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MERISTIC AND PLASTIC CHARACTERISTICS OF GRASS CASPIC, CTENOPHARYNGODON IDELLA, CULTRED IN PONDS IN UZBEKISTAN

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ABSTRACT

The meristic and plastic characteristics of grass carp (Ctenopharyngodon idella), an important commercial fish introduced into Uzbekistan from China and cultivated in new conditions since the 1960s, were determined. Meristic indicators were determined: D III 7, A III 7-8 (average 8), in the lateral line 39 - 45 (42) scales, on the first gill arch 19 - 22 (21) rakers. Indices of plastic characteristics are given according to the classical scheme for measuring fish of the cyprinid family, as well as according to the method of geometric morphometry.

Keywords: grass carp, Ctenopharyngodon idella, fish morphology, Uzbekistan

INTRODUCTION

Grass carp, Ctenopharyngodon idella (Valenciennes, 1844) - a representative of the carp family (Cyprinidae) is of interest because it feeds on higher aquatic plants, grows quickly, and is popular as a food product. As a result, it is used as an important link in the pond polyculture of cyprinids in tropical and southern temperate zones, as well as as an ameliorator fish, effectively clearing canals and irrigation reservoirs from excessive overgrowth. In world aquaculture, grass carp is one of the most cultivated fish species in terms of catches (FAO, 2020).

In the early 1960s, grass carp larvae along with silver carp (Hypophthalmichthys molitrix) were brought from the northern part of China to newly built pond farms in the middle reaches of the Syrdarya River in the Tashkent region of Uzbekistan. After the development of artificial reproduction methods, grass carp became one of the main objects of fish farming and was widely distributed throughout all lowland pond farms, reservoirs and lakes that store drainage water in Uzbekistan (Kamilov, 1973; Amanov, 1985; Yuldashov, Kamilov, 2018).

Despite the commercial significance of the species, no work on morphological features was carried out under new conditions. The purpose of this work was to study the morphological characteristics of commercial grass carp (age 1+) in the Tashkent region as the core of the introduction of the species into our region.

MATERIALS AND METHODS

The material was collected in November 2023 in the fish hatchery of the Institute of Fisheries (formerly the State Zonal Fish Hatchery) of the Tashkent region, where they have been using their own broodstock of the species since the 1960s. During the total fishing of the feeding pond, we selected random 25 individuals of grass carp from the two-year-olds selected for the replacement herd, measured their total (TL) and standard (SL) body lengths, total body weight (W), and calculated meristic characteristics. The fresh fish were placed on their sides, the fins were straightened, and digital photographs were taken using a tripod. The axis of the camera was strictly perpendicular to the plane on which the fixed fish lay. Plastic characteristics were measured from photographs using the "Ruler" tool in Photoshop. Characteristics were measured according to the measurement scheme for fish of the carp family (Cyprinidae) (Pravdin, 1966). We also identified 10 landmarks along the perimeter of the body of the fish lying on its side. Whole fish were photographed at a strict right angle using a fixed tripod. Using photographs, we measured the distances in a straight line between landmarks, i.e. made up the so-called "truss" protocol (Strauss, Bookstein, 1982; Strauss, Bond, 1990). The measurement lines are indicated in the following format: for example, "2 – 4" indicates the measurement between landmarks 2 and 4 in a straight line (Fig. 1). To level out the influence of allometric growth of fish, indices (%%) of plastic traits were calculated in relation to the standard body length.

