

Fauna and Ecology of Hydrobionts of Zarafshan River Middle Stream Water Ecosystems

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Abstract: For the first time that 23 species of hydrobionts are distributed in the Zarafshan National Nature Park and 16 species are studied in the Ziyovuddin region by us. In the lower part of the Zarafshan river, the number and density of species is less than in the upper part, which is due to the pollution of the waters. *Corbiculina tibetensis* and *C. ferghanensis*, which are widely adapted, are dense in the lower part of the river. The species density of *Colletopterum bactrianum*, *Colletopterum cyreum sogdianum*, *Corbicula cor*, *Corbicula fluminalis*, *Corbicula purpurea*, *Pontastacus leptodactylus* and *Hirudo medicinalis* is found to be low.

Key words: Zarafshan River, Ziyavuddin area, hydrobionts, density, *Colletopterum bactrianum*, *Colletopterum cyreum sogdianum*, *Corbicula cor*, *Corbicula fluminalis*, *Corbicula purpurea*.

Introduction. The inventory and use of biological resources in aquatic ecosystems is a present problem of great importance to humanity. It is especially important to improve the prospects for the use of biological resources and protect them, to further improve the lifestyle of the population, and to use the available resources wisely, especially when the terrestrial part of the Earth is being widely exploited. The sudden change in the ecological situation observed on the globe today is mainly the result of the influence of anthropogenic forces, which affects the bioecological characteristics of the animal world, its distribution, including mollusks and crustaceans, resulting in the loss of their habitats, and its turn, changes the population of common species have been causing the extinction of rare and rare species.

Analysis of literature on the topic. Foreign scientists Froufe, E., Goncalves, D.V.,(2010), Teixeira, A., Sousa, R.,(2011), James H.,(2011), Alanp C.,(1991), Huber M.,(2010), Bogan A.,(2010) Maria H., Graf, D.,(2011) Cummings. K., Klishko.O, (2012,) Lopez-Lima. M., Froufe. E.,(2013)., Vasiliev. L, (2018) conducted researches on systematics, ecology and utilization of bivalves, gastropods, crustaceans and leeches.

On the assessment of the biological diversity, taxonomic structure, density, population status of hydrobionts in the territory of the Commonwealth of Independent States, importance of hydrobionts in determining the level of water pollution can be seen in researches by Bogatov V.V., Starobogatov

Ya.I. (2004), Bogatov V.V. (2014), Andreev N.I. (2009), Alyokhina G.P. (2007), Panov V.F., et. al. (2009), Son M.O. (2009), Yanovich L.N. (2013), Rijnashvili A.L. (2009), Sinyurina A.V., Bigaliev A.B. (2009), Kuzmenkin D.V. (2015). Information about bivalves and gastropods of aquatic ecosystems in Uzbekistan is reflected in the researches by Izzatullaev (1992, 2019, 2021), Kh.T. Boymurodov (2009, 2015, 2019, 2021), in it can be found only information about hydrabiont species in some water bodies of Uzbekistan [3,6,7,8,9,10]. the distribution of hydrobiont fauna and ecology of Middle Zarafshan water ecosystems has not been specially studied up to now.

Research methodology. For research, the materials were collected from the water ecosystems of Middle Zarafshan in the spring, summer and autumn of 2017-2022. A total of 221 samples were studied, including 457 hydrobionts. Hydrobionts from the sediments of the shores of aquatic ecosystems with a steel net, and from underwater were collected with a sieve with a metal mesh barrier. The size of large shells was measured using a caliper, and the size of small shells was measured using an eyepiece micrometer MBS-1. The distribution and populations of hydrobionts in biotopes were studied by the method by Lukanin V.V., Naumov A.D., Fedyakov V.V., 1986., Alykhina G.P., Misetov I.A., Puzakkova M.V., 2007, Z.I. Izzatullaev 2018.

