



FISH FAUNA OF FISH RESERVOIRS IN BUKHARA REGION (BELOW THE ZARAFSHAN RIVER)

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Article history:	Abstract:
Received: 1 st March 2023 Accepted: 3 rd April 2023 Published: 6 th May 2023	This article discusses the creative activity of Borbad Marvazi, the founder of professional music, composer, musician. Also, opinions and considerations are given regarding the decision of the genre of the series in the framework of Borbad's creative works.
Keywords: endemic species, valid species, invasive species, acclimatization	

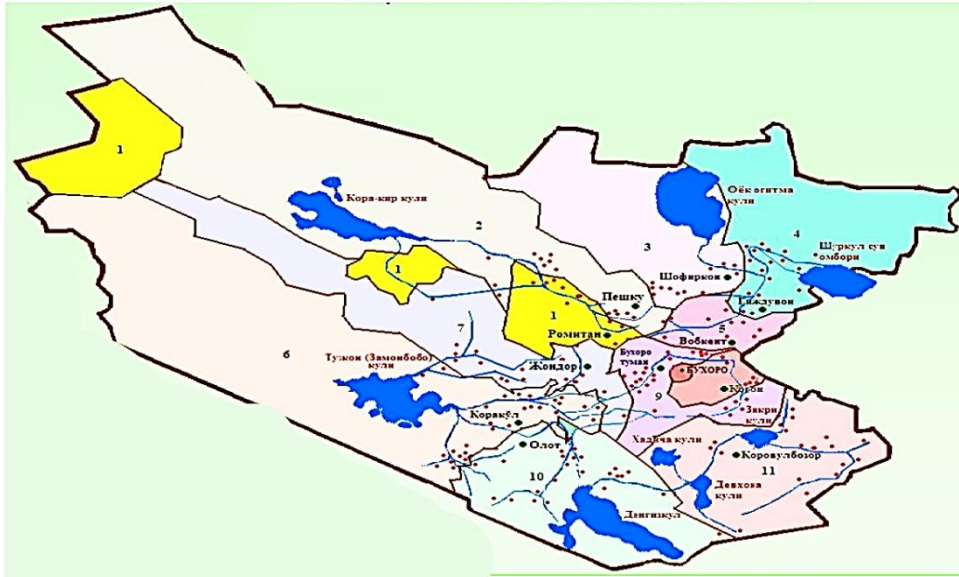
INTRODUCTION: Scientific classification of fish species, identification of species is important not only taxonomically, but also in determining the potential of the fishing industry, natural water resources and food composition. The species composition of the ichthyofauna of the water basin, the regular monitoring of the state of the population of these species on a scientific basis is an important task facing the sciences of ichthyology and aquaculture.

Bukhara region is located in the southwest of the Republic of Uzbekistan and along the lower reaches of the Zarafshan River. The Lower Zarafshan River started in the ancient times from the Kyzyltepa highlands, was located in the south of the Bukhara oasis, in the Karakol oasis, around Dengizkol, and flowed into the Amudarya, covering an area of yellow, red, brown sand and sandstone. As the Amudarya flows northwest (towards the Aral Sea), the Zarafshan River begins to flow into the Amudarya. The Zarafshan River occasionally flowed into the Amudarya. However, as a result of the Kashkadarya and Sangzor rivers not flowing into Zarafshan, Zarafshan branched out and formed the Karakol delta. The Kashkadarya turns south, branches off and forms a large delta, the Sangzor River turns north and begins to flow towards Mirzachol, as a result of which the Zarafshan water decreases and does not reach the Amudarya. In the XVII-XVIII centuries, the water sources of the present-day Bukhara region were the Amudarya and Zarafshan rivers. Bukhara is the lower part of the Lower Zarafshan River and the Zarafshan Valley. The Lower Zarafshan River includes the Bukhara and Karakol oases. The length of collectors and canals flowing into the Lower Zarafshan River reaches 70-80 km [19]. As you can see, the Zarafshan River used to be the water supplier of Bukhara region in ancient times!

The current water supplier of Bukhara region is the Amudarya. From the Amudarya, through the pumping stations "Hamza-1", "Hamza-2" water rises to a height of 64 m and flows into the Amu-Bukhara canal, and the region is fully supplied with water.

