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# MAIN CHARACTERISTICS OF PHYTO- AND ZOOPLANKTON OF LAKE TALDYKOL IN 2022

Lake Taldykol is a water body that experiences significant anthropogenic impact, which is reflected in its hydrochemical and hydrobiological state. In this paper, a comprehensive analysis of water quality is carried out, including a study of the chemical composition, saprobity and structure of plankton communities. The aim of this work was to assess the species composition, abundance and biomass of phytoplankton and zooplankton of Lake Taldykol, as well as to determine possible changes in the structure of these communities under the influence of hydrological and environmental factors, in particular, under conditions of fluctuating water levels. The scientific significance of the work lies in the comprehensive study of anthropogenic impact on the reservoir and determination of its ability to self-purify. The practical significance lies in the possibility of using the obtained data to develop measures to protect and restore the lake ecosystem. The study revealed that the maximum permissible concentrations were exceeded for a number of pollutants, such as COD, suspended solids, phosphates, nitrites and iron, which indicates a high anthropogenic load. The dynamics of the number and biomass of phytoplankton and zooplankton indicate seasonal changes in the trophic level of the reservoir. Saprobic indices showed that the lake belongs to the β-mesosaprobic zone, but in spring and autumn there is a deterioration in water quality.

**Key words:** phytoplankton, zooplankton, hydrochemistry, hydrobiocenosis.

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## Талдыкөл көлінің фито- және зоопланктонының 2022 жылғы негізгі сипаттамасы

Талдыкөл көлі-оның гидрохимиялық және гидробиологиялық жағдайына әсер ететін айтарлықтай антропогендік әсерге ие су айдыны. Бұл жұмыста планктондық қауымдастықтардың химиялық құрамын, сапробтылығын және құрылымын зерттеуді қамтитын су сапасына кешенді талдау жүргізілді. Бұл жұмыстың мақсаты Талдыкөл көлінің фитопланктоны мен зоопланктонының түрлік құрамын, саны мен биомассасын бағалау, сондай-ақ гидрологиялық және экологиялық факторлардың әсерінен, атап айтқанда су деңгейінің ауытқуы жағдайында осы қауымдастықтардың құрылымындағы ықтимал өзгерістерді анықтау болды. Жұмыстың ғылыми маңыздылығы су қоймасына антропогендік әсерді кешенді зерттеу және оның өзін-өзі тазарту қабілетін анықтау болып табылады. Практикалық маңыздылығы-алынған деректерді көлдің экожүйесін қорғау және қалпына келтіру шараларын әзірлеу үшін пайдалану мүмкіндігі. Зерттеу нәтижесінде КПК, тоқтатылған заттар, фосфаттар, нитриттер және темір сияқты бірқатар ластаушы заттар бойынша ШРК-ның асып кетуі анықталды, бұл антропогендік жүктеменің жоғары екендігін көрсетеді. Фитопланктон мен зоопланктонның көптігі мен биомассасының динамикасы су қоймасының трофикалық деңгейінің маусымдық өзгеруін көрсетеді. Сапробтық индекстер көлдің β-мезосапробты аймаққа жататынын көрсетті, бірақ көктемде және күзде су сапасының нашарлауы байқалады.

**Түйін сөздер:** фитопланктон, зоопланктон, гидрохимия, гидробиоценоз.

 

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## Основные характеристики фито- и зоопланктона озера Талдыколь в 2022 году

Озеро Талдыколь представляет собой водоём, испытывающий значительное антропогенное воздействие, что отражается на его гидрохимическом и гидробиологическом состоянии. В данной работе проведён комплексный анализ качества воды, включающий исследование химического состава, сапробности и структуры планктонных сообществ. Целью настоящей работы являлась оценка видового состава, численности и биомассы фитопланктона и зоопланктона озера Талдыколь, а также определение возможных изменений в структуре этих сообществ под влиянием гидрологических и экологических факторов, в частности, в условиях колебания уровня водности. Научная значимость работы заключается в комплексном исследовании антропогенного влияния на водоём и определении его способности к самоочищению. Практическая значимость заключа- ется в возможности использования полученных данных для разработки мероприятий по охране и восстановлению экосистемы озера. В результате исследования выявлено превышение ПДК по ряду загрязняющих веществ, таких как ХПК, взвешенные вещества, фосфаты, нитриты и железо, что свидетельствует о высокой антропогенной нагрузке. Динамика численности и биомассы фитопланктона и зоопланктона указывает на сезонные изменения уровня трофности водоёма. Индексы сапробности показали, что озеро относится к β-мезосапробной зоне, однако весной и осенью наблюдается ухудшение качества воды.

