POPULATIONS OF CORBICULA FLUMINALIS IN WATER ECOSYSTEMS OF UZBEKISTAN

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Abstract. *The purpose of the study is the current state of Corbicula fluminalis populations distributed in the reservoirs of Uzbekistan consists of teaching malacalogical, ecological research methods and the method of comparative analysis. The aim of the study is to determine the faunal composition of Corbicula fluminalis bivalves in the reservoirs of Uzbekistan and to assess the prospects for their use. Corbicula fluminalis. Status. 2 (VU:D): Weak, shrinking appearance. The state of the C. fluminalis population in the reservoirs of Uzbekistan is the following: P1. Ferghana population of the Syr Darya: 2 – 43%, p=2.6; 3 – 37%, p=2.2; 4 – 20%, p=1.2. P2. Syrdarya population of Syrdarya: 2 – 41%, p=2.8; 3 – 43%, p=2.5; 4 – 16%, p=1.1. P3. Average Zarafshan: 2 – 44%, p=3.3; 3 – 39%, p=2.9; 4 – 17%, p=1.3. P4. Middle Kashkadarya: 2 – 44%, p=2.9; 3 – 38%, p=2.5; 4 – 18%, p= 1.2. P5. Middle Amu Darya: 2 – 40%, ρ=2,4; 3 – 45%, ρ=2,7; 4 – 5%, ρ=0,9. Indicators of the age ratio of the C. fluminalis population are observed in populations distributed in the territory of the Fergana region of the Syrdarya basin, Middle Zarafshan and Middle Kashkadarya.*

Conclusion In all studied populations of Corbicula fluminalis (Müller, 1774); body parameters (shell length, height, swelling) linearly increase with the age of mollusks. Similar to other members of the Corbicula genus, the active period of the organism's indicators corresponds to the age of 2-3 years. After the age of 4, they grow very slowly. It should be noted that in the population of Syrdarya region of Syrdarya and Middle Amudarya, shell size does not change after 3 years of age. The smallest biomass of the species in the population corresponds to the contribution of 2-year-old individuals, in which their mass is 59-75 g. but they have the highest density in it during this period. The highest biomass corresponds to the share of 3-year-old individuals of the species in the population.

Keywords: *populations, Corbicula fluminalis, organism indicators, shell length, height, convexity, age of mollusks.*

Introduction. The rational use of biological objects is successful only when the user (human) has the opportunity to describe the factors affecting them. Based on such predictions, specific environmental situations can be manipulated to achieve practical results. Today, the population is considered as the basis of the unit of use of biological resources. At this point, the main tool of biosystems management is considered quality population-biological analyzes and documentation of demographic trends obtained on their basis [4,5]. This is key to assessing the status and specific adaptation strategies of the species being studied, and provides information on whether the species' range is shrinking or stagnating or expanding [2,3].

Bivalve molluscs are considered the main component of benthos organisms in freshwater ponds. Their population has a high ecological plasticity, due to which they have the ability to spread over a wide range even in permanent hydrotopes of different anthropogenic levels. During the last 10 years, anthropopression has largely determined the structure of mollusk population groups. Today, the depletion and pollution of fresh water resources on land require obtaining information about the demographic (population) trend of mollusks in freshwater basins [6,7, 15, 17, 18].

For example, among extinct mollusk species in Europe, which has the highest diversity of freshwater molluscs in the world, it can be said that many species have declined in the last 10-30 years. In the 1980s alone, severe environmental pollution in the Balkans and Western Europe caused the number of species there to drop dramatically from the 1920s to 1960s [1,4, 24,26,28].

Studying the current state of freshwater mollusks, particularly bivalve mollusk populations, evaluating the factors affecting them, and developing protection measures accordingly are among the most urgent problems of biodiversity conservation. It should be noted that today there is no information on the variability of the majority of freshwater mollusk populations (82.6%) in the world, which limits the possibilities of obtaining objective information about the modern state of mollusk populations and carrying out their conservation. Here, according to data, freshwater mollusk populations have decreased by 10.6%, 6.3% are stable, and only 0.5% are expanding [2,3].

