



MORPHOLOGICAL PECULIARITIES OF THE STONE MOROKO (PSEUDORASBORA PARVA) FROM COLDWATER ZONE OF THE CHIRCHIK RIVER BASSIN IN UZBEKISTAN

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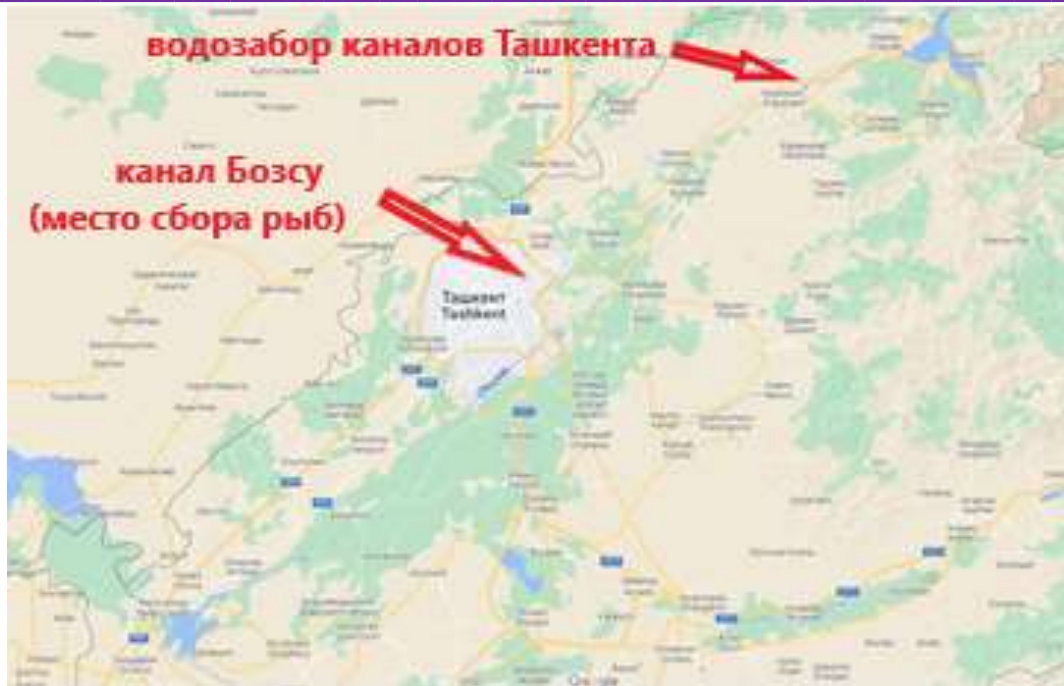
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Article history:		Abstract:
Received:	20 th July 2023	In 2022, the morphological features of stone moroko (<i>Pseudorasbora parva</i>) in the canals of Tashkent was studied. The place can be attributed to the cold-water zone of the Chirchik river basin. This invasive species was once accidentally entered to fish ponds in the lower reaches of the Chirchik River in the 1960s, adopted to local environments and spread widely throughout the republic. Traditionally, it is considered as a warm-water species, however, it has settled in the lower part of the cold-water zone. For stone moroko, the formula of the rays of the dorsal fin is defined as D III 7 (8), the formula of the rays of the anal fin is A II 6 in the channels of Tashkent. In the lateral line there are 33 – 37 (average 35) scales. The plastic features of the fish of the studied stock are given.
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Amur chebaka or pseudo-parva - *Pseudorasbora parva* (Temminck et Schlegel, 1846) is a small freshwater fish from the carp family (Cyprinidae), had a native range in the lowland reservoirs of Asian rivers of the Pacific Ocean (China, Amur basin, Mongolia, Japan, Taiwan islands, Hainan) (Berg, 1949). As a result of unauthorized introduction, it spread widely in water bodies of Eurasia (Atlas..., 2003). In the early 1960s, larvae of silver carp (*Hypophthalmichthys molitrix*) and grass carp (*Ctenopharyngodon idella*) were brought to fish farms in the Tashkent region, while juveniles of other fish of the ichthyofauna of China, including Amur chebak. Small species of invaders from the Chinese fauna turned out to be more competitive and replaced small native species (Kamilov, 1973; Salikhov, Kamilov, 1995; Salikhov et al., 2003; Yuldashov, Kamilov, 2018). The Amur chebak is considered a warm-water fish. However, by 2020, it became widespread in the canals of Tashkent, where conditions can be classified as colder (this is the upper foothill part of the Chirchik River irrigation network). The purpose of this work was to determine the morphological indicators of pseudo-razbora in the irrigation canals of the upper reaches of the river. Chirchik.