**Ключевые слова:** фитопланктон, зоопланктон, гидрохимия, гидробиоценоз.

### Introduction

Hydroecosystems are characterized by variable hydrological and hydrochemical regimes, therefore, the study of species diversity, abundance dynamics, biomass and structural characteristics of plankton communities is important for assessing the status and sustainability of water bodies [1]. Phyto- and zooplankton are bioindicators of water quality, reflecting both natural fluctuations in environmental conditions and the level of anthropogenic impact. Their qualitative and quantitative parameters react sensitively to changes in the hydrological regime, trophicity and degree of pollution of a water body [2].

The object of the study was Lake Taldykol, located within the city of Astana. This lake is the largest body of water in the system of lakes, which have become very shallow in recent years. The reservoir is of natural origin, belongs to closed shallow lakes with an already formed ecosystem, but in recent years it has been subject to significant anthropogenic and technogenic loads [3]. Lake Taldykol is an important natural site that, despite its urban environment, retains significant biodiversity and performs important ecological functions. Taldykol is an important stopover for migratory birds, making the lake a key ornithological zone, which gives special conservation significance to this water body in the context of fulfilling the requirements of the Ramsar Convention and the Convention on Biological Diversity [4].

However, against the backdrop of increasing anthropogenic impact and transformation of natural conditions, changes are occurring in the ecosystem structure of the lake [5]. The effects of the water level fluctuations recorded in 2022 were particularly noticeable. The reduction in water volume can significantly affect biogeochemical processes, including nutrient circulation and oxygen balance, which in turn affects the state of plankton communities [6, 7].

The aim of this work was to assess the species composition, abundance and biomass of phytoplankton and zooplankton of Lake Taldykol, as well as to determine possible changes in the structure of these communities under the influence of hydrological and environmental factors.

The conducted research allows us to better understand the ecological state of Lake Taldykol and serves as a basis for further work on monitoring and ecological rehabilitation of the reservoir. The results can be used by environmental organizations to assess and reduce anthropogenic impact on water bodies.

### Materials and methods

The study of hydrochemical parameters of water was carried out in 2022-2023 in the spring, summer and autumn periods using the methods of State Standards [8-12] for reservoirs based on the analytical laboratory of sewage treatment facilities of the State Enterprise “Astana-su Arnasy”.

*Study of species diversity of phytoplankton*

To collect phytoplankton, Apshteyn net gas No. 77 was used (Kiselev, 1969; Wasser et al., 1989) [13, 14]. Samples were taken from the surface of the reservoir with a capacity of 10 liters and passed through the Apshteyn net – a total of 10 times. The sample was fixed at the rate of 20-40 ml of 40% formalin per 1 liter of sample. The pH of the fixative was first adjusted to 7 by adding a small amount of Na2CO3 solution. After that, the sample was concentrated by the precipitation method to 100 ml over 24 hours.

Phytoplankton identification was carried out by microscopy using a 90 (2 mm) immersion objective on an Olympus CX-31 microscope.

*Determination of saprobity of water bodies*

The saprobity of water bodies was determined by the composition of phytoplankton using the Pantle and Buck method as modified by V. Sladechek [15-20].

For this purpose, lists of pollution indicator organisms were used.

Indicator significance $S_i$ for oligosaprobes is 1.0; beta-mesosaprobes – 2; alpha-mesosaprobes – 3; and polysaprobes – 4.

The relative number of $h_i$ individuals was assessed on a three-point scale: random finds – 1; frequent occurrence – 3; mass occurrence – 5.

The saprobity index is calculated based on the individual saprobity characteristics of the species represented in the aquatic phytoplankton community using the formula (1):

$$S = \sum S_i h / \sum h_i \qquad (1)$$

where S is the saprobity index, dimensionless;

$S_i$ is the saprobity value of the aquatic organism (according to special tables);

$h_i$ is the relative occurrence of indicator organisms in the microscope field;

n is the number of selected indicator organisms.

