value, D - pino dorsalis, A - pino analis, V - pino ventralis (pelvic), P - pino pectoralis, l. l. - lateral line, SL - standard length.

RESULTS

Three Barbel species present in Montenegro's waters are as follows: *Barbus balcanicus* Kotlik, Tsigenopoulos, Rab & Berrebi, 2002, *Barbus barbus* (Linnaeus, 1758) and *Barbus rebeli* Koller, 1926 (Marić et al. 2010).

***Barbus balcanicus* Kotlik, Tsigenopoulos, Rab & Berrebi, 2002**

Common name – Large spot barbel

Barbus balcanicus Kotlik, Tsigenopoulos, Rab & Berrebi, 2002: 233, pl. 1-2. sl. 4.

Barbus meridionalis peteny Taler, 1954: 444; Krivokapić & Marić, 1993: 44 i dr.

Barbus peloponnesius Karaman, 1971: 207, fig. 23.

Barbus balcanicus Marić, St. et al. 2010: 176, fig. 4.

Diagnosis. Distinguished from other species of *Barbus* in waters of Montenegro (Danube drainage, Adriatic basin and Balkan Peninsula) by following characteristics: last simple dorsal ray weak, not serrated posteriorly; lower lip thick, with a short median lobe usually 11-12 scale rows between lateral line and dorsal origin; 8-11 scale rows between lateral line and pelvic origin (usually 9-10); 50-70, usually 55-62, lateral line scales, top of head with conspicuous black dots or spots, about size of pupil; cheek and opercle with dark dots; paired fins with dark spots, at least dark pigments on rays forming 1-2 dark bars; body with dark dots and blotches much darker than background; caudal with elongate spots longer than pupil

diameter; simple pelvic ray distinctly shorter than second branched ray. Size up to about 200 mm SL.



Figure 1:
B. balcanicus from Tara river.

Description. Morphometric characters are summarized in Table 1. The general shape of the head (lateral and ventral - lower jaw) shown in fig 1-2. Snout typically bluntly pointed. Lower lip thick, with a short median lobe (fig. 3). Body with dark dots and blotches much darker than background, belly yellowish white. Top of head with conspicuous brown-black dots or spots, cheek and opercle with dark dots; all fins with dark spots, spots typically arranged into rows on dorsal and caudal fins and into band on ventral fins; peritoneum black. Head length is usually greater than $\frac{1}{4}$ of the standard length, and length of caudal peduncle about $\frac{1}{5}$ of SL. Anteye distance and posteye distance is equal. Horizontal diameter of eye (4-6% SL) 2 times in distance between the eyes and usually <5 times in the head length. Minimal body depth (9,8-12,7) a few smaller to posteye distance (10,5-13,2). The dorsal origin behind pelvic origin so that the anteventral distance is larger than antedorsal distance. The pelvic origin is in all specimens moved back and is in the second part of the body.

Length of base D less than (for $\frac{1}{5}$) its depth, and length of base A usually 2 times less than its depth. Depth of A can be shorter or longer than length caudal peduncle, and can reach to the caudal fin. Dorsal origin is slightly moved forwards than ventral fins. Depth of dorsal to depth of pelvic and depth of pectoral fin are the differences with the other two. Dorsal fin with 2-3 unbranched rays, last one always soft, not srated along posterior margin, and 8 branched rays, last one split to base (all specimens), outer margin straight or slightly concave. Anal fin with 1-3 unbranched rays, and 5 branched rays, last one split to base (all specimens). Pectoral fins usually with 14 i 15 branched rays and gill rakers on first left gill arch usually 9–10. There are 50-70 scales along lateral line (L.L.) usually 55-62, mean 55,91. Scale rows between lateral line and dorsal origin is 10-14, usually 11-12; 8-11 scale rows between lateral line and pelvic origin (usually 9-10). The total vertebrae including four Weberian vertebrae and the last hypural complex centrum are 37-40 (n=38).

Table 1: Morphological data (in % of standard length) of *B. balcanicus* from Montenegrin rivers (Tara, Lim and Ćehotina, n = 76).