Analysis and results. Zarafshan River - in historical sources, Zarafshan River is included in the literature with names such as Politimet, Namiq, Rudi Mosaf, Rudi Sharg', Kohak River. This river has been called Zarafshan since the 18th century. The length of the river is more than 781 km, the basin area is 41680 km², the mountainous part of the basin is 17710 km². The Zarafshan river begins with the name Mastchokhdarya from the Zarafshan glacier in the Kok suv (Blue Water) mountain node at the junction of the Turkestan, Zarafshan and Oloy ridges, and after flowing for about 200 km, it joins the Mastchokh and Fondaryo to form the Zarafshan river.

The Zarafshan River divides into two large branches in the territory of Samarkand region - Akhdarya and Karadarya. We conducted continuous surveys for research in two areas, in the Zarafshan National Nature Park area of the Zarafshan River and in the Ziyavuddin area of the Zarafshan River. We studied that the territory of the Zarafshan National Nature Park of the Zarafshan River is located at an average height of 760 meters above the ocean level. As a result of our research, 23 species of hydrabionts belonging to the families *Unionidae*, *Corbiculidae*, *Beelgrandiellidae*, *Lymnaeidae*, *Physidae*, *Planorbidae*, *Pontastacus*, and *Hirudinidae* are distributed in the Zarafshan River, 9 species of bivalve mollusks and 2 subspecies, 10 species of gastropod mollusks, 1 species of shrimps and leeches are distributed in Zarafshan River. (Table 1, Figure 1).

In swampy biotopes of the Zarafshan River in the territory of the Zarafshan National Nature Park, the species *Sinanodonta gibba*, *S. orbicularis* and *S. puerorum* from the genus *Sinanodonta* of the family *Unionidae* of the bivalve mollusks are distributed at depths of 0.5-2.3 meters, on average 1.2-1.8 per 1 m² in scattered biotopes. Among these mollusks, all species of Chinese toothless were also collected from the waters near Toyloq and Jomboy. They are shown for the first time for the malacofauna of the Zarafshan River. Chinese toothless fish are distributed in the reservoirs of the Zarafshan fishery of the river bank. They came to this area as a result of acclimatization of Chinese complex fishes: white carp, carp. That's why the larvae of Chinese toothless glochidia are parasitic in these fish. Along with live mollusks, their empty shells are also found in the river.

Colletopterum bactrianum 0.4, *C. cyreum sogdianum* 0.9, and *Colletopterum ponderosum volgense* 0.6, included in the "Red Book", were studied in fish farms, ponds and slow-flowing parts of the river. Among these, the latter is more numerous, total mollusks are found in abundance in muddy parts of the river, where macrophytes and reeds grow a lot. Here they live at depths of 0.2-2.5 m, sometimes they can be found in sandy areas. In rocky and sandy biotopes, *Corbicula cor* 0.4, *C. fluminalis* 0.9, *C. purpurea* 0.7, *Corbiculina tibetensis* 1.8 and *C. ferghanensis* 1.7 are distributed. These species are distinguished by their density compared to other species. Gastropod aquatic mollusks in the water

ecosystems of Zarafshan National Park *Martensamnicola brevicula* 1.2, *M. hissarica* 1.1, *B. bucharica* 0.9, *Lymnaea stagnalis* 0.7, *L. truncatula* 1.2, *L. thiessea* 1.1, *L. oblonga* 1.0, *L. subangulata* 0.9, *L. auricularia* 1.3 biotopes from *Martensamnicola* seed of Beelgrandiellidae were studied.

Table 1. Distribution and ecological groups of hydrobionts in biotopes in Middle Zarafshan rivers (n= 10, m²/piece)

