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# TO THE BIOLOGY OF THE SNOW TROUT IN THE UPPER REACH OF THE CHIRCHIK RIVER

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**Abstract**
Males of the snow trout (Schizothorax curvifrons) in the upper reaches of the Chirchik River in Uzbekistan reach sexual maturity at the 2nd - 3rd year of life with a standard body length of 12 - 15 cm; females - in the 3rd - 4th year of life at 14 - 23 cm. Individual absolute fecundity is 6.6 - 71.5 thousand eggs. The coefficient of maturity of females before spawning was 5.48 - 17.5%. Yearlings reach an average standard length of 9.0 cm, two-year-olds - 13.9 cm, three-year-olds - 15.9 cm, four-year-olds - 21.7 cm, five-year-olds - 24.8 cm.

**Keywords**. Snowtrout, Schizothorax curvifrons, growth, maturation, fecundity, fish feeding, the Chirchik River, Uzbekistan.

## Introduction

The Chirchik River is the largest tributary of the Syrdarya, one of the few large rivers flowing mostly through the territory of Uzbekistan. The river feeds the largest region of the country - the Tashkent oasis. Great anthropogenic impact (creation of a large irrigation system, including reservoirs, introduction of new species of fish for the needs of aquaculture and fishing) (Salikhov, Kamilov, 1995, Yuldashov, Kamilov, 2018). At the same time, no fishery research has been carried out in the upper reaches of the Chirchik River in recent decades, which does not allow assessing the condition of specific fish species in the basin. The purpose of this work was to determine the biological parameters of one of the main indigenous fish species in the upper reaches of the Chirchik River at present - the common marinka, Schizothorax curvifrons Heckel, 1838 (=Schizothorax intermedius).

## Material and Methodology

In 2022, monthly research fishing was carried out from the headwaters of the rivers Ugam, Pskem, Koksu, Chatkal, Aksakata, including the Charvak reservoir, to the border of the upper sections of the middle reaches of Chirchik near the village of Pakh-ta, Yangiyul district, Tashkent region, using fixed nets, traps, nonsense with a mesh of 10 - 100 mm. All fish of the studied species were analyzed.

In fish, the standard body length (to the end of the scale cover) was measured with an accuracy of 1 mm, and the total body weight was measured with an accuracy of 1 g. Scales were collected from the area of the body above the lateral line strictly under the dorsal fin. In laboratory conditions, the scales were cleaned and preparations were prepared using generally accepted methods. Age was determined from the preparations using an MBS-2 binocular magnifying

glass. Using an eyepiece micrometer, the sizes of annual rings were measured and the growth rate was reconstructed by years of life according to the method of Einar Lea (Pravdin, 1966).

When conducting a general biological analysis, the sex and stage of maturity of the fish were determined. The gonads of sexually mature females caught from January to April were removed, weighed to the nearest 0.1 g, and a sample (1 g) was fixed in a 4% formaldehyde solution. In laboratory conditions, the number of yolk oocytes was counted, converted to the total mass of the gonads, and absolute fertility was determined.

For nutrition analysis, samples collected from May to September were processed. The entire intestinal tract was cut out and placed with a label in a three-layer piece of gauze, the piece was tied with a bag and placed in a common jar with a 4% formaldehyde solution. In laboratory conditions, samples were washed with water and disassembled using generally accepted methods to determine the contents.

**Results**

In the bed of the Chirchik River, its tributaries and the Charvak reservoir, fish of this species with a standard length of 7.0 - 30.5 cm and a total weight of 7.5 - 501.0 g were caught. The common marinka lives everywhere in different ecological conditions: in reservoirs, shallow mountain rivers and in the bed of the main river in backwaters, on the current.

In the processed samples there were fish at 1–6 years of age. The common marinka is characterized by a relatively slow growth rate. The empirical growth rate is shown in Table 1.

