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Algae of the Dengizkul Collector Waters

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Abstract The article presents analysis of water samples obtained by research carried out in the lower, middle, upper reaches of the seaside collector of Bukhara region. In addition, as a result of research carried out in the Dengizkul collector between 2020 and 2022, several dominant types of algae were bred in laboratory conditions. The purification of the hydro chemical composition of the water of the Dengizkul collector with the help of algae was achieved.

Keywords Microscopic algae, Plankton, Bentos, Hydrobiont, Salinity

1. Introduction

Due to the shortage of Water Resources, Water Basin mineralization and their pollution by various chemicals are increasing in subsequent years. In the composition of collector-drainage waters, the number of different disease-dispersing bacteria of organic matter in subsequent times increases. Because often collectors are supplied from cities, factories and factories, as well as from agricultural enterprises (cattle farms, poultry farms, pig-breeding complexes, canned food farms, etc.).) the effluents that come out are thrown away without cleaning or in a immature purified state. In particular, all sewage from the cities of the guard, Kagan, Bukhara, Jandar, Karakul and Alat will be thrown into the Dengizkul collector and, as a result, will be put on the Dengizkul. Before using Collector waters, it is advisable to clean and use mineral salts, organic substances in their composition, as well as bacteria that spread various diseases. To reduce the level of soil salinity, to meet the water demand of agricultural crops, Amudarya water is used. In 1978, the volume of collector waters in Bukhara region amounted to 1494 million m^3 [1]. Dengizkul collector as a continuation of the Shurarik ditch in the Navai region, the upper flow of the pond begins from the Kagan District of the Bukhara region (Figure 1). The sailor collector is considered the main throwing ditch and acts as a result of the pouring of several small ditch waters – the expulsion of water leaking from under the ground, poison water (Grunt waters) from the territory of the district. Length 126.4 km, commissioned in 1967. In 2016, it was renovated by the Kagan water construction organization [2].

2. Literature Review

The dynamics of growth of some green algae in the Collector-drainage waters of the Bukhara region has been studied. According to the result of the study carried out in the collectors of the Bukhara region, 24 species and species of their waters were identified as the most common. In addition, about 850 algae and a total of 389 species and species were identified from the largest collectors in the Bukhara region – Lightning a, Sakovich and Mavliyan, of which 72 blue-green algae, 3 dinophytes, 163 diatoms, 19 Euglena algae and 132 green algae were identified. To reproduce them, a nutrient medium consisting of collector water and manure juice and a lotoc-type device for gross reproduction were created and recommended for use in the national economy [1].

A.E.Ergashev studied the flora of collectors and ditches in the Bukhara region. As a result of the research, 365 species and species have been identified, 2 of which are hara, 4 pyrophytes, 12 euglenas, 78 are blue-green, 42 are green and 157 are belonging to diatom algae, and data on their seasonal development are also provided [3].

3. Materials and Methods

The research work began in the spring season of 2020-2022 and was carried out in field and laboratory conditions. Hydrobiological samples were collected from the Dengizkul collector of Bukhara region once a month. During the research, the main three streams of the Dengizkul collector were covered:

Upper flow of Kagan District of Bukhara region;

Middle stream of Jondor District of Bukhara region;

Lower reaches of Karakul District of Bukhara region;

The analysis of the physico – chemical state of water consists of two types.

1. Hydrochemical analyzes in field conditions.
2. Hydrochemical analysis in laboratory conditions

In field conditions, indicators of water temperature, color, clarity, turbidity and rn were determined. With the air temperature "TSN -15" thermometer, the water temperature

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should be determined using the WT-1 digital thermometer, and the thermometer should be kept at a sampling depth of at least 7-10 minutes to determine the temperature. To determine the clarity of the water is a common *Secchi disk* (a white plate with a diameter of 20 cm is fixed on a measuring rope).

Water medium pH that is, the amount of hydrogen ion of water (pH)- using indicator paper, and the LPU-01 brand pH was measured in meters. The light was measured on the Yu-16 brand lux meter instrument. During the experiment, the DRL-400 lamp was used to provide the algae with light in laboratory conditions. All the remaining indicators of water were determined in laboratory conditions. In the conditions of the laboratory, the scientific laboratory of biotechnology and ichthyology of Bukhara State University and the scientific laboratory of the State Committee for Ecology and Environmental Protection Yu.Yu.Lurye [4;446-p] and N.S.Stroganov [5–; 195-p] analyzed by Styles.