In the polysaprobic zone, the saprobity index is – 4.0-3.5; in the α-mesosaprobic zone – 3.5-2.5; in the β-mesosaprobic zone – 2.5-1.5; in the oligosaprobic zone – 1.5-1.0.

*Study of species diversity of zooplankton*

To identify zooplankton species, water was scooped from a 100-liter boat and passed through an Apshteyn net with gas No. 55 [20, 21]. The collected samples were immediately fixed with 4% formalin. To prevent shell deformation and eggs from falling out of the brood chambers, sucrose (40 g/l) was added to the samples. The sample was left to settle until 200 ml.

Microscopy of zooplankton samples and identification of species was carried out with a 90 (2 mm) objective on an Olympus CX-31 microscope.

## Результаты и обсуждения

*Study of hydrochemical analysis of water in Lake Taldykol*

Hydrochemical analysis of the water of Lake Taldykol was carried out from autumn 2022 to summer 2023, where such indicators as pH, $BOD_5$, COD, suspended solids, chlorides, sulfates, phosphates, ammonium nitrogen, nitrites, nitrates, iron, surfactants, dry residue, oil products, chromium, nickel, zinc, manganese, fluorides, hardness, alkalinity were determined.

The Taldykol lake system has been heavily impacted by anthropogenic factors in recent decades, which has significantly affected the hydrochemical parameters.

The results showed that Lake Taldykol is a reservoir with a variable hydrochemical composition. In 2022, the water in the lake had high mineralization, but in 2023, the mineralization decreased, which corresponds to brackish wa- ter. In 2022, the lake had a chloride-sulfate type of water with very high mineralization, but in 2023, a decrease in the content of chlorides and sulfates was observed, indicating a change in the water type towards hydrocarbonate, which may indicate dilution of the lake with fresh wa- ter.

An analysis of hydrochemical indicators for two years showed that pollution with organic substances has decreased, but the $COD_5$ value still shows an excess of the MAC by 1.4 times, and in the summer of 2023, a jump in the concentration of biogenic elements (phosphates and nitrites) was observed, which may indicate the influx of wastewater. The content of heavy metals and oil products has decreased, but the iron level still exceeds the permissible values (Figure 1).

Analysis of water quality indicators for the period under study shows a change in the hydrological regime of the lake. This may indicate an increase in anthropogenic load on the reservoir.

