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Ixthiofauna in Need of Protection of the Lower Zarafshan River (Bukhara Region)

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Abstract: Fishery reservoirs in Bukhara region are located in the lower reaches of the Zarafshan River and are one of the most important reservoirs in western Uzbekistan. Based on the research conducted in the natural and artificial fishery reservoirs of Bukhara region and the analysis of the literature on ichthyofauna of the region, it has been identified that 31 species of fish belonging to 6 genera and 12 families are found in the region. Of these 31 species, 23 species are listed in the Red Data Book of the International Union for Conservation of Nature (IUCN) and 5 species in the Red Data Book of the Republic of Uzbekistan.

Keywords: aquaculture, ichthyology, systematics, endemic species, valid species, invasive species, climate, taxonomy.

Introduction: Today, there are more than 36,000 species of fish in the world, accounting for about half of all vertebrates on Earth. Fish is a key component of biodiversity, but also an important source of animal protein, which is of great economic importance and essential for human health. Scientific classification of fish species, identification of species is important not only in taxonomy, but also in determining the potential of the fishing industry, natural water resources and the composition of food products. One of the important tasks of ichthyology is to regularly monitor the species composition of the ichthyofauna of the water basin and the state of the population of these species on a scientific basis. The Zarafshan River is one of the wettest rivers in Central Asia. The Lower Zarafshan River is the third part of 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 is 70-80 km. 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 turned south, branched off and formed a large delta, while the Sangzor River turned north and began to flow towards Mirzachol, as a result of which the Zarafshan water decreased and did not reach the Amudarya. The water sources of the Lower Zarafshan oasis are the Amudarya and Zarafshan rivers. The water of the Lower Zarafshan River is used for irrigation through Shafirkan, Vobkent, Romitan, Shohrud and other main canals, and only groundwater flows from the natural river. In the past, Zarafshan water flowed through the lower Zarafshan oasis and was absorbed into the sand less than 20 km from the Amudarya. Due to the fact that the water of the Zarafshan River is used in the Middle Zarafshan oasis, the lower Zarafshan oasis does not have enough water. Therefore, the 268 km long Amu-Bukhara main canal was built to improve irrigation and provide water to the population. In the Lower Zarafshan oasis, groundwater levels are not uniform across the region, depending on the terrain. The groundwater in the eastern highlands is relatively fresh and good. The

Lower Zarafshan River flows into the village of Kharkhorak (N-40.057300, E-64.774715) in the Gijduvan district of the Bukhara region and flows into the main river due to the inflow of collector and ditch water, which has a significant negative impact on the hydrochemical composition of the water. The Lower Zarafshan River enters the territory of Vobkent district of Bukhara region (N-40.022830, E-64.585831) and officially loses its status as the Zarafshan River and becomes the Central Bukhara Collector (MBK).

The first ichthyological research in the basins of the Zarafshan River began in the late 19th and early 20th centuries, with the study of the lower reaches of the Amudarya. (1873-1940) Russian scholars 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. Nikolsky (1940), R. Tleuov and Sh. Conducted by several ichthyologists such as Tleuberganov (1974). Recent studies indicate that the number of fish species in the lower reaches of the Zarafshan River is 36 [2]. E.B. Jalolov also analyzed the impact of high aquatic plants on fish in the lower Zarafshan watersheds in his 2016-2020 research work in fish ponds in Bukhara region [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 using the DNA barcode method to create a phylogenetic tree 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 lower reaches of the Zarafshan River [24], [31], [32], [33], [34], [35], [36], [37]. The aim of this study was to study the current taxonomic status of ichthyofauna in the lower Zarafshan basin. Materials and methods: This research was conducted in 2019-2021 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].

The aim of this study was to study the current taxonomic status of fish species in need of protection in the fishery basins of Bukhara region, as well as to compile a list of species listed in the International Union for Conservation of Nature (IUCN) and the Red Book of Uzbekistan.

Materials and methods: This research was conducted in 2014-2021 at a total of 3839 points from all fish ponds and their tributaries in the territory of Bukhara region. Of these conditional objects, 2380 (61.99%) are located in natural fishing ponds, and 1459 (38.01%) are located in artificial fishing ponds. Fishing specimens were mesh 1x1 to 10x10 mm, 1 m high and 1.5 m wide, as well as special small mesh fishing nets and a variety of fishing gear. 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). The current status of fish protection in the country was checked through the Red Book of the Republic of Uzbekistan [38], [39], [40], [41], [42], [43]. A 10% solution of formalin was used to fix the samples. Samples obtained for genetic analysis were fixed using a 96% alcohol solution to prevent denaturation of the protein. The systematic status of the fish was given on the basis of a generally accepted system [5].

