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Research Article

POPULATION INDICATORS OF GIRDOBIONTS. (MIRZACHUL AREA)

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ABSTRACT

Environmental studies of populations of hydrobionts such as Unionidae, Corbiculidae, Beelgrandiellidae, Lymnaeidae, Physidae, Planorbidae, Astacidae, and Haemopidae are mentioned. These organisms play an important role in the processes of self-purification and water quality management of water bodies, helping to ensure the stability of the aquatic ecosystem. The study of their diversity and distribution is directly related to the current state of the environment, especially in the context of climate change and anthropogenic impact. Research is carried out in the Mirzachul area, specifically in the Sirdarya and Sangzor river systems and in the Southern Mirzachul and Dustlik canals. The results show a correlation between water resource status and hydrobiont populations. This is decisive for the management of Water Resources and the conservation of biodiversity.

KEYWORDS

Hydrobiont, Ecological Research, population, ecosystem, water Resources, Biodiversity, dominance, competition, ecological valence, euribiont.

INTRODUCTION

Studies of environmental conditions in populations of hydrobionts such as Unionidae, Corbiculidae, Beelgrandiellidae, Lymnaeidae, Physidae, Planorbidae, Astacidae, and Haemopidae form an important aspect of Ecological Research. These organisms are crucial in maintaining the wellness of aquatic ecosystems by participating in the processes of self-purification and water quality management of water bodi

Introduction. Studies of environmental conditions in populations of hydrobionts such as Unionidae, Corbiculidae, Beelgrandiellidae, Lymnaeidae, Physidae, Planorbidae, Astacidae, and Haemopidae form an important aspect13].

Located in Uzbekistan, Mirzachul is a popular area with various water problems. The water systems of the area include the Syrdarya and Sangzar rivers, Zominsuv

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Sonyi and the Southern Mirzachul and Dustlik canals. These wetlands not only provide important resources for the local flora and fauna, but also serve as a source of water for agriculture and other needs. The characterization of Myrtle's contoured water system allows water resources to be managed to maintain biodiversity and ensure ecosystem stability. The study of aquatic ecosystems, in particular their biodiversity, plays an important role in managing ecological processes and ensuring the sustainability of water systems. Water factors such as water temperature, clarity level, mineralization and dissolved oxygen content have a direct effect on the condition of the hydrobionts population. Since these groups of organisms are sensitive to changes in the physiological and physical parameters of the environment, they control ecological state indicators.

This study aims to determine the correlation between the state of water factors and hydrobionts populations in the Mirzachul coastal region. Water resources in the area are characterized by seasonal variability and specificity of chemical composition, which creates special conditions for the survival and development of hydrobionts. The study of environmental conditions to observe these organisms in myrzachol conditions is important not only to assess the current state of the aquatic ecosystem of the region, but also to predict changes in biodiversity in the context of climatic and anthropogenic impacts.

Thus, this study is aimed at analyzing water factors and their effects on hydrobiont populations in Mirzachol, which allows a deeper understanding of the mechanisms of interaction between ecosystems and their components. This knowledge is necessary for the development of effective strategies for the protection of the environment and the rational use of the resources of the region.

METHODS

Methods for collecting and analyzing data. Field and laboratory methods were used to study external factors affecting hydrobiont populations in myrzachol. Data collection was carried out using traditional methods such as network and water net bag (sachok), set-top captures(trap)dan. These methods made it possible to obtain representative samples of hydrobionts from different water bodies of the region[1,9,11,12,13,14].

Collected hydrobiont samples clarifiers in material picking from the area Plokhinsky, (1970); Rijinashvili, (2005); Starobogatov, Izzatullayev, (1984, 1986, 2018, 2019); Izzatullayev, Baymuradov, (2009, 2019, 2021, 2022) in his monographs, Alexnovich a(2016), Lukin (1976) used his methods cited in the literature and identified by species using morphological features. This makes it possible to accurately determine the taxonomic affiliation of each organism and ensure the accuracy of further analysis.

Mirzachol area distribution and ecological groups of hydrobionts in populations in rivers and canals (n= 10, m2/PCs.

