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Number and Biomass of Blue-Green Algae of the Mejdurechencky Reservoir

Alimjanova Kholishon Alimjanovna[1*], Elmuratova Aigul Almuratovna[2] and Jumaeva Diloram Sardalovna[3]

[1]*Institute of Botany of the Academy of Sciences of the Republic of Uzbekistan*
[2]*Karakalpak Scientific Research Institute of Natural Sciences of the Karakalpak Branch of the Academy of Sciences of the Republic of Uzbekistan*
[3]*NUUz – Applicant, Republic of Uzbekistan*

**Corresponding author*

Abstract

In the Present study reported on the abundance and biomass of blue-green algae. They develop in the form of a mass in plankton from the second half of April to November, but mainly at the end of July and in the first ten days of August in the coastal areas of the studied water bodies at 2-3 m depth of water, at a temperature of 28-29^{o}C. Their total number in the Koshpeli Aydin, its northwestern shallow water area, reaches 41,293 million cells / m^{3}. North eastern and northwestern regions of Koksu and lower - Balta Ketken. Wide distribution of representatives of Lyngbya and other species within the studied reservoir.

Article Info

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Keywords

Abundance, biomass, algae, Mezhdurechensky reservoir.

Introduction

Climate change and the impact of anthropogenic pressure have now become one of the influencing factors on water and biological resources. Due to this, the Aral Sea gradually dries up and splits into several particles.

The Mezhdurechensk reservoir is one of the particles of the Aral Sea. The biological resources of the reservoir are the great importance. And this is interconnected with water resources. The study of biological and water resources, and their relationship is an urgent problem. Until now, the abundance and biomass have been insufficiently studied (3, 4). In this connection, we paid attention to the study of the abundance and biomass of phytoplankton in the Mezhdurechensk reservoir.

The aim of the research is to study the abundance and biomass of blue-green algae in the Mezhdurechensk reservoir.

Research objectives

Collecting materials from monitoring stations; determination of the species composition; calculation of the abundance and biomass of blue-green algae.

Objects, Materials and Research Methods.

The objects of research are blue-green algae of the Mezhdurechensk reservoir. During 2003-2012. and 2018-2021 collected (1,5) algological samples of phytoplankton, phytobenthos, periphyton of the planned

monitoring stations (MS) of the reservoirs. In laboratory conditions, the species composition (3, 4), the abundance and biomass of blue-green algae were determined. The study used hydrobiological and algological research methods (1, 5). We used a Carl Zeiss microscope, plankton set No. 78, and other instruments. As a result, we got the following results:

Results and Discussion

Determination of the number and biomass of algae in the Mezhdurechensk reservoir is relevant, since they are primary producers and are of great importance in the life of consumers, such as hydrobionts of zooplankton and zoobenthos. During the study period (2003-2012, 2018-2021) of the Mezhdurechensk reservoir, we encountered 462 species and intraspecific taxa of algae belonging to 8 divisions, 16 classes, 28 orders, 54 families and 103 genera. Below is a description of the species and intraspecific taxa of algae inhabiting the Mezhdurechinsk reservoir in 2003-2007, 2010-2012 and 2018-2021 yy.

Non-green algae (Cyanophyta) in the Mezhdurechenskoye reservoir are represented in rather numerous quantities. They are represented by 18 genera, 13 families and 103 species and varieties. The richest in species composition is the genus Oscillatoria (27 species). Representatives of this genus are found throughout the entire water area: as part of plankton, benthos, and periphyton of the reservoir. Oscillatorialimosa and *O. terebriformis* are found everywhere in abundance. They develop in the form of a mass in plankton from the second half of April to November, but mainly at the end of July and in the first ten days of August in the coastal areas of the studied water bodies at 2-3 m depth of water, at a temperature of 28-29^{o}C. Their total number in the Koshpeli Aydin, its northwestern shallow water area, reaches 41,293 million cells / m^3. And *also O. irrigua, O. simplicissima* are very different in their development from other blue-green and are found almost everywhere, but at the same time they develop maximally in summer plankton in the northeastern and northwestern regions of Koksu and the lower - Balta ketken. Their rather long and twisted thalli, together with other filamentous algae, often cause "bloom" of water here. Other species sporadically.