Characteristics of the research region. The rivers of the Chirchik basin flow from the slopes of the Talas Alatau mountains and its southwestern spurs and irrigate the Tashkent oasis of Uzbekistan. The Chirchik River itself is formed at the confluence of the Chat-Kal (main component) and Pskem rivers. The area of the Chirchik basin reaches 18,061 km². The length of the river is 155 km, from the sources of the Chatkal River - 328 km. In the upper section (about 30 km) the Chirchik flows in a canyon; below, the valley expands and loses its characteristic relief features. The Chirchik River is fed by mixed water, mostly snow. The average water flow in the upper reaches of the river is 221 m³/sec. Ice phenomena are observed from November to March. Large canals originate in the upper reaches of Chirchik and carry water at high speed, including to Tashkent. The climate in Tashkent is moderate, sharply continental. In the flat part, summer is hot (the average monthly air temperature in July is about 29°C; during the day it often reaches 35-42°C, and maybe even higher). Winter is quite cold (the average monthly temperature in January is -2°C, bodies of standing water are often covered with ice for up to 1.5 months).

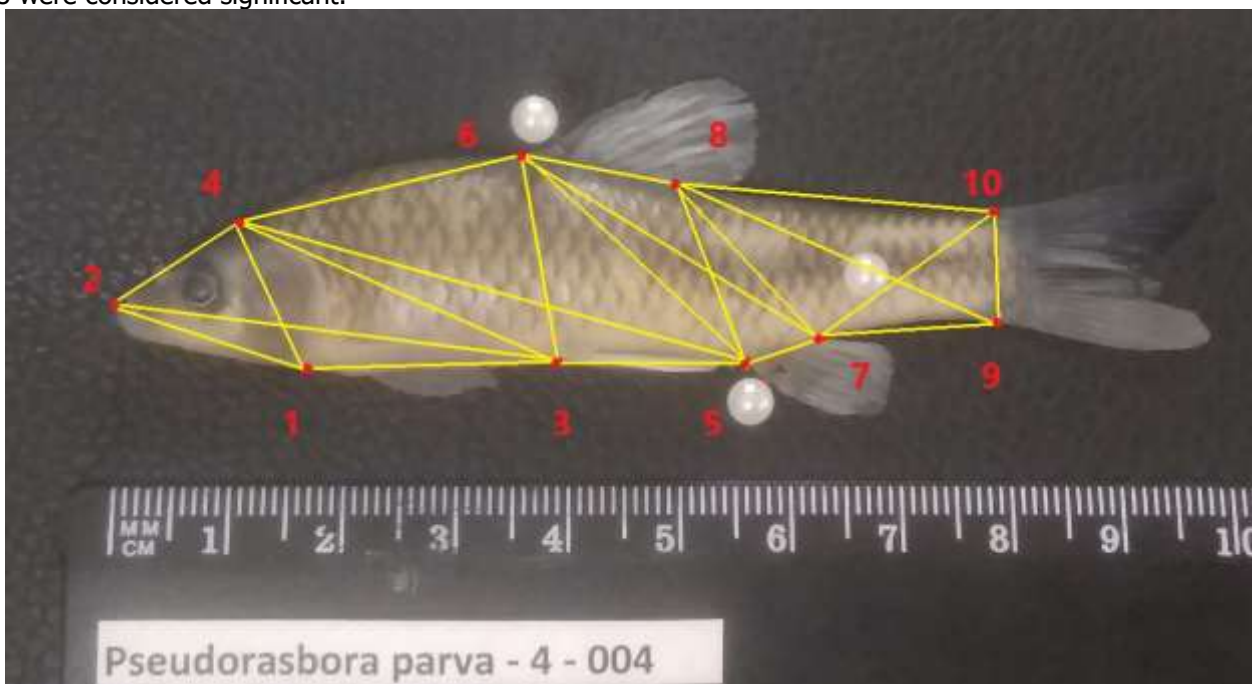


Pic. 1. River basin Chirchik, water intake of Tashkent canals, Bozsu canal - place for collecting samples of Amur chebak.

Material and methodology. Samples of the Amur chebak were collected in September - November 2022. In research catches with small-mesh snouts installed in a canal flowing through the Botanical Garden, the Institute of Zoology and the Zoo (Fig. 1), we identified the Amur chebak (Salikhov et al., 2003). Total length (TL), standard length (without caudal fin, to the end of the scaly cover) (SL) with an accuracy of 1 mm and total body weight (W) with an accuracy of 1 g were recorded. Meristic characters were calculated.

