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Sseasonal Development of Algoflora of the South Ferghana Canal in 2019-2020

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Abstract: The article is devoted to the taxonomic analysis of algae found in the South Fergana Canal for all seasons of the year. As a result of the research, 181 species and types of algae (134 species, 36 variations, 11 forms) belonging to 6 divisions, 13 classes, 20 orders, 32 families, and 57 families were identified. Among them Cyanophyta - 30, Chrysophyta - 2, Bacillariophyta - 125, Pyrrophyta - 1, Euglenophyta - 9, Chlorophyta - 14 species and species.

Keywords: algoflora, algae, systematics, Southern Fergana channel, observation point, flow, species, variety, natural environment.

INTRODUCTION

The main channel of the South Fergana which flows through the territory of the Republics of Uzbekistan and Kyrgyzstan. The main reason for the creation of the canal is to regulate the water streams which are coming down from the Aloy Mountains and to improve the water supply in the eastern and southern parts of the Fergana Valley. The Southern Fergana canal was dug for this purpose in 1940 with a road. This channel is a major branch of the Shahrikhonsoy channel (on the left bank of Karadarya). The excavation of the canal was first dug up to Besholish area in Isfaramsoy, then its excavations were extended to Margilonsoy area. By 1946, the possibility of water supply of the Southern Fergana canal was extended to the territory of Altiariqsoy.

Currently, the length of the channel is 184.2 km. The width of the main channel of the Southern Fergana reaches 12 m in the upper, while its width reaches only 2 m in the lower part. This is due to the use of canal water in the irrigation system.

LITERATURE ANALYSIS AND METHODS

Ecological factors play a decisive role in the development and distribution of all algae. The temperature, gas exchange, clarity, mineralization, as well as the amount of biogenic elements along the streams of the Southern Fergana channel changed depending on the season.

In the Southern Fergana Canal, the increase of sunlight in the spring season, the temperature of the water along the channel streams is 6-7-8 °C, the air temperature is in the range of 28-30°C, the water clarity is 0.5-1 m, pH - 7, the flow speed changes to 1-1.5 m/sec, the color of the water is slightly lighter. In such conditions , a total of 59 types and species of algae were identified in the spring season along the channel streams . Among them, 3 species of green algae, 1 species of euglena algae, 1 species of pyrophytes, 43 species and varieties of diatoms (36 species, 7 variations), 1 species of golden algae, blue - 10 species of green algae (6 species and 4 forms). During this period, it was studied that the number of species and the level of their meeting increased sharply with the increase in water temperature.

In the summer season, water temperature along the stream is in the range of 18-20-26 ^{0}C, air temperature is in the range of 26-40 ^{0}C, pH -8, flow speed 1.0-1.5 m/sec, we observed that the color of the water in the canal was light in the upper reaches and cloudy in the lower reaches, so the water transparency was 0.25-0.30 m. 45 species and varieties were identified (34 species, 9 variations, 2 forms). Among them, there are 8 species and varieties of blue-green algae (6 species, 2 forms), 1 species of golden algae, 31 species and varieties of diatom algae (23 species). , 8 variations), 2 species of euglena algae, 3 species of green algae, and species diversity (2 species, 1 variation) were found.

In the autumn season the temperature of the canal along the stream is in the range of 15-20-22 ^{0}C, and the air temperature is in the range of 18-35 ^{0}C, pH-8, flow speed 1.0-1.5 m/sec, we observed that clarity is 25 -30m. During the autumn season, 50 species and varieties were identified. Among them, there are 6 species and varieties of *Cyanophyta* (4 species, 2 forms), *Chrysophyta* 1 species, *Bacillariophyta* 38 species and species (29 species, 8 variations, 1 form), *Euglenophyta* 2 species, *Chlorophyta* 3 species were found. Species belonging to *Pyrrophyta* section were not identified.