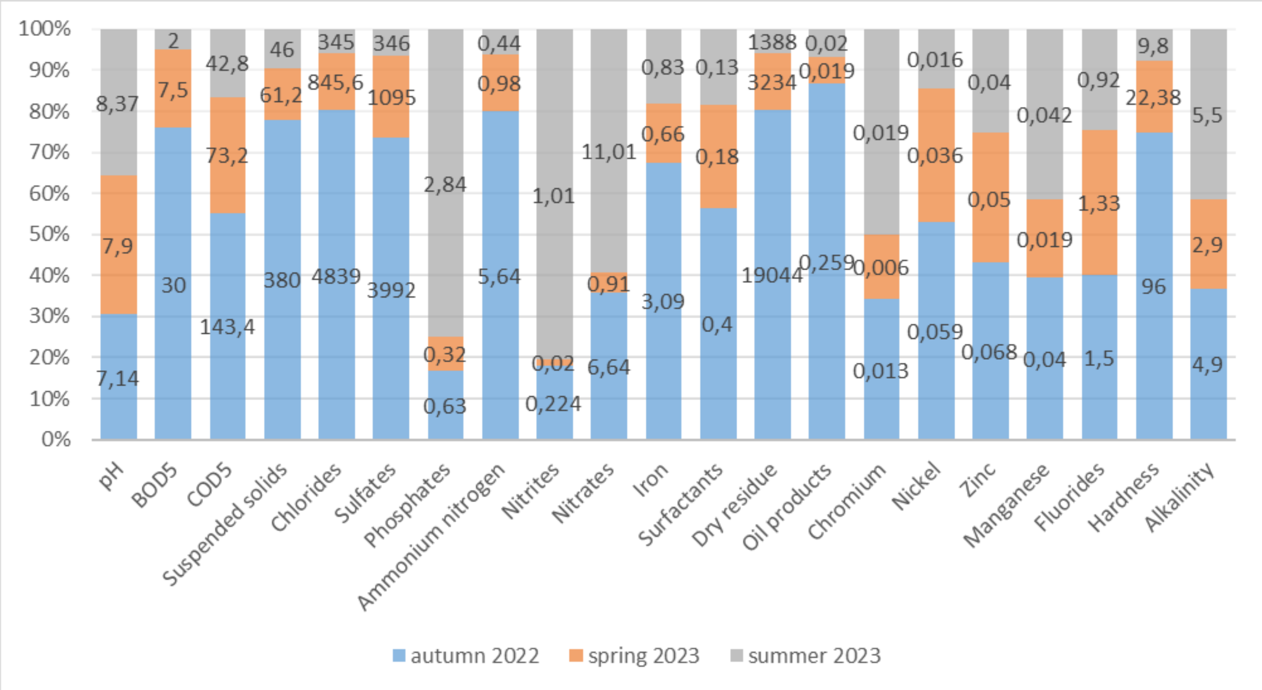


**Figure 1 –** Hydrochemical indicators of water in Lake Taldykol for 2022 and 2023.

The self-purification capacity of a reservoir can be assessed by the ratio of free oxygen content R to BOD5. The ratio of these indicators can reflect the relationship of photosynthetic activity in a reservoir to its destructive capacity: R/BOD5. The higher this ratio, the higher the potential for self-purification in reservoirs, and vice versa – the lower the ratio, the lower the capacity of the reservoir for self-purification [22]. In our studies, this ratio in 2023 was 1.5, which indicates a moderate capacity of the reservoir for self-purification.

*Hydrobiological analysis of water in Lake Taldykol*

Among the main types of aquatic flora in Lake Taldykol we can highlight:

Common reed (*Phragmites australis*, (Cav.) Trin. ex Steud) is the dominant plant growing along the shoreline. Lake bulrush (*Schoenoplectus lacustris*, (L.) Palla) is an important species that supports local aquatic biotopes. Broadleaf cattail (*Typha latifolia* L.) is often found in the coastal zones of the lake. These species play a key role in stabiliz- ing the banks, creating habitat for aquatic animals, and maintaining water quality [23, 24]. Of the submerged plants, the most widespread are various species of pondweed and water rhizome. The area of overgrowth of the lake as a whole is 30%.

*Quantitative indicators of phytoplankton in Lake Taldykol*

The studied reservoir contained individual species from the following classes of phytoplankton: Diatoms (*Bacillariophyta*, Haeckel, 1878) are one of the main groups of phytoplankton in reservoirs; Green algae (*Chlorophyta*, Haeckel, 1894); Blue-green algae (*Cyanobacteria*) are well adapted to extreme conditions, including high salinity, and can cause “water blooms” [25].

Diatoms were predominant in spring – 62%, in summer – 53% and in autumn – 58% (Table 1). Green algae also formed a large group: they made up 24% in spring, 35% in summer and 29% in autumn. The share of blue-green algae was 7% in spring, 6% in summer and 9% in autumn.

In total, 62 species of phytoplankton were identified in the lake for the studied seasons of the year. Species identification in the lakes showed the following results (Table 2):

**Table 1** – Dominant classes of phytoplankton in Lake Taldykol

| Phytoplankton | Share, % | | |
|---|---|---|---|
| | Spring | Summer | Autumn |
| *Bacillariophyta* | 65 | 53 | 58 |
| *Chlorophyta* | 24 | 35 | 29 |
| *Cyanobacteria* | 7 | 6 | 9 |

