

Taxonomic analysis of the species composition and fauna of fish caught in the watery areas of Bukhara region

Avaz Rayimov^{1*}, Muxtor Turaev¹, Nodira Azizova¹, and Nazira Turayeva¹

¹Bukhara State University, Street Mukhammad Ikbol, 11, 200118, Bukhara, Uzbekistan

Abstract. The article analyzes the species composition, the leading orders, the spectrum of families, the taxonomic composition of fish harvested in Bukhara region and adjacent watery areas. Data on the ecology of seasonal and territorial distribution of fish fauna collected from reservoirs of various types in Bukhara region, and environmental factors affecting them and manifestations of fish adaptation to these impacts are presented. The economic efficiency of fishery farms can be improved by preserving their stability through special breeding of fish species and introducing hunting tourism.

1 Introduction

Due to the fact that the arable lands of Bukhara region were not provided with water from the Zarafshan River, after the 1950s for irrigation of crops Amudarya was connected to the river Zarafshan through the Amu-Karakul and Amu-Bukhara channels and regional irrigation networks started to function as a completely new system. After several pumping stations for raising water and water distributors were built, radical changes occurred in the water supply of the lower districts of the Zarafshan River of Bukhara region and Navoi region, as a result of which the ichthyofauna in the waters of the lower reaches of the Zarafshan River developed in combination with the ichthyofauna of Kashkadarya and Amu Darya through these channels [1]. High rates of population growth have led to an increase in demand for fish products. In order to provide the population with high-quality fish products, special attention is paid to the development of fishing stock, improvement of breeding work. Significant results have been obtained in the volume of cultivation, breeding and processing of commercial fish, the introduction of modern methods of growing commercial fish. Due to the annual growth of interest in fishing in the world, in particular in hunting tourism, much attention is paid to improve the system of fishery management, special breeding and protection of commercial fish, as well as the introduction of best practices in the industry. As a result of the application of modern methods and technologies in the activities of fishing farms, the conservation of the number of species, and the stability of their habitat, has been achieved. Meanwhile, the development of the feed supply of the fishing industry requires scientifically approved results on the use of the biological potential of planktonic organisms of natural and artificial

* Corresponding author: rayimov78@bk.ru

reservoirs to provide their farms with natural, affordable and high-quality feeds and to increase the productivity of reservoirs based on them. Some improvements are needed in the existing methods of identification of fish fauna caught from various types of reservoirs of Bukhara region.

2 Material and methods

To study the fauna of commercial fish in Bukhara region, research was carried out in 2012-2022 in the lakes Karakir, Zamanbobo, Denizkul, Hadicha, Zikri, Devkhona, Kumsultan and Ogitma, reservoirs Todakol, Kuyimozar and Shurkul, networks of the AMU-Bukhara machine channel and in the territories of the Kagan fisheries district narration [2,3].

Fish samples from the ponds of Bukhara region were taken out using a mesh of different sizes (35,45,55,65 mm). When catching small fish, a net with a cage of 15-30 mm, a Braden net with a cage of 8-10 mm, a mesh net and fishing rods were used. The caught fish was fixed with 4% formalin. Collections of fish caught in different years were also used, in particular those stored in the Zoo Museum of Bukhara State University [4,5]. Fishing rods were used to catch predatory fish. The weight of the fish was measured on an electronic scale. When determining the species composition of fish, works of Mirabdullaev and other authors were used, scientific names and systematic interpretation of fish were performed using literature published by Dadaev and others[5-8].

3 Result and discussion

Based on the analysis of the field material collected during our research in Bukhara region, 3 orders belonging to 1 larger order of fish (Teleostei) were distinguished (Cypriniformes, Siluriformes, Perciformes), which include 4 families (Cyprinidae, Siluridae, Percidae, Channidae) and 18 species all of which are fished regularly. (Table 1).

