

Downstream Ichthyofauna of the Zarafshan River

Aziz Mukhtorovich Kobilov, Elbek Bakhshillovich Jalolov, Mirzobek Ulug'bek O'gli Yusupov

Department of Biology, Bukhara State University, Bukhara, Uzbekistan

Email: elbek_jalolov@mail.ru

How to cite this paper: Kobilov, A.M., Jalolov, E.B. and Yusupov, M.U.O. (2022) Downstream Ichthyofauna of the Zarafshan River. *Open Journal of Animal Sciences*, 12, 271-276.

<https://doi.org/10.4236/ojas.2022.122020>

Received: December 27, 2021

Accepted: April 12, 2022

Published: April 15, 2022

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Abstract

The lower reaches of the Zarafshan River are one of the most important watersheds in western Uzbekistan. Based on the research conducted in the lower reaches of the Zarafshan River and the lower Zarafshan watersheds, as well as the analysis of the literature on ichthyofauna of the region, it was determined that currently there are 6 species and 31 species of fish belonging to 12 families.

Keywords

Endemic Species, Valid Species, Invasive Species, Acclimatization, Taxonomy

1. 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).

2. Methods

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 [1]. 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 [2] [3] [4] [5]. 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 [6]. 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 [7]-[15]. 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 $1 \times 1 - 10 \times 10$ 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) [16]. Identifiers developed by local authors [17] and data from international fish databases were used to identify fish species [18]. 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 [19].

3. 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 during the study
		1	Cobitidae Swainson	1	<i>Sabanejewiaaurata</i>	+	-
		2	Nemacheilidae Regan	2	<i>Dzihuniaamudarjensis</i>	+	+
				3	<i>Carassiusgibelio</i>	+	+
		3	Cyprinidae Rafinesque	4	<i>Cyprinuscarpio Linnaeus</i>	+	+
				5	<i>Luciobarbuscapito</i>	+	+
				6	<i>Ctenopharyngodon idella</i>	+	+
				7	<i>Hemiculterleucisculus</i>	+	+
1	Cypriniformes Bleeker	4	Xenocyprididae Günther	8	<i>Hypophthalmichthys molitrix</i>	+	+
				9	<i>Hypophthalmichthys nobilis</i>	+	+
				10	<i>Parabramispekinensis</i>	+	+
		5	Acheilognathidae Bleeker	11	<i>Rhodeusocellatus</i>	+	+
				12	<i>Abbottinarivularis</i>	+	+
		6	Gobionidae Bleeker	13	<i>Gobiolepidolaemus Kessler</i>	+	-
				14	<i>Pseudorasboraparva</i>	+	+

Continued

			15	<i>Abramisbrama</i>	+	-	
			16	<i>Alburnoidesholciki</i>	+	+	
			17	<i>Alburnuschalcoides</i>	+	+	
			18	<i>Aspioluciusesocinus</i>	+	-	
	7	Leuciscidae Bonaparte	19	<i>Ballerussapa</i>	+	-	
			20	<i>Capoetobramakuschakewitschi</i>	+	+	
			21	<i>Leuciscusaspis</i>	+	+	
			22	<i>Pelecuscultratus</i>	+	+	
			23	<i>Scardiniuserythrophthalmus</i>	+	-	
2	Siluriformes Cuvier	8	Siluridae Rafinesque	24	<i>Silurusglanis</i>	+	+
3	Gobiiformes Bleeker	9	Gobiidae Cuvier	25	<i>Neogobiusmelanostomus</i>	+	+
				26	<i>Neogobius pallasii</i>	+	+
4	Anabantiformes Britz	10	Channidae Flower	27	<i>Channa argus</i>	+	+
5	Cyprinodontiformes Berg	11	Poeciliidae Bonaparte	28	<i>Gambusia holbrooki</i>	+	+
				29	<i>Gymnocephaluscernua</i>	+	-
6	Perciformes Bleeker	12	Percidae Rafinesque	30	<i>Percafluviatilis</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 [20]. 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.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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