Characters	Min	Max	\bar{x}	\pm SE p=0.05(95%)	confidence interval
Standard length	62,7	188,0	103,81	2,72	98,39 - 109
Total length	112,5	124,0	119,36	0,21	118,93 - 120
Body depth	19,6	24,6	22,58	0,14	22,31 - 23
Minimal body depth	9,8	12,7	11,1	0,08	10,95 - 11
Head length	24,6	31,0	27,2	0,13	26,94 - 27
Anteeye distance	9,8	14,4	12,07	0,09	11,9 - 12
Distance between the eyes	7,6	9,7	8,59	0,05	8,48 - 9
	4,0	5,9	4,86	0,05	4,76 - 5
Posteye distance	10,5	13,2	11,87	0,07	11,74 - 12
Antedorsal distance	49,5	56,0	52,4	0,14	52,12 - 53
Postdorsal distance	32,2	41,9	37,82	0,19	37,45 - 38
Anteventral distance	51,1	58,4	55,23	0,16	54,91 - 56
Postventral distance	38,7	47,2	43,54	0,18	43,17 - 44
Anteanal distance	70,5	79,8	76,34	0,16	76,01 - 77
Length of caudal peduncle	17,0	21,2	19,22	0,1	19,01 - 19
Length of base D	10,4	14,2	12,52	0,09	12,35 - 13
Depth of D	14,8	21,4	18,79	0,15	18,49 - 19
Length of base A	4,6	8,4	6,75	0,08	6,6 - 7
Depth of A	13,8	23,7	15,4	0,23	18,96 - 20
Length of P	17,1	21,2	19,42	0,1	18,33 - 19
Length of V	13,7	20,7	18,53	0,11	15,18 - 16
Distance P-V	28,0	34,0	31,06	0,15	30,77 - 31
Distance P-A	47,0	56,9	52,6	0,19	52,22 - 53
Distance V-A	19,1	25,6	22,18	0,16	21,87 - 22
Branched rays of D	8	9	8	0	0
Branched rays of P	13,0	16,0	14,63	0,09	14,46 - 15
Branched rays of V	7,0	8,0	7,96	0,02	7,92 - 8
Branched rays of A	4	5	5	0	0
Lateral line scales(l.l.)	50,0	70,0	55,91	0,46	54,98 - 57
No of scales above l.l.	10,0	14,0	11,91	0,09	11,73 - 12
No of scales below l.l.	8,0	11,0	9,36	0,09	9,18 - 10
No. of branchiospines	6,0	13,0	9,64	0,16	9,33 - 10



Figure 2: Shape of the head (lateral and ventral - lower jaw) of 3 species of the genus *Barbus* A) *B. balcanicus*, B) *B. barbus*, C) *B. rebeli*.

