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Species Composition and Ecology of Macrozoobenthos in The Shakhrikhonsoy Canal

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Abstract. This article is dedicated to studying the species composition and ecology of macrozoobenthos in the Shakhrikhonsoy Canal. During the research, the ecological state of the canal water was assessed based on the biological diversity of macrozoobenthos. A total of 23 identified species of macrozoobenthos were analyzed as ecological indicators, and their relationship with water quality was determined. Classes such as Gastropoda, Ephemeroptera, Plecoptera, and Hirudinea played a significant role in identifying the degree of organic pollution and ecological balance of the aquatic environment. The findings of the study serve as an essential foundation for the ecological monitoring of the Shakhrikhonsoy Canal, the management of biological resources, and the development of strategies for improving water quality.
Keywords: macrozoobenthos, Shakhrikhonsoy Canal, ecological monitoring, biological diversity, water quality.

The water resources of the Republic of Uzbekistan play a crucial role in agriculture, industry, and drinking water supply. At the same time, water bodies and canals are among the key factors in ensuring the sustainability of ecosystems. Macrozoobenthos play a significant role in assessing the ecological status of water resources, serving as biological indicators of the aquatic environment.

The Shakhrikhansoy Canal is one of the important water bodies flowing through the Andijan region. This canal is significant in Uzbekistan's irrigation system, and studying its ecological condition is essential for the sustainable management of local water resources. The canal’s biological diversity, particularly the composition and ecology of macrozoobenthos, is vital for assessing water quality and the ecological environment.

Macrozoobenthos are a group of invertebrate animals living on the bottom of water bodies. Their ecological characteristics make them indicators of the condition of water bodies. These organisms exhibit variability in species composition under the influence of ecological factors such as oxygen saturation, pollution levels, and other environmental conditions. Investigating the species composition and ecological features of macrozoobenthos in the Shakhrikhansoy Canal is a pressing issue for conducting biological monitoring of this water body and maintaining its ecological balance.

This study aims to investigate the species composition and ecological condition of the macrozoobenthos in the Shakhrikhansoy Canal. The research results will contribute to developing practical recommendations for managing the canal’s biological resources, monitoring water quality, and improving its ecological condition. Furthermore, the obtained data will serve as an essential basis for implementing sustainable development principles in water bodies.

Numerous studies have demonstrated the efficiency of using macrozoobenthos in biological monitoring of aquatic environments. For instance, Rosenberg and Resh (1993) deeply analyzed the relationship between macrozoobenthos species and water quality and pollution levels. They highlighted the sensitivity of macrozoobenthos to oxygen deficiency, an increase in organic matter, or the impact of pollutants in the aquatic environment.

In Uzbekistan, scientific studies on the biological diversity of water bodies have primarily focused on the Amu Darya, the Syr Darya, and their tributaries. Qodirov (2015) studied the ecological role of macrozoobenthos and their life cycles in water bodies, emphasizing their importance in water quality monitoring. Similarly, Usmonov (2018) analyzed the sensitivity of water bodies to anthropogenic impacts and changes in the species composition of macrozoobenthos.

On an international scale, the methodology of the biotic index developed by Hilsenhoff (1988) has been widely applied in studies utilizing macrozoobenthos for water resource monitoring. This method is extensively used as a key tool for assessing the ecological condition of water bodies based on pollution levels and the impact of organic matter.

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Studies on the Shakhrikhansoy Canal are relatively limited. Existing literature primarily focuses on water resource utilization and irrigation issues, while the canal's biological diversity has not been sufficiently studied. Research conducted by Tursunov et al. (2020) aimed at providing a general assessment of the Shakhrikhansoy Canal's water resources but did not perform an in-depth analysis of the ecological condition of its macrozoobenthos.

A review of the literature indicates that studying the species composition and ecological characteristics of macrozoobenthos is essential for significant water bodies like the Shakhrikhansoy Canal. By integrating Uzbek and international experiences, this study can propose novel approaches to assess the ecological condition of the Shakhrikhansoy Canal. Moreover, the findings will contribute to the rational use of water resources and ensure their ecological sustainability.

As a result of the conducted research, the species composition of macrozoobenthos in the Shakhrikhansoy Canal has been identified, and its modern taxonomic structure has been established.