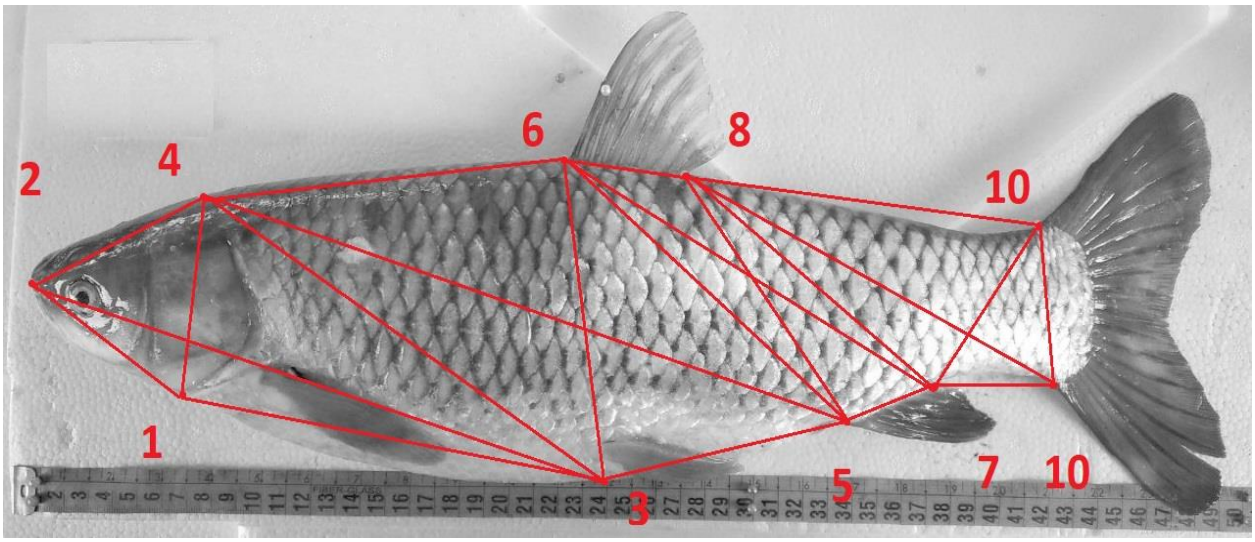

Fig. 1. Landmarks on the body surface of marketable two-year-old grass carp, Tashkent region.

RESULTS

Two-year-old grass carp have an elongated ridged body and a semi-inferior mouth. Fairly wide forehead.

In the studied sample of two-year-old silver carp, there were individuals with a total length of 44.2 - 51.2 (average 48.1) cm, a standard length of 38.9 - 45.9 (43.0) cm. It is clear that white carp has rapid growth in the conditions of pond polyculture in the Tashkent region, in two growing seasons the fish reached marketable sizes.

In individuals of the studied sample, the meristic indicators are as follows: D III 7, A III 7-8 (on average 8), in the lateral line there are 39 - 45 (42) scales, on the first gill arch there are 19 - 22 (21) rakers. Grass carp is a large-scaled fish.

Indices of plastic characteristics of grass carp according to the classical scheme of measuring cyprinid fish are presented in Table 1, and indicators of geometric morphometry ("truss-protocol") – in Table 2.

Table 1. Indices of plastic characteristics of marketable two-year-old grass carp according to the classical scheme of carp measurements, Tashkent region, 2023

Index	Min - Max.	$X_{average} + S_x$	Cv, %
Total Body Length (TL)	110,6 – 113,7	111,90 + 0,22	0,8
Body length	77,3 – 88,3	79,32 + 0,67	3,3
Snout length	2,9 – 4,7	3,60 + 0,11	12,4
Eye diameter	2,7 – 3,7	3,18 + 0,09	10,8
Postorbital region of the head	13,6 – 15,7	14,46 + 0,16	4,4
Head length	20,0 – 22,7	21,22 + 0,23	4,2
Head height at the back of the head	16,2 – 18,6	17,25 + 0,17	3,7
Maximum body height	25,4 – 29,6	26,82 + 0,29	4,2
Lowest body height	11,3 – 13,3	11,93 + 0,14	4,5
Antedorsal distance	50,7 – 53,0	51,88 + 0,17	1,3
Postdotal distance	36,0 – 41,7	38,86 + 0,37	3,7
Caudal peduncle length	13,7 – 16,8	15,34 + 0,23	5,9
Base length D	9,8 – 12,1	10,67 + 0,18	6,5
Maximum height D	15,6 – 17,5	16,40 + 0,14	3,2
Base length A	6,9 – 9,8	8,00 + 0,21	10,2
Maximum height A	11,7 – 14,1	12,68 + 0,16	4,9
Length P	17,4 – 20,8	19,06 + 0,28	5,6
Length V	13,0 – 14,5	13,85 + 0,11	3,0
P-V distance	31,1 – 33,6	32,18 + 0,21	2,5
Distance V - A	22,8 – 25,9	24,14 + 0,21	3,4

Table 2. Indices of plastic characteristics of geometric morphometry of commercial two-year-old grass carp, Tashkent region, fish hatchery, 2023