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	Species	Syrdarya river	Zaminsov	Sangzor river	Guralash river	South Mirzachul canal	Dustlik canal	Environmental groups
	Class bivalve molluscs (Bivalvia Family Unionidae							
1	*Sinanodonta gibba*	1,9±0,2	1,3±0,2	1,8±0,2	-	1,6±0,1	-	Peloreophilus
2	*Sinanodonta puerorum*	1,4±0,2	-	1,3±0,2	-	1,7±0,1	0,9±0,1	Peloreofil
3	*Sinanodonta orbicularis*	2,1±0,2	1,1±0,1	1,6±0,1	-	1,8±0,2	1,0±0,1	Peloreofil
4	*Colletopterum bactrianum*	0,7±0,1	-	0,9±0,1	-	0,4±0,1	0,5±0,1	Rheophilus
5	*Colletopterum cyreum sogdianum*	1,3±0,2	1,4±0,2	0,5±0,1	-	0,6±0,1	-	Rheophilus
6	*Colletopterum ponderosum volgense*	1,2±0,2	-	0,8±0,1	-	0,5±0,1	0,7±0,1	Pelolimnofil
	Family Corbiculidae							
7	*Corbicula cor*	0,9±0,1	-	0,7±0,1	-	0,2±0,1	-	Peloreophilus
8	*Corbicula fluminalis*	0,8±0,1	1,1±0,1	0,6±0,1	-	0,7±0,1	0,3±0,1	Peloreophilus
9	*Corbicula purpurea*	0,6±0,1	0,9±0,1	1,1±0,1	-	0,6±0,1	0,8±0,1	Peloreophilus
10	*Corbiculina tibetensis*	1,0±0,1	1,7±0,3	1,1±0,1	1,4±0,2	1,2±0,2	1,3±0,2	Peloreophilus
11	*Corbiculina ferghanensis*	0,9±0,1	1,5±0,2	1,0±0,1	1,6±0,2	1,1±0,1	1,6±0,3	Peloreophilus
	Family Beelgrandiellidae, class							

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	of Crustacean molluscs (Gastropoda							
12	*Martensamnicola brevicula*	-	-	0,7±0,1	0,8±0,1			Phytophilus
13	*Martensamnicola hissarica*	-	0,8±0,1	-	1,1±0,1			Crenophilus
14	*Bucharamnicola bucharica*	-	-	-	0,4±0,1			Crenophilus
	Lymnaeidae family							
15	*Lymnaea stagnalis*	1,2±0,2	0,9±0,1	0,7±0,1	-	0,7±0,1	0,8±0,1	Phytophilus
16	*Lymnaea truncatula*	1,7±0,2	-	-	0,7±0,1	-	-	Telmatophilus
17	*Lymnaea thiessea*	1,3±0,2	-	1,2±0,2	0,6±0,1	-	-	Rheophilus
18	*Lymnaea oblonga*	-	0,7±0,1	0,6±0,1	0,5±0,1	-	-	Phytophilus
19	*Lymnaea subangulata*	-	0,9±0,1	-	-	-	-	Phytophilus
20	*Lymnaea auricularia*	1,9±0,4	1,2±0,2	1,2±0,1	-	0,8±0,2	0,6±0,2	Phytoreophilus
21	*Lymnaea bactriana*	1,2±0,1	1,0±0,1	-	-	-	-	Phytophilus
	Physidae family							
22	*Costatella acuta*	1,4±0,1	0,9±0,1	0,3±0,1	0,4±0,1	0,9±0,1	0,7±0,1	Phytophilus
	Planorbidae family							
23	*Planorbis planorbis*	1,5±0,2	0,9±0,1	0,9±0,1	0,9±0,1	-	-	Phytophilus
24	*Planorbis tangitarensis*	1,6±0,2	1,1±0,2	0,8±0,1	1,1±0,1	0,7±0,2	0,8±0,1	Phytophilus
25	*Anisus ladacensis*	1,1±0,1	-	-	0,8±0,1	-	-	Phytophilus
	Crustacean class (Crustacea Family Astacidae							
26	*Pontastacus leptodactylus*	1,5±0,2	-	1,2±0,1		0,5±0,2	0,6±0,1	Phytophilus
	Zoological genus Hirudinea Family Haemopidae							
27	*Haemopis sanguisuga*	1,4±0,1	1,4±0,1	1,3±0,1		-	0,4±0,1	Phytophilus
		22	**17**	**21**	**13**	**16**	**14**	

Statistical analysis. The data obtained was processed using statistical methods that included the calculation of biodiversity indicators, such as the Shannon index and Simpson index. These indices make it possible to quantitatively assess the biodiversity of ecosystems and the uniform distribution of species [10].