We photographed the fish with a Cannon digital camera at a strict right angle. Plastic indicators were measured on a computer from digital photographs using the "Ruler" tool in the Photoshop program, the scale was determined and the results were converted into absolute units of length (mm). Classical plastic characteristics were measured according to the measurement scheme for fish of the cyprinid family (Pravdin, 1966). We established 10 landmarks along the perimeter of the fish's body (Fig. 2), measured straight lines between the landmarks, and compiled the so-called. "truss-protocol" (protocol of "trusses") (Strauss, Bookstein, 1982; Strauss, Bond, 1990). Measurements were indicated in the following format: for example, "2-4" indicates a straight-line measurement between landmarks 2 and 4. Absolute measurements of plastic characteristics were converted into indices in %% of standard body length.

Statistical features were calculated, including the coefficient of variation (Cv, %); for statistical tests, P values ≤ 0.05 were considered significant.



Pic. 2. Guidelines for the diameter of the body shape of the Amur chebak and rafters ('truss protocol').

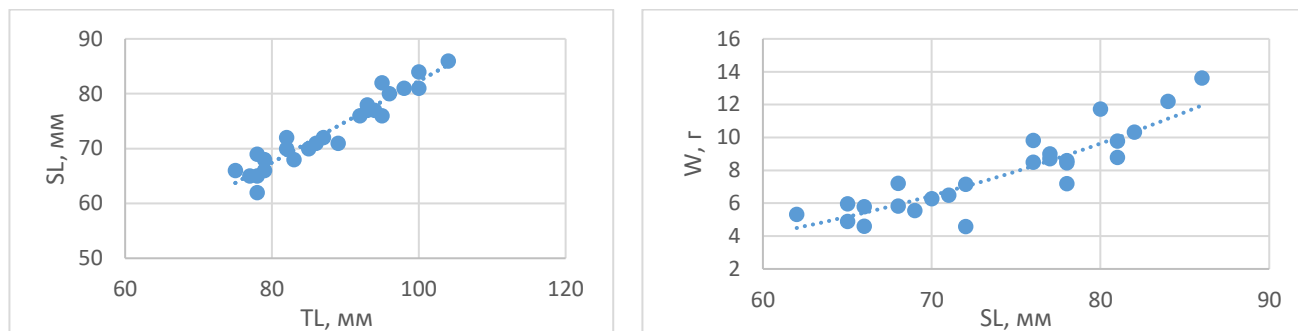
RESULTS

The Amur chebak has a moderately elongated body, a small upper mouth, and no antennae. Juveniles have a dark stripe on the sides of the body; in adults it disappears. The scales along the edge are bordered by a dark rim; as they grow older, the rim becomes more clearly visible.

A total of 50 individuals were analyzed with a total body length of 44 - 110 mm, a standard length of 37 - 91 mm, and a total weight of 1.1 - 13.9 g.

A strong relationship was identified between the total body length and the standard body length of carp, which is reliably described by the linear regression equation: $SL = 0.743 * TL + 8.04$ ($r = 0.96$).

A strong positive relationship was also revealed between total body weight and standard length $W = 0.00001 * SL^{2.99}$ (Fig. 3).



Pic. 3. Dependence of standard length indicators on the total body length (left) and total mass on the standard body length (right) of the Amur chebak, 2022.

Meristic indicators. In the Amur chebak, the formula of the rays of the dorsal fin is defined as III 7 (8), the formula of the rays of the anal fin is II 6. There are 33 – 37 (on average 35) scales in the lateral line.

The indices of the plastic parameters of the Amur chebak according to the classical scheme for carp are given in Table. 1, according to "truss-protocol" - in table. 2.

Table 1. Indices of plastic characteristics of the Amur chebak (% of the standard body length), p. Chirchik, 2022

Index	Minimum	Maximum	Average $\pm S_x$	CV, %
Body length	74,5	80,3	77,02 \pm 0,36	2,1
Snout length	5,7	10,0	7,88 \pm 0,22	12,4
Eye diameter	3,5	7,0	5,14 \pm 0,21	18,1
Postorbital region of the head	9,5	13,4	11,45 \pm 0,26	10,1
Head length	21,2	27,6	24,40 \pm 0,37	6,8
Head height at the back of the head	15,6	22,1	18,32 \pm 0,31	7,5
Maximum body height	0,0	27,9	24,50 \pm 1,32	24,0
Lowest body height	11,1	17,7	12,79 \pm 0,31	10,8
Antedorsal distance	48,3	53,4	50,93 \pm 0,32	2,8
Postdotal distance	19,0	23,2	21,22 \pm 0,33	5,2
Caudal peduncle length	14,8	20,7	17,91 \pm 0,36	8,9
Base length D	12,5	18,8	14,90 \pm 0,39	11,8
Maximum height D	15,1	21,9	18,85 \pm 0,40	9,5
Base length A	7,8	12,7	9,68 \pm 0,31	14,2
Maximum height A	11,7	15,2	13,54 \pm 0,21	7,0
Length P	14,4	21,1	17,13 \pm 0,37	9,8
Length V	14,2	20,3	16,50 \pm 0,32	8,8
Distance P-V	19,8	27,9	24,00 \pm 0,52	9,6
Distance V - A	18,3	24,8	20,83 \pm 0,34	7,3

Table 2. Indices of body shape measurements of the Amur chebak ("truss-protocol") (% of the standard body length), p. Chirchik, 2022.