Regional species composition and distribution of bivalve mollusks, including hydrabionts were carried out scientific works on their protection by foreign scientists J.H. Thorp., A. Covich (1991), D.C. Aldridge (1999), P. Bouchet (2017), H. Marcus (2010), A.F. Bogan (2010), A.Cuttelod., M. Seddon., E. Neubert. (2011), M. Haws (2002), N.F. Conducted by Mamangkey (2009), [3,4].

In CIS countries, V.V. Bogatov, Ya.I. Starobogatov (2004), V.V. Bogatov (2014), N.I. Andreev., S.I.Andreeva., A.N.Krasnogorova (2009), G.P. Alyokhina I.A.Misetov.. M.V.Puzakova (2007), M.O. Son (2009), L.N. Yanovich (2013), A.L. Rijinashvili (2009), A.V. Sintyurina, A.B. Bigaliev (2009), D.V. Kuzmenkin (2015) [5,4]. studied.

Z.I. Izzatullaev (1992,2002), H.T. Boymurodov (2017, 2022), A.N. Egamkulov (2021) H. Boymurodov, Kh. Jabborov, T. Jabbarova, B. Aliyev, O. Mirzamurodov, A. Egamkulov, (2022). conducted research in Uzbekistan.

Materials and learning methods. The study of the modern condition state of *Corbicula fluminalis* populations distributed in the water bodies of Uzbekistan and the collection of materials began in 2014. The modern status, inter-biotope distribution and importance of *Corbicula fluminalis* populations distributed in the water bodies of Uzbekistan were not sufficiently comprehensively studied up to now. Materials for research were conducted in the spring, summer and autumn seasons of 2014-2022.

A total of 62 samples were studied, including 216 mollusks. These mollusk samples are large systematic works, in the identifiers Rizhinashvili, 2009, Starobogatov, Izzatullaev, 1985, Izzatullaev, Boymurodova, 2009, Izzatullaev, 2019. were studied according to mentioned the methods.

Results of the study and their discussion. In the course of research, the population indicators of endemic and rare bivalve mollusks (like: *Colletopterum bastrianum, Colletopterum cyreum sogdianum, Colletopterum kokandicum, Corbicula cor, Corbicula purpurea, Corbicula fluminalis*) listed in the "Red Book" were studied and evaluated. The fact that 50% (6 species) of

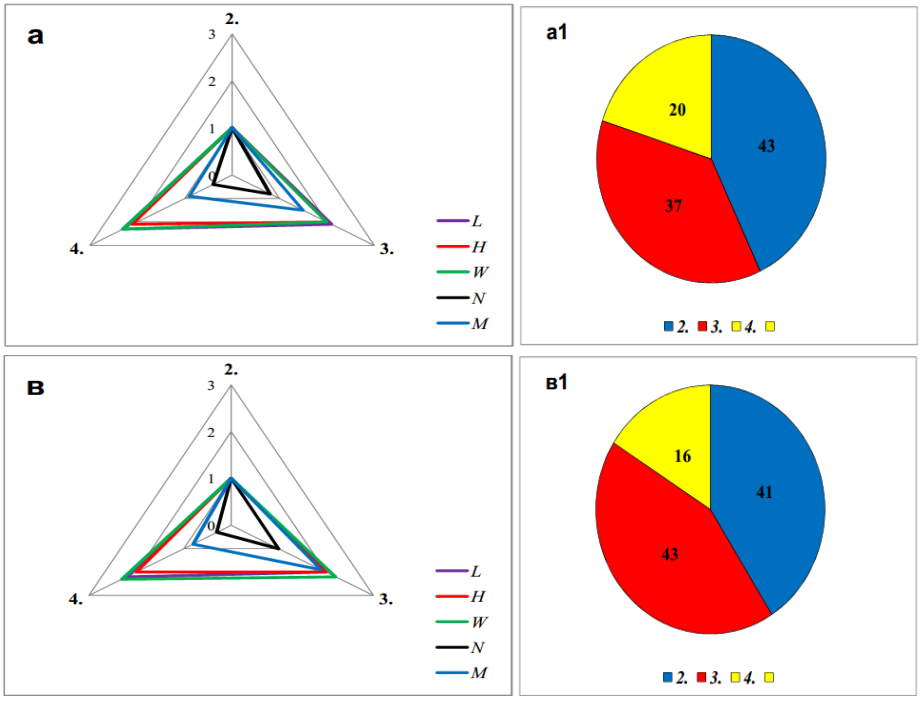
12 types of bivalve mollusks found in the water bodies of Uzbekistan are listed in the "Red Book" indicates the need to obtain information on the current state of their populations. Information on the status of populations of *Corbicula fluminalis* included in the “Red Book” of the Republic of Uzbekistan is given below.