№	Types	Zarafshan river		Biotops			Ecological groups
		Area of Zarafshan National Nature Park	Ziyaddin area	rocky lands	sand lands	clays	
	Bivalve molluscs (Bivalvia) class Unionidae family						
1	<i>Sinanodonta gibba</i>	1,8±0,3	1,2±0,1	-	-	+	Peloreophil
2	<i>Sinanodonta puerorum</i>	1,4±0,2	1,0±0,1	-	+	-	Peloreophil
3	<i>Sinanodonta orbicularis</i>	1,2±0,3	0,9±0,1	-	-	+	Peloreophil
4	<i>Colletopterum bactrianum</i>	0,4±0,1	-	-	-	+	Rheophile
5	<i>Colletopterum cyreum sogdianum</i>	0,9±0,1	-	-	-	+	Rheophile
6	<i>Colletopterum ponderosum volgensis</i>	0,6±0,1	0,4±0,1	-	+	-	Pelolimnophile
	Corbiculidae оиласи						
7	<i>Corbicula cor</i>	0,4±0,1	-	-	+	-	Peloreophil
8	<i>Corbicula fluminalis</i>	0,9±0,1	-	-	+	-	Peloreophil
9	<i>Corbicula purpurea</i>	0,7±0,1	0,4±0,1	-	+	-	Peloreophil
10	<i>Corbiculina tibetensis</i>	1,8±0,2	1,2±0,2	+	-	-	Peloreophil
11	<i>Corbiculina ferghanensis</i>	1,7±0,3	1,6±0,3	-	+	-	Peloreophil
	Spieces of Gastropoda mollusks from Beelgrandiellidae family						
12	<i>Martensamnicola brevicula</i>	1,2±0,3	0,9±0,1	+	-	-	Crenophyllum
13	<i>Martensamnicola hissarica</i>	1,1±0,3	-	-	+	-	Peloreophil
14	<i>Bucharamnicola bucharica</i>	0,9±0,2	0,6±0,1	-	+	-	Peloreophil
	Lymnaeidae оиласи						
15	<i>Lymnaea stagnalis</i>	0,7±0,1	-	+	-	-	Phytophil
16	<i>Lymnaea truncatula</i>	1,2±0,2	0,8±0,1	-	-	+	Telmatophile
17	<i>Lymnaea thiessea</i>	1,1±0,3	-	-	-	+	Rheophile
18	<i>Lymnaea oblonga</i>	1,0±0,3	0,6±0,1	-	+	-	Phytophil
19	<i>Lymnaea subangulata</i>	0,9±0,1	-	-	-	+	Phytophil
20	<i>Lymnaea auricularia</i>	1,3±0,3	1,1±0,1	-	-	+	Phytophil
21	<i>Lymnaea bactriana</i>	-	0,5±0,1	-	+	-	Phytophil
	Planorbidae оиласи						Phytophil
22	<i>Planorbis planorbis</i>	-	1,2±0,2	-	-	+	Phytophil
23	<i>Planorbis tangitarensis</i>	1,3±0,1	1,3±0,1	-	-	+	Phytophil
	Spices of Crustacea from Pontastacus family						
24	<i>Pontastacus leptodactylus</i>	0,9±0,1	1,0±0,1	-	+	-	Phytophil
	Spices of Hirudinea from Hirudinidae Family						
25	<i>Hirudo medicinalis</i>	0,5±0,1	-	-	+	-	Phytophil
	Total number of types	23	16	3	13	11	

Additionally, *Planorbis tangitarensis* 1.3 from *Planorbis* family, *Pontastacus leptodactylus* 0.9 from crabs, and *Hirudo medicinalis* 0.5 from leeches are distributed (Fig. 2).

The low water purity and mineralization level of water ecosystems of the Zarafshon River in the Zarafshon National Nature Park had an impact on the biological diversity of hydrabionts, and we studied that 23 species are distributed in this area. 16 types of hydrobionts are distributed in the Ziyovuddin area of the Zarafshan river at an altitude of 413 meters, coordinates N 40.014698542542945 and E 65.93805313110353. We studied that 6 types of bivalve mollusks and 1 subspecies, 8 types of gastropod mollusks are distributed (Figure 1).