Stizostedion lucioperca, which is in high commercial demand, is one of the main objects of industrial fishing. *Channa argus* and *Silurus glanis* are very rare among the caught fish. *Cyprinus carpio*, *Ctenopharyngodon idella*, *Hypophthalmichthys molitrix* and *Aristichthys nobilis* are in demand most of the time in local market. We have to look for measures to use them as promising species from now on. In Bukhara Region, it is difficult to classify *Parabramis pekinensis*, *Rutilus rutilus aralensis*, *Cyprinus carpio*, *Carassius gibelio* as valuable fish species.

In Bukhara region and in all adjacent aquatic biotopes *Rutilus rutilus aralensis*, *Chalcalburnus chalcoides aralensis*, *Abramis Brama orientalis*, *Carassius gibelio*, *Cyprinus carpio*, *Silurus glanis*, *Stizostedion lucioperca* can be attributed to the dominant species that are being fished. Subdominant species include *Channa argus*, *Varicorhinus heratensis steindachneri*, *Hypophthalmichthys molitrix*, *Ctenopharyngodon idella*. Species found in separate biotopes *Mylopharyngodon Piceus*, *Aristichthys Nobilis*, *Aspius aspius*, *Pelecus Cultratus*, *Aspius aspius Taeniatus*, *Clarias Griepinus*. (Table 1). *Rutilus rutilus aralensis*, is one of the commercial fish species of the waters of Bukhara region. It accounts for 65-75% of the fish caught in all reservoirs.

Table 1. Species composition of fish harvested in the Bukhara region and adjacent water areas (2012-2022).

No	Fish species	Devkhona	Xadicha	Ogitma	Dengizkul	Kora-qir	Shurkul	Tudakul reservoir	Kuyimozar reservoir	Amu-Bukharo channel	Amudarya
	Phylum. Chordata										
	Subphylum. Craniata										
	Group. Anamnia										
	Superclass. Pisces										
	Class. <i>Osteichthyes</i>										
	Subclass. <i>Actinopterygii</i>										
	Infraclass. <i>Teleostei</i>										
	Order. <i>Cypriniformes</i>										
	Family. <i>Cyprinidae</i>										
1	<i>Rutilus rutilus aralensis</i> (A)	+	+	+	+	+	+	+	+	+	+
2	<i>Aspius aspius taeniatus</i> (A)	-	-	-	-	-	+	-	-	+	+
3	<i>Pelecus cultratus</i> (A)	-	-	-	-	-	+	+	+	+	+
4	<i>Aspius aspius</i> (A)	-	-	-	-	+	+	+	-	+	-
5	<i>Chalcalburnus chalcoides aralensis</i> (A)	+	+	+	+	+	+	+	+	+	+
6	<i>Varicorhinus heratensis steindachneri</i> (Z)	-	+	+	+	+	+	+	-	+	-
7	<i>Abramis brama orientalis</i> (A)	+	+	+	+	+	+	+	+	+	+
8	<i>Carassius gibelio</i> (K)	+	+	+	+	+	+	+	+	+	+
9	<i>Cyprinus carpio</i> (Z)	+	+	+	+	+	+	+	+	+	+
10	<i>Hypophthalmichthys molitrix</i> (I)	+	-	+	+	+	+	+	+	-	-
11	<i>Aristichthys nobilis</i> (A)	-	-	-	-	-	+	+	-	-	-
12	<i>Ctenopharyngodon idella</i> (I)	-	+	+	+	+	+	+	+	+	+
13	<i>Mylopharyngodon piceus</i> (A)	-	-	-	-	-	+	+	-	+	+
14	<i>Parabramis pekinensis</i> (Z)	-	-	+	-	+	+	+	-	+	+
	Order. Siluriformes										
	Family. Siluridae										
15	<i>Silurus glanus</i> (A)	+	+	+	+	+	+	+	+	+	+
16	<i>Clarias griepinus</i> (I)	-	-	-	-	-	-	+	-	+	-
	Order. Perciformes										
	Family. Percidae										
17	<i>Stizostedion lucioperca</i> (I)	+	+	+	+	+	+	+	+	+	+
	Family. Channidae										
18	<i>Channa argus</i> (Z)	-	-	+	+	+	+	+	+	+	+
	Total	8	9	12	10	13	17	17	11	16	13

Note: (A) -fish that have passed through the Amu Darya; (Z)-fish that have passed through Zarafshan River; (K) - fish that come from Kashkadarya basin.- (I) acclimatized.