Corbicula fluminalis is a vulnerable, declining species (Status. 2 (VU:D)), distributed in the Zarafshan River of Uzbekistan. Apart from Uzbekistan, it is found in the territories of Turkmenistan, Azerbaijan, Iran, Syria and Israel. The number has sharply decreased in the following decades, it has the properties of water purification [5].

As a result of research, it was found that the species is distributed in Syrdarya, Kashkadarya and Amudarya, except for Zarafshan. Below is data on the current status of large populations of *Corbicula fluminalis* in Fergana and Syrdarya regions, Middle Zarafshan, Middle Kashkadarya and Middle Amudarya regions of the Syrdarya.

P₁. The largest population of the species in Fergana region of Syrdarya is located in Khojaabad region of Namangan (N40°50'34.46 “E71°08'40.75”). It was found that 2-year-old individuals make up 43% of the population, their density is higher than that of other individuals (2.6) (L-10, H-11, W-9.0). The share of 3-year-old individuals in the population is equal to 37% (density - 2.2, shell sizes - L-21, H-23, W-18). The share of 4-year-old individuals of the species in the population is 20%, and the density is 1.2 (L-23, H-24, W-21).

P₂. The population of *Corbicula fluminalis* in the Syrdarya region (N40°55'11.63 “E68°40'36.85”) differs from the population of Fergana. The population has a higher density of 3-year-old individuals than 2-year-old individuals. In this case, the share of 3-year-old individuals in the population is 43%, the density is equal to 2.5 (L-20, H-22, W-18). 2-year-old individuals make up 41% of the population, and the density reaches 2.8 (L-10, H-11, W-8.0). The share of 4-year-old individuals is 16%, the density is 1.1 (L-22, H-23, W-19) (Fig. 1).



