



SOME ECOLOGICAL CHARACTERISTICS OF FRESH-WATER GASTROPODS IN THE UPPER SYR DARYA RIVER BASIN, FERGANA VALLEY

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ABSTRACT

This article studies the indicator properties of gastropods common in the Upper Syr Darya River basin. They are divided into ecological groups according to their habitats. The generally accepted ecological and zoological methods were used in the research. According to the research results, fresh-water gastropods of the Fergana Valley inhabit xenosaprobic, oligosaprobic, β – mesosaprobic, α – mesosaprobic and β – polysaprobic waters. Molluscs are mainly distributed in stagnant water bodies. The substrate of most mollusks are aquatic plants.

KEY WORDS: *gastropods, bioindicator, saprobity, ecological group, pollution.*

INTRODUCTION

Conservation of biodiversity in nature, ensuring ecosystem stability is a global problem today. Environmental changes under the influence of anthropogenic factors are causing the loss of biological diversity, including a decrease in the diversity of animal resources. In this regard, it is important to determine the species composition of mollusks common in natural water bodies, identify factors affecting their populations, preserve rare and endemic species, and study their ecological groups.

Assessment of the environment using the characteristics of living organisms is used in many fields. For example, the state of organic pollution of water bodies, that is, the level of saprobity, can be determined using hydrobionts. Based on the results, the water body can be ecologically assessed.

Fresh-water gastropods are often used as bioindicator organisms (Sladeczek, 1973; Balushkina, 1995; Chertoprud and Chertoprud, 2011). Among hydrobionts, gastropod molluscs are widely used to determine the level of saprobic waters. The purpose of this study is to study some of the ecological features of aquatic gastropod mollusks in the Fergana Valley. In particular, to study the indicator properties of molluscs in determining the level of saprobic waters and to divide them into ecological groups.

MATERIALS AND METHODS

More than 3500 molluscs were collected as material from different regions of the Fergana Valley during 2016-2021. Aquatic gastropods were collected from different water types: rivers, streams, lakes, springs, reservoirs, canals and ditches. Monographs by Kruglov (2005) and Izzatullaev (2018) were used to determine the species composition of the collected materials.

Indicator properties of aquatic gastropods, that is saprobic levels of water pollution, were analyzed by Woodiwiss (1964, 1978), King and Ball (1964), Sladeczek (1973), Chertoprud and Chertoprud (2011) methods. Izzatullaev (2018, 2019) methods were used to classify molluscs into ecological groups.

RESULTS AND DISCUSSION

Molluscs are very common in the Fergana Valley. In the Fergana Valley, 29 species of fresh-water gastropods have been identified, belonging to 2 subclasses, 6 families, 14 genera (Umarov, 2022).

Indicator properties of gastropods. Water bodies can be divided into 6 groups according to their pollution by organic matter: very clean, clean, moderately polluted, polluted, highly polluted and very heavily polluted. The characterization of the level of saprobity of water pollution according to Woodiwiss (1978) index is given in the table below (Tab. 1).



Table 1
Characterization of water pollution by level of saprobity

Water pollution level	Saprob character	Index of Woodiwiss
very clean	xenosaprobic	8 – 10
clean	oligosaprobic	5 – 7
moderately polluted	β – mesosaprobic	3 – 4
polluted	α – mesosaprobic	1 – 2
highly polluted	β – polysaprobic	0 – 1
very heavily polluted	α – polysaprobic	0

Fresh-water gastropods of the Fergana Valley live in xenosaprobic, oligosaprobic, β – mesosaprobic, α – mesosaprobic and β – polysaprobic waters (only *Physella acuta*). However, molluscs were not found in α – polysaprobic waters. According to the indicator characteristics of fresh-water gastropods, it was determined that mainly xenosaprobe and oligosaprobe molluscs live in springs, rivers, streams,

lakes of fishing farms, and β - α – mesosaprobe mollusc species live in reservoirs. The β - α – mesosaprobe pollution of the region's water bodies prevails. Mollusc species belonging to the Lymnaeidae, Physidae and Planorbidae families are widely distributed in them, and it is recommended to use these molluscs in determining water quality groups (Tab. 1).