To date, the main water supply of Bukhara region is the Amu-Bukhara canal, which is based on a single artificial irrigation system in the Republic of Uzbekistan. The water coming through the Amu-Bukhara canal is used only for irrigation of agricultural crops, winter saline washing of fields and irrigation of lands. The source of water for pond fisheries in Bukhara region is the southern, central and northern collectors and ditches. The collector in the region is a highly mineralized water of organomineral origin, formed as a result of irrigation and winter saline leaching. These effluents have accumulated to form large natural reservoirs such as Dengizkol, Karakir, Ayoqogitma, Khadija, Devxona, Zamonbobo, Zikri, Qumsultan. In Bukhara region, there are currently a total of 349 fish farms, which provide the population with quality and clean fish products. The total area of these fisheries is 34,570 hectares. Of these, 15 natural (4.29%) reservoirs (32081 hectares), 92.8% and 334 artificial (95.7%) reservoirs (2489 hectares) 7.19% are fisheries. (Figure 1)

Figure 1.
Map of natural and artificial fishing reservoirs in Bukhara region



The taxonomic study of fish living in the basins of Bukhara region began in the late 19th and early 20th centuries with the study of the lower reaches of the Amu Darya and the Zarafshan River. Several ichthyologists have conducted research: for example, (1873-1940) Russian scientists N.A. Severtsov (1873), M.N. Bogdanov (1882), K.F. Kessler (1877), L.S. Berg (1905, 1948, 1949a, 1949b), F.A. Turdakov (1935, 1936), G.V. Nikolskiy (1940), R. Tleuov Tleuberganov (1974). In the course of the research, A.M. Nikolsky - 14 rounds, 8 of these rounds, L.S. Berg - 42 rounds, of which 26 rounds, G.V. Nikolsky and G. H. Shaposhnikova noted that 40 species, including 29 species, and B. Khakberdiev - 27 species out of 36 species meet in the lower Zarafshan River [23]. Recent studies have estimated that there are 36 species of fish in the lower reaches of the Zarafshan River [2]. In 2014-2016, E.B. Jalolov noted that in addition to the economically viable fish in the Lower Zarafshan River, which flows through the Bukhara Fish Basin, there are more than 15 wild and non-wild fish [25]. E.B. Jalolov analyzed the impact of high aquatic plants on fish in the lower Zarafshan watersheds in his research on fish ponds in Bukhara region in 2016-2020 [26], [27], [28], [29]. B. Sheraliyev and E. Jalolov collected 28 species of fish samples from the middle and lower reaches of the Zarafshan River in 2017-2018 and analyzed them by DNA barcoding to create a phylogenetic pedigree of fish [30]. B. Sheraliyev and A. Ruzimov and others also conducted protected species and their current status and morphometric analysis in the lower reaches of the Amudarya and the Zarafshan River [24], [31], [32], [33], [34], [35], [36], [37].

MATERIALS AND METHODS: This research was conducted in 2019-2023 at a total of 19 points in the lower Zarafshan region. Of these, 10 are on the right bank of the lower Zarafshan River and 9 are on the left bank. The distance between each conditional object is 1.5-2.5 km. Fish samples were used with a mesh size of 1x1-10x10 mm, a height of 1 m and a width of 1.5 m, as well as special small fishing nets. Fish samples were collected using the traditional method in all four seasons of the year: spring, summer, autumn and winter. Ichthyological research was based on the methodology of Kottelat and Freyhof (2006) [3]. Identifiers developed by local authors [17] and data from international fish databases were used to identify fish species [1]. The current conservation status of fish was verified through the online database of the International Union for Conservation of Nature (IUCN). A 10% solution of formalin was used to fix the samples. The systematic status of the fish was given on the basis of a generally accepted system [5].

RESULTS AND DISCUSSION: Based on the results of ichthyological research in the Lower Zarafshan watershed and the results of previous studies on the region's fish, a comparative systematic species composition of the ichthyofauna of the Lower Zarafshan River has been developed. The comparative systematic species composition of the ichthyofauna of the lower Zarafshan river formed during the research is of phylogenetic origin in terms of series and families, and the species in their composition are given in alphabetical order: (Table-1)

Table-1.

