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SEASONAL DEVELOPMENT OF THE ALGOFLORA OF THE SOUTH FERGANA CHANNEL IN 2023-2024

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ABSTRACT

The article is devoted to the taxonomic analysis of algae found in the South Fergana Canal for the 4 seasons of 2023-2024. As a result of observations, it was determined that algae have 204 species and subspecies (172 - species, 30 - variations, 2 - forms) belonging to 4 kingdoms, 6 divisions, 10 classes, 22 orders, 30 families, 41 orders. Of these, Heterokontophyta - 179, Cryptista - 1, Chlorophyta - 1, Charophyta - 1, Euglenophyta - 4, Cyanobacteria - 18 species and subspecies.

Key words

algoflora, algae, systematics, South Fergana Canal, observation point, stream, species, species type, natural environment.

INTRODUCTION

The Southern Fergana Canal is one of the major irrigation canals flowing through the Fergana Valley. The chief designer of the canal is the "Uzgidrovodxoz" institute, while the main repair works are carried out by "Farg'onagidrovodxoz." The canal was reconstructed between 1969 and 1985. This canal is considered a major tributary of the Shahrixonsoy Canal, located on the left bank of the Qoradaryo River.

Several structures and technical devices have been built along the canal, which are of great economic and social importance. These include 1 main distributor, 12 defense structures, 162 water conduits, 3 pump stations for lifting water, 31 road bridges, 4 railway bridges, 1 aqueduct, 32 conduits for flood protection, 3 emergency discharge outlets, 8 quick-release devices, 21 weirs, and 8 water

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discharge points. These facilities serve to ensure the technical safety of the canal's operation.

ANALYSIS OF LITERATURE AND METHODS

During the collection of water samples from the Southern Fergana Canal, important indicators of the area were taken into account, including the characteristics of the sampled water basin, as well as the air temperature at the time of sampling, the width of the canal, water clarity, water flow velocity, sources of water pollution, the amount of dissolved oxygen in the water, and the water's environment (pH).

For collecting samples of plankton organisms, we used a plankton net numbered 78. Additionally, for collecting benthic and periphyton samples of algae flora, we utilized scalpels and rulers.

When taking samples from the coverings of aquatic plants growing on the concrete walls of the Southern Fergana Canal or from filamentous, green, blue-green, and brown films that had formed on stones at the water's surface, we directly cut and scraped them by hand from areas measuring 1-10 cm^2 using scalpels and knives. Their length was measured on-site with a ruler.

The collected samples were placed in special containers filled with canal water, and 3-4 drops of a 4% formalin solution were added for fixation (preservation). In each sampling area, a portion of the collected samples was brought to the laboratory of the Department of Botany, Biotechnology, and Ecology at Fergana State University without fixation, in order to study live samples. In the laboratory, we prepared specimens from the unfixed aquatic plant samples and identified the species composition of the plants under a light microscope.

In determining the species composition and taxonomic position of the aquatic plants in the Southern Fergana Canal, we utilized identification guides such as "Identification of Freshwater Algae of the USSR," "Identification of Freshwater Algae of the Ukrainian SSR," "Identification of Cyanobacteria of Central Asia," "Identification of Protococcoid Algae of Central Asia," and "Flora of Algae in Mountain Water Bodies of Central Asia." We also referred to the monographs by A.M. Muzafarov, K.Yu. Musayev, A.E. Ergashev, S.A. Khalilov, R.Sh. Shoyakubov, S.X. Khalilov, and X.A. Alimjanova, M.A. Shayimkulov. For some taxonomic changes in the names of diatom classes (Centrophyceae, Pennatophyceae) and green algae (Chlorococcophyceae), we referenced the works of S.P. Vasser and conducted a re-analysis of the identified species using databases such as algaebase.org and gbif.org.

RESULTS AND DISCUSSION

The development and distribution of aquatic plants are significantly influenced by ecological factors. We observed changes in water temperature, water

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clarity, and air temperature in relation to the season along the Southern Fergana Canal.

During the autumn season (November 26, 2023), the temperature along the flow ranged from 5 to 10°C, while the air temperature was between 10 to 15-20°C. The pH level was measured at 7.7 to 8.2. We noted that the water in the lower part of the canal was stagnant, while in the middle and upper flows, it moved at a speed of 1.0 to 2.0 m/sec. Throughout the autumn season, we identified 101 species and varieties (87 species, 14 variations, and 1 form).

In winter, the decrease in sunlight and the drop in water temperature led to a reduction in species diversity. Consequently, our winter samples revealed 89 representatives of aquatic plants. The samples were collected on January 7, 2024, when the average air temperature was between 6 to 11°C, and the water temperature ranged from 5 to 9°C. It was determined that since the sources feeding the Southern Fergana Canal were mountainous snowfields, the water volume was stagnant in the lower reaches of the canal.

For the spring season of the Southern Fergana Canal, samples were collected on March 24, 2024. On that day, the water temperature along the canal flow varied between 8 to 12°C, while the air temperature ranged from 13 to 20°C. The turbidity of the water was moderate, with visibility averaging between 25 to 40 cm. The flow speed was measured at 2 to 2.5 m/sec in the upper reaches and between 0.5 to 1 m/sec in the lower reaches. Analysis of the samples revealed a total of 97 species and varieties during the spring season (88 species and 9 variations).

