

Biometry of the fishes *Barbus plebejus* and *Barbus capito* from Coruh Basin, Turkey

Kemal Solak¹, Ali Alas^{2*}, Muhittin Yılmaz³ & Ahmet Öktener⁴

1. Department of Biology, Faculty of Education, Gazi University, Ankara, Turkey.
- 2.* Department of Natural Sciences, Faculty of Education, Aksaray University, 68100, Aksaray-Turkey; alasali@hotmail.com
3. Department of Biology, Faculty of Science and Art, Kafkas University, 36100, Kars, Turkey.
4. Istanbul Provincial Directorate of Agriculture, Directorate of Control, Kumkapı Fish Auction Hall, Aquaculture Office, Kumkapı, TR-34130 Istanbul, Turkey.

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Abstract: Metric and meristic characters are important to identify fish species and their habitat peculiarities. There are many species that belong to the fish genus *Barbus*, which is found in tropical and extratropical regions, but there are few studies covering the Coruh basin. Two subspecies of *Barbus* were found in the Coruh River system of Eastern Anatolia, Turkey: *Barbus plebejus escherichi* and *Barbus capito capito*. We collected specimens in seven localities for measurement. The number of vertebra were determined radiographically. Some specimens of *B. capito capito* have a sharper snout in the segments of Coruh where the water flows faster, suggesting a modification related to current. The biometric measurements vary geographically and could be related to abiotic and biotic factors in the habitat. Rev. Biol. Trop. 57 (1-2): 159-165. Epub 2009 June 30.

Key words: *Barbus*, metric and meristic characters, Coruh Basin, Turkey.

Metric and meristic characters are important to identify fish species and their habitat peculiarities as well as ecological criteria in any stream, lake or sea (Karaman 1971, Geldiay and Balık 1998, Karatas 2005). A variety of morphological, physiological, behavioral and biochemical characteristics are used to identify and classify fishes. In practice though, it is more common to use morphometric measurements (i.e., body length, body depth, head length, eye diameter, jaw length) and meristics (i.e., fin ray, scale, teeth, gill raker, and lateral line pore counts). These morphometric measurements are usually presented as a proportion of standard, fork and total length (Howe 2002).

There are limited studies concerning this topic in Coruh basins (Karaman 1971, Kuru 1975). Two subspecies of *Barbus* were found in the Coruh River system of Eastern Anatolia,

Turkey. These are *Barbus plebejus escherichi* Steindachner, 1897 and *Barbus capito capito* Guldenstadt, 1773.

The purpose of the present study is to contribute to the knowledge of the biometric measurements and their relationships to *Barbus plebejus escherichi* and *Barbus capito capito* inhabiting Coruh Basin from Turkey.

MATERIALS AND METHODS

This study was based on specimens collected from Coruh Basin (Fig. 1). Samples were caught by using electroshocker in 7 localities. Metric characters of fishes were measured by using compass and ruler, and meristic characters were determined under binocular microscope and magnifier. The number of vertebra were determined radiographically

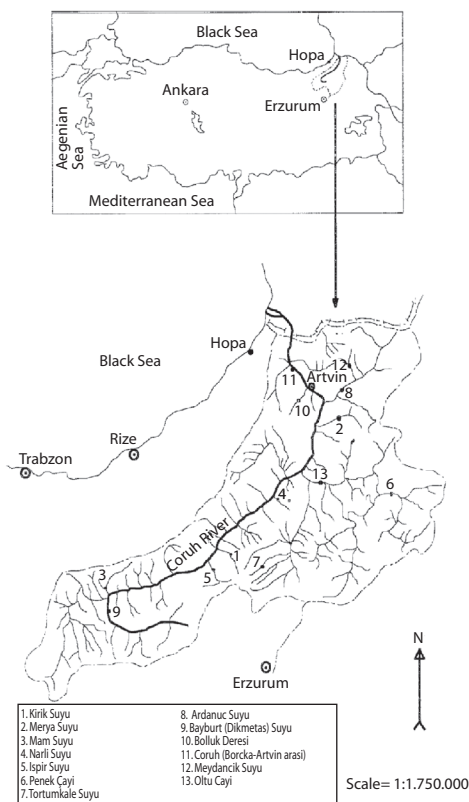


Fig. 1. Distribution of *Barbus* in the Coruh Basin.