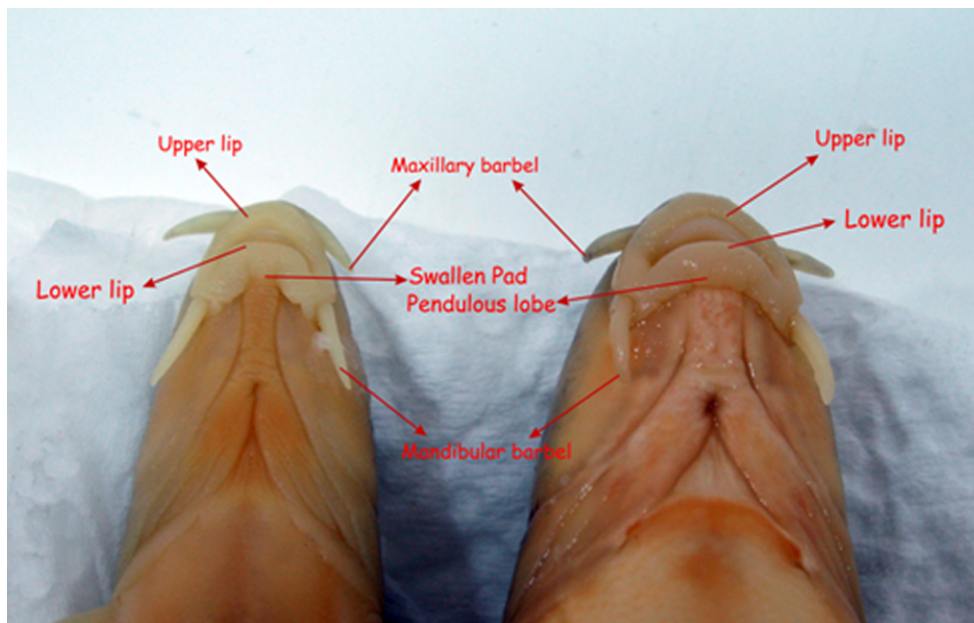


Figure 3: Shape of the lower jaw (left - *B. barbus*, right - *B. balcanicus*).

***Barbus barbus* (Linnaeus, 1758)**

Common name - Barbel

Cyprinus Barbus Linnaeus, 1758: 320

Barbus barbus Taler; 1954: 443 Drecun, 1962: 6; Vuković & Ivanović, 1971: 177, fig. 164, Marić, St. et al. 2010: 176, fig. 4.

Diagnosis. Distinguished from other species of *Barbus* in waters of Montenegro (Danube drainage, Adriatic basin and Balkan Peninsula) by the following characteristics: last simple dorsal ray spinous, serrated along entire

posterior edge; posterior margin of dorsal concave; lower lip thick, with a median swollen pad (fig 3); fine dark spots present in individuals larger than 100 mm; 11-12 scale rows between lateral line and dorsal origin; usually 8-10 scale rows between lateral line and pelvic origin; 57-61 lateral line scales; pelvic origin about below dorsal origin; scales with free posterior part pointed; scales on back with 1-5 well developed median longitudinal epithelial crests. The dorsal fin has 3 simple and 8 branched rays in all specimens; posterior margin of dorsal concave. The ventral fin has 8 branched rays in all specimens.

Description. Morphological characteristics are summarized in Table 2. The general shape of the head (lateral and ventral - lower jaw) shown in Fig 2 and 4. Maxillary barbel is shorter than mandibular barbel, but mandibular does not reach to eyes; median part of the lower lip not delimited posteriorly or delimited by a shallow groove. Dorsal fin with 3 unbranched and 8 branched rays and anal fin with 3 unbranched and 5 or 6 branched rays. Pectoral fin with 14-16 branched rays. Scales along lateral line (L.L.) 57-61, mean 58.55. Scale rows between lateral line and dorsal origin is 11-12; 8-11 scale rows between lateral line and pelvic origin (usually 9). The number of gill rakers (in total on the outer side of the first left gill arch) varied from 9 to 14.

Length of caudal peduncle longer than depth of anal fin, so the depth of anal fin doesn't reach the origin caudal fin. Depth of dorsal fin (20,8-23,7) longer than pelvic, pectoral and anal fins. Pectoral fins greater than ventral fins (the difference from the *Barbus rebeli*). Caudal fin is moderately forked, its upper lobes shorter than lower. The maximum body depth is between the pectoral and ventral fins, and varies from 21 to 23% SL. Antedorsal and anteventral distance in all specimens is < 50% SL. Head length is (27.2-29.6% SL) equal to distance P-V. Posteye distance equal or shorter than anteye distance. Depth of caudal peduncle about 2.0-2.3 times in its length, length of caudal peduncle usually about 25% SL. Postdorsal distance 2.0 times in anteanal distance, as well as length of base A 2.0 times in its depth. The back is olive green colored. Posterior margin of dorsal and caudal fins is dark, paired fins are reddish. Adult spawning males have nuptial tubercles located on the upper head surface. Size up to usually 500 – 600 mm SL in rivers Lim and Čehotina.



Figure 4: *B. barbus* from river Lim (from Marić et al., 2010).

Table 2: Morphological data (in % of standard length) of *B. barbuis* from the Lim drainage basin (n = 11).