<i>Index</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Average ± S_x</i>	<i>CV, %</i>
2 - 4	16,0	23,4	19,89 ± 0,35	9,7
4 - 6	27,9	35,7	31,47 ± 0,34	5,9
6 - 8	12,1	20,1	15,08 ± 0,30	11,0
8 - 10	29,4	37,8	34,14 ± 0,33	5,3
9 - 10	11,6	14,8	12,76 ± 0,15	6,3
7 - 9	13,8	20,8	17,26 ± 0,30	9,6
5 - 7	7,4	13,2	9,82 ± 0,26	14,6
3 - 5	18,1	25,1	20,98 ± 0,30	7,7
2 - 3	48,7	55,7	51,20 ± 0,31	3,3
1 - 2	18,4	27,0	21,67 ± 0,36	9,2
1 - 4	15,9	22,1	18,44 ± 0,22	6,6
1 - 3	24,1	35,5	30,60 ± 0,49	8,8
3 - 4	35,2	51,7	38,51 ± 0,55	7,9
5 - 6	29,1	38,7	32,25 ± 0,34	5,7
7 - 8	20,7	32,1	24,41 ± 0,38	8,5
4 - 5	52,5	59,6	55,98 ± 0,31	3,1
3 - 6	23,2	41,0	25,86 ± 0,57	12,1
6 - 7	33,6	40,4	37,33 ± 0,32	4,7
5 - 8	19,1	24,0	21,38 ± 0,24	6,1
7 - 10	18,6	39,7	22,45 ± 0,66	16,0
8 - 9	22,1	42,6	37,35 ± 0,63	9,2

DISCUSSION

The Amur chebuchek is one of the fish species of the Chinese faunal complex, which has spread widely along with the introduction of silver carp and grass carp throughout many regions of Eurasia. In relation to Uzbekistan, it can be considered that, introduced unauthorized one-time - in the early 1960s - into the ponds of the Kalgan-Chirchik fish farm in the middle reaches of the Syr Darya (the fish farm feeds on both the water of the Chirchik River in the lower reaches and the Syr Darya), this species has again spread throughout all flat water bodies of Uzbekistan. Secondary resettlement occurred as a result of the annual (and currently) resettlement of yearlings of cultivated carp fish in fish farms and in reservoirs and drainage water storage lakes in the basins of the Amu Darya, Syr Darya, Kashkadarya, and Zarafshan rivers. The Amur chebuchek is a flexible species that has found favorable conditions in the lentic lowland reservoirs of the Aral Sea basin, adapts well, reaches maturity and creates self-reproducing herds (Yuldashov, Kamilov, 2018). Of interest is the analysis of morphological indicators in all reservoirs of invasion of the species, since a very limited number of individuals of the parent stock were actually introduced into each one (i.e., with a limited gene pool compared to the gene pool of the native range of the species). In this article, we analyze a herd of Amur shad in the foothill cold-water zone of the Chirchik basin. Previously, it was believed that this species still belonged to warm-water species; the cheetah did not penetrate into foothill reservoirs.

In the modern distribution area of the Amur chebak, D III 7, A III 5-6, and 35 – 39 scales in the lateral line are noted (Atlas..., 2003). Our data show that the Amur chebuchek in the canals of Tashkent has two hard rays in the anal fin, and 33–37 scales in the lateral line.

Note that most of the indices of plastic characteristics of the Amur chebak can be classified as low-variable; their coefficient of variation is less than 10%. At the same time, the smallest body height, the length of the base of the dorsal fin, the length of the snout, the length of the base of the anal fin, the diameter of the eye have a coefficient of

variation of indices ranging from 10.8 to 18.1%, and the highest body height in the sample was the most variable trait (24, 0%).

With regard to the "truss - protocol" indices, most of the indicators were also slightly variable (the coefficient of variation did not exceed 10%), Indexes 6-8, 3-6, 5-7, 7-10 were more variable and had a coefficient of variation - tions within 11 – 16%.

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