Table 2. The spectrum of the leading orders and families of fish harvested in watery areas of Bukhara region and surrounding areas.

Order	Number of families	(%)	Number of species	(%)
<i>Cypriniformes</i>	1	25	14	77.78
<i>Siluriformes</i>	1	25	2	11.11
<i>Perciformes</i>	2	50	2	11.11
Total	4	100	18	100

According to the results obtained, 18 species of fish were identified in Bukhara region and adjacent water areas, and by species composition there are 14 species (77.78%) from the order Cypriniformes, 2 species (11.11%) from Siluriformes, other 2 species (11.11%) from the order of Perciformes. Figure 1.

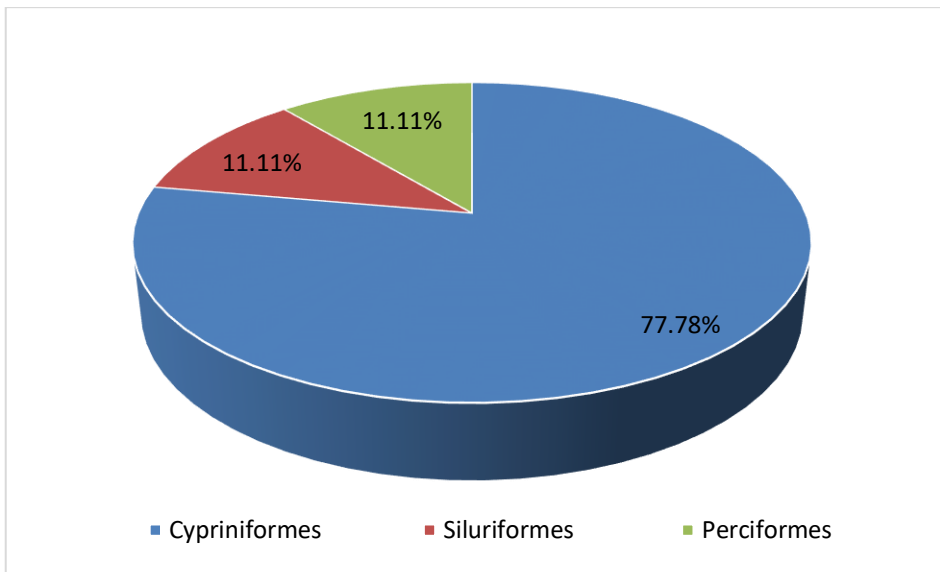


Fig. 1. Distribution of hunting fish by category in Bukhara region and adjacent watery areas.

14 species of the Cyprinidae family, Cypriniformes order, 2 species of the Siluridae family, Siluriformes order, 2 species of the Percidae and Channidae families, Perciformes order make up the fish species harvested in watery areas Bukhara region.

Table 3. Taxonomic composition of commercial fish of watery areas in Bukhara region and adjacent areas.

Phylum	Class	Order	Family	Species
Chordata	Pisces	Cypriniformes	Cyprinidae	<i>Rutilus rutilus aralensis</i>
				<i>Aspius aspius taeniatus</i>
				<i>Pelecus cultratus</i>
				<i>Aspius aspius</i>
				<i>Chalcalburnus chalcoides aralensis</i>
				<i>Varicorhinus heratensis steindachneri</i>
				<i>Abramis brama orientalis</i>
				<i>Carassius gibelio</i>
				<i>Cyprinus carpio</i>
				<i>Hypophthalmichthys molitrix</i>
				<i>Aristichthys nobilis</i>
				<i>Ctenopharyngodon idella</i>
				<i>Mylopharyngodon piceus</i>
		<i>Parabramis pekinensis</i>		
		Siluriformes	Siluridae	<i>Silurus glanus</i>
				<i>Clarias griepinus</i>
		Perciformes	Percidae	<i>Stizostedion lucioperca</i>
	Channidae	<i>Channa argus</i>		

The artificial formation of the ichthyofauna is associated with the transplantation of new fish species into the reservoirs of Bukhara region. Large-scale acclimatization processes that were carried out in our republic from 1960 to 1970, and fishing farms organized in each region led to the formation of populations of new species of commercial fish throughout the country [9,10].