RESULTS AND DISCUSSION

We can see the decrease of sunlight and water temperature down to 10 C in the winter season of the Southern Fergana Canal as a limiting factor for the survival of algae. But this did not prevent the variety of species from increasing, and 97 species and varieties of species were found during the season (73 species, 21 variations, 3 forms). *Cyanophyta* has 9 species and varieties (8 species, 1 form), *Bacillariophyta* has 76 species and varieties (55 species, 19 variations, 2 forms), *Euglenophyta* has 4 species and varieties (3 species, 1 variation), *Chlorophyta* 8 species and varieties (7 species, 1 variation) were found. *Chrysophyta* and *Pyrrophyta* species were not identified.

6 sections, 13 classes, 20 orders, 32 families, 181 species and varieties belonging to 57 families (134 species, 36 variations, 11 - form) is the result of our observations during the 4 seasons of the year. We have observed the results of each season, i.e. spring, summer, autumn, winter, which are completely different from each other in terms of types, as well as similarities. For example, *Fragilaria virescens* Ralphs , *Synedra ulna* (Nitzsch.) Ehr., *Cocconeis disculus* var . *diminuta* (Pant.) Sheshukova, *Gyrosigma scalproides* (Rabenh.) Cl., *Gyrosigma spenceri* (W.Sm.) Cl., *Cymbella affinis* Kuetz., *Gomphonema tergestinum* (Grun.) Fricke were found in all seasons of the year. Some species were found only in one season of the year.

The importance of the seasonal analysis in algo-floristic analysis of the channel is the basis for our scientific conclusion about the extent to which the algae are adapted to seasonal changes in the situation caused by the ecological characteristics of the algae.

At present, the influence of the anthropogenic factor is increasing in the seasonal changes of algo-flora of the channel. Taking this into account, it is important to carefully study the abundance of species and the probability of meeting these species in seasonal analyses, through which the species in the anthropogenically polluted areas of the Southern Fergana Canal should simultaneously show the characteristics of adaptation to seasonal changes.

In the seasonal analysis, we have determined the four seasons of 2021, and it is appropriate to analyze the winter season as the first season.

The winter season is distinguished from other seasons by the relatively low number of species. The main reason for this is the reduction of daylight hours and the decrease of water temperature to the limit of viability. In addition, as a result of our observations in the winter season, I can say that we observed that the water level and the flow rate were relatively reduced. This, in turn, has a negative effect on the heat absorption of water and causes a sharp drop in temperature.

In the winter season, in some sections of algae, species richness prevailed over the rest of the season. Although the water temperature has increased in the samples taken in the spring months, we

can observe that the water clarity has decreased in the main, middle and lower streams of the channel, which in turn affects the water's permeability to sunlight, and as a result, the number of species remains. does not differ much from the seasons. As a result of my observations, I am sure that the temperature and clarity of the water is proportional to the number of species. The temperature and clarity of the water are changing in relation to each other. After all, when the temperature of the water rises, the clarity of the water decreases, this situation is related to the cloudiness of the mountain rivers that come to the Shahimardonsoi canal, which receives water from the canal.

Taking into account the fact that the temperature of the water rose a little in the summer season, and the length of the light day increased, it was assumed that there would be a large number of species, but our assumptions were not justified. As the reason for this, I would like to point out that a large amount of canal water is involved in irrigation works and the level of anthropogenic water pollution has increased compared to other seasons. During our expedition, I observed that water pollution has reached a high level in many areas by the local people and under the influence of various processes.

In this process, the consumption of most of the water through irrigation systems, in turn, had a negative impact on the development of species and reproduction processes.

During our expedition, it was found that the temperature of the water dropped a little in the autumn season. The cases of decrease in air temperature and shortening of daylight hours were found. At this time, the occurrence of large amounts of seasonal winds, contamination of the upper layers of water with soil rocks, and rainfall did not affect the clarity of the water. We must admit that in terms of species richness, it is not behind the summer and spring seasons.

I found it necessary to carry out the analysis of the representatives of the 6 sections identified from the samples of the Southern Fergana channel in the seasonal changes, in the case of dividing them into sections.