Comparative systematic species composition of the ichthyofauna of the Lower Zarafshan River

Nº	Category	Nº	Family	Nº	Species	Comparative System	Meeting the study		
1	Cypriniformes Bleeker	1	Cobitidae Swainson	1	<i>Sabanejewia aurata</i>	+	-		
		2	Nemacheilidae Regan	2	<i>Dzihunia amudarjensis</i>	+	+		
		3	Cyprinidae Rafinesque	3	<i>Carassius gibelio</i>	3	<i>Carassius gibelio</i>	+	+
				4	<i>Cyprinus carpio Linnaeus</i>	4	<i>Cyprinus carpio Linnaeus</i>	+	+
				5	<i>Luciobarbus capito</i>	5	<i>Luciobarbus capito</i>	+	+
		4	Xenocyprididae Günther	6	<i>Ctenopharyngodon idella</i>	6	<i>Ctenopharyngodon idella</i>	+	+
				7	<i>Hemiculter leucisculus</i>	7	<i>Hemiculter leucisculus</i>	+	+
				8	<i>Hypophthalmichthys molitrix</i>	8	<i>Hypophthalmichthys molitrix</i>	+	+
				9	<i>Hypophthalmichthys nobilis</i>	9	<i>Hypophthalmichthys nobilis</i>	+	+
		10	<i>Parabramis pekinensis</i>	10	<i>Parabramis pekinensis</i>	+	+		
		5	Acheilognathidae Bleeker	11	<i>Rhodeus ocellatus</i>	11	<i>Rhodeus ocellatus</i>	+	+
		6	Gobionidae Bleeker	12	<i>Abbottina rivularis</i>	12	<i>Abbottina rivularis</i>	+	+
				13	<i>Gobio lepidolaemus Kessler</i>	13	<i>Gobio lepidolaemus Kessler</i>	+	-
				14	<i>Pseudorasbora parva</i>	14	<i>Pseudorasbora parva</i>	+	+
		7	Leuciscidae Bonaparte	15	<i>Abramis brama</i>	15	<i>Abramis brama</i>	+	-
				16	<i>Alburnoides holciki</i>	16	<i>Alburnoides holciki</i>	+	+
				17	<i>Alburnus chalcoides</i>	17	<i>Alburnus chalcoides</i>	+	+
				18	<i>Aspiolucius esocinus</i>	18	<i>Aspiolucius esocinus</i>	+	-
				19	<i>Ballerus sapa</i>	19	<i>Ballerus sapa</i>	+	-
				20	<i>Capoetobrama kuschakewitschi</i>	20	<i>Capoetobrama kuschakewitschi</i>	+	+
				21	<i>Leuciscus aspius</i>	21	<i>Leuciscus aspius</i>	+	+
				22	<i>Pelecus cultratus</i>	22	<i>Pelecus cultratus</i>	+	+
		23	<i>Scardinius erythrophthalmus</i>	23	<i>Scardinius erythrophthalmus</i>	+	-		
2	Siluriformes Cuvier	8	Siluridae Rafinesque	24	<i>Silurus glanis</i>	+	+		
3	Gobiiformes Bleeker	9	Gobiidae Cuvier	25	<i>Neogobius melanostomus</i>	+	+		
				26	<i>Neogobius pallasii</i>	+	+		
4	Anabanti-formes Britz	10	Channidae Flower	27	<i>Channa argus</i>	+	+		
5	Cyprinodonti-formes Berg	11	Poeciliidae Bonaparte	28	<i>Gambusia holbrooki</i>	+	+		
6	Perciformes Bleeker	12	Percidae Rafinesque	29	<i>Gymnocephalus cernua</i>	+	-		
				30	<i>Perca fluviatilis</i>	+	-		
				31	<i>Sander lucioperca</i>	+	+		

It is noteworthy that 31 species of fish in the region make up more than 45% of the species of the Uzbek ichthyofauna [18]. Although the region is rich in rare species, it is known that some species are on the verge of extinction as a result of declining water levels, salinity, artificial river control, water pollution, invasive species and poaching.

Formerly a member of the Perciformes family, the Gobiidae family is now a separate family of Gobiiformes. In addition, the sub-families Acheilognathidae, Gobionidae, Leuciscidae, and Xenocyprididae, formerly members of the Cyprinidae family, now have separate family status.

The acclimatization of fish species has also affected the ichthyofauna of the basin, with 12 species of temperate fish found in the lower Zarafshan watershed. The food competitiveness of many invasive species, their adaptability to changes in water temperature, their tolerance to high water-soluble salts, and their high reproduction rates have displaced the remaining 19 species of indigenous and endemic species.

The ichthyofauna of the lower reaches of the Zarafshan River currently consists of 31 species of fish. Due to the importance of endemic species in ichthyofauna, the development of conservation and reproduction measures remains one of the most important tasks facing the science of zoology [24].

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