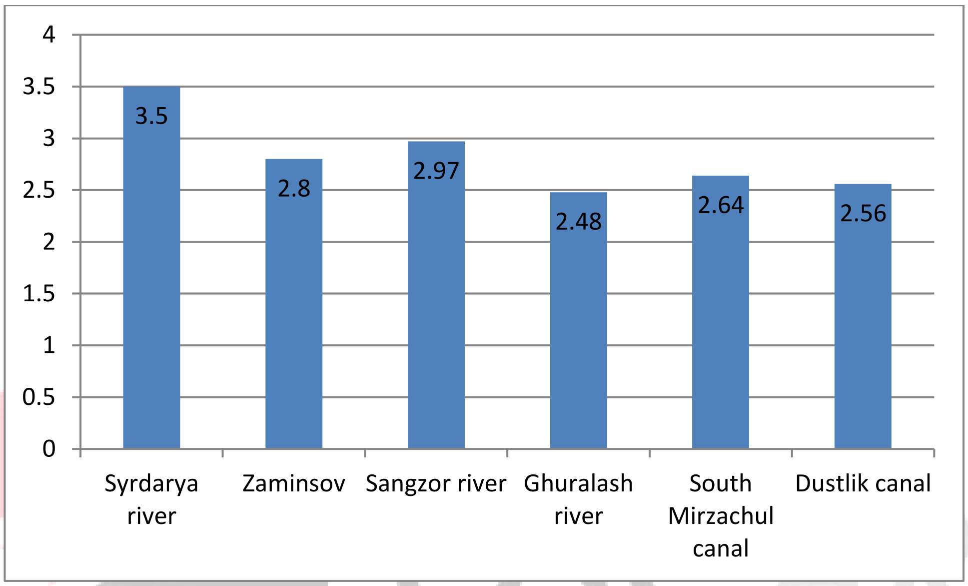

Figure 1.According to the Shannon index. Diversity of populations.

The application of the Shannon and Simpson indices to assess biodiversity is the application of the Shannon (H) and Simpson indices to assess biodiversity and sustainability of an ecosystem. The Shannon Index assesses the breadth of species diversity and their uniform distribution, while the Simpson index shows the probability that two randomly selected individuals belong to different species. These methods allow a detailed assessment of the ecosystems and structural characteristics of hydrobiont populations.

According to the Shennon index, Syrdarya is 2.8 in 3.5 Zuminsuv number in the river, Sangzor is 2.9 in the river, Guralash is 2.4 in the river. the river with a high degree of biodiversity (H'<2.5)-Syrdarya is 3.5 in the river, Sangzor is 2.97 in the river, Zominsuv is 2.8 in the river, South Mirzachul canal is 2.64, Dustlik canal is 2.56 . The average (2.5>H') gurgling river showed 2.48).

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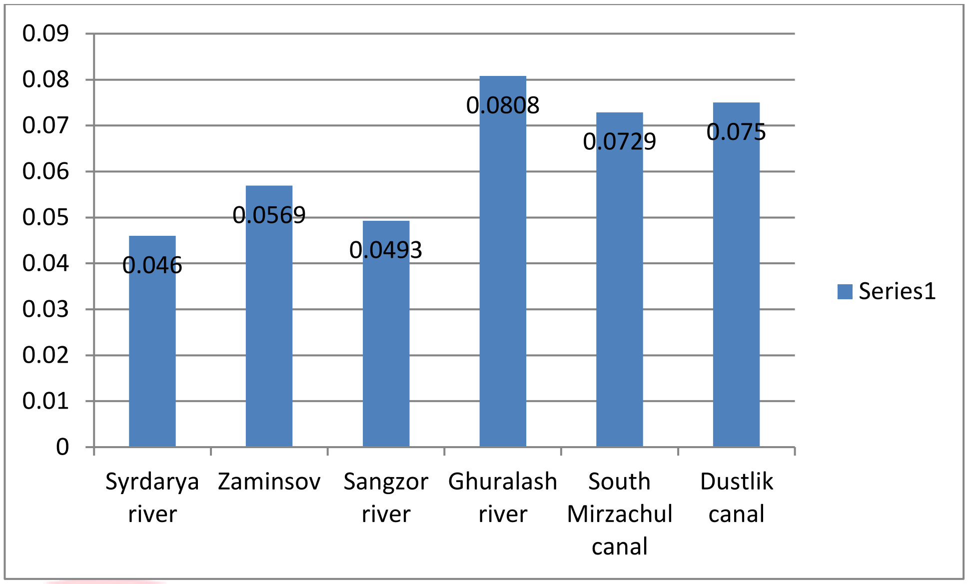

Figure 2. According to the Simpson index. Dominance of populations.