Table 1. Empirical growth rate of the common marinka of the Chirchik River, 2022.

| Показатель | Возрастная группа, лет | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1+ | 2+ | 3+ | 4+ | 5+ | 6+ | 7+ |
| SL, см | 7-11<br>9,0 | 12,5-15,3<br>13,9 | 14,4-18,8<br>15,9 | 17,1-23,6<br>21,7 | 23,4-26<br>24,8 | 24,3-27,5<br>26,6 | 24,8-30,5<br>27,8 |
| W. г | 7-28<br>15,5 | 41-66<br>34,7 | 41-120<br>80 | 120-202<br>161 | 253-300<br>275 | 274-347<br>303 | 285-501<br>350 |

Males reach sexual maturity in the 2nd – 3rd year of life when they reach a standard body length of 12 – 15 cm; females reach first sexual maturity at the 3rd - 4th year of life when they reach a standard body length of 14 - 23 cm.

Regarding the reproduction of the common marinka, one can note its high plasticity. In the conditions of the Tashkent region, spawning is very extended; we noted spawning from the second half of April (observations in 2022) until the end of August (observations in 2021). We noted the spawning of the common marinka in sections of all studied rivers (including small mountain rivers), canals, and shallow lentic reservoirs with low water flow at a water temperature of 10–14°C.

Observations in June 2022 showed that spawning took place in the morning in areas with weak water flow in places up to 1-1.5 m deep. Spawning took place on the bottom with sand, although individuals were noted spawning in areas with flooded vegetation.

In the Charvak Reservoir, we noted a concentration of mature fish for spawning at the mouth of the Nauvalisai (a large inflowing river). The fish came to spawn in small flocks (according to

subjective data - up to 30 - 50 individuals). When catching two such schools in July, a predominance of fish with a standard length of 23–38 cm (88 and 90%) was noted; larger fish (40–50 cm) accounted for only about 10 and 12%.

In the flock, the ratio of males to females was 2:1. Males were, on average, smaller in size. In July, the males had their nuptial plumage - a white rash (bu-hills) on the snout and the top of the head.

The individual absolute fecundity of the common marinka in collections in February - the first half of April 2022 was determined for females 23 - 30 cm long within the range of 6.6 - 71.5 thousand eggs. In the studied sample of fish, the maturity coefficient of sexually mature females reached 5.48 – 17.5%.

Despite the high plasticity of the reproductive biology of the species in local conditions, we drew attention to one feature in the development of eggs: in all studied marinkas, we noted one ripening portion of eggs. At the same time, on the approaches to the spawning ground there were females of the same state of ripening eggs. And in the feeding areas of different females, the developing portion could be represented by eggs of different sizes. It is due to the difference in quality between females that the extended spawning of marinka is explained.

Analysis of the diet of the common marinka showed high diversity. Up to 20 components have been identified in the intestines. Detritus predominated (in 78% of the fish in the studied sample), insect larvae (75%), remains of higher aquatic vegetation (71%), caddisfly larvae (43%), mayflies (40%), and midges (36%) were present. Remains of insects were found: beetles (28%), bees *36%), etc. Remains of fish were rarely found in the intestines (8%). In the intestines of algae, diatoms (40%), green (25%), and blue-green (14%) were noted. Apparently, these algae are part of the fouling that marinka actively feeds on.

**Discussion**

The common marinka is a typical representative of the Mountain Asian ichiofauna, recorded in the mountainous and foothill regions of Afghanistan, Pakistan, India, China, Kazakhstan, Kyrgyzstan, and Uzbekistan. This is a benthopelagic, highly adaptive, polymorphic fish in mountainous conditions poor in fish resources and of local commercial importance. In Uzbekistan, it was recorded in the upper reaches of the Syrdarya and its tributary rivers. In the Chirchik river basin, it currently lives in mountainous and foothill areas in rivers, canals, reservoirs, and lakes. There are numerous marinkas in the canals of Tashkent (Boz-Su, Ka-rasu, Karakamysh, Ankhor and others). Data on the biology of the common marinka in the water bodies of Uzbekistan are fragmentary and date back to the second half of the twentieth century (Kamilov, 1973; Salikhov et al., 2003). The purpose of this work was to determine the biological indicators of the common marinka population living in the upper sections of the Chirchik River bed and a large irrigation canal.

