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Zoology

MORPHO-BIOLOGICAL FEATURES OF TEREK BARBEL (*BARBUS CISCAUCASICUS* KESSLER, 1877) IN THE RIVERS OF THE NORTH-EASTERN AZERBAIJAN

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(Presented by Academician of NAS of Azerbaijan S.V.Aliyev)

Terek barbel (Barbus ciscaucasicus Kessler, 1877) distributed in the rivers Kuma, Terek, Sulak, Rubashchay, Chyrahchay et al., which take their beginning in the Greater Caucasus mountain range and flow into the Caspian Sea. In Azerbaijan, it lives in the Samur River and small rivers flowing through the territory of the Khachmaz District. Data on the populations of these fish in Azerbaijan relate to 50 years of the last century [1, 2, 3, 4]. Due to the fact that these data are outdated and morpho-biological features of Terek barbel never been researched, it was time for a thorough study of this fish.

Keywords: Terek barbell, *Barbus ciscaucasicus*, morphological features, Devechichay, Azerbaijan

Materials and methods

In different seasons of 2010-13 in the rivers Samur, Gusarchay, Gudyalchay, Agtafachay, Garachay, Velvelechay, Shabbranchay and Devechichay, which run through the north-eastern part of Azerbaijan and flow into the Caspian Sea, along with the other fishes 464 specimens of Terek barbel were caught and identified. All of them were studied by conventional ichthyological methods [7, 8] for the revelation of biological indicators, and 55 specimens were studied for the revelation of morphometric features (5 meristic and 25 plastic signs).

During the analysis of the study the following symbols were used: *TL* – total length of the fish body; *SL* – the distance from the tip of the snout to the end of the scaled cover (standard length of the body); *W* – the total mass of fish body; *W₁* – the mass of fish without viscera; *F* – the coefficient of fatness by Fulton; *K* – the coefficient of fatness by Klark; *l.l.* – the number of scales in the lateral line organ; *nss* – the number of scales above the lateral line organ; *nsi* – the number of scales below the lateral line organ; *D*, *A* – the number of branched rays in the dorsal and anal fins; *c* – the length of the head; *H* – the maximum height of the body; *h* – the minimum height of the body; *AD*, *aV*, *aA* and *PD* – antedorsal, anteventral, anteanal, and postdorsal distances; *l_{caud}* – the length of

the caudal fin; *ID* – the length of the dorsal fin; *hD* – the length of the longest ray of the dorsal fin; *IA* – the length of the anal fin; *hA* – the length of the longest ray of the anal fin; *IP*, *IV* – the length of the thoracic and pelvic fins; *PV*, *VA* – the distance between the chest and abdominal fins, ventral and anal fins; *IC₁*, *IC₂* – the length of the upper and lower lobes of caudal fin; *ao*, *po* – preorbital and postorbital distances; *o* – the diameter of the eye; *hc* – the height of the head; *io* – the width of the forehead; *lu₁* – the length of front pare of mustache; *lu₂* – the length of the rear pare of mustache.

The results of the measurements were processed with statistical methods [6], the arithmetic mean of the number (*M*) and its error (*m*) identified.

Results and their discussion

The standard length of the body (*SL*) of the specimens of Terek barbel examined for the morphometric features ranged within 70.0-163.0 mm, an average of 107.1 ± 2.44 mm. The standard length of the body of males was 70.0-126.0 mm, an average 97.9 ± 0.24 mm; females – 83.0-163.0 mm, on average 114.8 ± 0.33 mm. The difference between the length of the body of males and females was in average 16.9 mm. The details on the morphometric features of the fish are shown in table 1.

Table 1

Morphometric parameters of Terek barbel in the rivers of the North-East Azerbaijan