Table 2
Species composition of indicator fresh-water gastropods found in water types of Fergana Valley

Species	Springs	Rivers	Streams	Fishing farms	Water reservoirs	Water quality limits
1	2	3	4	5	6	7
<i>Kainarella likharevi</i>	o	-	-	-	-	o
<i>Martensamnicola brevicula</i>	k	-	-	-	-	k
<i>M. hissarica</i>	k	-	-	-	-	k
<i>Bucharamnicola bucharica</i>	o	-	-	-	-	o
<i>Sogdamnicola pallida</i>	o	-	-	-	-	o
<i>Valvatamnicola archangelskii</i>	k	-	-	-	-	k
<i>V. schahimardanica</i>	k	-	-	-	-	k
<i>Acroloxus lacustris</i>	o	-	-	-	-	o
<i>Lymnaea stagnalis</i>	-	α	o	α	β	o- β - α
<i>L. goupili</i>	o	o	-	-	o	o
<i>L. subdisjuncta</i>	-	α	α	β	β	β - α
<i>L. tengriana</i>	o	o	o	-	-	o
<i>L. subangulata</i>	o	o	o	β	β	β - α
<i>L. rectilabrum</i>	-	β	β	β	β	β
<i>Galba truncatula</i>	o	β	o	β	β	o- β
<i>G. bowelli</i>	o	β	β	β	β	o- β
<i>Radix auricularia</i>	o	α	β	α	β	o- β - α
<i>R. bactriana</i>	β	β	-	-	-	β
<i>Ampullaceana fontinalis</i>	o	α	α	α	α	o- α
<i>A. lagotis</i>	α	α	-	α	-	α
<i>Physella acuta</i>	α	β (p)	β	α	β	β (p)- α
<i>Ph. integra</i>	-	β	-	-	-	β
<i>Planorbella duryi</i>	-	β	-	-	-	β
<i>Planorbis planorbis</i>	α	β	-	β	-	o- β
<i>Pl. tangitarenensis</i>	o	β	-	β	-	o- β
<i>Gyraulus acronicus</i>	β	β	-	β	β	β
<i>Gy. albus</i>	-	-	-	β	-	β
<i>Gy. convexiusculus</i>	-	-	-	β	-	β
<i>Gy.ladacensis</i>	α	-	-	β	β	β - α

Explanation: k – xenosaprobic, o – oligosaprobic, β – mesosaprobic, α – mesosaprobic, β (p) – polysaprobic.



Kainarella likharevi, *Martensamnicola brevicula*, *M. hissarica*, *Bucharamnicola bucharica*, *Sogdamnicola pallida*, *Valvatamnicola archangelskii*, *V. schahimardanica* and *Acroloxus lacustris* species of gastropod molluscs in the valley area were found to live in the cleanest waters.

The most species of molluscs are found in moderately polluted waters, including *Lymnaea stagnalis*, *L. subdisjuncta*, *L. subangulata*, *Radix auricularia*, *Physella acuta*, *Ph. integra*, *Gyraulus acronicus*, *Gy. albus*, *Gy. convexiusculus* and *Gy. ladacensis*.

Species *L. stagnalis*, *L. subdisjuncta*, *A. lagotis* and *Ph. acuta* were observed to be more common in polluted waters. Some species of molluscs can inhabit clean, moderately polluted and polluted waters. For example, *L. stagnalis* and *R. auricularia* are among such species (Pazilov and Umarov, 2021a).

Ecological groups of molluscs. The Fergana Valley stands out in Central Asia for its variety of waters, unique rivers, lakes, springs, streams, reservoirs, ponds and canals. These bodies of water differ in their formation, location relative to sea level, flow velocity, organic matter content, salinity, transparency, temperature, ambient (pH) and other environmental factors (Kholiqov, 2020). Similarly, different ecological groups of molluscs have formed.