The common marinka is a very polymorphic species with strong variability in meristic and plastic characters, primarily at the interpopulation level. In the habitat of the common marinka, the dorsal fin has the ray formula D (II) III-IV (5) (6) 7-9 (usually 5), and the anal fin I-III has 4-7 (usually 5). 85–120 scales were noted in the lateral line. On the first gill arch, 7–17 rakers were noted. The pharyngeal teeth are three-rowed, 5*3*2 – 2*3*5 (Salikhov, 1974; Ryby..., 1983).

Throughout its range, it has been noted that in different conditions the common marinka can have very different growth rates. Fish grow faster in lentic reservoirs and large rivers. In small rivers and small mountain lakes it creates tall forms, for example in Kazakhstan, in the rivers of the Karatai ridge, the maximum sizes of marinka are 20 - 24 g (Ryby..., 1983). Comparison of our data with other reservoirs of the range shows that in the Charvak reservoir, in the upper reaches of Chirchik and in the upper sections of large irrigation canals in the Tashkent region, the common marinka has a growth rate that is quite fast for the species.

In the water bodies of Kazakhstan, the achievement of the first sexual maturity of the common marinka was noted in large numbers at 3-4 years of age when females reached an average body length of 20 cm, males - 16 cm. At the same time, there are populations where the achievement of sexual maturity occurs when significantly smaller sizes: with a body length of 10-12 cm, and even 6 cm as in the Karatau River (Ryby..., 1983). Our data show that, compared with the water bodies of more northern Kazakhstan, the common marinka in the Chirchik basin reaches maturity a little earlier with similar body sizes.

In the common marinka, spawning is greatly extended in different parts of the range. However, if in the reservoirs of Kazakhstan it is noted that spawning ends in May, then in our conditions it ends in August; we noted spawning from the second half of April to the end of August. Such extended spawning in fish from the foothill and mountain zones can be explained both by the low supply of food for juveniles and by constant conditions during the specified period of the year (Vasnetsov, 1950).

In general, in the common marinka, spawning migrations to the upper reaches of rivers and tributaries were noted, spawning in lakes and rivers on sandy-pebble soils, and in lentic reservoirs, spawning can occur in coastal thickets of higher vegetation. In more northern water bodies of Kazakhstan, for example, in the Assinsky lakes, the beginning of spawning was noted from the second half of March - early April at a water temperature of 5-7 ° C, but there spawning is friendly and ends by May (current males are found until July). In the Talas River, spawning takes place from late April to July, inclusive. In the reservoirs of Kazakhstan, an approximately equal ratio of males and females in the reservoir was noted, but on spawning grounds the proportion of males increases and exceeds the proportion of females by approximately 2 times (Ryby..., 1983).

The common marinka has fairly large caviar with a diameter of 1.7 - 2.2 mm. In the water bodies of Kazakhstan, the common marinka had an absolute fecundity of 12.9 - 29.1 thousand eggs with a female length of 32 - 39 cm and a weight of 430 - 880 g, a relative fecundity of 22.4 - 36.4 thousand eggs / kg of female weight. There are populations with significantly lower absolute fecundity: 5 – 12 thousand eggs (Pisces….1983). In our collections, individuals with a noticeably higher absolute fecundity (up to 70 thousand eggs) were noted, which we associate with the more southern location of the Chirchik basin and the presence of large lentic reservoirs (Charvak reservoir).

As in other areas of distribution, which are all located in the mountainous and foothill zones of Highland Asia, the common marinka in our conditions has a wide range of nutrition. This is also due to the low food supply in such conditions and the similarity of conditions throughout the entire range (Vasnetsov, 1950).

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