Plankton collection consists of two types: quality and quantity samples. In this, the Plankton net was used. Kapron No. 76, water inlet diameter No. 20. Samples from Bentos and periphyton were assembled by hand, using a scalpel and a knife. When determining the amount of phytoplankton, plankton samples were collected, mainly with a specially prepared kefir bottle (to a depth of 0.5; 3M). It was carried out according to the generally accepted method of collecting Material and its re-analysis. Having collected samples, a few drops of 4% formalin were dripped into it, and formalin was not added to the sample to isolate an algologically clean cell, and the number of species in both cases was determined. In the process of work, the XDS-3, B-380 microscope was used. The amount of phytoplankton was determined in ECZ/l, and biomass in mg, g / m3. In laboratory conditions, an increase in cells was observed, and the number was determined through the Goryaev chamber. At the end of the experiment, the cells of the algae were isolated using centrifuge.

The following authors ' methods [8; 50-54-p,] used plant species determinants [6; 350-p, 7; 405-p] to distinguish and biomass algological pure species from within identified algae when identifying and reproducing the types of algae in the waters of the Marine collector. When determining the number and biomass of phytoplankton's G.K. Plotnikov (2017) [9; 282-p] and others were identified using his literature in his authorship.

4. Results

As the air temperature rises, the process of activation of hydrobionts begins. The water of the Marine collector is freshwater. At some times of the year, the amount of minerals increased and approached slightly salty. The main reason for this is the result of the waters flowing into the Marine collector from several collectors due to the reduction in the amount of salinity in the soil, which is carried out in the winter season. The water is clear; the clarity is seasonal in nature. The highest pointer 2.8-3.0 meters is observed in January February. And in the summer season, this pointer is 0.5-1.5 meters. Water temperature is closely related to air temperature. During the year, the average air temperature indicator was 20°C, and the water temperature indicator was 15.4°C. During the spring season may of the Dengizkul collector, hydrobiological samples were harvested. The Dengizkul collector began to flow higher than Kagan district in Bukhara region, coordinates 39°45′37.34″N, 64°38′07.64″E. The upper flow of the ditch is at the beginning of May, the air temperature is 18 0 – 190 C, the water temperature is 21.40 – 21.70 C. (hours: 6: 30). The depth of the ditch in the upper reaches is 1.5 – 2.0 meters. The clarity of the water is 1.0 meters. the pH-amount is 6.0 saline.

