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Bioindication and Biotesting in the Reservoirs of the Aral Sea

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Abstract: The article discusses the issues of ensuring environmental safety and environmental protection in the Aral Sea, rational use of natural resources, combating the negative consequences of climate change, highlights the results of an innovative approach to combating soil degradation by expanding the area of natural areas, especially the effective use of water resources, promising endemic plants adapted to the ecological conditions of the Southern Aral Sea in combating soil degradation.

As a result of the anomalous phenomena occurring in nature today and the increased anthropogenic pressure, climate change has become a global problem for the entire world community. Water-scarce regions are rapidly developing desertification processes that are the result of climate change. The rapid drying of the Aral Sea led to a global change in all natural conditions.

Desertification caused by the drying of the Aral Sea is the reason for the aggravation of the environmental situation. On these lands, the role of representatives of the local flora in strengthening mobile sands, reducing the process of desertification and positively solving existing environmental problems in the development of saline soils is great. And this is due to the fact that the bioecology of plant species common in this area is the study of plant species with high salt resistance, the creation of plantations of these plants is one of the urgent environmental problems today.

Keywords: Aral Sea, biodiversity, aquatic basin, hydrobionts, hydrobiological analysis, algocenoses, indicator – saprobic species, promising algae species.

Introduction.

The quality of natural waters is currently being formed under the influence of a heterogeneous anthropogenic load. The functioning of industry, agricultural activity, population growth, and the process of urbanization are obvious causes of anthropogenic pollution of the natural environment, including aquatic ecosystems. Therefore, there is a need to obtain reliable information about the quality of the environment. Currently, the quantity and quality of information does not correspond to the minimum required to achieve an accurate quantitative assessment of the impact of anthropogenic factors on the environment.

The development of the" model of the nature of the dynamic changes and current state of hydrobionts of the dry part of the Aral Sea", ecoalgocenoses, based on changes in the composition of species, provides a long-term forecast of the current state of water bodies and their changes and the possibility of targeted use of promising plant species and forms.

Paragraph 5.1 of the "strategy of action on 5 priority areas of development of the Republic of Uzbekistan in 2017-2021", which is presented in Appendix 1 of the decree of the president of the Republic of Uzbekistan PF - 4947 of February 7, 2017, issues "prevention of environmental problems that harm the environment, Population Health and gene pool", aims to protect the environment, develop environmental science, promote ecology knowledge, preserve natural systems, their biological to achieve, to ensure environmental safety is to reduce the level of environmental pollution.

Implementation of a practical project carried out within the framework of the" hydrobiological research monitoring " continuous monitoring of positive and negative changes occurring in the cross-section of the studied objects makes it possible to identify zones of environmental risk at different levels and complex study of changes occurring in ecoalgocenoses.

An important mechanism of saturated and saturated fatty acids in the cell, such as the synthesis of more flexible proteins, forms the functioning of membrane lipids. Hydrobionts of the Aral Sea and its dry bottoms and its bioecological and physiological characteristics, adaptation capabilities, water quality studies, determination of the level of nutrient supply of livestock, poultry and fishing industries, determination of the volume of necessary additional nutrients, determine the prospects for economic-efficient commercialization of sustainable development.

For the first time, " the algofloras of the Aral Sea and its dry bottom saline water bodies are taxonomically analyzed, bioecological and adaptive capabilities are studied, the biomass of algae is determined, and through this a scientifically based practical project on improving the lifestyle of the local population is carried out in various areas of agriculture, pharmaceutical sectors.

Some glaze are consumed by the peoples of China, Russia, Japan and Korea. Agar - agar made from red algae is widely used in the food industry, especially in confectionery and paper making industries, in the areas of paper bleaching. In China, algae have been used for more than 3,000 years of medicinal quality, usalgae produce iodine, potassium salt, acetic acid, vitamins and minerals. It is used in animal husbandry, in the development of poultry and fish farms, as a nutritious feed rich in protein. From algae, flour is prepared on the basis of special technologies. It is widely used as a natural, laser treatment agent in the treatment of various diseases with the help of mineral-rich healing clays.

The study of the bio-ecological, Morpho-physiological properties and adaptive capabilities of the hydrobionts of the Aral Sea and its dry bottom water bodies consists in determining the prospects for the economic-efficient commercialization of the effective use of promising algae in various fields of Pharmacology, medicine and agriculture and developing scientifically based practical recommendations.

From scientists who conducted scientific research on algofloristic data on the flora of algae of various water bodies of Central Asia, A.M. Muzafarov, K.Yu. Musaev, A.E. Ergashev, M.A. Kuchkarova, S.A. Khalilov, Sh.I. Kogan, Sh.Tajiev, E.A. Elmuratov, R.Sh. Shoyakubov, A.A. Abdukodirov, H. Khabibullaev, S. Bouriev, B.K. Karimova, H.A. Alimzhanova, M.I. Mustafaeva, M.A. Shayimkulova, A.A. Boronbaeva, B.A. Halmurzaeva, N.E. Rashidov, M.A. We meet in the work of Abdullaeva and others.