Samples for the summer season were collected on September 3, 2024. It was observed that the significant amount of sunlight falling on the canal water caused the water temperature to rise to between 16-19°C, while the air temperature ranged from 19-33°C. Due to the stagnation of the water, its clarity was around 10-30 cm, with a pH of 7-8.2. The flow speed varied between 1-2.5 m/sec, but in the lower reaches, the canal water was observed to have dried up due to its use for irrigation. During this period, it was noted that with the increase in water temperature, the number of species and their occurrence levels sharply increased. According to the analysis, there were 102 species and varieties identified (87 species, 14 variations, and 1 form).

The systematic analysis of the aquatic plants in the Southern Fergana Canal revealed a total of 204 species and varieties belonging to 6 divisions, 10 classes, 21 orders, 30 families, and 41 taxa across the four seasons of the year (172 species, 30 variations, and 2 forms). Each season—spring, summer, autumn, and winter—showed fundamentally different results in terms of species as well as some similarities. For example, species such as Gomphonema abbreviatum C.Agardh,

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Cocconeis hustedtii Krasske, Gyrosigma kuetzingii (Grunow) Cleve, Navicula gregaria Donkin, Cymbella affinis Kützing, Fragilaria virescens Ralfs, and Synedra ulna (Nitzsch) Ehrenberg were identified in all seasons of the year, while some species were only found in one specific season.

The importance of seasonal analysis in algofloristic studies lies in its ability to provide a scientific basis for understanding how aquatic plants adapt to seasonal changes in their ecological characteristics. Among the species, the Plantae was represented by the identification of 2 species belonging to 2 divisions. Chlamydomonas globosa J.W.Snow was found during the spring season at observation points in the Tolmozor pumping station in the Quva district, Ershi QFY in the Marhamat district, and Obodonobod QFY in the Khojabad district. Meanwhile, Cosmarium bioculatum var. bioculatum Ralfs were observed only during the summer season at the observation point in the Povulgan QFY of the Oltyaryk district.

The representatives of the Protozoa species constituted 4 species from the Euglenophyta division: Astasia parvula Skuja, Astasia pygmaea Skuja, Phacus agilis Skuja, and Phacus parvulus G.A.Klebs.

The representatives of the Bacteria species showed diversity primarily during the summer and autumn seasons, while Oscillatoria rupicola (Hansgirg) Hansgirg ex Forti was identified during the winter season and Gloeocapsa minor (Kützing) Hollerbach was found in the spring. This species' representatives included a total of 18 species and varieties belonging to 4 orders, 6 families, and 9 taxa within the Cyanobacteria division, specifically the Cyanophyceae class (including 1 form).

The Chromista led in terms of species diversity with 180 species and varieties identified. These species included representatives from the Heterokontophyta and Cryptista divisions. The representative from the Cryptista division, Cryptomonas gracilis Skuja, was identified among the summer samples from our observation site in the Povulgan district of Oltyaryk. The Heterokontophyta division comprised 4 classes, 13 orders, 19 families, and included a total of 179 species and varieties.

In the section, there are species that occur in all seasons, including Cocconeis hustedtii Krasske, Cocconeis placentula Ehrenberg, Cocconeis Skvortzowii (Skvortsov) Sheshukova-Poretskaya, Gomphonema abbreviatum C.Agardh, Gomphonema olivaceum var. minutissimum Hustedt, Gomphonema tergestinum (Grunow) Fricke, Rhoicosphenia curvata (Kützing) Grunow, Gyrosigma kuetzingii (Grunow) Cleve, Gyrosigma scalproides (Rabenhorst) Cleve, Gyrosigma Spenceri (W.Smith) Griffith Henfrey, Navicula confervacea (Kützing) Grunow, Navicula gregaria Donkin, Cymbella affinis Kützing, Cymbella turgida W.Gregory, Cymbella ventricosa Kützing, Amphora ovalis Kützing, Amphora ovalis var. pediculus (Kützing) Van Heurck, Fragilaria pinnata Ehrenberg, Fragilaria virescens

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Ralfs, Synedra tabulata (C.Agardh) Kützing, Synedra ulna (Nitzsch) Ehrenberg, Opephora martyi Héribaud, Meridion circulare (Greville) C.Agardh, Diatoma anceps (Ehrenberg) Kirchner, Diatoma hyemalis (Roth) Heiberg, Melosira islandica O.Müller, and Melosira varians C.Agardh.

CONCLUSION

It should be emphasized that the systematic analysis of the algoflora of the Southern Fergana Canal in all four seasons showed that, in addition to water clarity, water temperature, and flow rate, the main factor affecting the diversity of aquatic plants is the influence of anthropogenic factors. The impact of anthropogenic factors has an inverse proportional relationship with species diversity at the observation points. According to our observations, the excessive consumption of water through irrigation systems has negatively affected the development and reproduction processes of the species.

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