Indicators	Males (n=25)	Females (n=30)	Both sexes (n=55)	P (♂-♀)
	$\lim$ M±m	$\lim$ M±m	$\lim$ M±m	
<i>SL, mm</i>	<u>70.0-126.0</u> 97.9±2.39	<u>83.0-163.0</u> 114.8±3.33	<u>70.0-163.0</u> 107.1±2.44	<0,001
<i>l.l.</i>	<u>61-75</u> 66.7±0.66	<u>62-75</u> 69.6±0.71	<u>61-75</u> 68.2±0.54	<0,001
<i>nss</i>	<u>12-14</u> 13.4±0.13	<u>12-15</u> 13.5±0.15	<u>12-15</u> 13.47±0.10	>0,05
<i>nsi</i>	<u>9-12</u> 10.6±0.19	<u>9-12</u> 10.4±0.18	<u>9-12</u> 10.5±0.13	>0,05
<i>D</i>	<u>7-8</u> 7.9±0.05	<u>7-8</u> 7.97±0.03	<u>7-8</u> 7.94±0.03	>0,05
<i>A</i>	5	5	5	-
% of the standard body length (SL)				
<i>c</i>	<u>23.5-27.4</u> 26.0±0.22	<u>24.9-29.4</u> 26.9±0.22	<u>23.5-29.4</u> 26.5±0.17	<0,001
<i>H</i>	<u>19.6-23.4</u> 21.7±0.18	<u>20.1-24.1</u> 22.5±0.16	<u>19.6-24.1</u> 22.1±0.14	<0,001
<i>h</i>	<u>9.5-11.4</u> 10.4±0.07	<u>8.9-11.1</u> 10.0±0.08	<u>8.9-11.4</u> 10.2±0.06	<0,001
<i>AD</i>	<u>50.4-55.8</u> 53.0±0.26	<u>51.3-55.8</u> 53.9±0.21	<u>50.4-55.8</u> 53.5±0.18	<0,001
<i>aV</i>	<u>47.7-52.3</u> 50.3±0.22	<u>48.8-53.5</u> 51.5±0.21	<u>47.7-53.5</u> 51.0±0.18	<0,001
<i>aA</i>	<u>70.3-74.5</u> 72.5±0.20	<u>71.3-75.9</u> 73.7±0.21	<u>70.3-75.9</u> 73.1±0.17	<0,001
<i>PD</i>	<u>20.2-41.1</u> 34.8±1.31	<u>19.6-39.7</u> 33.6±1.27	<u>19.6-41.1</u> 34.1±0.95	>0,05
<i>l_{caud}</i>	<u>18.7-36.8</u> 21.3±0.62	<u>18.5-22.3</u> 20.3±0.14	<u>18.5-36.8</u> 20.8±0.32	>0,05
<i>lD</i>	<u>11.5-14.0</u> 12.9±0.12	<u>11.4-14.3</u> 12.8±0.13	<u>11.4-14.3</u> 12.87±0.09	>0,05
<i>hD</i>	<u>14.3-18.9</u> 16.0±0.22	<u>14.1-18.9</u> 16.8±0.23	<u>14.1-18.9</u> 16.4±0.17	<0,001
<i>lA</i>	<u>6.8-8.9</u> 7.8±0.10	<u>6.7-8.5</u> 7.7±0.09	<u>6.7-8.9</u> 7.74±0.07	>0,05
<i>hA</i>	<u>13.7-18.2</u> 15.6±0.21	<u>16.4-21.2</u> 18.6±0.25	<u>13.7-21.2</u> 17.3±0.27	<0,001

<i>lP</i>	<u>10.1-22.1</u> 19.6±0.41	<u>17.6-22.8</u> 20.1±0.21	<u>10.1-22.8</u> 19.8±0.24	>0,05
<i>lV</i>	<u>15.4-19.2</u> 17.4±0.19	<u>15.6-19.1</u> 17.3±0.16	<u>15.4-19.2</u> 17.32±0.13	>0,05
<i>P-V</i>	<u>25.3-28.8</u> 27.1±0.15	<u>25.7-29.5</u> 27.5±0.19	<u>25.3-29.5</u> 27.4±0.13	>0,05
<i>V-A</i>	<u>20.5-24.2</u> 22.6±0.17	<u>20.7-25.3</u> 22.6±0.19	<u>20.5-25.3</u> 22.6±0.13	>0,05
<i>lC₁</i>	<u>17.1-22.2</u> 20.2±0.24	<u>17.9-23.3</u> 20.3±0.19	<u>17.1-23.3</u> 20.26±0.16	>0,05
<i>lC₂</i>	<u>17.7-23.2</u> 21.2±0.25	<u>19.0-24.7</u> 21.4±0.21	<u>17.7-24.7</u> 21.3±0.17	>0,05
% of the length of the head				
<i>ao</i>	<u>38.2-44.6</u> 41.1±0.26	<u>38.6-45.9</u> 42.0±0.27	<u>38.2-45.9</u> 41.6±0.20	<0,001
<i>o</i>	<u>13.7-18.3</u> 16.2±0.21	<u>12.9-17.6</u> 15.2±0.26	<u>12.9-18.3</u> 15.7±0.18	<0,001
<i>po</i>	<u>43.9-50.4</u> 46.5±0.25	<u>44.7-48.5</u> 46.2±0.18	<u>43.9-50.4</u> 46.3±0.16	>0,05
<i>hc</i>	<u>54.6-64.0</u> 60.4±0.41	<u>56.6-81.0</u> 60.9±0.78	<u>54.6-81.0</u> 60.7±0.47	>0,05
<i>io</i>	<u>28.6-35.5</u> 31.7±0.39	<u>27.1-37.7</u> 31.3±0.38	<u>27.1-37.7</u> 31.5±0.28	>0,05
<i>lu₁</i>	<u>13.7-30.6</u> 21.7±0.74	<u>16.7-33.5</u> 24.2±1.14	<u>13.7-33.5</u> 23.1±0.73	>0,05
<i>lu₂</i>	<u>22.9-43.4</u> 31.2±0.84	<u>24.6-42.5</u> 33.1±0.64	<u>22.9-43.4</u> 32.2±0.55	>0,05