ANNELIDA

Rhynchobdellida

1. *Alboglossiphonia hyalina* (Müller, 1774)
2. *Alboglossiphonia lata* (Oka, 1910)
3. *Helobdella stagnalis* (Linnaeus, 1758)
4. *Piscicola geometra* (Linnaeus, 1758)

Arhynchobdellida

5. *Hirudo orientalis* Utevsky & Trontelj, 2005
6. *Haemopis sanguisuga* (Linnaeus, 1758)
7. *Erpobdella nigricollis* (Brandes, 1900)

MOLLUSCA

Bivalvia

8. *Corbiculina ferghanensis* (Kursalova et Starobogatov, 1971)
9. *Corbiculina tibetensis* (Prashad, 1929)
10. *Corbicula purpurea* (Prime, 1864)

Gastropoda

11. *Lymnaea stagnalis (Linnaeus, 1758)*
12. *Lymnaea subdisjuncta (G. Nevill, 1878)*
13. *Galba truncatula* (O.F.Müller, 1774)
14. *Radix auricularia* (Linnaeus, 1758)
15. *Physella acuta* (Draparnaud, 1805)
16. *Gyraulus acronicus* (Férussac, 1807)

CRUSTACEA

Amphipoda

17. *Gammarus subaequalis* (Martynov, 1935)

INSECTA

Ephemeroptera

18. *Baetis heptapotamicus* Brodsky, 1930
19. *Rhithrogena tianschanica* Brodsky, 1930

Plecoptera

20. *Amphinemura crenata* (Koponen, 1949)
21. *Protonemura tianshanica* Zhiltzova, 1971

Odontata

22. *Ophiogomphus cecilia* (Fourcroy, 1785)
23. *Gomphus vulgatissimus* (Linnaeus, 1758)

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The ecological analysis of macrozoobenthos species identified in the Shakhrikhansoy Canal reflects their living conditions and the ecological status of the aquatic environment. The species found in the canal possess various ecological characteristics, playing a significant role in assessing water quality and pollution levels.

Species such as *Alboglossiphonia hyalina* and *Piscicola geometra* from the class Hirudinea indicate good ecological quality due to their preference for clean, oxygen-rich water environments. Conversely, species like *Helobdella stagnalis* and *Haemopis sanguisuga* occur in parts of the canal prone to organic pollution, highlighting ecological imbalance in specific areas. Other species, such as *Hirudo orientalis* and *Erpobdella nigricollis*, are found in low-quality water and are adapted to environments rich in organic matter.

Representatives of the Mollusca class, including gastropods such as *Lymnaea stagnalis* and *Radix auricularia*, are widespread in nutrient-rich water bodies, indicating eutrophication in certain canal areas. Additionally, bivalves such as *Corbiculina ferghanensis* and *Corbicula purpurea* are tolerant to pollution and thrive in areas with increased organic matter.

Among crustaceans, species like *Gammarus subaequalis* prefer clean water, reflecting the high ecological quality of some sections of the canal. This species is an indicator of ecological stability due to its presence in oxygen-rich environments.

Insects, particularly Ephemeroptera species such as *Baetis heptapotamicus* and *Rhithrogena tianschanica*, are found in clean sections of the canal, indicating high ecological quality. Similarly, Plecoptera species like *Amphinemura crenata* and *Protonemura tianshanica* require clean, oxygen-rich conditions. Odonata species such as *Ophiogomphus cecilia* and *Gomphus vulgatissimus* also play a crucial role in maintaining water quality and ecological balance.

Overall, the macrozoobenthos species found in the Shakhrikhansoy Canal serve as reliable indicators for assessing the ecological status of this water body. Species from orders like Ephemeroptera, Plecoptera, and Odonata signal clean water conditions, while Gastropoda and Hirudinea indicate elevated levels of organic pollution. This analysis is practically significant for establishing ecological monitoring and developing measures to improve water quality in the canal.

The diagram presented below illustrates the species composition of macrozoobenthos in the Shakhrikhansoy Canal, classified by taxa. The vertical bars represent the number of identified species by class, providing valuable insights into the ecological conditions and biological diversity of the canal. These data are essential for evaluating the ecological environment of various sections of the canal.