According to the Simpson index: dominance index (1-D), (D = 0.046) can also be used to measure diversity in Mirzachul area rivers from 0 to 1; Syrdarya-0.046, Zominsuv number - 0.0569, Sangzor-0.0493, Guralash-0.0808, South Mirzachul channel-0.729, Dustlik canal - 0.075 species index in rivers.

Assessment of species distribution, richness and average number of populations. Analysis of species distribution and richness involves measuring the number of different hydrobionts and their frequency of occurrence. The average number of species was measured in terms of frequency and total number of occurrences per group. The system of rivers and canals in the mirzachul region provides a variety of microenvironments that contribute to the development of different groups of organisms.

Hydrobiont biodiversity analysis. Hydrobiont analysis covered the study of species in families such as the Myrtle-dwelling Unionidae, Corbiculidae, Beelgrandiellidae, Lymnaeidae, Physidae, Planorbidae, Astacidae, and Haemopidae. These organism groups have different ecological adaptations and occupy important ecological positions in aquatic ecosystems. Populations of species such as Sinanodonta gibba, Corbiculina tibetensis, Lymnaea stagnalis, Pontastacus leptodactylus and Haemopis sanguisuga allow us to assess the ecological condition of the river and determine the patterns of influence of external factors on them[3,4,11,15].

Description of the main types of hydrobionts and their ecological functions. Located on the Left Bank of the Syrdarya river, Mirzachul is characterized by its rich biodiversity and unique hydrobionts. A variety of hydrobionts have been identified in the area, which play an important role in maintaining the health of aquatic ecosystems.

Molluscs. Molluscs such as Sinanodonta gibba, Sinanodonta puerorum and Sinanodonta orbicularis in the family Unionidae are the main representatives of Myrtle bodies of water. These molluscs act as water purifiers and serve as a source of nutrients for other organisms. Their number directly depends on the quality of the aquatic environment and the breeding conditions[8,13,].

Main species: Sinanodonta gibba: occurring at a density of about 1.9 ± 0.2 per unit area, one of the most common species.

Sinanodonta puerorum: groups occur at a density of 1.4 ± 0.2.

Synanodonta orbicularis: groups occur at a density of 2.1 ± 0.2.

Other important molluscs include Colletopterum bactrianum, Colletopterum cyreum sogdianum, and Colletopterum ponderosum volgense, among others. Their number varies from 0.7 to 1.3 per unit area. The species Corbicula fluminea is known for its rapid reproduction and ability to occupy new territories.

The main species of Corbicula: Corbicula cor: group occurs at a density of 0.9 ± 0.1.

Corbicula purpurea: the group occurs at a density of 0.6 ± 0.1.

Molluscs with a belly. Among the clawed molluscs, representatives of the Lymnaea generation are of particular note. In particular, species such as Lymnaea stagnalis, Lymnaea truncatula and Lymnaea auricularia play an important role in maintaining the biodiversity of water systems.

The main species of Lymnaea: lymnaea stagnalis: density is about 1.2 ± 0.2.

Lymnaea truncatula: density about 1.7 ± 0.2.

Lymnaea auricularia: density around 1.9 ± 0.4.

Crustaceans and leeches. Mirzachul bodies of water are also home to crustaceans such as Pontastacus leptodactylus and leeches such as Haemopis sanguisuga. While crustaceans are involved in the processing of organic matter as primary predators, leeches are bioindicators of the aquatic environment[5,6,9].

Pontastacus leptodactylus: the number reaches 1.5 ± 0.2 per unit area.

Haemopis sanguisuga: occurs at a density of 1.4 ± 0.1.

Assessment of water environment factors. Analysis of the physicochemical properties of Myrtle water systems has shown that water factors have a decisive influence on the hydrobiont population.

The main factors include: water temperature: varies between 20-25°C, which creates favorable conditions for the growth and reproduction of most aquatic organisms.

The water varies from pH: 6.5 to 8.5, providing optimal conditions for a variety of molluscs and crustaceans.

Flow rate: from 0.5 to 2.5 m/s, which affects the transport of nutrients and the clarity of water.

Transparency: varies from 0.5 to 2 meters, which affects the photosynthesis of aquatic plants and, accordingly, the nutrient chains.

Dissolved oxygen concentration: in the range of 6-12 mg/l, it is a necessary important factor for maintaining the life activity of hydrobionts.