The comparing of 5 meristic signs of males and females shows that by one of the signs (*l.l.*) they were significantly different ($P < 0,001$), and the differences by three signs (*nss*, *nsi*, *D*) were unreliable ($P > 0,05$). By one sign (*A*) there were no differences.

The comparing of the 18 plastic signs of males and females shows that by 8 of the signs (*c*, *H*, *h*, *AD*, *aV*, *aA*, *hD*, *hA*) differences were reliable, and by 10 signs (*PD*, *lcaud*, *ID*, *lA*, *lP*, *lV*, *PV*, *VA*, *lC₁*, *lC₂*) they were unreliable ($P > 0,05$).

The comparing of the males and females by 7 plastic signs connected with length of the head shows that only by 2 of them (*ao*, *o*) dif-

ferences were reliable ($P < 0,001$). By to other 5 signs (*po*, *hc*, *io*, *lu₁*, *lu₂*) they were unreliable ($P > 0,05$).

Based on differences in morphological characters it can be argued that the Terek barbel has a poorly developed sexual dimorphism. During the spawning period, as many other fish of the cyprinid family, the males of this fish have on the head *marriage decoration* in the form of processes. It is observed only during spawning, the rest of the year it is difficult to distinguish between males and females in appearance.

Our observations have shown that at present in Azerbaijan Terek barbel lives in rivers

Samur, Gusarchay, Gudyalchay, Agtafachay, Garachay, Velvelechay, Shabbranchay and Devechichay (figure). This fish is more often found in the middle reaches of the rivers.

The total length of the body (TL) of investigated barbels ranged within 31.0-192.0 mm, an average 97.1 ± 2.21 mm; the standard body length (SL) 24.0-163.0 mm, an average 81.3 ± 1.93 mm; the total mass of the body (W) 0.36-

93.6 g, an average 11.0 ± 0.73 g; the body weight mass without viscera (W_1) 0.27-79.6 g, on average, 11.0 ± 0.73 g; the coefficient of fatness by Fulton (F) 1.39-2.68, average 1.89 ± 0.01 ; the coefficient of fatness by Clark (K) 1.15-2.58, on average 1.6 ± 0.01 . Detailed information on biological characteristics of fish is given in table 2.

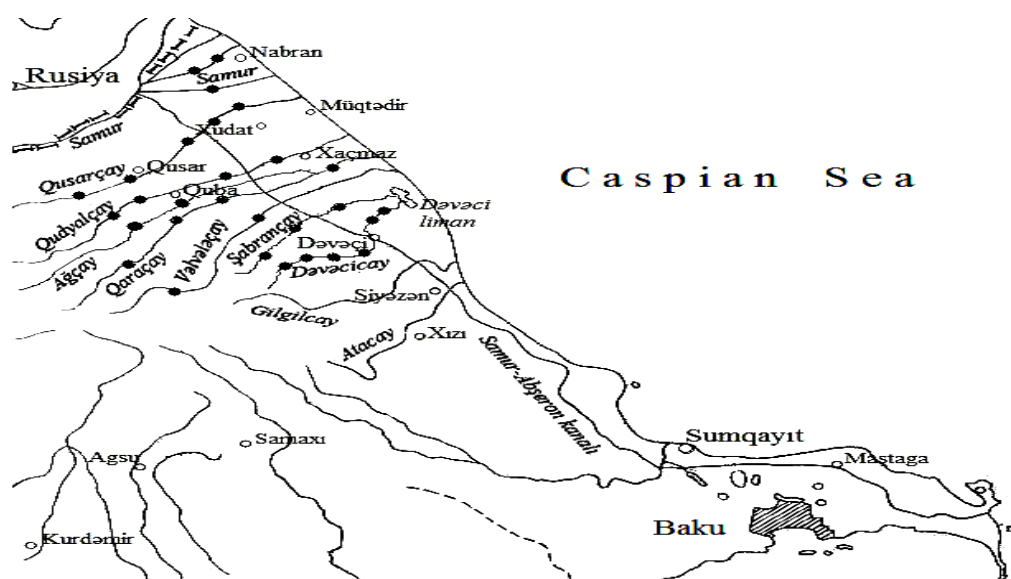


Fig. Detection points of Terek barbel in the rivers of the North-East Azerbaijan (•)