Cyanophyta, i.e. blue-green algae section, 30 species and species were identified during 4 seasons. (22 species, 8 forms) Of these, only 3 species: Oscillatoria *agardhii f. aequicrassa* Elenk ., *Oscillatoria tenuis* Ag. and *Oscillatoria Woronichinia* Anissim, was detected in summer and autumn seasons, and I did not meet any other species during 2 seasons. This indicates that their vegetation period is only compatible with the ecological conditions of that season.

Hormogoniophyceae in the winter season from representatives of *Cyanophyta* division and *Chroococcophyceae* I found out that representatives of the class met. In the winter season, 1 form with 8 species belonging to *Cyanophyta was identified.* Interestingly, these identified species were not observed in other seasons. Taking this into account, we can call these representatives of the blue-green algae department the species adapted to the winter season, and in the rest of the periods, they were in their state of anabasis, and active development was observed in the winter season.

A total of 10 species and varieties (6 species, 4 forms) from 2 classes belonging to the section (*Chroococcophyceae, Hormogoniophyceae)* were identified.

The number of species in the summer season is similar to the spring season, but the representatives are completely different. A total of 8 species and varieties were identified.

In the autumn season, the tours showed the same results as in the rest of the seasons. 4 species and 2 forms were identified, a total of 6 species and varieties.

A total of 2 species of representatives of the *Chrysophyta* section were identified in the samples, of which *Synochromonas pallida.* Korsch found in the samples taken during our expedition in the spring and summer seasons. This species was not detected in the samples from the remaining seasons.

Chromulina freiburgensis Dofl. belongs to *Chrysophyceae* class of *Chrysophyta* in autumn season was determined. At this point, I should mention that no species or varieties belonging to this section have been identified in the winter season.

the *Pyrrophyta* division, only the *Cryptomonadineae* class *Cryptomonadales* order, Family *Cryptomonadales* to the genus *Cryptomonas* belonging to *Cryptomonas obtorto* Conr. observed only in the spring season. Other representatives of this section and from other seasons were not identified.

the *Euglenophyta* division by seasons, species found in all seasons were not identified. In addition, species or species observed in one season were not observed in other seasons. *Phacus parvulus* Klebs is a species of the *Phacus* genus identified in the spring season of the euglenoid algae section.

In the summer season, 2 species belonging to *the Euglena* series were identified. These are *Euglena variabilis* Klebs. and *Euglena pisciformis* Klebs .

Even in the autumn season, there was no species richness. But the 2 species identified this season belong to different groups. *Trachelomonas volvocina* belonging to the genus *Trachelomonas* Ehr. and *Astasia* belonging to the genus *Astasia parvula* Skuja.

The number of species and species identified in the winter season was 4. The difference from other seasons is that it experiences variation. This was the only variation in the algo-flora of the Southern Fergana channel belonging to this section. 3 species and species belong to the same genus, *Trachelomonas*. These are *Trachelomonas scabra* Playf., *Trachelomonas oblonga* Lemm. and *Trachelomonas oblonga* var . *truncata* Lemm., and the remaining 1 species is *Colacium arbuscula* Stein.

Bacillariophyta is the section that differs in terms of species richness among the algae sections identified in the samples of the Southern Fergana Canal area. During the seasons of the year, it was determined that there are 2 classes, 5 orders, 8 families, 125 species and varieties of 28 families belonging to this section.

Among the representatives of this section, it was observed that there are species and species that can fully adapt to the vagaries of nature in all seasons, this situation was not observed in the representatives of any other section. These are *Fragilaria virescens* Ralphs , *Synedra ulna* (Nitzsch.) Ehr., *Cocconeis disculus* var. *diminuta* (Pant.) Sheshukova, *Gyrosigma scalproides* (Rabenh.) Cl., *Gyrosigma spenceri* (W.Sm.) Cl., *Cymbella affinis* Kuetz., *Gomphonema tergestinum* (Grun.) Fricke.