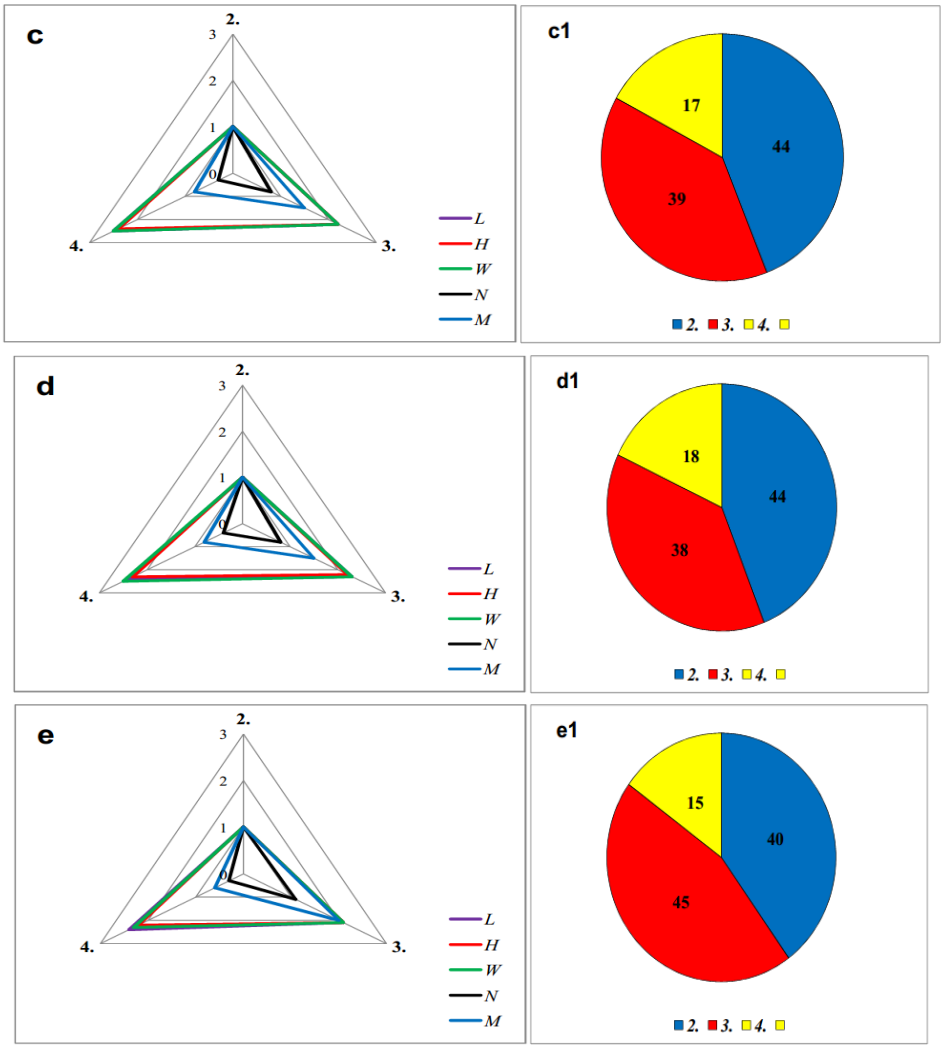


Figure 1. Indicators of Corbicula fluminalis populations
a – Syrdarya – territory of Fergana region, b– Syrdarya – territory of Syrdarya region, c – Middle Zarafshan, d – Middle Kashkadarya, e – Middle Amudarya; 1 – distribution of population age indicators in the basin (%); L – shell length, H – shell height, W – shell convexity; N – density, M – mass. Source: [compiled by the authors].

P3. The population of *Corbicula fluminalis* in the Middle Zarafshan region (N39°53'45.40 "E66°27'06.38") is ahead of the populations in the rest of the water bodies in terms of organism and population indicators. 2-year-old individuals are 44% of the population, density is 3.3 (L-9, H-10, W-8.0). In the next place are 3-year-old individuals, the share is 39%, the density is equal to 2.9 (L-20, H-22, W-18).The share of 4-year-old individuals reaches 17%(density 1.3,L-23,H-24,W-20).

P4. The Middle Kashkadarya population of this species (N38°51'49.46 " E65°54'40.78") ranks second after Middle Zarafshan. In this population, young individuals (2) make up 44% of the population, the density is higher than that of the remaining individuals (2.9) (L-9.0, H-9.8, W-7.9). The share of 3-year-old individuals in the population is 38% and the density is 2.5 (L-21, H-22, W-18). The share of 4-year-old individuals of the species in the population is 18%, the density reaches 1.2 (L-22, H-23, W-20).

P5. Small indicators of *Corbicula fluminalis* population are seen in the population of Middle Amudarya region (N37°12'24.99" E67°18'32.69") and its indicators are similar to the population of Syrdarya region of Syrdarya. In particular, the share of 3-year-old individuals in the

population is high - 45% (density - 2.7, L-19, H-21, W-17). 2-year-old individuals are 40% of the population, the density is 2.4 (L-9, H-10, W-86). The share of 4-year-old individuals is 15%, and the density is 0.9 (L-22, H-22, W-19).