Research findings and discussion: According to the 2019 list of the International Union for Conservation of Nature (IUCN), more than 112,430 species on the planet are in need of protection. More than 30,000 of these species are endangered, accounting for 27% of the total list. If we look at this indicator in terms of individual animal classes, 16,539 of them belong to the large class of fish.

If we look at the regions, we can see that more than 50 species of fish in the water basins of Uzbekistan are listed in the Red Book.

In the fish ponds of Bukhara region there are 6 species, 12 families and 31 species of fish. The latest edition of the Red Book of the Republic of Uzbekistan (2019) includes representatives of 6 species, 8 families and 18 species of fish. 1 species, 3 families, 5 species of these fish are distributed in the fishery reservoirs of Bukhara region, they are:

Currently, 5 species (16.3%) out of 31 species of fish found in the fish ponds of Bukhara region are included in the Red Data Book of Uzbekistan. In general, 23 species (74.2%) of the region's ichthyofauna are included in the Red Data Book of endangered species. These include “Extinct” (EX; 0 species, 0%), “Species on the verge of extinction” (CR; 0 species, 0%), “Weak species” (VU; 4 species, 17.39%), close” (NT; 1 species, 4.34%), “at risk of extinction” (LC; 15 species, 65.21%) and “Insufficient information” (DD; 3 species, 13.04%). [8], [10]. You can see these figures in the table below! (Table 1)

(Table 1) **Ichthyofauna of Bukhara region and protected species**

№	Category	№	Family	№	Type	IUCN “Red book”	Uzbekistan ,, Red Book’’
1	Cypriniformes Bleeker	1	Cobitidae Swainson	1	*Sabanejewia aurata*	LC	NT
		2	Nemacheilidae Regan	2	*Dzihunia amudarjensis*	-	-
		3	Cyprinidae Rafinesque	3	*Carassius gibelio*	-	-
				4	*Cyprinus carpio Linnaeus*	VU	-
				5	*Luciobarbus capito*	VU	VU: D
		4	Xenocyprididae Günther	6	*Ctenopharyngodon idella*	-	-
				7	*Hemiculter leucisculus*	LC	-
				8	*Hypophthalmichthys molitrix*	NT	-
				9	*Hypophthalmichthys nobilis*	DD	-
				10	*Parabramis pekinensis*	-	-
		5	Acheilognathidae Bleeker	11	*Rhodeus ocellatus*	DD	-
		6	Gobionidae Bleeker	12	*Abbottina rivularis*	-	-
				13	*Gobio lepidolaemus Kessler*	-	-
				14	*Pseudorasbora parva*	LC	-
		7	Leuciscidae Bonaparte	15	*Abramis brama*	LC	-
				16	*Alburnoides holciki*	-	-
				17	*Alburnus chalcoides*	LC	-
				18	*Aspiolucius esocinus*	VU	EN
				19	*Ballerus sapa*	VU	VU: D
				20	*Capoetobrama kuschakewitschi*	DD	VU: D
				21	*Leuciscus aspius*	LC	-
				22	*Pelecus cultratus*	LC	-

				23	*Scardinius erythrophthalmus*	LC	-
2	Siluriformes Cuvier	8	Siluridae Rafinesque	24	*Silurus glanis*	LC	-
3	Gobiiformes Bleeker	9	Gobiidae Cuvier	25	*Neogobius melanostomus*	LC	-
				26	*Neogobius pallasi*	LC	-
4	Anabanti-formes Britz	10	Channidae Flower	27	*Channa argus*	-	-
5	Cyprinodonti-formes Berg	11	Poeciliidae Bonaparte	28	*Gambusia holbrooki*	LC	-
6	Perciformes Bleeker	12	Percidae Rafinesque	29	*Gymnocephalus cernua*	LC	-
				30	*Perca fluviatilis*	LC	-
				31	*Sander lucioperca*	LC	-

Conclusion: The ichthyofauna of Bukhara region currently consists of 31 species of fish. Due to the importance of endemic and endemic species in ichthyofauna, the development of conservation measures and the development of reproduction remains one of the most important tasks facing the science of zoology [24]. In order to protect these fish species in need of protection, the introduction of special protection regimes in their habitats, ie the introduction of water reserves, the eradication of poaching, the study of fish biology and ecology and the organization of artificial reproduction. we thought it was necessary to do.

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