Biodiversity and homogeneity assessment. The use of the Shannon (H’) and Simpson indices in assessing the biodiversity of the mirzachool water system showed the following results:

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Shannon index (H'): 3.05, which shows high biodiversity and uniform distribution of species. Figure 1.

Simpson index: 0.046, which indicates a low dominance and high homogeneity of one species.Figure 2.

These indicators suggest that the Mirzachol aquifers are in a stable ecological state despite anthropogenic impacts and seasonal changes. The effect of temperature on hydrobionts water temperature is one of the main environmental factors that determine the survival and growth of hydrobionts in Myrzachol. Characterized by a continental climate, the temperature of the water in rivers such as the Syrdarya varies from 20 to 25°C. These conditions contribute to the active development and reproduction of most species of Unionidae and Lymnaeidae. High water temperatures can accelerate metabolism and growth, but excessive heat can lead to stress and reduce the viability of sensitive species such as Unionidae and Lymnaeidae.

The effect of water pH on biodiversity. The pH of water plays an important role in the formation of biodiversity in mirzachul water bodies. For most hydrobionts, the optimal pH values vary from 6.5 to 8.5, providing favorable conditions for their survival. Changes in acid-base balance affect the health of organisms, especially, It can negatively affect sensitive species such as Corbiculidae and Physidae. For example, increased acidity of water can reduce the availability of essential minerals, which in turn affect food chains.

Water temperature is one of the main environmental factors that determine the survival and growth of hydrobionts in Myrtle. In this region with a continental climate, the temperature of the water in rivers such as the Syrdarya varies from 20 to 25°C. These conditions contribute to the active development and reproduction of many species of Unionidae and Lymnaeidae. High water temperatures can accelerate metabolism and growth, but excessive heat can cause stress and decrease their survival in sensitive species such as Unionidae and Lymnaeidae.

The effect of the pH of water on biodiversity. The pH of water plays an important role in the formation of biodiversity in mirzachul water bodies. For most hydrobionts, the optimal pH values range from 6.5 to 8.5, providing favorable conditions for their survival. Changes in acid-base balance can adversely affect the health of organisms, especially sensitive species such as Corbiculidae and Physidae. For example, increased acidity of water can reduce the availability of essential minerals, which in turn affect food chains.

Flow rate and water clarity as environmental factors. In mirzachol rivers, the flow rate varies from 0.5 M/s to 2.5 m / S, which creates different conditions for hydrobiont survival. Sediment accumulation increases when the flow rate is low, which can negatively affect species that prefer fresh water. The fact that the clarity of water varies from 0.5 to 2 meters also affects the photosynthesis of aquatic plants. High transparency ensures sufficient light levels for photosynthetic organisms, which maintains a nutrient environment for species such as Lymnaeidae and Physidae.

Mineralization of dissolved oxygen and water. Dissolved oxygen levels in water vary from 6 to 12 mg/l, a prerequisite for hydrobionts to survive. Organisms such as Haemopidae and Astacidae, especially it is sensitive to changes in oxygen levels, with improved growth and survival rates at high oxygen concentrations. The fact that water mineralization varies from 200 to 800 mg/l also affects population dynamics. Excessive mineralization can cause stress in some species, while moderate concentration maintains a healthy balance of micronutrients.

Assessment of biodiversity and density based on the Shannon index. The Shannon index is applied to assess the biodiversity of hydrobionts in Mirzachol watersheds. In this region, the values of the Shannon index vary from 2.5 to 3.5, indicating the average biodiversity of aquatic ecosystems. The average population size is 0.0972, as evidenced by the proportional distribution of the species. Analysis shows that species such as Corbiculidae and Unionidae are present in large numbers, ensuring the diversity and stability of this ecosystem.

Major factors affecting the population of hydrobionts in mirzachul include water temperature, pH, flow rate, transparency, dissolved oxygen content, and mineralization levels. In order to develop strategies for protecting the aquatic ecosystems of the region and managing water resources, it is necessary to study these factors in depth. The use of the Shannon and Simpson indices is instrumental in quantitative assessment of the ecological condition of water bodies and in the implementation of measures to improve them.

High levels of biodiversity and uniform distribution of species indicate the stability and wellness of the aquatic ecosystems of the region. The use of the Shannon and Simpson indices in biodiversity assessment makes it possible to quantitatively characterize the level of species diversity and ecosystem stability. By analyzing the distribution, richness of species and the average number of populations, it is possible to understand the impact of local conditions on the biodiversity and wellness of the region's ecosystem.

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