The genus Lyngbya in the plankton of the reservoir is represented by 19 species and forms; in terms of the amount of floristic composition, it takes the second place, after the genus Oscillatoria. The wide distribution of Lyngbya representatives within the studied reservoir undoubtedly plays a significant role in the creation of phytoplankton biomass, and more than 45% of the reservoir's water area is heavily occupied together with other algae. An abundant population of representatives of this genus is noted in the reservoir everywhere, but they differ significantly in the coastal part of the reservoir, in the northeastern region, near the village. Shegeaul, and further in the Lower regions of Autel and Nogaiuzyak, where calm weather is observed in most cases. In the upper and lower areas, Shuakuzyak and Balta ketken are observed in the warm season in the surface layer of the reach, from late May to September, and is considered a lingby area due to the high concentration of its thalli, since the smell of hydrogen sulfide is emitted during the hot time of the day.

At the same time, some areas of the coastal area are shallow, significantly occupied by dense reeds, together with dwarf thickets of cattail. Deeper than the reservoir, populations of species of the genera of hornwort and pondweed continue. The leaves and stems of the underwater part of these macrophytes are almost permanently covered with slimy and slimy *Lyngbya thalli*, *L. confervoides* and *L. majuscula* reach the maximum development in the reservoir layer at a depth of 1.5-3.0 m, almost annually from the beginning of July to August with numbers up to 3310 and 5231 million cells / m^3, respectively. The development of *L. martensiana* and *L. aestuarii* is observed in the eastern coastal areas of Koksu and the southwestern part of Balta Ketken, in the central regions of Koshpeli Aydin and Shuakuzyak. In 2006, after August 15, in Zhideli, a narrow area under low water conditions, their total number in the 2.0 m water layer almost constantly exceeded 2905 million cells / m^3, however, their development after a dry state gave way to another *L. martensiana* specimen.

In the central part, Koksu was distinguished by the development of Lyngbyalutea; in the summer period, at 1–3 m water depth, its abundance exceeded 47190 million cells / m^3. The rest of the Lyngbya representatives in the studied water bodies were rarely or sporadically encountered in the warm seasons. In creating the productivity of the reservoir, while sometimes due to its small size, they were of little importance.

The genus Gloeocapsa is represented by 13 species, but none of them, with the exception of *G. crepidinum*, reached significant development during the year. However, *G. crepidinum* is found everywhere in the

reservoir, and significant development is noted almost annually from late May to mid-September in 2005 and 2006. in the central area of the Koshpeli Aydin and in the end area of Nogai, the uzyak, at a water temperature of 26-290C, as well as in the bottom plankton, respectively, 23045 and 19782 million cells/m3 (Fig. 1, 2-4).

Creation of small local water bodies in the Amu Darya delta:

The genus Microcystis includes 11 species and forms that are of great importance for the Mezhdurechye reservoir. Thus, *Microcystis aeruginosa* and its *F. flos-aquae* develop in bulk, usually at 1–2 m water depth, and play the role of dominants or subdominants in the plankton composition. In the reservoir, they are found everywhere, especially in its shores, in calm weather they often cause "bloom" of water, in the spring at the end of May (up to 860 and 740 million cells / m3) for recent years, and in the summer season, during calm periods, the water surface is covered with a thick layer films of these algae with various bubbles, the thickness of which reaches from 0.5 to 2.5 cm (Fig. 2-4).

After a period of reservoir flooding in 2011 and 2012. its high concentration is constantly observed in the northeastern region of the lake. Shchegekul, near the reaches of less frequently growing and dwarf thickets of *Phragmites communis*, amounting to 19000-21785 and 24186-25660 million cells / m3, respectively.

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The genus Merismopedia is represented by 8 species and forms, of which *M. tenuissima* and *M. punctata* occupy a leading position and are distributed throughout the entire water area of the reservoir. The abundance, especially of the first species, from July to the first half of August at a depth of 1.0-2.5 m of water reaches from 24300 to 37500 million cells / m3, and then their development gradually decreases with increasing water depth.