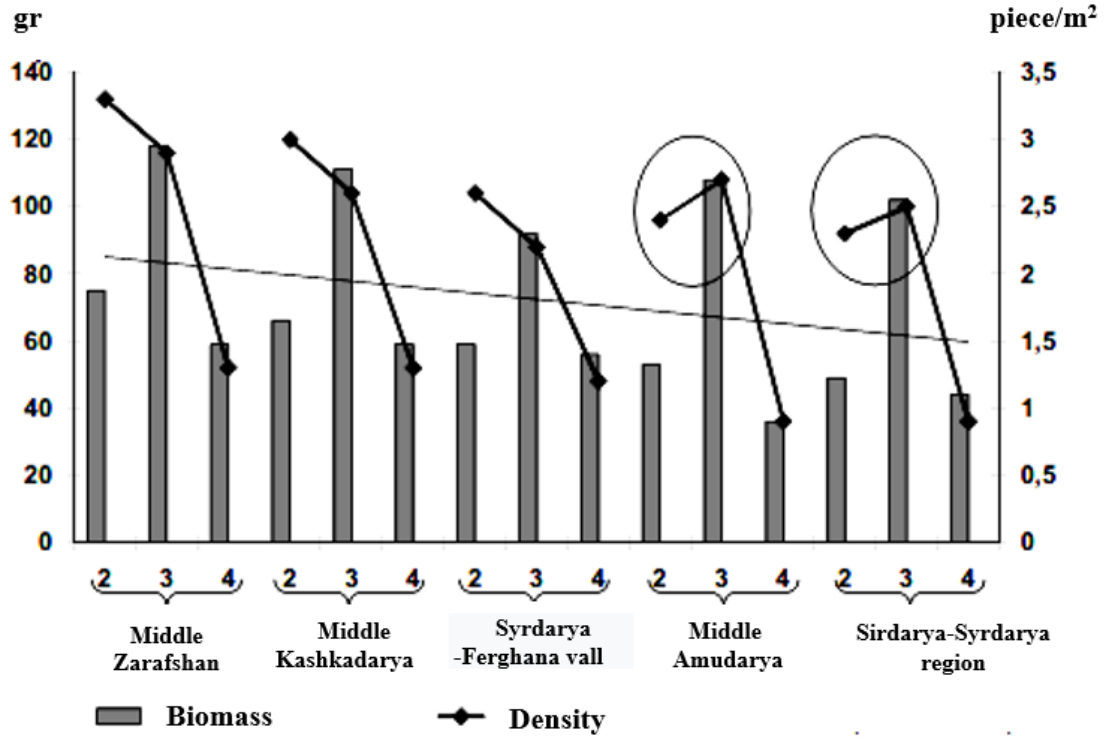


Figure 2. Status of biomass and densities of Corbicula fluminalis in water bodies of Uzbekistan. Source: [compiled by the authors].

In all studied populations of *Corbicula fluminalis*, body parameters (shell length, height, swelling) linearly increase with the age of mollusks. Similar to other members of the Corbicula genus, the active period of the organism's indicators corresponds to the age of 2-3 years. After the age of 4, they grow very slowly. It should be noted that in the population of Syrdarya region of Syrdarya and Middle Amudarya, shell size does not change after age of 3. The smallest biomass of the species in the population corresponds to the contribution of 2-year-old individuals, in which their mass is 59-75 g. but they have the highest density in it during this period. The highest biomass corresponds to the share of 3-year-old individuals of the species in the population (92-118 g).

Discussion

Conclusion. *Corbicula fluminalis* population decline in age indicators was observed in its populations scattered in Fergana region, Middle Zarafshan and Middle Kashkadarya region of Syrdarya. The density of juvenile (2+) individuals in the populations of the Middle Amudarya and Syrdarya regions of the Syrdarya region is lower than that of middle (3+) age individuals, indicating a low self-recovery process in the population (Fig. 2). This can be explained by the fact that the amount of muddy discharge in these river areas negatively affects the growth and development of young individuals.