**Table 2** – Phytoplankton species in Lake Taldykol

| Types of phytoplankton | Spring | Summer | Autumn |
|---|---|---|---|
| *Bacillariophyt*a | | | |
| *Melosira varians* Agardh | + | - | + |
| *Cyclotella species* Kützing | + | + | - |
| *Diatoma sp* Müller | + | + | + |
| *Diatoma anceps* Ehrenberg, Kirchn. | + | + | + |
| *Synedra acus Kütz.* | - | + | - |
| *Synedra tabulata* (Ag.) Kütz. | + | + | - |
| *Meridion circulare* Ag. | - | + | + |
| *Melosira arenaria* Moore | + | - | + |
| *Fragilaria construens* (Ehr.) Grun. | - | + | + |
| *Synedra ulna (*Nitzsch.) Ehr. | - | - | + |
| *Cocconeis pediculus* Ehr. | + | - | - |
| *Cocconeis placentula* Ehr. | - | + | + |
| *Rhoicosphenia curvata* (Kütz.) Grun. | - | + | - |
| *Navicula cuspidate* Kütz | - | + | - |
| *Navicula sp* Bory de Saint-Vincent | + | + | - |
| *Navicula gracilis* Kütz | + | + | - |
| *Navicula viridula* Kütz | - | + | + |
| *Navicula radiosa* Kütz | + | + | - |
| *Navicula exigua (Greg.)* J.Müll. | - | + | - |
| *Navicula prostrata* Ehr | - | + | - |
| *Navicula amphibola* Brebisson | + | + | + |
| *Caloneis silicula (*Ehr.) Cl. | - | + | - |
| *Girosigma Spenseri* (W.Sm.)Cl. | - | + | - |
| *Girosigma balticum* (Ehr.)Rabenh. | - | - | + |
| *Caloneis amphisbaena* (Bory) Cl. | - | - | + |
| *Gyrosigma acuminatum* Bory de Saint-Vincent | + | - | - |
| *Amphora ovalis* Kütz. | + | - | - |
| *Cymbella prostata* (Berkley) Cl. | - | + | - |
| *Cymbella affinis* Kütz. | - | + | + |
| *Cymbella lanceolata* (Ehr.) V.H. | - | - | + |
| *Cymbella cistula (*Hemp.) Grun. | + | - | - |
| *Cymbella stigmafora* Grunow | - | + | + |
| *Nitzschia Sigma (*Kütz.) W.Sm. | + | - | - |

*Continuation of the table*

| Types of phytoplankton | Spring | Summer | Autumn |
|---|---|---|---|
| *Nitzschia acicularis* Kütz | + | + | + |
| *Surirella Capronii* Breb. | - | + | - |
| *Surirella ovalis* Ehr. | + | + | + |
| *Gomphonema constrictum* Ehr. | - | + | - |
| *Gomphonema intricatum* Ehr. | - | + | + |
| *Bacillaria paradoxa* Gmelin | + | - | - |
| *Symatopleura solea (*Breb.) W.Sm. | - | - | + |
| *Pinnularia subgibba* Ehr. | + | + | + |
| *Pinnularia* Ehr. | - | + | - |
| *Tabellaria* Ehr. | + | - | - |
| *Chlorophyta* | | | |
| *Lagerheimia* Alder | + | - | + |
| *Geminella sp* Ehr. | + | + | + |
| *Chlorella* Beijerinck | + | + | - |
| *Oocystis* Bory de Saint-Vincent | - | + | + |
| *Spirogira Weberi* (Kütz.) Czurda | + | - | - |
| *Pediastrum* Bory de Saint-Vincent | - | + | + |
| *Scenedesmus* Corda | - | + | - |
| *Stigeoclonium tenue* Kütz | + | + | - |
| *Ulotrix subtilis* Kütz | - | + | - |
| *Cyanophyta* | | | |
| *Microcoleus tenerrimus* Mertens ex Gomont | - | + | - |
| Aphanizomenon *Lemm.* | - | + | - |
| Anabaena sp. Bory de Saint-Vincent | - | + | + |
| *Oscillatoria brevis* Kützing *ex* Gomont | + | - | - |
| *Oscillatoria chalybea* Mertens ex Gomont | + | + | - |
| *Oscillatoria princeps* Vaucher ex Gomont | + | + | + |
| *Spirulina fusiformis* Voronichin | + | + | - |
| *Euglenophyta* | | | |
| *Euglena gracilis* Klebs | + | + | - |
| *Trachelomonas volvocina* Ehrenberg | - | - | + |
| *Peridinium* Ehrenberg | - | + | + |

The primary productivity of phytoplankton varied at different times of the year: in spring the total number was 12.19 thousand cells/cm³, and the total biomass was 3.1 mg/dm³; in summer the total number reached 24.6 thousand cells/cm³, the total biomass was 7.6 mg/dm³; in autumn the total number was 27.9 thousand cells/cm³, the total biomass was 12.93 mg/dm³ (Table 3).