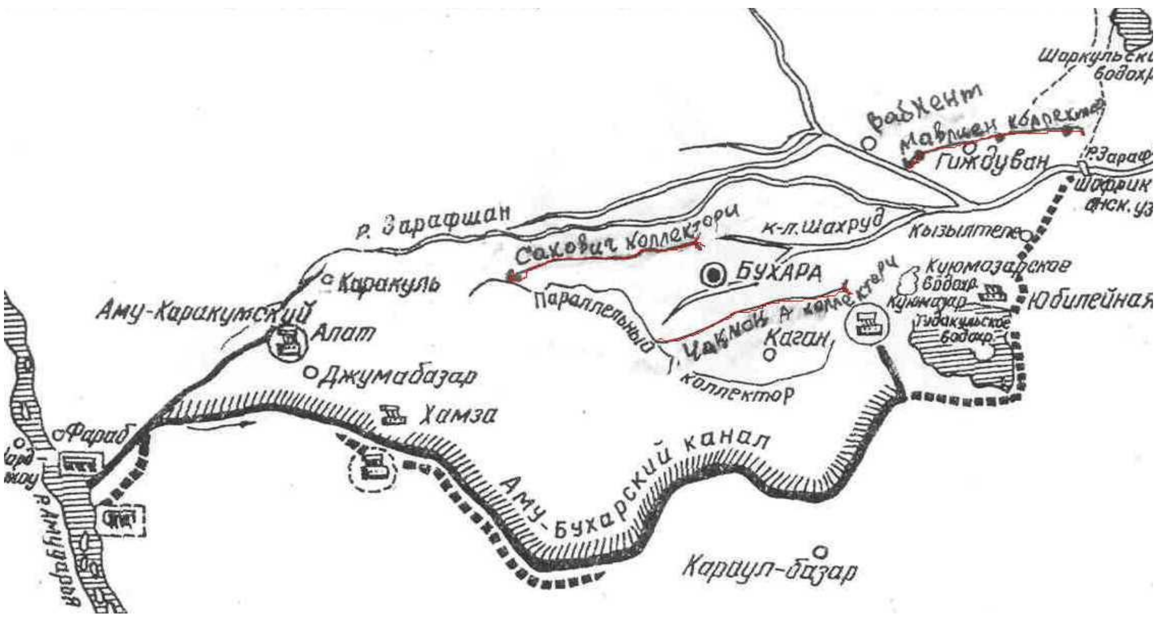

Figure 1. Location of collectors

The pond of Dengizkul dump middle stream continues its mission to transport the main pond Waters to the Dengizkul in a side-by-side position with the Kuymazar canal as a result of the pouring of several large and small ditches in the Jandar district. Coordinates 39°37′55.22 ″N, 64°06′10.7″E. The length of the throw middle stream of the ditch is 25 km, the service area is 480 ha. Samples were taken from the part of the ditch with the addition of the railway ditch and the Yakkatut ditch and from the areas of the ditch 10 meters away. At the beginning of May, the air temperature is 38 0 C, the water temperature is 23.40 – 23.50 C. (hours: 10: 40). In the middle parts of the throw middle stream of the ditch, the depth is 3 – 3.5 meters, in the previous kisms-2-2.5 meters. The clarity of the water is 1 -1.5 meters. it was found that the pH is 7, close to the amount of neutral saline. As a result of the addition of other ditch waters in the middle reaches of the ditch, the amount of suspended matter, chlorides and sulfates was found to be higher than the amount of indicators compared to other streams of the Dengizkul collector.

The lower reaches of the Dengizkul collector are the largest in comparison with other areas, and the Karakul district corresponds to the Paykent area (figure 2). The saltwater ditch is poured into the Dengizkul collector as a result of its confluence into a ditch named Sayot and the pond Association, which has an area of 16.85 km in length. [10] The downstream, which forms an area of 16 km, flows through the Alat district by going to the Dengizkul collector.

Coordinates 39°37′55.22″N, 64°06′10.7″E

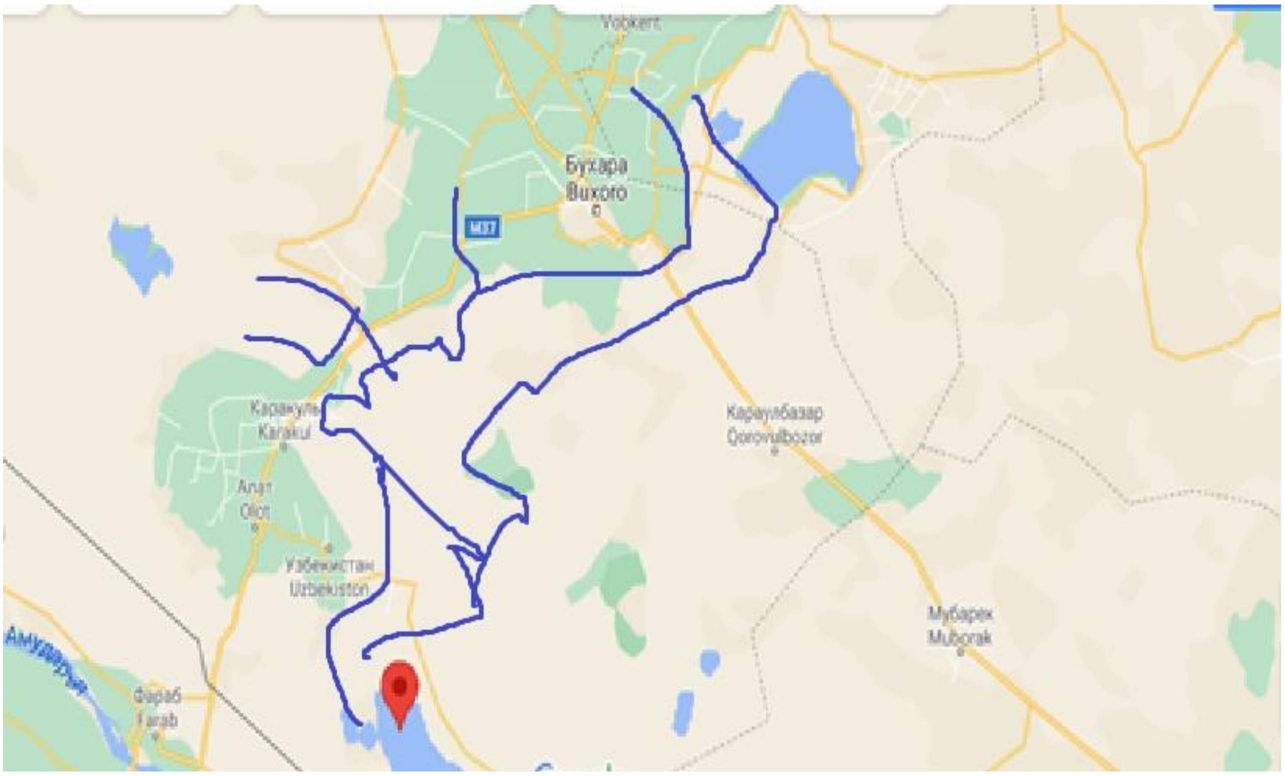

Figure 2. View of all streams of the Dengizkul collector

Table 1. Hydrochemical analysis of the upper flow of industrial water and all flaws of the Kagan District of the Dengizkul collector