All water bodies in the Fergana Valley can be divided into 2 groups (Zhadin, 1952) The first group includes springs, rivers, ditches and canals, which are considered running water or lotic water bodies. The second group includes lakes, ponds, ponds and swamps, which are either stagnant waters or lentic water bodies.

Molluscs that live in lotic water bodies are considered rheophiles, they love dissolved oxygen in water and need a constant supply of clean water. Since lotic water bodies are constantly in motion, they have higher oxygen concentrations than limnic water bodies (Izzatullaev, 2018). For example, the following molluscs live in the water bodies of the Fergana Valley: *Kainarella likharevi*, *Martensamnicola brevicula*, *M. hissarica*, *Sogdamnicola pallida*, *Valvatamnicola archangelskii*, *V. schahimardanica*, *Acroloxus lacustris*, *L. subdisjuncta*, *L. subangulata*, *Radix auricularia*, *Ampullaceana lagotis*, *Physella acuta*, *Galba truncatula*. Species of molluscs living in running water - springs are divided into the crenophilic ecological group. For example, members of the family Hydrobiidae are mostly crenophilic species.

Molluscs can also be divided into ecological groups according to the substrate they cling to (Izzatullaev, 2019). People who stick to plants - phytophiles: *M. brevicula*, *M. hissarica*, *L. stagnalis*, *L. rectilabrum*, *R. auricularia*, *A. fontinalis*, *Ph. acuta*, *Ph. integra*, *Pl. planorbis*, *Pl. tangitarenensis*, *Gy. acronicus*, *Gy. albus*, *Gy. convexiusculus* va *Gy. ladacensis*; those who live clinging to stones - lithophiles: *K. likharevi*, *S. pallida*, *V. archangelskii*, *V. schahimardanica*, *A. lacustris*, *L. tengriana*, *L. subangulata*, and *R. Bactriana*; mud dwellers – pelophiles: *L. goupili*, *L. subdisjuncta*, *L. rectilabrum*, *G. truncatula*, *G. bowelli* va *Planorbella duryi* types include.

Molluscs that live in lotic water bodies are called stagnophiles, and they are common in relatively stable water

types. Molluscs that live in this type of water bodies can be divided into the following groups: living in lakes - limnophile, living in brackish waters - telmatophile, living in swamps – eleophile (Izzatullaev, 1981). Most species of the Lymnaeidae family belong to the limnophilous ecological group. *G. truncatula*, *A. fontinalis*, *A. lagotis*, *Pl. planorbis*, *Pl. tangitarenensis* va *Gy. ladacensis* – telmatophilic species; *Lymnaea stagnalis* – are examples of eleophilic species.

The resistance of molluscs to environmental abiotic factors is also of particular importance. The resistance of individuals to abiotic factors determines whether their ranges are wide or narrow. For example, representatives of the Hydrobiidae family of aquatic gastropods of the Fergana Valley are intolerant to changes in water temperature. They live mainly in springs with cold water (12-16°C). A rise in water temperature will have a negative effect on them. *Acroloxus lacustris* is tolerant to a slight change in water environment (pH) (Pazilov and Umarov, 2021b; Stadnichenko, 2004). For this reason, they are considered stenobiont species. All other species are classified as mesoeuribiont - moderately resistant and eurybiont - broadly resistant. For this reason, species belonging to these ecological groups can be found in biotopes with different conditions.

CONCLUSIONS

According to the results of the conducted research, water gastropod molluscs of the Upper Syr Darya River basin live in xenosaprobic, oligosaprobic, β – mesosaprobic, α – mesosaprobic and β – polysaprobic waters, and among them β - α – mesosaprobic predominate.

It was recommended to use mollusk species belonging to Lymnaeidae, Physidae and Planorbidae families to determine water quality groups.

It was found that aquatic gastropod molluscs are mainly distributed in lentic water bodies in the Fergana Valley. Among them, it was observed that the percentage of cranophilic crane found in springs is higher than in other running water bodies. Since the main substrate of molluscs is plants, it determines the importance of aquatic plants in their distribution.

According to the ecological groups of molluscs, mainly mesoeurybiont and eurybiont species are considered.

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