The genus Gomphosphaeria includes 5 species and forms, of which *G. lacustris*, *L. Aponina f. delicatula, f. multiflex*. The maximum of their development is observed from the first half of May to the end of September, but significantly in July-August. They are found throughout the entire water area of the reservoir, but reach the greatest development (up to 3460 million cells / m3) in the northeastern and northwestern deep-water areas of Lake. Shchegekul and the eastern region of Koksu, as well as in Zhideliuzyak and Koshpeli Aydin. All other representatives of blue-green algae, with the exception of Aphanizomenonflos-aquae (they act as dominants almost all year round), are qualitatively poor. Each genus includes from 2 to 5 species (Spirulina - 5, Phormidium - 5, Schizothrix - 2), which, as a rule, are rare, in small numbers and only occasionally act as dominants. These include *Cyanothrix gardneri, C. gardneri f. caspica*, *Coelosphaerium pucillum*.

As a result of the study, the intended goals and objectives of the research were obtained. Long-term studies on monitoring stations were carried out and the species composition was revealed, the average data on the abundance and biomass of blue-green algae in the Mezhdurechinsky reservoir were calculated. The following conclusions follow from these:

Department of Blue-green algae consists of 18 genera, 13 families and 103 species and varieties. The most diverse in terms of species richness are the genus Oscillatoria (27 species), Lyngbya (19 species) and Gloeocapsa (represented by 13 species).

Oscillatoria limosa, *O. terebriformis* are found everywhere in large quantities. They develop in the form of a mass in plankton from the second half of April to November, but mainly at the end of July and in the first ten days of August in the coastal areas of the studied water bodies at 2-3 m depth of water, at a temperature of 28-29oC. Their total number in the Koshpeli Aydin, its northwestern shallow water area, reaches 41,293 million cells / m^3.

Fig.1 Map of the Mezhdurechensk reservoir of the South Aral Sea region

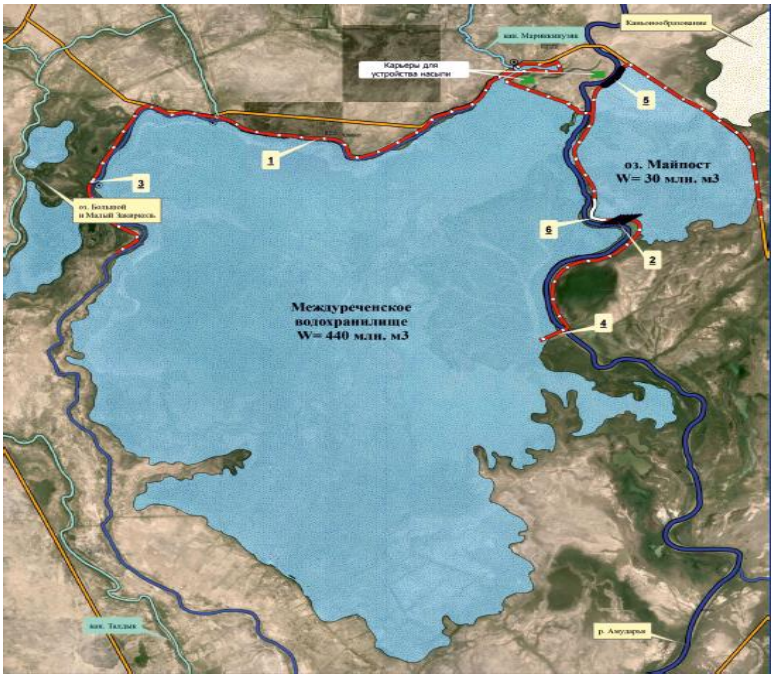


Fig.2 Seasonal and interannual dynamics of the abundance of common phytoplankton species in the Mezhdurechensk reservoir in 2003