Characters	Min	Max	\bar{x}	\pm SE p=0.05(95%)	confidence interval
Standard length	59,4	99,0	73,42	3,7	65,18 - 82
Total length	121,1	123,9	122,49	0,25	121,94 - 123
Body depth	21,5	23,3	22,61	0,15	22,27 - 23
Minimal body depth	9,4	11,3	10,49	0,17	10,12 - 11
Head length	27,2	29,6	28,68	0,19	28,25 - 29
Anteeye distance	12,1	13,5	12,75	0,12	12,48 - 13
Distance between the eyes	8,5	9,7	9,06	0,12	8,79 - 9
Diameter of eye	5,0	7,2	5,49	0,2	5,05 - 6
Posteye distance	11,8	12,7	12,21	0,09	12,02 - 12
Antedorsal distance	51,9	56,1	53,88	0,37	53,05 - 55
Postdorsal distance	32,3	38,1	36,59	0,49	35,5 - 38
Anteventral distance	53,0	55,9	53,98	0,25	53,44 - 55
Postventral distance	43,1	45,1	43,73	0,19	43,3 - 44
Anteanal distance	74,4	76,7	75,37	0,23	74,86 - 76
Length of caudal peduncle	18,8	27,8	20,38	0,76	18,68 - 22
Length of base D	12,1	13,5	12,74	0,15	12,4 - 13
Depth of D	20,8	23,7	22,18	0,3	21,52 - 23
Length of base A	5,8	7,9	6,53	0,19	6,1 - 7
Depth of A	16,6	18,0	17,25	0,15	16,92 - 18
Length of P	17,83	19,5	18,63	0,56	17,89 - 19
Length of V	16,1	17,8	16,98	0,16	16,62 - 17
Distance P-V	27,3	28,9	27,85	0,15	27,53 - 28
Distance P-A	48,7	51,6	50,04	0,28	21,81 - 23
Distance V-A	21,1	24,5	22,55	0,33	49,41 - 51
Branched rays of D	8	8	8	0	
Branched rays of P	14,0	16,0	14,73	0,19	14,29 - 15
Branched rays of V	8,0	8,0	8	0	8 - 8
Branched rays of A	5	6	5,	0	
Lateral line scales(I.I.)	57,0	61,0	58,55	0,47	57,49 - 60
No of scales above I.I.	11,0	12,0	11,91	0,09	11,71 - 12
No of scales below I.I.	8,0	11,0	9,09	0,28	8,46 - 10
No. of branchiospines	9,0	14,0	10,36	0,47	9,31 - 11

***Barbus rebeli* Koller, 1926: 178**

Common name- Western Balkan barbel

Barbus rebeli Koller, 1926:178. Marić, St. et al. 2010: 176, fig. 4.

Barbus meridionalis petenyi Heckel, 1847; Taler, 1954: 444; Drecun 1957: 37 i 1962: 4.

Barbus peloponnesius Karaman, 1971: 207, fig. 23.

Barbus meridionalis rebeli Vuković & Ivanović, 1971: 182; Ivanović 1973: 98, pl. 29. Knežević 1981: 313; Drecun et al. 1985: 29; Marić, 1995: 190.

Barbus peloponnesius rebeli Marić & Krivokapić 1997: 217.

Diagnosis. Distinguished from other species of *Barbus* in waters of Montenegro (Danube drainage, Adriatic basin and Balkan Peninsula) by the following combination of characters: last simple dorsal ray weak, not serrated posteriorly; lower lip with a small median lobe; head, body and fins with numerous small black dots, larger and darker on back; posterior margin of dorsal straight to slightly concave; simple pelvic ray about as long as second branched ray. Usually 11-12 scale rows between lateral line and dorsal origin; 7-10 scale rows between lateral line and pelvic origin; 47-55 lateral line scales (usually 50-52); The vertebrae including four Weberian vertebrae and the last hypural complex centrum usually 38-39; the anal fin has 3 simple and 5 branched rays in all specimens. The ventral fin has 3 simple and commonly 8 branched rays (9 branched rays were found in only 2 specimens). Pectoral fins have usually 14-16 branched rays. Size up to about 250 mm SL.

Description. Morphometric characters are summarized in Table 3. The general shape of the head (lateral and ventral - lower jaw) shown in Fig 2-5.



Figure 5:
Barbus rebeli
from river Cijevna.