Table 2

Biological characteristic of Terek barbel in the rivers of the North-East Azerbaijan

Indicators	Males (n=176)	Females (n=184)	Both sexes (n=360)	Baby fishes (n=104)
	<u>lim</u> M±m	<u>lim</u> M±m	<u>lim</u> M±m	<u>lim</u> M±m
TL, mm	<u>65.0-148.0</u> 99.7±2.14	<u>74.0-192.0</u> 116.1±2.81	<u>65.0-192.0</u> 108.1±1.93	<u>31.0-91.0</u> 54.2±2.11
SL, mm	<u>54.0-126.0</u> 84.0±1.82	<u>62.0-163.0</u> 97.1±2.51	<u>54.0-163.0</u> 90.4±1.64	<u>24.0-74.0</u> 44.4±1.80
$W, (q)$	<u>2.9-37.0</u> 11.8±0.79	<u>4.4-93.6</u> 20.0±1.65	<u>2.9-93.6</u> 16.0±1.0	<u>0.36-7.6</u> 1.99±0.25
$W_1, (q)$	<u>2.4-31.3</u> 10.1±0.68	<u>3.6-79.6</u> 16.5±1.36	<u>2.4-79.6</u> 13.4±0.82	<u>0.27-6.99</u> 1.7±0.24
F	<u>1.39-2.25</u> 1.83±0.02	<u>1.57-2.21</u> 1.89±0.02	<u>1.39-2.25</u> 1.86±0.01	<u>1.54-2.68</u> 2.02±0.04
K	<u>1.15-2.49</u> 1.57±0.02	<u>1.27-1.84</u> 1.57±0.01	<u>1.15-2.49</u> 1.57±0.01	<u>1.34-2.58</u> 1.7±0.04

The age of the examined fishes ranged from 0⁺-5⁺, dominated by fish aged 2-3 years. Changes of biological characteristics depending on age are shown in table 3.

Terek barbel reaches sexual maturity after the second year of life. However, some specimens reach maturity at the age of 1 year. This fish spawns in piecemeal three times. According the data of A.N.Derjavin [5] Terek barbel begins spawning in March, spawning lasts until the end of June. In mid-November the gonads of 56 specimens of the barbel from the rivers Devechichay, Şabbranchay, Velvelechay and Garachay were at the stage of maturity of the II-III, the diameter of the large eggs varied in range of 0.48-0.80 mm. The

gonads of 32 fishes, which we studied in the March-April were at the stage of maturity of the II-III.

During this period, the diameter of the large eggs ranged within 0.58-0.70 mm. In the first decade of March the gonads of investigated fishes (26 specimens) were at the III-V stage of puberty. The diameter of the eggs ranged: large eggs within 0.8-1.4 mm, medium eggs within 0.6-0.8 mm, small eggs within 0.3-0.5 mm. From mid-June from the 42 specimens of studied barbels, 18 specimens were already spawned-out fish. During this period, the diameter of the large eggs varied within 1.4-1.6 mm.