REFERENCES

1. 1.Алимов А.Ф. 1965. Фильтрационная спасобность рода Sphaerium (Scopoli)// Доклады АН СССР. Т. 164, №1-3. С.185-197.

2. 2.Алимов А.Ф. 1981. Функциональная экология пресноводных двустворчатых моллюсков. Л.: Наука. 343 с.
3. James H.Thorp., Alanp Covich. Ecology and Classification of lVorth merican Fresh water in vertebrates // Academic Press, Inc. Harcourt Brace Jovanovich, Publishers San Diego. – New York-Boston-London-Sydney-Tokyo-Toronto, 1991; 4.Aldridge DC. The morphology, growth and reproduction of Unionidae (Bivalvia) in fenland waterway. *J. Moll Stud*, 1999. 65:47-60. http://dx.doi.org/10.1093/mollus/65. 1.47;
4. 5.Bouchet P. Inventorying the molluscan fauna of the world: how far to go? In: K. Jordaens, N. van, 2007. – P.180;
5. 6.Huber Markus. Compendium of Bivalves. A Full-color Guide to 3, 300 of the Worlds Marine Bivalves. A Status on Bivalvia after 250 Years of Research. – Conch Books, 2010. P. 23;
6. Bogan A.E. Mollusca Bivalvia. Freshwater Animal Diversity Assessment Project (FADA). Belgian Biodiversity Platform. 2010. P.220;
7. 8.Annabelle Cuttelod, Mary Seddon and Eike Neubert. European Red List of Non-marine Molluscs. – Luxembourg: Publications Office of the European Union, 2011. 98 p.
8. Maria Haws. The Basics of Pearl Farming: A Layman's Manual. Center for Tropical and Subtropical Aquaculture Publication No. 127, 2002;
9. Bogatov V.V., Starobogatov Ya.I. Genus *Corbicula* in the Amir Reiver (Bivalvia, Corbiculidae) // *Ruthinica*, 2004, 4(2). – PP. 147 – 150;
10. 11.Bogatov V.V. Comparatory Method and diagnostics of the freshwater large bivalve mollusks (Bivalvia: Unionida) // Abstacts of the cinference Mollusks of the Eastern Asia and Adjacents Seas. – Vladivostok, Russia, 2014. – P.6-12;
11. 12.Андреев Н.И., Андреева С.И., Красногорова А.Н. Изменчивость таксономических признаков двустворчатых моллюсков в условиях загрязнения водоемов // Проблемы экологии. – Омск, 2009. – С.35.
12. 13.Алёхина Г.П. Мисетов И.А. Пузакова М.В. Размерно-возрастная структура популяции двустворчатых моллюсков среднего течения реки Урал и её притоков // Вестник Оренбургского государственного университета, 2007. №75. – С. 18-20;
13. 14.Сон М.О. Моллюски-вселенцы на территории Украины: источники инаправления инвазии // Российский журнал биологических инвазий, 2009. № 2. – С. 37-48;
14. 15.Янович Л.Н. Перловицевые Unionidae Rafinesque, 1820 (Bivalvia) в современных экологических условиях Украины (состояние популяций, особенности половой структуры и размножения, биоценотические связи и фауна): Автореф. ... дисс. докт.биол.наук. – Киев, 2013. – 53 с.
15. Рижинашвили А.Л. Рост, функциональное и биоиндикационное значение популяций перловиц (Bivalvia, Unionidae) в экосистемах водоемов Европейской части России и сопредельных территорий: Автореф. ... дисс. кандидата биол. наук. – Санкт-Петербург, 2009. – 22 с;
16. 17.Синтюрина А.В., Бигалиев А.Б. Особенности аккумуляции радионуклидов гидробионтами и обитателей прибрежной зоны Северо-Каспийского региона // Вестник КазНУ, 2009. – №1 (24). – С. 97-100; 20.