Table 4. Commercial fish species acclimatized in reservoirs of Bukhara region and its surroundings.

№	Fish species	Country of origin	Acclimatized year	Acclimatized condition	
				Acclimatized intentionally	Acclimatized by chance
1	<i>Hypophthalmichthys molitrix</i>	China	1961	+	
2	<i>Aristichthys nobilis</i>	China	1961		+
3	<i>Carassius gibelio</i>	Russia	1951	+	
4	<i>Parabramis pekinensis</i>	China	1960		+
5	<i>Abramis brama orientalis</i>	China	1961		+
6	<i>Ctenopharyngodon idella</i>	China	1960	+	
7	<i>Stizostedion lucioperca</i>	Russia	1963	+	
8	<i>Clarias griepinus</i>	Russia	2000	+	
9	<i>Channa argus</i>	China	1961		+

Once being brought into reservoirs, promising commercial fish species found a good space for themselves, multiplied and became suitable not only for preserving their species, but also for expanding their range. Such species include *Parabramis pekinensis*, *Stizostedion lucioperca*, *Carassius gibelio*, *Ctenopharyngodon idella* and other main consumed species. In order to increase fish productivity in natural, artificial reservoirs as well as to maintain fish resource in Bukhara region, *Hypophthalmichthys molitrix*, *Silurus glanus*, *Aristichthys nobilis*, *Ctenopharyngodon idella*, *Cyprinus carpio*, *Mylopharyngodon piceus*, *Parabramis pekinensis* are preferable to acclimatize (Table 4).

4 Conclusion

Some measurements have to be taken to protect and balance the fauna, biodiversity of commercial fish in the water areas of the Bukhara region, as well as their distribution, abundance, bioecological features. By creating a cadastral information for monitoring the status of commercial fish populations in the watery areas of Bukhara and organizing artificial spawning grounds we can achieve a rise in productivity. On the territory of fisheries in Bukhara region, it is necessary to organize incubation workshops and carry out fish breeding based on biotechnology.

References

1. A.R. Rayimov, M.M. Turaev, J. of Survey in Fisheries Sci. Canadian Fishery Dept., pp. 916-922 (2023)
2. M.M. Toraev, A.R. Rayimov, M.A. Rustamova, *Bioecological features of the fish found in the Red Book of the Republic of Uzbekistan found in Bukhara Region*. Current problems and solutions of preservation of biological diversity in Fergana Valley. Andijan, pp. 163-166 (2022)
3. A.R. Rayimov, R.R. Rahmonov, M.A. Rustamova, *Bioecological characteristics of rare fish included in the Red Book of the Republic of Uzbekistan*. Problems and prospects of fishery development in the conditions of Uzbekistan (Bukhara, 2021)
4. O.A. Kotlyar, Methods of fisheries research (ichthyology). Rybnoe, D.F. (Astrakhan: ASTU, 2004)
5. S. Dadaev, K. Saparov, Zoology of vertebrates (Tashkent, 2019)
6. M.A. Abdullaev, D.U. Urchinov, Commercial fish of the reservoirs of the lower reaches of the river. Zarafshan (T.: Fan, 1989)
7. S.Q. Husenov, D.S. Niyazov, Fishing (Tashkent, 2013)
8. I.M. Mirabdullaev, U.T. Mirzaev, A.R. Kuzmetov, Z.O. Kimsanov, Fish finder of Uzbekistan and neighboring regions (Tashkent: Sano-standard, 2011)
9. Red Book of the Republic of Uzbekistan. Volume 2. (Tashkent, 2019)
10. A.R. Rayimov, H.U. Murodova, Eur. J. of Academic Res., pp.106-111 (2023)