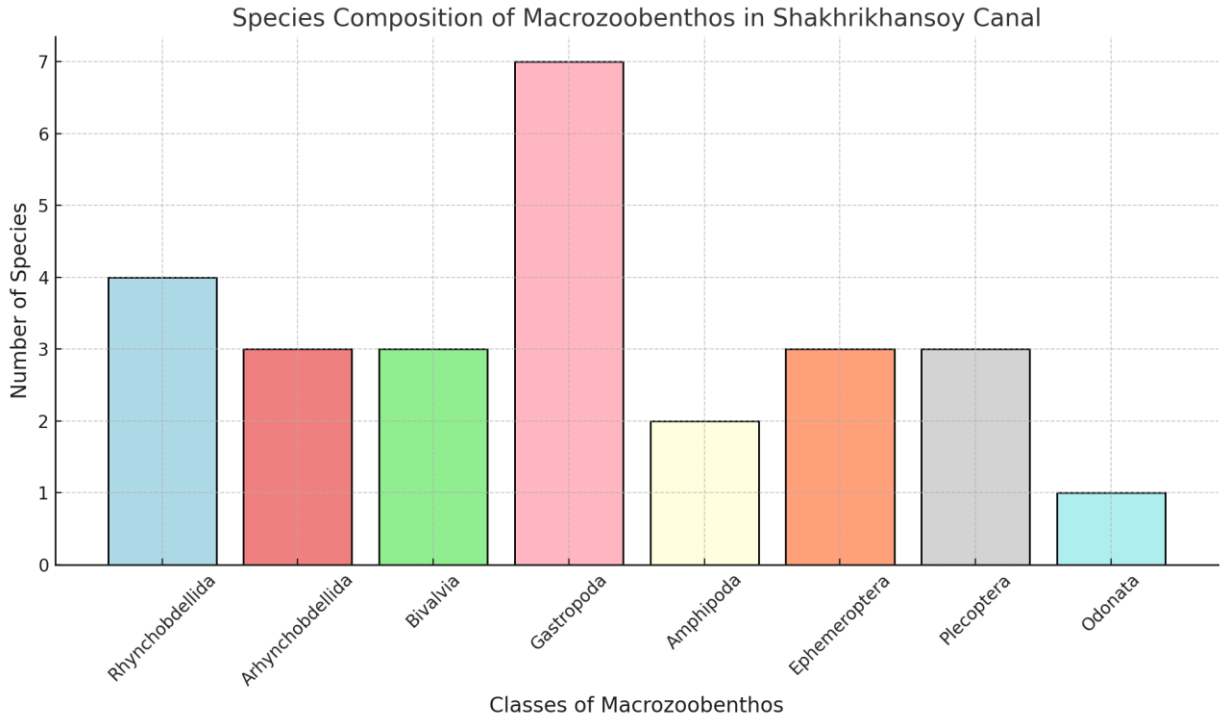

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Diagram. Species composition of macrozoobenthos in Shakhrikhansoy Canal

The majority of species belong to the Gastropoda class, accounting for a total of 7 species. This indicates that the canal is rich in nutrients or has a eutrophic environment. The Rhynchobdellida class, with 4 species, is notable for its occurrence in parts of the canal with clean to moderately ecological conditions. The Arhynchobdellida and Bivalvia classes are represented by 3 species each and are found in ecologically balanced sections of the canal.

Ephemeroptera, Plecoptera, and Odonata classes, each consisting of 2 species, represent parts of the canal with high ecological quality. These classes prefer clean, oxygen-rich aquatic environments. On the other hand, the Amphipoda class is represented by only one species, distinguished by its sensitivity to ecological conditions.

The dominance of the Gastropoda class highlights the nutrient-rich nature of the canal, while the presence of Ephemeroptera and Odonata classes indicates high ecological quality in certain sections. This information is crucial for establishing ecological monitoring and developing strategies for the sustainable management of resources.

In conclusion, studying the species composition of macrozoobenthos and analyzing their ecological characteristics provides vital insights into the ecological status of the Shakhrikhansoy Canal. The 23 species identified during the study reflect the water quality and ecological balance across different sections of the canal based on their ecological requirements and living conditions.

Species from insect classes such as Ephemeroptera, Plecoptera, and Odonata represent clean, oxygen-rich parts of the canal, indicating high ecological stability and quality. Conversely, certain species from the Gastropoda and Hirudinea classes serve as indicators of areas with increased organic pollution.

Additionally, species of mollusks and crustaceans indicate the nutrient-rich and eutrophic state of the canal, while some annelids draw attention by their presence in parts of the canal with lower ecological quality.

The results of this study provide a solid foundation for ecological monitoring of water resources, conservation of biological diversity, and development of strategies to ensure the ecological sustainability of the canal. In the future, scientific and practical measures must be developed to improve the ecological condition of the Shakhrikhansoy Canal. This information is essential for implementing sustainable management of the waterbody.

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