In all the studied seasons, the lake waters were classified as β-mesosaprobic zone, however, in autumn, saprobity increases and is on the border closer to the L-mesosaprobic zone. Thus, most lakes have a tendency to eutrophication of waters, and therefore have a low self-purification potential. Despite the overall high productivity of algae in water bodies, the function of saprophytes remains low.

However, in terms of the total number of algal flora, the trophicity of the lake in the selected areas is mesotrophic, as it is in the range of 3.85-20 million cells/l.

**Table 3** – Quantitative indicators of phytoplankton in Lake Taldykol

| Indicators | Spring | Summer | Autumn |
|---|---|---|---|
| Total number of algal flora (thousand cells/cm³) | 12,19 | 24,6 | 27,9 |
| Total biomass mg/dm³ | 3,1 | 7,6 | 12,93 |
| Saprobity index | 1,70 | 1,81 | 2,5 |

*Quantitative indicators of zooplankton in Lake Taldykol*

Zooplankton in the lake is an important component of the ecosystem, playing a key role in the food chain of water bodies. It serves as an important link between phytoplankton (algae) and larger organisms such as fish [26]. The main groups of zooplankton that are found in Lake Taldykol are:

- Cladocera (*Cladocera* G. O. Sars), in particular small crustaceans such as *Daphnia* (Linnaeus (1758), *Bosmina* (Baird (1850), and *Chydorus* (Baird (1850);
- *Copepods* (Copepoda Linnaeus (1758). Of the representatives of this group, *Cyclops* (Linnaeus (1758) and *Diaptomus* (Koch (1837) predominate) play an important role in maintaining the balance of the ecosystem of water bodies;
- *Rotators* (*Rotifera*, Bory de Saint-Vincent (1824). Such as *Brachionus*, Bory de Saint-Vincent (1824), *Keratella* (Gosse, 1851) have been discovered.

Zooplankton plays an important role in regulating the abundance of phytoplankton, which helps maintain balance in aquatic ecosystems. In addition, zooplankton is the main food source for many fish species, especially juveniles [27].

The composition and abundance of zooplankton varied depending on the season and the availability of nutrients. A total of 22 species of zooplankton were identified in the studied lakes (Table 4).

**Table 4 –** Zooplankton species in Lake Taldykol

| Types of zooplankton | Spring | Summer | Autumn |
|---|---|---|---|
| *Rotifera* | | | |
| *Asplanchna silvestris* Daday | + | + | - |
| *Synchaeta sp.* Linnaeus | - | - | + |
| *Euchlanis sp.* Linnaeus | + | - | + |
| *Lepadella patella* Gosse | + | - | - |
| *Brachionus quadridentatus hyphalmyros* Tschugunoff | + | + | + |
| *B.angularis* Gosse | + | + | - |
| *B.calyciflorus spinosus* Wierzejski | + | + | - |
| *Keratella cochlearis* Gosse | + | + | + |
| *Testudinella trilobata* Gosse | - | + | - |
| *Keratella quadrata* Gosse | - | + | + |
| *Euchlanis triquetra* Müller | + | + | + |
| *Cladocera* | | | |
| *Rhynchotalona falcatasp* Koch | + | + | + |
| *Daphnia cucullata* Sars | + | - | + |
| *Daphnia longispina* Muller | - | - | + |
| *Magna sp.* Straus | + | - | - |
| *Ceriodaphnia sp.* Richardson | + | + | - |
| *Bosmina sp.* Baird | + | + | + |
| *Chydorus sphearicus* Muller | + | + | + |

*Continuation of the table*

| Types of zooplankton | Spring | Summer | Autumn |
|---|---|---|---|
| *Leptodora kintii* Focke | + | + | + |
| *Pleuroxus striatus* Baird | - | - | + |
| *Copepoda* | | | |
| *Cyclops sp.* Linnaeus | + | + | + |
| *Eurytemora velox* Sars | + | - | + |
| *Acanthocyclops vernalis* Fischer | - | - | - |
| *Cyclop strenuous* Sars | - | - | - |

The abundance of cladocerans in May was 22.07%, in August 38%, in October 34% (Table 5).