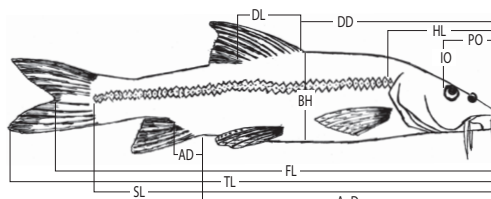


Fig. 2. Some metric characters of *Barbus*.

by using convenient x-rays dosages. Findings were statistically calculated by using SPSS programme.

Determining of metric characters for *Barbus* species and subspecies are shown in Figure 2.

This research covers the variations of the ratios HH/HL, IO/HL, PO/HL, HL/TL, AnD/TL, DD/TL (Fig. 2), their X, S, V, F values (Tables 1 and 2). The identifications of these abbreviations are given in each table. Moreover, meristic characters of two subspecies of *Barbus* were found out in this paper (Table 3).

Meristic measurements of each subspecies (Table 3), and metric and meristic characters of different *Barbus* species, according to various authors, are also given (Table 4).

TABLE 1A
Biometric measurements of Barbus plebejus escherichi in various localities of the Coruh Basin

Localities	n	HH/HL				IO/HL			
		\bar{X}	SD	Var	f	\bar{X}	SD	Var	f
Kırık Suyu	12	0.58	0.042	7.25	0.54-0.65	0.29	0.015	5.17	0.27-0.32
Merya Suyu	28	0.56	0.030	5.31	0.53-0.65	0.29	0.029	10.17	0.23-0.33
Mam Suyu	22	0.56	0.035	6.24	0.50-0.62	0.30	0.019	6.47	0.25-0.33
Narlı Suyu	16	0.57	0.036	6.24	0.50-0.64	0.29	0.017	5.98	0.25-0.32
Ispir Suyu (Coruh)	18	0.57	0.031	5.40	0.53-0.66	0.29	0.022	7.76	0.25-0.32
Penek Cayı	24	0.58	0.037	6.45	0.51-0.66	0.31	0.016	5.39	0.28-0.34
Tortumkale Suyu	25	0.60	0.029	4.90	0.54-0.65	0.32	0.024	7.50	0.27-0.38

n = sample size, HH =head height, HL = head length, IO = interorbital width.

TABLE 1B
Biometric measurements of Barbus plebejus escherichi in various localities of the Coruh Basin

Localities	n	PO/HL				HL/TL			
		\bar{X}	SD	Var	f	\bar{X}	SD	Var	f
Kırık Suyu	12	0.44	0.024	5.50	0.39-0.48	0.24	0.010	4.18	0.23-0.26
Merya Suyu	28	0.38	0.035	9.12	0.31-0.45	0.24	0.009	3.81	0.22-0.26
Mam Suyu	22	0.43	0.028	6.47	0.34-0.48	0.24	0.010	4.04	0.23-0.28
Narlı Suyu	16	0.44	0.033	7.58	0.38-0.48	0.24	0.012	4.90	0.21-0.26
Ispir Suyu (Coruh)	18	0.44	0.029	6.65	0.38-0.48	0.23	0.009	3.95	0.21-0.25
Penek Cayı	24	0.44	0.019	4.36	0.40-0.47	0.22	0.008	3.80	0.20-0.23
Tortumkale Suyu	25	0.45	0.027	6.12	0.40-0.50	0.23	0.010	4.48	0.21-0.24

n = sample size, PO = proorbital length, HL = head length, TL = total length.