In addition, there are species identified in 3 seasons among the representatives of the department. *Diatoma heimale* (Lyngby.) Heib., *Diatom vulgare* Bory, *Amphora ovalis* var. *pediculus* Kuetz., *Cymbella lata*. there *is baicalensis* Sky. observed in spring, summer and autumn seasons, not detected in winter season. From this we can conclude that these species and species spend the rest period in the winter season. *Cocconeis pediculus* Ehr., *Cymbella aspera* (Ehr.) Cl. and *Gomphonema constrictum* Ehr. if it was not detected in the summer season, its presence among the samples was observed in the rest of the seasons. *Rhoicosphenia curvata* (Kuetz.) Grun. and if it was not found in the samples of the autumn season, it was found in all other seasons. *Synedra actinastroides* Lemm. observed in all seasons except spring season.

A total of 43 species and varieties were identified in the spring season, of which 36 are species and 7 are variations. It was found that the species identified in the spring season belong to 2 classes, 5 orders, 6 families, and 16 genera. The number of species and varieties encountered only in the spring season is 16, and they are *Melosira varians* Ag., *Tabellaria fenestrata* (Lyngb.) Kuetz., *Diatoma hiemale* var. *mesodon* (Ehr.) Grun., *Fragilaria capucina* var . *lanceolata* Grün., *Fragilaria crotonensis* Kitt., *Cocconeis thumensis* A. Mayer, *Mastogloia pumila* (Grun.) Cl., *Mastogloia smithii* Thw. there is *amphicephala* Grun., *Navicula incerta* Grun., *Amphora proteus* Greg., *Cymbella laevis* Naeg., *Cymbella prostrata* (Berk.) Cl., *Gomphonema parvulum* (Kuetz.) Grun., *Nitzschia distans* Greg . , *Nitzschia sigma* (Kuetz.) W. Sm., *Surirella robusta* var. *splendid* Ehr.

In the summer season, 23 species and 8 variations were identified, belonging to 2 classes, 5 orders, 5 families, and 12 categories. The species found only in the summer season took a significant

place. 9 species and species were not observed in other seasons. *Diatom elongatum* var. *tenue* (Ag.) VH., *Fragilaria bicapitata* A.Mayer, *Synedra ulna* var. *oxyrhynchus* (Kuetz.) VH., *Cocconeis hustedtii* Krasske., *Navicula dicephala* (Ehr.) W. Sm., *Navicula fluens* Hust., *Gyrosigma acuminatum* var. *lacustrine* Meist., *Gomphonema constrictum* var. *capitatum* (Ehr.) Cl., *Bacillaria paradoxa* Gmelin. such species were observed only in the autumn season.

In the autumn season, 29 out of 38 species and varieties were found to be species, 8 were variations and 1 was a form. When I analyzed the algoflora of the season, I found that it corresponds to 2 classes, 5 orders, 6 families, and 15 categories. Only in the autumn season, there were 11 species. *Cyclotella planktonica* Brunnth., *Navicula kolbei* Poretzky et., *Navicula viridula* var. *pomirensis* Hust., *Pinnularia braunii* var. *amphicephala* (A. Mayer) Hust., *Pinnularia leptosoma* Grun., *Pinnularia macilenta* (Ehr.) Cl., *Cymbella australica* AS., *Cymbella helvetica* Kuetz., *Gomphonema abbreviatum* Kuetz., *Gomphonema olivaceum.* there *is minutissima* Hust., *Cymatopleura elliptica* (Breb.) W.Sm . were found only in the autumn season.