Table 3

Changes of the biological characteristics of Terek barbel depending on age

Indicators	1-year-old (n=76)	2-years-old (n=152)	3-years-old (n=210)	4-years-old (n=21)	5-years-old (n=4)	6-years-old (n=1)
	$\frac{\text{lim}}{M \pm m}$	$\frac{\text{lim}}{M \pm m}$	$\frac{\text{lim}}{M \pm m}$	$\frac{\text{lim}}{M \pm m}$	$\frac{\text{lim}}{M \pm m}$	-
TL, mm	$\frac{31.0-76.0}{51.9 \pm 1.87}$	$\frac{65.0-12.1}{89.5 \pm 1.39}$	$\frac{87.0-145.0}{118.3 \pm 1.28}$	$\frac{126.0-172.0}{148.6 \pm 4.07}$	$\frac{163.0-176.0}{169.5 \pm 6.52}$	192.0
SL, mm	$\frac{24.0-65.0}{42.3 \pm 1.59}$	$\frac{54.0-102.0}{74.6 \pm 1.19}$	$\frac{74.0-122.0}{98.9 \pm 1.10}$	$\frac{107.0-145.0}{125.4 \pm 3.33}$	$\frac{136.0-148.0}{142.0 \pm 6.02}$	163.0
W, q	$\frac{0.36-5.2}{1.7 \pm 0.19}$	$\frac{2.87-16.6}{8.1 \pm 0.36}$	$\frac{7.57-36.34}{18.7 \pm 0.64}$	$\frac{25.0-54.2}{37.6 \pm 3.27}$	$\frac{48.8-60.4}{54.6 \pm 2.78}$	93.6
W ₁ , q	$\frac{0.27-4.48}{1.03 \pm 0.17}$	$\frac{2.41-13.4}{6.9 \pm 0.31}$	$\frac{6.2-30.3}{15.7 \pm 0.53}$	$\frac{19.9-44.3}{31.1 \pm 2.57}$	$\frac{37.8-48.4}{42.1 \pm 3.28}$	79.6
F	$\frac{1.54-2.68}{2.02 \pm 0.04}$	$\frac{1.41-2.31}{1.87 \pm 0.02}$	$\frac{1.39-2.21}{1.85 \pm 0.01}$	$\frac{1.60-2.09}{1.87 \pm 0.05}$	$\frac{1.68-1.94}{1.81 \pm 0.13}$	2.16
K	$\frac{1.34-2.58}{1.67 \pm 0.03}$	$\frac{1.21-2.49}{1.59 \pm 0.02}$	$\frac{1.15-2.42}{1.60 \pm 0.02}$	$\frac{1.29-1.94}{1.56 \pm 0.06}$	$\frac{1.37-1.50}{1.44 \pm 0.07}$	1.83

The fertility of barbels, which we investigated in rivers north-eastern part of Azerbaijan, ranged within 2.2-12.4 thousand eggs, on average 7.4 thousand eggs.

The length of the body of a young barbel from the Devechichay and Shabbranchay rivers, which were studied in September, was 31.0-38.0 mm, and weight was 0.36-0.71 g.

Outcome

1. During the research conducted in 2010-2013 Terek barbel was registered in the Samur, Gusarchay, Gudyalchay, Agchay, Garachay, Velvelechay, Shabbranchay and Devechichay rivers, flowing through the north-eastern part of Azerbaijan.

2. The studies found that the Terek barbel has a poorly developed sexual dimorphism. However, during the breeding male on the head of the fish formed the processes that distinguish them from females.

3. In Azerbaijan waters the majority of the specimens of Terek barbel reaches sexual ma-

turity at 2 years and spawn in May-July. The most intense period of the spawning is June.

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ŞİMAL-ŞƏRQİ AZƏRBAYCANIN ÇAYLARINDA TEREK ŞİRBİTİNİN (*BARBUS CISCAUCASICUS* KESSLER, 1877) MORFOBİOLOJİ XÜSUSİYYƏTLƏRİ

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2010-2013-cü illərin müxtəlif fəsilələrində Şimal-şərqi Azərbaycanın çaylarından 464 ədəd Terek şirbiti ovlanmış, morfometrik (5 meristik və 25 plastik əlamət) və bioloji (yaşı, uzunluğu, kütləsi, dolğunluğu, məhsuldarlığı) xüsusiyyətləri ətraflı tədqiq olunmuşdur. Aparılmış tədqiqatlar nəticəsində Terek şirbitində cinsi dimorfizmin zəif inkişaf etdiyi, bu növə aid balıqların 2 yaşında cinsi yetkinliyə çatması və may-iyun aylarında kürü tökməsi məlum olmuşdur.

Açar sözlər: Terek şirbiti, *Barbus ciscaucasicus*, morfobioloji xüsusiyyətlər, Dəvəçiçay, Azərbaycan

МОРФОБИОЛОГИЧЕСКИЕ ОСОБЕННОСТИ ТЕРСКОГО УСАЧА (*BARBUS CISCAUCASICUS* KESSLER, 1877) В РЕКАХ СЕВЕРО-ВОСТОЧНОГО АЗЕРБАЙДЖАНА

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В различные сезоны 2010-2013 гг. из рек Северо-Восточного Азербайджана выловлено 464 экз. терского усача, определены морфометрические (5 меристических и 25 пластических признаков) и биологические (возраст, рост, масса, упитанность, производительность) особенности. В результате проведенных исследований установлено, что у терского усача слабо развит половой диморфизм, рыбы этого вида достигают половой зрелости в 2 года и нерестятся в мае-июне.

Ключевые слова: терский усач, морфологические особенности, Девечичай, Азербайджан