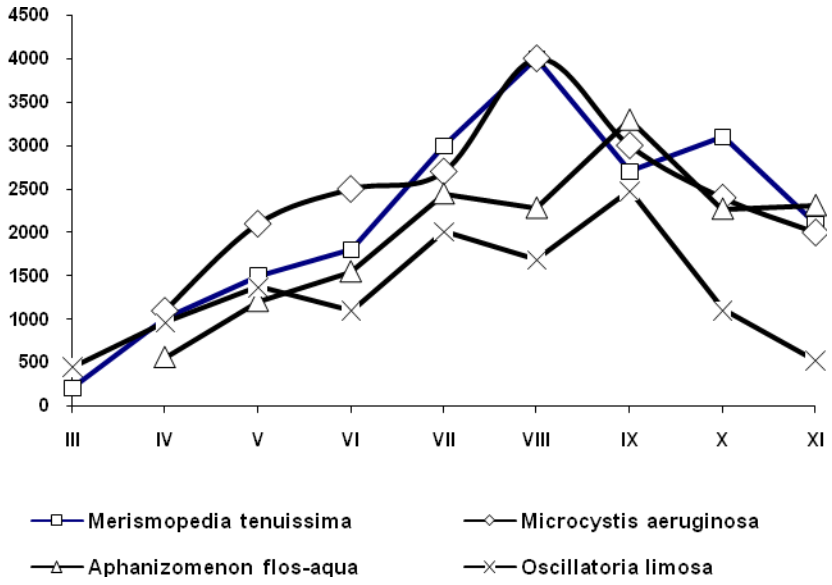


Fig.3 Seasonal and interannual dynamics of the abundance of common species phytoplankton in the Mezhdurechinsk reservoir in 2005.

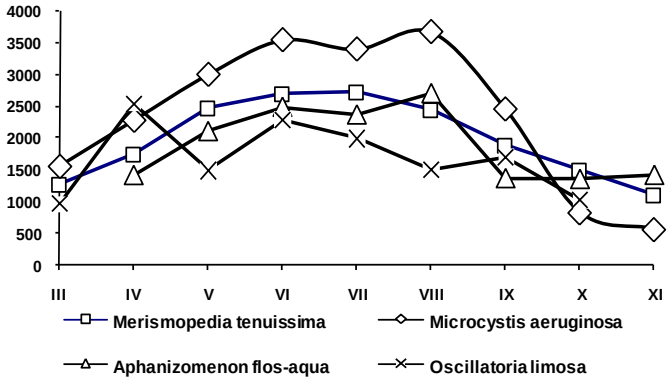
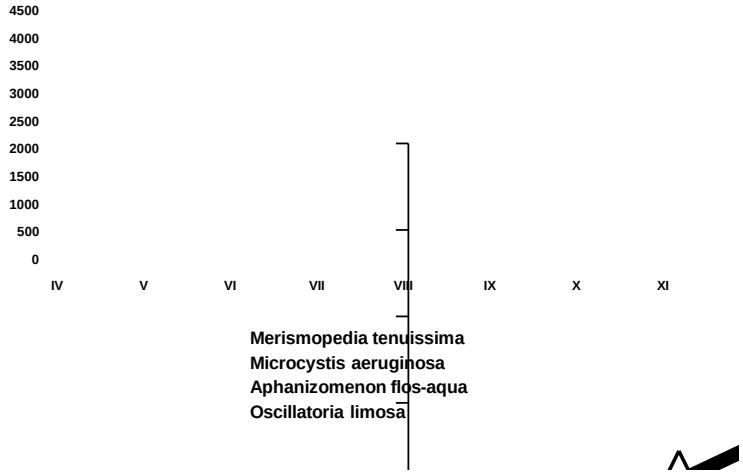


Fig.4 Seasonal and interannual dynamics of the abundance of common phytoplankton species in the Mezhdurechinsk reservoir in 2006



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million cells / m^3). The number of species of algae from the genus Merismopedia reaches from 24300 to 37500 million cells / m^3, Gomphosphaeria - up to 3460 million cells / m^3

Recommendations

The amount and biomass of algae allows natural feeding of fish in the Mezhdurechinsk reservoir. In this regard, we recommend using blue-green algae when feeding fish in natural conditions.

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