№	Ingredients	Kagan District area industrial water upper stream	Kagan District area upper stream	Jandar District area Marine dump middle stream	Karakul District area Poykent lower stream
1.	Hanging items	25	23	24	22
2.	Chlorides	1797,3	966,05	879,1	879,1
3.	Sulfates	1643,0	2261,4	1610,5	1931,2
4.	Dry residue	5500	5500	5000	6500
5.	Nitrites	0,08	0,14	0,064	0,09
6.	Ion ammonium	1,4	2,6	1,3	1,8
7.	Oil products	6,4	8,6	7,8	7,4
8.	Phosphates	0,5	0.4	0,5	0,3

As the air temperature rises, the water temperature rises. At the beginning of May, the air temperature is 39 0 C, the water temperature is 26.50 – 27.50 C. (clock:13:14) and the air temperature at the time of completion of the collection of samples is 41 - 42 0 C, the water temperature is 26.80 – 27.90 C. (hours:13: 50). In the middle parts of the lower reaches of the ditch, the depth is 3 – 3.5 meters, in the previous kisms-3 meters. The clarity of the water is 0.5 meters. it was found that the pH – amount is 5-6, and the salinity is much higher than the amount. At the end of the experiment, the physic-chemical composition of the waters was determined – the amount of dry residue, ammonia, nitrites, chlorides and sulfates (Table 1).

The amount of dry residues in the collector was determined to a certain extent in the summer season, and in the Bukhara region due to the high air temperature in the summer and autumn seasons, an increase in dry residues as a result of the shining of water. It was found that the content of chlorides in the sea buckthorn water is 966.05– 879.1 mg/l, sulfates are at a high concentration of 2261.4– 1931.2 mg/l, seasonal due to the shine of the waters, the degree of salinity is at the expense of chlorides sulfates. Biogenic elements contained in water are assimilated by nitrogenous and phosphorus compounds, native and high plants in the lake. Because of this, the amount of oxygen in the water increases, and they were kept at 6.6 – 6.8 mg/l during the season.

Several types of dominant algae have been identified from the Dengizkul collector waters. Of these, Microcystis aeruginosa, M. aeruginosa f. flos-aquae, Nodularia harveyana, N. spumigena, Oscillatoria limosa, O. princeps, A. tenois, A. lemmermannii, A. woronichinii-blue-green algae; Synedra ulna, Cocconeis pediculus, C. placentula, Navicula cryptocephala, Nitzschia hungarica, N. sigmoidea - diatom algae; Euglena proxima, Phacus caudatus var. Minar, Ph. pleuronectes-evglena algae and Chlorella vulgaris, Ch. pyrenoidosa, Scenedesmus oblique, S. quadricauda, Cosmarium biocolatum, C. granatum-belongs to green algae. Of these, Chlorella vulgaris, Chlorella pyrenoidosa and Scenedesmus obliquus species were selected for breeding.