The body is dark brown-grey, laterally with yellow-grays, and grey-white ventral side. Head and body with numerous small brown-black dots, larger and darker on the back. All fins with heavily dark spotted with spots typically arranged into rows on caudal, dorsal and ventral fins. Lower lip thick, fleshy, with a small median lobe (Fig. 2.). Head length 24.1-30.1 % SL significantly greater than body depth, but at adult spawning females body depth significantly greater or equal to head length. Anteye distance equal to posteye distance and minimal body depth. The dorsal fin origin behind pelvic origin so that the anteventral distance usually larger than anedorsal distance, and anal fin origin usually is in the middle of the dorsal fin base below. Length of base A (5.7-9.1. SL) 2 times in length of base D and

significantly less than minimal body depth. Depth of dorsal fin (18-23% SL) equal to length of pectoral, few greater then length of ventral fins (16.0-21,0 SL).

Table 3: Morphological data (in % of standard length) of *B. rebeli* from the Morača drainage basin (n = 61).

Characters	Min.	Max.	\bar{X}	\pm SE p=0.05(95%)	confidence interval
Standard length	46,5	164,0	99,5	2,63	94,24 - 104,77
Total length	106,4	130,8	120,37	0,35	119,67- 121,06
Body depth	18,8	25,4	22,4	0,18	22,04 - 22,77
Minimal body depth	10,2	12,0	11,01	0,05	10,91 - 11,12
Head length	24,1	30,1	26,98	0,15	26,69 - 27,28
Anteeye distance	10,0	12,9	11,67	0,08	11,51 - 11,84
Distance between the eyes	7,2	10,5	8,53	0,08	8,37 - 8,7
Diameter of eye	4,0	6,2	5,26	0,06	5,14 - 5,38
Posteye distance	10,4	13,5	11,73	0,08	11,56 - 11,9
Antedorsal distance	49,7	56,6	52,39	0,16	52,07 - 52,72
Postdorsal distance	32,7	35,1	38,98	0,91	37,15 - 40,8
Anteventral distance	48,0	57,9	53,69	0,19	53,3 - 54,08
Postventral distance	39,6	49,7	45,06	0,22	44,62 - 45,5
Anteanal distance	72,6	80,4	75,41	0,19	75,03 - 75,8
Length of caudal peduncle	18,5	22,1	20,08	0,12	19,85 - 20,32
Length of base D	11,2	16,9	13,03	0,12	12,79 - 13,27
Depth of D	18,0	22,9	20,25	0,16	19,93 - 20,57
Length of base A	5,7	9,1	7,21	0,1	7,00 - 7,42
Depth of A	10,6	24,8	19,34	0,27	18,79 - 19,88
Length of P	17,6	22,3	19,97	0,12	19,72 - 20,21
Length of V	15,7	21,0	17,08	0,12	16,83 - 17,32
Distance P-V	26,9	33,5	29,37	0,15	29,07 - 29,67
Distance P-A	47,7	58,5	51,54	0,24	51,06 - 52,03
Distance V-A	19,5	28,7	22,84	0,20	22,45 - 23,24
Branched rays of D	7	9	8	0	
Branched rays of P	12,0	16,0	14,69	0,17	14,35 - 15,03
Branched rays of V	8,0	9,0	8,03	0,02	7,99 - 8,08
Branched rays of A	5	5	5	0	
Lateral line scales(I.I.)	47,0	55,0	50,92	0,20	50,53 - 51,31
No of scales above I.I.	10,0	13,0	11,61	0,08	11,44 - 11,77
No of scales below I.I.	7,0	10,0	8,15	0,10	7,95 - 8,35
No. of branchiospines	6,0	11,0	8,1	0,13	7,84 - 8,36

Anteventral distance (range) is equal to distance P-A (range) as well as the antedorsal distance. Length of caudal peduncle is equal to depth of D (5 times SL). Diameter of eye <2 times in anteeye distance; anteeye distance (10-13% SL) is

equal to posteye distance and significantly greater than distance between the eyes. Linea lateralis is located, closer to ventral side. The number of total lateral scales is 47-55 (average 50.92); usually 11-12 scale rows between lateral line and dorsal origin (range 10-13); 7-10 scale rows between lateral line and pelvic origin (average 8); the total vertebrae including four Weberian vertebrae and the last hypural complex centrum are 37-41: 37 (6), 38 (33), 39 (34), 40 (17), 40 (11); the anal fin has 3 simple and 5 branched rays in all specimens. The ventral fin has 3 simple and commonly 8 branched rays (9 branched rays were found in only 2 specimens). Pectoral fins has 12-16, usually 5-16 branched rays. The number of gill rakers (in total on the outer side of the first left gill arch) varied from 6 to 11 (average 8).