TABLE 1C
Biometric measurements of Barbus plebejus escherichi in various localities of the Coruh Basin

Localities	n	An D/TL				DD/TL			
		\bar{X}	SD	Var	f	\bar{X}	SD	Var	f
Kırık Suyu	12	0.61	0.013	2.08	0.58-0.63	0.43	0.011	2.49	0.40-0.44
Merya Suyu	28	0.60	0.030	4.97	0.57-0.64	0.43	0.010	2.41	0.41-0.45
Mam Suyu	22	0.61	0.011	1.88	0.59-0.63	0.44	0.008	1.89	0.43-0.46
Narlı Suyu	16	0.62	0.012	1.95	0.58-0.64	0.43	0.011	2.65	0.41-0.45
Ispir Suyu (Coruh)	18	0.61	0.011	1.82	0.59-0.63	0.43	0.009	2.06	0.42-0.46
Penek Cayı	24	0.61	0.019	3.13	0.54-0.66	0.43	0.010	2.38	0.41-0.46
Tortumkale Suyu	25	0.61	0.023	3.72	0.57-0.66	0.44	0.013	3.08	0.39-0.46

n = sample size, An D = anal distance, TL = total length, DD = dorsal distance.

RESULTS

Dorsal fin rays, the vertebrate film and pharyngeal teeth of *B. plebejus escherichi* are given in Fig. 3, 4 and 5, respectively. Our findings regarding metric characters are given in Table 1 and Table 2. Meristic characters are given in Table 3.

According to Table 3, the number of vertebra found for *Barbus capito capito* was 38-39 in Coruh. Pharyngeal teeth numbers and rows were determined as 5+3+2/2+3+5 for this subspecies (Table 3; Fig. 5). Lateral line scales change for each subspecies (Table 3).

DISCUSSION

Almacá (1984a, b) has reported that the forms of *Barbus plebejus* group present 5+3+2 teeth in each pharyngeal bone. Lateral line scales are 11/55-61/7-8, 11-13/53-70/7-9 for *B. plebejus escherichi*. In *B. cyri* from Lake Tschaldyr (Cildir Lake) one specimen presented 5+3+2+1/1+2+3+5 teeth, 4(5)+3+2 in *B. ksibi*, and 5+3+2+1/1+2+3+5 in *B. moulouyensis* (Almacá, 1984a, b). We found the same number of teeth in each pharyngeal bone based on the study of Almacá (1984a, b).

TABLE 2A
Biometric measurements of Barbus capito capito in various localities of the Coruh Basin

Localities	n	HH / HL				IO / HL			
		\bar{X}	SD	Var	f	\bar{X}	SD	Var	f
Ardanuc Suyu	22	0.56	0.028	5.00	0.50-0.61	0.30	0.025	8.30	0.25-0.37
Bayburt (Dikmetas) Suyu	19	0.58	0.032	5.47	0.51-0.66	0.30	0.024	8.26	0.27-0.33
Bolluk Deresi	15	0.57	0.039	6.81	0.52-0.63	0.29	0.034	11.52	0.23-0.35
Coruh (Borcka-Artvin arası)	14	0.62	0.023	3.78	0.57-0.67	0.29	0.015	5.18	0.27-0.33
Meydancık Suyu	12	0.58	0.030	5.20	0.53-0.63	0.29	0.017	5.84	0.27-0.31
Oltu Cayı	14	0.58	0.036	6.19	0.51-0.68	0.30	0.029	9.73	0.26-0.38

n = sample size, HH = head height, HL = head length, IO = interorbital width.

TABLE 2B
Biometric measurements of Barbus capito capito in various localities of the Coruh Basin

Localities	n	PO / HL				HL / TL			
		\bar{X}	SD	Var	f	\bar{X}	SD	Var	f
Ardanuc Suyu	22	0.40	0.024	5.96	0.35-0.44	0.24	0.012	5.16	0.21-0.27
Bayburt (Dikmetas) Suyu	19	0.45	0.026	5.67	0.42-0.52	0.23	0.008	3.22	0.22-0.25
Bolluk Deresi	15	0.41	0.032	7.71	0.36-0.48	0.23	0.009	4.09	0.21-0.25
Coruh(Borcka-Artvin arası)	14	0.47	0.018	3.76	0.44-0.50	0.23	0.007	3.05	0.22-0.24
Meydancık Suyu	12	0.41	0.025	6.14	0.39-0.47	0.25	0.023	9.57	0.23-0.25
Oltu Cayı	14	0.43	0.017	3.98	0.40-0.47	0.22	0.005	2.36	0.21-0.24

n = sample size, PO = proorbital length, HL = head length, TL = total length.