17. 18.Кузменкин Д.В. Эколого-фаунистическая характеристика пресноводных моллюсков бассейна верхней Оби: Автореф. ... дисс. кандидата биол. наук. – Барнаул, 2015. –28 с.
18. 19.Иззатулаев З.И. Водные моллюски Средней Азии – индикатори загрязнения водоемов и водотоков // Гидробиологический журнал,1992.Т.28,–№1.С.85-90;
19. 20.Izzatullaev.Z.I. Results of a study of Bivalve moluscs of Certral Asia // Вестник Житомирского педагогического университета, 2002. – №5. – С.21 23.
20. 21.Иззатуллаев З.И., Старобогатов Я.И. Зоогеографическая характеристика пресноводных моллюсков Средней Азии и вопрос о существовании Нагорноазиатской подобласти Палеарктики // Зоологический журнал, 1985. –№ 4. – С. 506-517.
21. 22.Иззатуллаев З.И., Боймуродов Х.Т. Зарафшон дарёси ҳавзаси иккипаллали моллюскалари. Монография. – Самарқанд, 2009. – Б. 95.
22. 23.Иззатуллаев З.И. Фауна моллюсков водных экосистем Средней Азии и сопредельных территорий. Монография. Тошкент: «LESSON PRESS», 2019. – 420 с.
23. 24.Эгамқулов А.Н. Сурхондарё соҳили сув типларида иккипаллали моллюскалар тарқалишига абиотик омиллар таъсири мавзусидаги биология фанлари бўйича фалсафа доктори (PhD) илмий даражасини олиш тайёрлаган диссертацияси автореферати. – Тошкент, 2021. –Б. 41.
24. 25.Боймуродов Х.Т. 2017. Двустворчатые моллюски (Bivalvia:Unionidae, Corbiculidae) водных бассейнов Узбекистана // Автореф. докторской (DSc) диссертации по биол. наукам. Ташкент. С.29-60.
25. Boymurodov Kh. T. i dr. ISTOChNIKI ZAGRYaZNENIya VODNYX RESURSOV SREDNEGO TECHENIya REKI ZERAVSHAN I TECHNOLOGII VODOPODGOTOVKI //Chemistry, physics, biology, mathematics: teoreticheskie i prikladnye issledovaniya. - 2022. - S. 16-19.
26. H. Boymurodov, Kh. Jabborov, T. Jabbarova, B. Aliyev, O. Mirzamurodov, A. Egamqulov. CHANGES IN THE HABITATS OF THE UNIONIDAE, EUGLESIDAE, PISIDIDAE AND SORBICULIDAE SPECIES WITH THE CONSTRUCTION OF RESERVOIRS IN THE KASHKADARYA BASIN DUE TO CLIMATE CHANGE. Reliability: Theory and Applications ELECTRONIC JOURNAL OF INTERNATIONAL GROUP ON RELIABILITY JOURNAL IS REGISTERED IN THE LIBRARY OF THE U.S. CONGRESS Special Issue 4 (70), November 2022 SPECIAL ISSUE 4 (70) November 2022. P. 343-347.
27. H. Boymurodov. DISTRIBUTION AND ECOLOGICAL GROUPS OF BIVALVE MOLLUSKS OF THE FAMILIES UONIONIDAE AND SORBICULIDAE IN THE AQUATIC ECOSYSTEMS OF THE KYZYLKUM NATURE RESERVE . Reliability: Theory and Applications ELECTRONIC JOURNAL OF INTERNATIONAL GROUP ON RELIABILITY JOURNAL IS REGISTERED IN THE LIBRARY OF THE U.S. CONGRESS Special Issue 4 (70), November 2022 SPECIAL ISSUE 4 (70) November 2022. P. 562-566.