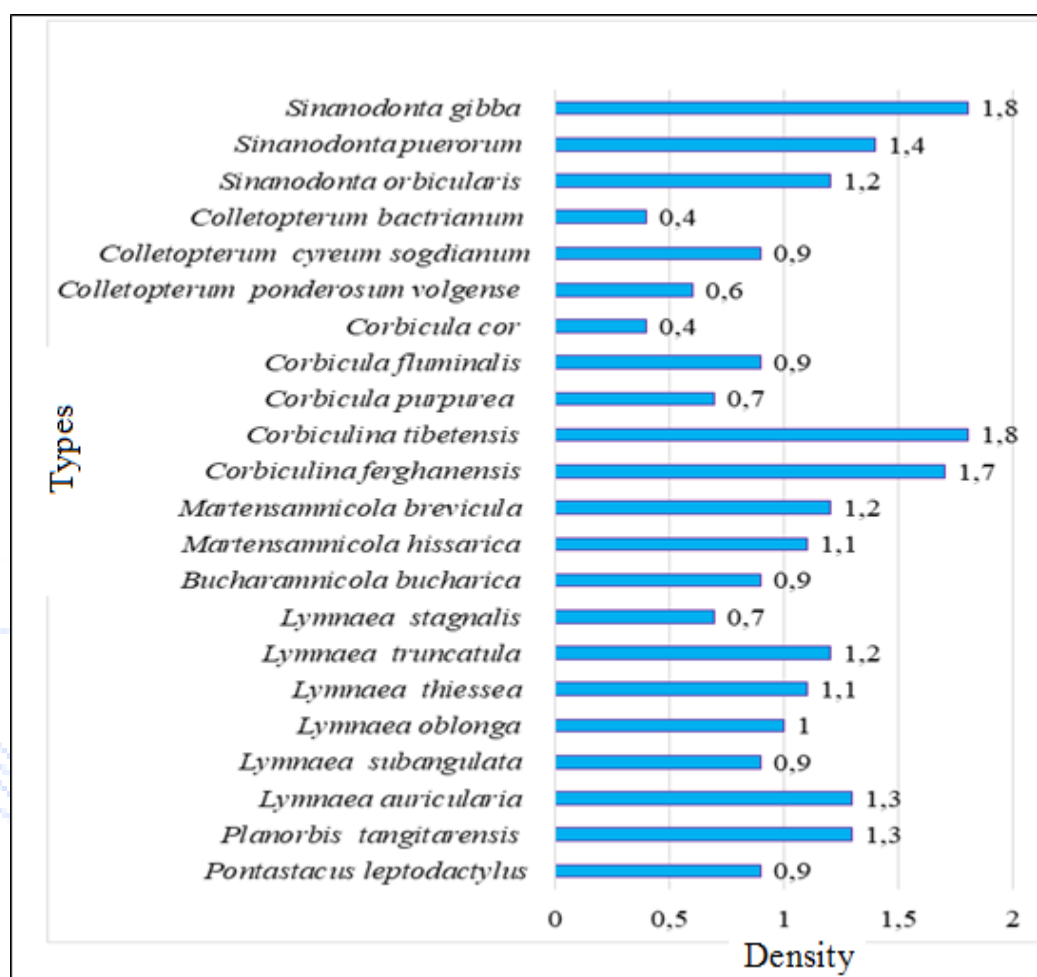


Figure 1. Distribution of hydrobionts in Zarafshan National Nature Park.