TABLE 2C
Biometric measurements of Barbus capito capito in various localities of the Coruh Basin

Localities	n	An D / TL				DD / TL			
		\bar{X}	SD	Var	F	\bar{X}	SD	Var	f
Ardanuc Suyu	22	0.60	0.015	2.56	0.58-0.63	0.44	0.019	4.28	0.40-0.50
Bayburt (Dikmetas) Suyu	19	0.60	0.012	1.98	0.57-0.61	0.43	0.016	3.72	0.41-0.50
Bolluk Deresi	15	0.61	0.010	1.60	0.58-0.63	0.44	0.007	1.70	0.42-0.45
Coruh(Borcka-Artvin arası)	14	0.62	0.011	1.86	0.59-0.64	0.43	0.011	2.57	0.42-0.47
Meydancık Suyu	12	0.61	0.010	1.63	0.59-0.62	0.43	0.009	2.14	0.42-0.45
Oltu Cayı	14	0.62	0.012	1.98	0.60-0.65	0.43	0.010	2.24	0.41-0.44

n = sample size, An D = anal distance, TL = total length, DD = dorsal distance.

TABLE 3
Some meristic measurements of *Barbus supspecies* in Coruh Basin

Subspecies		Vertebra numbers	Branchial spin	Line lateral numbers	Gill rakers	Pharangial teeth
<i>B. plebejus escherichi</i>	This study	-	D IV/8 A III/5	50-63	12-16	5:3:2 Outer surface have not notched
	Karaman (1971)	-	-	52-62	8-12	
	Kuru (1975)	-	D III-IV/7-8 A III/5	52-63		
<i>B. capito capito</i>	This study	38-39	D IV/8 A III/5	51-70	13-15	5:3:2 Outer surface haven't notched
	Karaman (1971)	-	-	52-70	13-15	
	Kuru (1975)	-	D IV/7-8 A III-5	56-67		

TABLE 4
Some metric and meristic characters of different *Barbus* species according to various authors

	Pellegrin (1909)	Boulenger (1911)	Skorepa (1977)	Daget (1954)	Tandon (1977)
MERISTICS					
Dorsal fin	III/8	III/8	III/8	IV/8	IV/7-9
Anal fin	III/5	III/5	III/5-6	III/5	III/6
METRICS					
Scales	3.5/23-25/3.5	3.5/23-25/3.5	3.5/(22-23)24-25(26-28)/3.5	3.5/24-26/3.5	8.5/46-52/5.5
Depth of body in % of the body length	25-28.6	25-28.6	27.7(23.2-31.5)	23.8-28.6	22.9(20-25)
Head length in % of the body length	-	-	29.4(26.5-32.1)	25-30.3	29.1(27-32)
Head width in % of the head length	-	-	57.6(52.0-67.9)	55.6-66.6	16.5(14-18)
Eye diameter in % of the head length	-	28.6-30.8	24.6(21.3-31.2)	25-33.3	19.5(14-24)

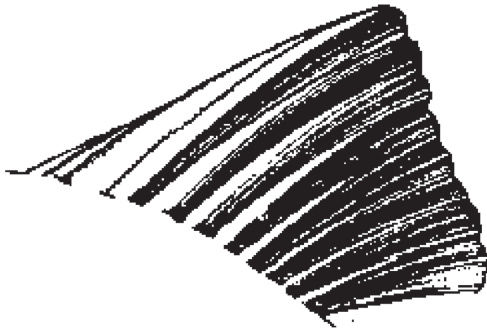


Fig. 3. Dorsal fin rays of *Barbus plebejus escherichi* Steindachner, 1897.