DISCUSSION

According to Marić et al. (2010) there are three species from the genus *Barbus* in waters of Montenegro: *Barbus balcanicus* Kotlik, Tsigenopoulos, Rab & Berrebi, 2002, *Barbus barbus* (Linnaeus, 1758) and *Barbus rebeli* Koller, 1926. General characteristics of external morphology showed great similarities between investigated species. All examined species (in Table 1-3 are summarized the results of morphological investigations) had almost identical values for the majority of the meristic characters (number of rays in D,A,V, number of scales above and below I.I.). Significant differences were found in lateral line scales and number of branchiospines. The uniformity of the number of rays in all fins, with the exception of pectoral fin, as well as the variability of the number of gill rakers and lateral line scales among the species, and their importance for a taxonomic identification of *Barbus* species were already reported (Vuković & Ivanović, 1971; Ivanović, 1973; Dimovski & Grupče, 1987; Sorić, 1987; Bianco, 1995; Kotlik et al., 2002; Economidis et al., 2003; Kottelat & Freyhof, 2007). Although the numbers observed by above mentioned authors are not completely the same as obtained in this investigation, they generally fall within the mentioned ranges, with some exceptions (50-70 lateral line scales of *B. balcanicus* from the Lim River drainage). The variability of all - meristic, morphometric and phenotypic - characters can also be noted between the different populations of the same species, probably depending on the ecological factors variation at different localities.

Investigated *Barbus* species differentiated from each other in several characteristics. *B. barbus* differs from the two other species by: lower lip with a median swollen pad vs. lower lip with a median lobe, last simple dorsal ray spinous, serrated along entire posterior edge vs. last simple dorsal ray weak, not serrated posteriorly. General characteristics of external morphology showed great similarities between *B. balcanicus* and *B. rebeli*. These two species are, also, very similar to *B. meridionalis*, *B. peloponnesius*, *B. petenyi* and *B. carpathicus*; characters

common to these six species include the following: last simple ray of the dorsal fin slender and undenticulated, similar colour pattern, and occurrence mainly in the upper montane reaches of rivers. Although there is overlap in most morphological characters (very similar to each other), two species from Montenegro can be distinguished from others by differences in the snout shape and body and fin colour pattern, as detailed in the diagnoses.

B. balcanicus can be distinguished from *B. rebeli* by differences in the size of the simple pelvic ray and second branched ray. Simple pelvic ray distinctly shorter than second branched ray in *B. balcanicus* and in *B. rebeli* simple pelvic ray about as long as second branched ray. In *B. balcanicus* pectoral fins are larger than the ventral, but smaller than the length of the dorsal fin (which is the difference with the *B. rebeli*). Also these species distinguished by the gill rakers on first left gill arch: in *B. balcanicus* 6–13, usually 9–10 vs. 6–11 usually 8 in *B. rebeli*. In *B. rebeli* the scales are larger than in the other two Montenegrin barbells and usually there are 49-51 (range: 47-55) scales on LL.

Above mentioned differences between the three Montenegrin barbells clearly demonstrated differences between them.

The key for the identification of species of genus Barbus in Montenegro:

1. Lower lip thick, with a median swollen pad; last simple dorsal ray spinous, strong serrae along almost entire length of posterior edge ***B. barbuis***
2. Lower lip with a median lobe; last simple dorsal ray weak (not spinous), not serrated posteriorly **3**
- 3a. Lower lip thick, with a short median lobe; Simple pelvic ray distinctly shorter than second branched ray; I.L. 50-70 ***B. balcanicus***
- 3b. lower lip with a small median lobe ; Simple pelvic ray about as long as second branched Ray; I.L. 47-54 ***B. rebeli***

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