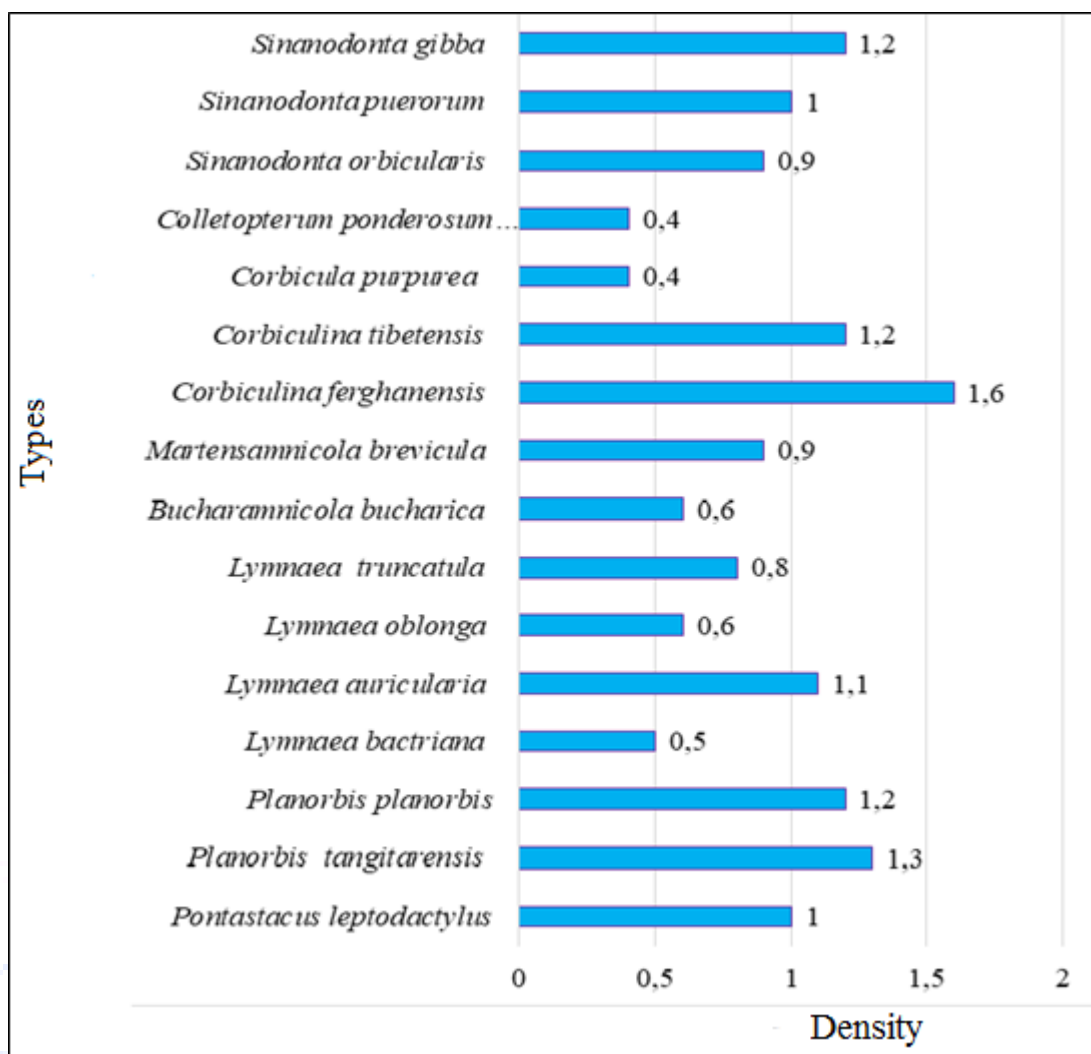


Figure 2. Distribution of hydrobionts in the Ziyavuddin region of the Zarafshan River.

In the swampy biotopes of the right and left banks of the river and in the waters of the fishing industry, at an average depth of 0.3-1.9 meters, on the muddy ground, in 1 m², *Sinanodonta gibba* from the family of *Unionidae* 1.2, *S. orbicularis* 0.9, *S. puerorum* 1.0 and *Colletopterum ponderosum volgense* 0.4 Spread out of 4. *Colletopterum bactrianum* and *C. cyreum sogdianum* were not found in the waters of this area.

In the rocky and sandy biotopes of the river, *Corbicula purpurea* 0.4 from the *Corbiculidae* family, *Corbiculina tibetensis* 1.2 from the *Corbiculina* genus, and *C. ferghanensis* 1.6 are found. In the waters of this region, the genus *Corbiculina* is distinguished by the number and density of species. Among the gastropod aquatic mollusks of the area, *Martensamnicola brevicula* from the *Beelgrandiellidae* family 0.9, *Bucharamnicola bucharica* 0.6, *Lymnaea truncatula* from the *Lymnaeidae* family 0.8, *L. oblonga* 0.6, *L. auricularia* 1.1, *L. bactriana* 0.5, *Planorbis planorbis*, 1.2, *P. tangitarensis* 1.3 from *Planorbidae* family distribution were studied.