Fig. 4. Vertebrae film of *Barbus plebejus escherichi* Steindachner, 1897.

There are 52-62 scales in the lateral line and 8-12 gill rakers in *B. plebejus escherichi* according to Karaman (1971). Kuru (1975) found 52-63 scales in the lateral line for this subspecies. These data were recorded by Karaman (1971). Kuru (1975) is very close to the our results in this study (50-63).

The number of gill rakers (8-12) of *B. plebejus escherichi* recorded by Karaman (1971) is different from our findings (12-16) as seen in Table 3. On the other hand, the results in the number of gill rakers noted by Karaman (1971) for *B. capito capito* is the same as our findings in this study (13-15).

According to Nicolsky (1963), there are certain anatomical modifications regarding the particular function of the first three fin rays. The number of branchial spines recorded by Kuru (1975) is very close to the number recorded for *B. plebejus escherichi* and *B. capito capito* in this study.

We have specimens of *B. capito capito* which show a sharp nose in the segments of Coruh where the water flows faster, suggesting a modification related to the speed of the water current in the river.



Fig. 5. Pharyngeal teeth of *Barbus plebejus escherichi* Steindachner, 1897 (5+3+2/2+3+5).

All the morphological differences are possibly due to the variability of the habitats (Nicol'sky 1963). Our results show that the biometric measurements are different from each other for the same species in the present study. These findings mean that this could be related to abiotic and biotic factors in the habitat.

The importance of our study is indirectly supported by Kosswig's (1969) and Stewart (1977).

REFERENCES

- Almaca C. 1984a. From relationships among western palearctic species of *Barbus* (Cyprinidae, Pisces). Arq. Mus. Boc. (2.^a serie) 2 n^o 12: 207-248.
- Almaca C. 1984b. Notes on some species of western palearctic *Barbus* (Cyprinidae, Pisces). Arq. Mus. Boc., (2.^c serie) 2 n^o 1: 1-76.
- Boulenger, G.A. 1911. Catalogue of the fresh-water fishes of Africa in the British Museum (Natural History) (2): VIII-XII London, England.
- Daget J. 1954. Les Poissons du Niger superieur. Mem. Ifan. Dakar 36:391.
- Geldiay, R. & S. Balik. 1998. Turkish Freshwater Fishes. Ege University Press, Izmir, Turkey.
- Howe J.C. 2002. Standard length: not quite so standard. Fisheries Research 56:1-7.
- Karaman M.S. 1971. Süswwasserfische der Turkei, revision der Barben Europas, vorderasiens und Nordafricas. Mitt. Hamburg Zoology Mus Inst. 67:175-254.
- Karatas, M. 2005. Research Techniques in Fish Biology. Nobel Press, Ankara, Turkey.
- Kosswig C. 1969. New contributions to the zoogeography of fresh water fish of Asia minor, based on collections made between 1964-1967. Israel Journal of Zoology 18: 249-254.
- Kuru, M. 1975. Researches on the systematics and zoogeography of freshwater fishes living in Kura-Aras, Van Lake and Black Sea regions. Habilitation Thesis, Atatürk University, Erzurum, Turkey.
- Nicol'sky, G.V. 1963. The ecology of fishes. Academic Press, London and New York, USA.
- Pellegrin J. 1909. Description d'un *Barbus* nouveau du Sahara. Bull. Mus. Nat. Hist. Nat. 15(1): 239-240.
- Skorepa V. 1977. On Sahara Barbel *Barbus deserti* Pellegrin fishes of Czech Sahara expedition of 1973. Vest Cs Spol Zool. 41(3):195-199.
- Stewart D.J. 1977. Geographic variation of *Barbus radiatus* Peters, a widely distributed African cyprinid fish. Env. Biol. Fish. 1n^o 10:113-125.
- Tandon K.K. 1977. A redescription of *Barbus biscarensis* Boulenger, 1911 (Cyprinidae, Osteichthyes) from the central Sahara (Hogger Mountains of Algeria). Vest Cs. Spol. Zool. 41(4): 266-270.