The content of rotifers was 0.03% in May, 28% in August, and 5% in October. Copepods were the most abundant in May – 77%, 51% in August, and 41% in October.

In terms of abundance and biomass, zooplankton was most abundant in summer (total abundance – 4.89 thousand specimens/m³, total biomass – 50.29 mg/m³) and spring (total abundance – 4.61 thousand specimens/m³, total biomass – 44.1 mg/m³); then in autumn – the total number is 3.33 thousand specimens/m³, the total biomass is 32.37 mg/m³.

Based on the calculation of saprobity indices for different groups of hydrobionts, it can be concluded that in all seasons the lake is classified as moderately saprobic (β-mesosaprobic) in terms of water quality. However, in spring and autumn, saprobity is higher than in summer, which indicates a decrease in the reservoir's ability to cope with organic pollution.

**Table 5 –** Dominant classes of zooplankton in Lake Taldykol

| Zooplankton indices | Spring | Summer | Autumn |
|---|---|---|---|
| Cladocera, % | 22,07 | 38 | 34 |
| Rotifers, % | 0,03 | 28 | 5 |
| Copepods, % | 77 | 51 | 41 |
| Total number, thousand specimens/m³ | 4,61 | 4,89 | 3,33 |
| Biomass, mg/m³ | 44,1 | 50,29 | 32,37 |
| Saprobity index | 1,92 | 1,85 | 2,3 |

As the results of our work show, the composition of species in the reservoir varies by season, although the lake is located within the β-mesosaprobic zone. The composition of zooplankton is not rich and is represented by species typical for this region, most of which have a wide range of tolerance.

## Conclusion

Lakes are key components of natural ecosystems, performing important ecological functions: regulating water balance, maintaining biological diversity and providing the population with fresh water. However, under conditions of increasing anthropogenic load, many water bodies, including Lake Taldykol, are facing increasing environmental problems. Pollution of water bodies with organic and chemical compounds coming from agricultural, industrial and domestic sources negatively affects the quality of water and the biodiversity of the lake, which leads to a decrease in its environmental sustainability.

Key findings:

1. According to the results of hydrochemical analysis of water in Lake Taldykol, a sharp decrease in mineralization and water hardness was recorded over the year, which indicates dilution of the lake with fresh water and a change in the type of water from chloride-sulphate to hydrocarbonate. At the

same time, a decrease in organic and chemical pollution is observed, with the exception of a summer surge in phosphates and nitrites, which may indicate a local influx of wastewater.

2. The phytoplankton of the lake is represented mainly by diatoms, green, and blue-green algae. A total of 62 species of algae were identified in the lake over the studied seasons. Seasonal variability in productivity was established: in spring (total abundance – 12.19 thousand cells/cm³, total biomass – 3.1 mg/dm³), in summer (total abundance – 24.6 thousand cells/cm³, total biomass – 7.6 mg/dm³), in autumn (total abundance – 27.9 thousand cells/cm³, total biomass – 12.93 mg/dm³).

3. 22 species have been identified in the lake's zooplankton. The maximum values of abundance and biomass were recorded in summer (total abundance – 4.89 thousand specimens/m³, total biomass – 50.29 mg/m³), followed by spring (total abundance – 4.61 thousand specimens/m³, total biomass – 44.1 mg/m³); and autumn (total abundance – 3.33 thousand specimens/m³, total biomass – 32.37 mg/m³), which confirms the seasonal features of zooplankton community development.

4. Calculations of saprobity indices for various groups of hydrobionts showed that Lake Taldykol retains the status of a moderately polluted water body throughout the year (β-mesosaprobic zone). However, in spring and autumn, saprobity is on the border closer to the L-mesosaprobic zone, significantly higher than in the summer period, which indicates a decrease in the reservoir's ability to cope with organic pollution. But in general, the reservoir retains a moderate ability to self-purify based on the ratio of free oxygen to $BOD_5$.

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