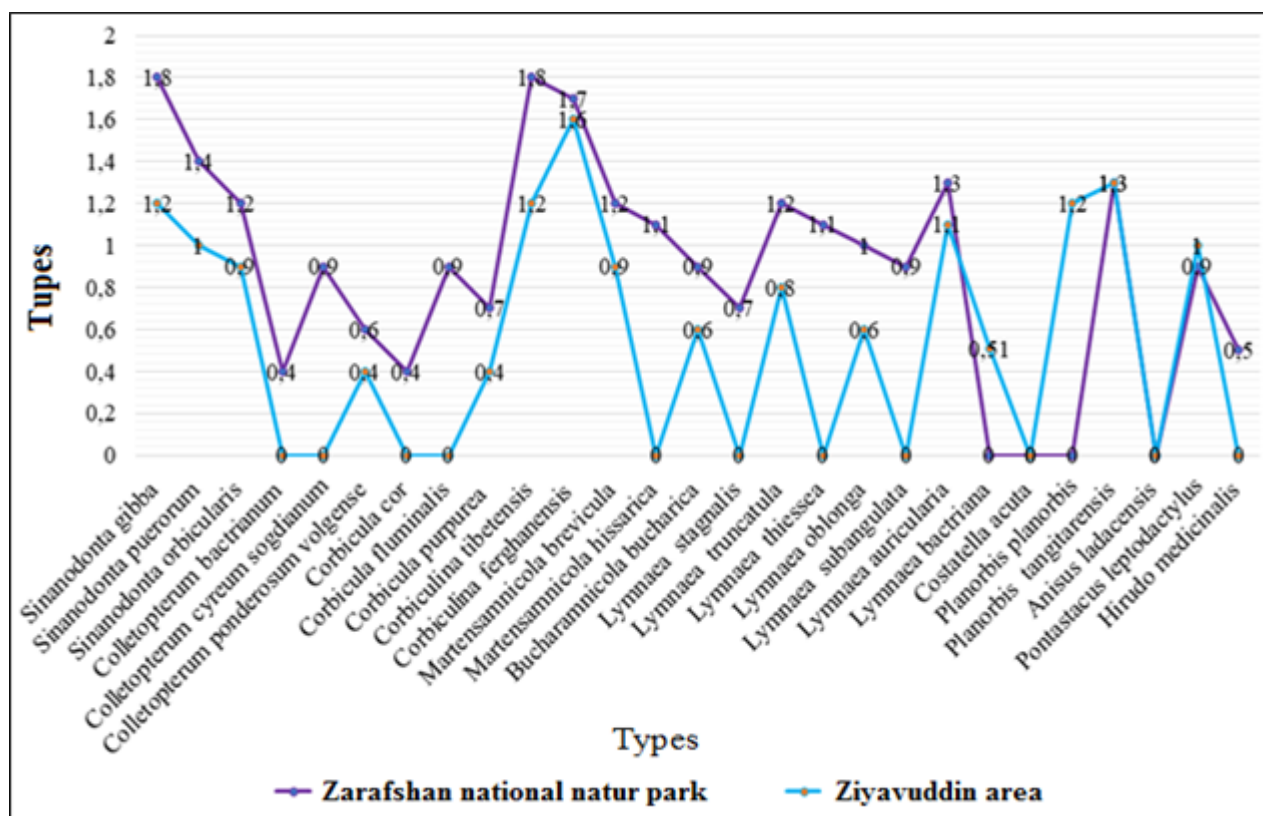


Figure 3. Differences in the distribution density of hydrobionts in the Zarafshan River Zarafshan National Nature Park and Ziyovuddin

In the riverbanks of the river's tidal flat channels and fish farms, the *Pontastacus* family of crabs *Pontastacus leptodactylus* is distributed from 1.0 to 1.0 and falls in large numbers to the fishermen during fishing (Fig. 2). Hydrobionts play a major role in the aquatic ecosystems of the study area. First, they are food for fish and birds, on the other hand, they play an important role in cleaning water polluted with organic substances, and their presence is an indicator of water purity.