We conducted experiments in laboratory and production conditions in order to study the growth and development of algological pure species in collector waters, as well as the degree of water purification. To determine the yield of algae, 100 ml of suspension was dried at 105 degrees of biomass, which was precipitated in centrifuge at a speed of 5-6 thousand in 30 minutes. Biomass precipitated in centrifuge was put in a boxing, the weight of which was determined, and dried in a dryer oven. Dried algae biomass weighed on the scales and determined the weight. In laboratory conditions, algae were grown in specially made 1.5-liter tall glass jars, as well as in 20-liter aquariums with a volume of 10 liters of collector water and mixed with the help of a micro compressor (MK-40). After adding 04 mineral nutrient media to the sample, the light was kept under a falling window. A glass container with a sample and feed medium was mixed 3-4 times every day. It was found that other algae were reduced under the microscope after algae grew and turned green within 4-5 days. A freshly prepared mineral feed was planted in the environment, taking it from the suspension, which turned out to be green. This glass jar was kept near the window for 4-5 days. During this time, the liquid in the tube container turned green. From a growing cell in a glass container, it was taken to a sterilized pipette and planted in a 2% agaric nutrient medium prepared for the petri Cup. The petri Cup was kept in the light for 4-5 days, and the germinated cells were planted in the Petri Cup for the 2nd time in this order, from there Chlorella vulgaris in the algological pure state, *Chlorella pyrenoidosa* Chick. and Scenedesmus oblique (radish.) Goetz. strains were isolated. The composition of the Mineral nutrient medium (gr per 1L of water. (NH4) 2so4-0.2 g/l; Ca(H2PO4)2·H2O-0.03 g/l; CaSO4·H2O-0.03 g/l; NaHCO3 -0.1 g/l; MgSO4·7H2O-0.08 g/l; KCl -0.025 g/l; FeCl3 –(1% solution)-0.15 ml; soil extract-0.15 ml; micronutrient solution – 1 ml. 2.0-2.5 million cells were planted in 1 ml of algae in the prepared nutrient medium, and every day we counted the number of cells in the Goryaev chamber using a microscope(figure 3). In the process of their growth, the room temperature was 18-25℃, and the light was 5-15 thousand Lux in open conditions. In the first experiment, to reduce the amount of mineral salts contained in the water of collectors, Chlorella vulgaris, Chlorella pyrenoidosa and Scenedesmus obliquus were planted in samples diluted with water from 1:1 in a ratio of 2.0-2.5 million/ml of cells.

Table 2. Hydrochemical analysis of the upper reaches of the Kagan District of the sea ditch on industrial water and all streams (in the case after the cultivation of Chlorella vulgaris, Chlorella pyrenoidosa and Scenedesmus obliquus)

№	Ingredients	Kagan District area industrial water upper stream	Kagan District area upper stream	Jandar District area Marine dump middle stream	Karakul District area Poykent lower stream
1.	Hanging items	23	28	20	21
2.	Chlorides	1787,3	956,05	869,1	869,1
3.	Sulfates	1633,0	2161,4	1690,5	1921,2
4.	Dry residue	5000	5500	4900	6000
5.	Nitrites	0,07	0,15	0,063	0,08
6.	Ion ammonium	1,0	2,0	1,2	1,7
7.	Oil products	6,5	8,0	7,5	7,0
8.	Phosphates	0,4	0.3	0,4	0,2

Figure 3. Reproduction of algae in the waters of the Marine collector

In the experiments carried out, the hydro chemical composition of water after sowing algae was determined (Table 2).

As a result of experiments in laboratory conditions, there was a decrease in a certain amount of suspended matter in the waters, as well as dry residues. Mineral substances contained in the dry residue are spent on the development of algae. As a result of the proliferation of Chlorella vulgaris, Chlorella pyrenoidosa and Scenedesmus oblique cells, that is, due to the photosynthetic process, the amount of oxygen in the water increased to 12.5-13.5 mg/l.

5. Discussion

Insufficient data on the cultivation of algae in collector waters, whether the collection of their biomass was fully created, and whether the algae growing in collector-drainage waters purified water not only by mineral substances, but also from various toxic substances, caused a lot of controversy in the conduct of scientific research. This is because many parts of sewage from livestock and industrial complexes are being disposed of in collector (pond) waters without being cleaned or chipped, creating great difficulties for the breeding of algae species in the aqueducts that exist in the area of the 126.4 km long marine collector. For example, when biological pools are aerated, the process of water purification there is accelerated, creating good conditions for the reproduction of algae.

As a result, the process of water purification is accelerated by rapidly growing green, blue-green, diatom, Euglena algae in the Collector waters of biological pools. But the insufficient number of aerating devices in the territory of the Marine collector is not enough for the reproduction process of algae in the water. During the research work, it is possible to grow Chlorella vulgaris, Chlorella pyrenoidosa and Scenedesmus obliquus in large-scale containers and ponds in which artificial pools was created. Through it, it is possible to increase algae in the three main streams of the Marine collector, as well as to achieve an improvement in the hydrochemical state.

6. Conclusions

In the waters of the lower, middle upper reaches of the Marine collector in the Bukhara region, the number of cells planted as a result of cleaning the waters from organo-minerals increased with the help of growing Chlorella vulgaris, Chlorella pyrenoidosa and Scenedesmus obliquus. This resulted in an increase in the amount of oxygen in water to 12.5-13.5 mg/l due to the photosynthetic process.

Nitrogen compounds, nitrites, nitrates, phosphates contained in waters were completely absorbed by algae. As a result of the experiments, there was a decrease in a certain amount of chlorides and sulfates in the waters.

Enrichment of collector water with ammophos fertilizer and manure juice has been found that the growth of green algae can be increased up to 2-2.5 times compared to that of collectors water.

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