Index	Min - Max.	$X_{average} + S_x$	Cv, %
2-4	15,6 – 18,7	17,11 + 0,23	5,2
4-6	34,2 – 37,6	35,73 + 0,28	3,0
6-8	9,8 – 12,1	10,67 + 0,18	6,5
8-10	33,4 – 36,8	33,70 + 0,23	2,6
9-10	12,1 – 14,5	13,42 + 0,14	4,1
7-9	8,6 – 12,0	10,45 + 0,23	8,7
5-7	6,9 – 9,80	8,00 + 0,21	10,2
3-5	22,8 – 25,2	23,98 + 0,19	3,1
1-3	36,9 – 41,52	39,41 + 0,35	3,4
1-2	15,8 – 18,9	17,44 + 0,20	4,6

3-4	43,5 - 47,2	45,24 + 0,24	2,1
2-3	53,6 – 57,9	55,85 + 0,27	1,9
1-4	16,5 – 17,8	17,22 + 0,10	2,2
5-6	33,4 – 36,1	35,06 + 0,19	2,1
3-6	24,5 – 29,1	26,50 + 0,33	4,8
4-5	63,8 – 67,2	65,47 + 0,26	1,5
7-8	28,1 – 30,8	29,40 + 0,24	3,2
5-8	24,8 – 27,9	26,69 + 0,21	3,0
6-7	38,1 – 40,4	39,15 + 0,21	2,1
7-10	15,8 – 18,6	17,42 + 0,23	5,2
8-9	36,4 – 40,4	38,332 + 0,30	3,0

DISCUSSION

Grass carp in its natural state lived in China in freshwater bodies of Asian rivers flowing into the Pacific Ocean, from the Amur River in the north and further in the rivers of China (Berg, 1949). Due to its qualities (macrophytophage, fast growth, high fertility), grass carp was introduced into more than 80 countries around the world for fish farming purposes in the 20th century (Schofield et al, 2005). In many of these countries, grass carp is included in the list of commercial fish species. In world aquaculture, grass carp occupies a leading place among the objects of cultivation (Schofield et al, 2005).

Since the early 1960s, reproduction of the species has been carried out in Uzbekistan; 4-5-year-old fish are mainly used for breeding, i.e. More than 10 complete generations have passed under new conditions for the species. There is an important task to monitor biological characteristics and their changes. Morphological studies make it possible to give quantitative characteristics controlled by polygenes. It is important to record phenotypic changes in a species during their ontogeny (Yu et al., 2010).

In recent decades, irrigation construction, water pollution, and other anthropogenic factors have affected fish. Acclimatization work and stocking of reservoirs with fish from fish farms also affect, among other things, the gene bank of the species. It is important to monitor the genetic conditions of commercial fish species, including aquaculture species, as well as changes in their biological characteristics (Cao, 2008). In this regard, the leading country in the world's fisheries sector, China, is constantly conducting research on the morphology and growth of the main fish farming objects to create a standard for their natural populations (Yu et al, 2010). One of the main methods of quantitative characteristics controlled by polygenes is morphometric studies, which reflect not only genetic conditions, but the adaptive potential of species.

In Uzbekistan, grass carp is one of the main commercial fish. At the same time, most fish are reproduced artificially in fish hatcheries. This also affects the gene bank of this species. Moreover, the species was introduced into the water bodies of the region in several batches of larvae in the early 1960s, i.e. a very limited gene bank. It is important to monitor species changes.

To characterize the phenotypic changes of whites in the process of their ontogenesis, we measure the external morphological characteristics of different age groups of grass carp in the

center of the species' introduction into the Aral Sea basin - in a fish hatchery in the Tashkent region.

In the Russian part of the native range of grass carp, the following meristic characters are noted: D III 7, A III 8, in the lateral line 39 - 47 scales, on the first gill arch 12 - 18 rare short rakers (Berg, 1949; Nikolsky, 1956; Atlas ..., 2003).

In Uzbekistan, earlier (in the 1970s) the following meristic characters of silver carp in the middle reaches of the Syr Darya were indicated: in the dorsal fin III 7, in the anal fin III 7-8. There are 38-45 scales in the lateral line. The gill rakers are short and sparse, there are 13-16 of them on the first arch. (Salikhov et al., 2001).

In the specimens of the sample we studied, the meristic indicators are as follows: D III 7, A III 7-8 (on average 8), in the lateral line there are 39 - 45 (42) scales, on the first gill arch there are 19 - 22 (21) rakers. White carp is a large-scaled fish. It can be seen that the number of rakers on the first gill arch has increased.

Note that we analyzed marketable two-year-old grass carp. From a biological point of view, these are immature individuals. This most important age group in fish farming is a product of growing marketable fish, which is sold in bulk for consumption. in the temperate climate of Uzbekistan.

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