According to the ecological groups of hydrobionts distributed in the Zarafshon River according to their habitat, 9 types of peloreophiles 39.5%, 2 types of rheophiles 9%, 1 type of pelolimnophiles 4%, 1 type of crenophiles 4%, 8 types of phytophiles 35.5%, 1 type of telmotophiles 4% and 1 type of phytophiles is 4% are analyzed. Species belonging to the peloreophile and phytophile ecological groups dominate riverside water ecosystems. We found out that the eurybiont species that are widely adapted to the factors of the water environment include *Sinanodonta*, *Corbiculina* and *Lymnaea* genera species. The distribution density of these species ranges from 1.1 to 1.8 per 1 m². The genera *Colletopterum* and *Bucharamnicola* are considered to be stenabiont species distributed in small areas with low density.

Conclusion. The distribution of 23 types of hydrobionts in the Zarafshan National Nature Park and 16 species in the Ziyovuddin region were analyzed. The number and density of species in the lower part of the Zarafshan River is lower than in the upper part, due to the pollution of the waters. In the lower part of the river, the density of *Corbiculina tibetensis* and *C. ferghanensis*, which can adapt to a wide range, is high. It was studied that the density of *Colletopterum bactrianum*, *Colletopterum cyreum sogdianum*, *Corbicula cor*, *Corbicula fluminalis*, *Corbicula purpurea*, *Pontastacus leptodactylus* and *Hirudo medicinalis* species included in the "Red Book" of Uzbekistan is relatively low.

REFERENCES

1. Boymurodov Husniddin* and Jabborova Tozagul. The Fauna and Ecological Groups of Bivalve Mollusks of Kamashi and Karabakh Reservoirs. International Journal of Current Microbiology and Applied Sciences ISSN: 2319-7706 Volume 9 Number 11 (2020). 3476-3480.
2. Kh. Boymurodov, Z. Izzatullaev, A. Egamkulov, B. Otakulov. Current Status of the Colletopterum bactrianum Rolle 1897 Population in the Uzbekistan Reservoirs. January 2020. Bulletin of Science and Practice 6(1):28-34.
3. Boymurodov H., Turekhanov F., Jalilov F. Influence of water environment factors on density and distribution of two-phase mollusk families Unionidae and Corbiculidae and Kattakurganskiy water feeders. theoretical and practical fundamentals of scientific progress and modern society. Collection statey. Mejdunarodnoy scientific and practical conference. October 10, 2020 5-7.
4. Boymurodov Kh., Izzatullaev Z., Otaqulov B., Egamkulov A., Hojiev M., Bobomuradov Z., Suyarov S. Freshwater Bivalve Mollusks in Artificial Reservoirs of Uzbekistan. International Journal of Current Microbiology and Applied Sciences. ISSN: 2319-7706 Volume 8 Number 12 (2019). 517-521p DOI: <https://doi.org/10.20546/ijcmas.2019.812.259>
5. Izzatullaev Z.I. Mollyuski mollusknodnykh ozer Pamir, ix rasprostranenie, voprosy isikhojdeniya and zoogeograficheskie svyazi dannoy fauna. Lake Eurasia: problems and solutions. Materialy 1 – y Mejdunarodnoy conference (September 11-15, 2017). Petrozavodsk, 2017. p. 501 – 505.
6. Izzatullaev Z.I., Stadnichenko A.P., Yanovich L.N. Complex response of the surface - active tissues (PAV) to the temperature regime and sertsebieenie Sinanodonta woodiana (Mollusca, Bivalvia, Unionidae). Scientific Bulletin. Biology, 2017, issue 5. - C. 157-161.
7. Izzatullaev Z.I. Itogi and perspective study of the fauna of mollusks in Central Asia// Aktualnye voprosy malakologii. November 1-3, 2017 Belgorod, 2017.S. 14-19.
8. Izzatullaev Z.I. Molluski vodnykh ecosystem Sredney Asia. Monograph. Tashkent: "LESSON PRESS". 2018. 230 p.
9. Izzatulayev Z.I., Kudratov J.A. Species composition, origin and economic 2018, significance of the Nurata mountain range (Uzbekistan)// European science review. (Austria), №3-4. – P. 36-39.
10. Izzatullaev Z.I. Itogi izucheniya faunisticheskogo spektra vodnyx mollyuskov Sredney Azii// Biologichni doslidjennya - 2018. Zbirnik naukovikh prats. Zhitomir. - 2018. PP "Ruta", -P. 117-120.