In the winter season, the number of species far surpassed other seasons. In this season, 54 species, 19 variations and 2 forms were identified, and they belong to 27 genera, 8 families, 5 orders, and 2 classes. *Melosira italica* (Ehr.) Kuetz., *Cyclotella bodanica* Eutenst., *Tetracyclus rupestris* (A. Br.) Grun., *Tabellaria fenestrata* (L y ngb.) Kuetz. there *is intermedia* Grun ., *Meridion circulare* Ag ., *Diatoma elongatum* (Lyngb.) Ag. f. *actinastroides* (Krieg.) Pr., *Diatoma vulgare* Bory var. *ovale* (Fricke) Hust., *Opephora martyi* Herib., *Fragilaria atomus* Hust., *Fragilaria brevistrata* Grun., *Asterionella gracillima* (Hantzsch.) Heib., *Cocconeis disculus* (Schum.) Cl., *Achnanthes conspicua* A. Mayer, *Achnanthes Hantzschii* (Grun.) Cl.) Schulz , *Achnanthes lanceolata* var. *rostrata* Hust., *Mastogloia smithii* Thw . there *is lacustris* Grun ., *Navicula exigua* (Greg.) O. Muell., *Navicula fragilarioides* Krasske, *Navicula gibbula* Cl., *Navicula Kotschyi* Grun., *Navicula lundstroemii* var. *subcapitata* Wisl. Et Pretzky, *Navicula peregrina* (Ehr.) Kuetz., *Navicula tuscula* var. *rostrata* Hust., *Navicula peregrina* (Ehr.) Kuetz. there *is Kefvingensis* (Ehr.) Cl., *Navicula hungarica* var . *lueneburgensis* Grun . , *Navicula muralis* Grun ., *Pinnularia fasciata* (Lagerst.) Hust ., *Pleurosigma salinarum* Grun ., *Amphora altaica* Poretzky . , *Amphora mongolica* f. *interrupta* Skw., *Amphora ovalis* var. *gracilis* Ehr., *Amphora veneta* Kuetz., *Cymbella aequalis* W. Sm., *Cymbella lata* . there is *minor* Muelder, *Cymbella ventricosa* var. *ovata* Grun., *Cymbella sinuate* Greg ., *Cymbella turgida* (Greg .) Cl ., *Stauroneis parvulum* var . *primula* Grun ., *Gomphonema constrictum* var . *hedinii* (Hust.) Zabelina, *Nitzschia hantzschiana* Rabenh., *Nitzschia punctata* (W. Sm) Grun., *Nitzschia tryblionella* var. *constricta* I. Kiss, *Nitzschia holsatica* Hust ., *Nitzschia paleacea* Grun ., *Cymatopleura solea* (Breb.) W. Sm., *Surirella ovata* Kuetz ., *Surirella ovata* Kuetz . there *is salina* (W. Sm.) Hust. I found that the representatives met only in the winter season are 30 types, 15 variations and 2 forms.

the Chlorophyta department in the samples collected and examined during the seasons. Almost none of the algae belonging to this section was detected in seasons other than one, with the exception of *S ladophora glomerata* (L.) Kuetz . there *is glomerata* and *Schizomeris leiblenii* Kuetz . presence was observed in summer and winter season samples.

The species identified in the spring season are: *Ulothrix zonata* Kuetz., *Schizomeris leiblenii* Kuetz., *Cladophora fracta* Kuetz. belongs to 2 classes identified in the spring season.

The 3 species and subspecies identified during the summer season are: *Cosmarium lagerheimii* Gutw., *Cosmarium pseudatlantoideum* West. (species) and *S ladophora glomerata* (L.) Kuetz . there *is glomerata* (variation)

Schizomeris leiblenii Kuetz in autumn., *Cladophora glomerata* (L.) Kuetz., *Cosmarium trilobulatum* Reinsch. met.

The winter season was distinguished from other seasons by its wealth of species. 7 species (*Pedinomonas major* Korsch, *Chlorella luteoviridis* Chodat, *Ulothrix zonata* Kuetz., *Oedogonium*

nodulosus Wittr., *Spirogyra calospora* Cleve, *Closterium nordstedtii* (Delp.) Chodat), while 1 variation (*Cladophora glomerata* (L.) Kuetz. var. *glomerata*) was identified.

CONCLUSION

It should be noted that the systematic analysis of algo-flora of the Main Canal of the Southern Fergana for 4 seasons showed that the main factors affecting the diversity of algae are water clarity, water temperature, and the influence of anthropogenic factors in addition to the flow speed. it should be noted that The influence of the anthropogenic factor is inversely proportional to the diversity of species at observation points. According to the results of our observation , the consumption of most of the water through the irrigation systems has had a negative impact on the development of species and reproduction processes.

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