A.M. Muzafarov studied Marghilonsoy in the Fergana Valley, Shakhimardonsoy, rivers in the Central Tyan - Shan mountains, i.e. the head tributaries of the Syrdarya, Karadarya, Norin Darya, Shahrikhonsoy and their tributaries, mountain streams, algae in lakes in the foothills of the Amudarya. According to the flora of the natural watersheds of Central Asia, it has been found that there are 2,965 species and species varieties, of which 67 are listed as high water plants.

A.M. Muzafarov wrote monographs on Algology based on his collected data, among which "Flora hydrogenosley gornix vodoemov Sredney Azii", "Flora hydrogenosley stoka Amu-Dari", "Flora hydrogenosley vodoemov Sredney Azii", "o geograficheskom raspredelenii hydrogenosley" are of great scientific, theoretical and practical importance.

Artificial bodies of water in Central Asia are the flora of algae A.E. Perfectly studied by Ergashev. From the canals of the Fergana Valley, the great Fergana, the Northern Fergana, the Great Chuy, the collector and cisterns in Mirzachul, the Cattacurgana, the Buxtarma reservoir, the shoalpoyas, the biological treatment and the fishing ponds the algae flora are included.

The author studied the chemical, gas and temperature regimes of channels and developed their typology. It was he who determined that the occurrence of algae in the channels depends on a number of factors, such as the speed of flow from environmental factors, low clarity (10 - 15 cm), low biogenic compounds.

K.Yu. Musaev had discovered that some algae had a role in increasing soil yield. K.Yu. Musaev studied the Bozsuv and Karasuv channels that cross the Qibray district, the algae distributed in the soils of this district, and found that there were 517 species and species varieties in this khudududud.

M.A. Kuchkarova studied the algae flora of Uzbekistan and Kyrgyzstan, and proved that algae have a significant contribution in increasing rice yields. A representative of olive blueberry algae has found that anabenas have a significant contribution to improving soil fertility by absorbing free nitrogen from the air.

S.A. Khalilov studied the algal flora of the Chardara reservoir, while also making an outstanding contribution to the writing of the identifiers of the Central Asian algal flora. Including, "The determinant of blue-green algae of Central Asia" and "The determinant of ulothrix algae of Uzbekistan" the likes can be cited.

R.Sh. Shoyakubov studied the flora of Chara algae in Uzbekistan khadi and representatives of tropical high algae in the conditions of Uzbekistan, their importance in the treatment of dirty waters.

R.Sh. Shoyakubov, T. Vasigov, A.A. By the rasulovs 1973-1975. in addition to other hydrobionts, algae are actively involved in the treatment of wastewater in biological pools, taking into account the important role in improving the sanitary condition of water bodies, algofloras of Angren, Ohangaron, Almali treatment facilities in Tashkent region have been studied.

Sh.I. Kogan and by his disciples much information has been cited regarding the study of wetlands of the water bodies of the Republic of Turkmenistan.

Sh. Tajiev studied the importance of algae in the biological treatment of wastewater in Shymkent city biological pools.

X.A. Alimzhanova studied the changes in flora – Systematics, ecology, influence of the ecological environment in terms of number and variety of wetlands of the Bozsuv canal and Chirchik River Basin, created a systematic analysis. Wetlands have proven that saprobic species dispersal laws of algae can be used to determine ecology-sanitation. Having determined the primary productivity of the wetlands, he established a collection of algae and identified 1,562 species and species varieties of algae in the Chirchiq river basin water networks [1,2,3,4,5,6,7,8].

Materials and methods of research

Physicochemical and biological methods are used to determine the degree of contamination of a reservoir, as well as to assess the quality of water used for various purposes. Each group of methods has its own advantages and disadvantages. It is impossible to give preference to one of them, therefore their joint use is most justified. In this case, we are talking about an integrated approach that is currently implemented in the system of the Unified State Environmental Monitoring Service (USEMS) [1,2,9].

It should be noted that in the Russian Federation, the dominance of physical and chemical methods of environmental monitoring remains. However, a natural and global trend is the active development of biological control methods. Thus, according to the European Union Water Framework Directive (2000), it is biological methods that are recognized as the basis for monitoring the state of aquatic ecosystemss. V.P. Severnaya (2002) mention that the outstanding Russian hydrobiologist G.G. Venberg gave biological methods a decisive role in assessing the effects of pollution by the degree of disturbance of the aquatic ecosystem [6].

Chemical assessment methods are well developed and accurate. They give a fairly complete picture of the amount of detectable substances dissolved and suspended in water, bath organic and mineral. It is obvious that the use of hydrochemical methods alone is insufficient, which make it possible to establish concentrations in water only from a clear list of components determined by the research program.

Therefore, undefined compounds will not be included in the assessment 16, and the effect of the combined effects of various components will not be taken into account. In addition, the hydrochemical assessment of the state of waters on the basis of a system of maximum permissible concentrations (MPC) of harmful (polluting) substances is imperfect in itself. This is due to the fact that the MPC concept provides for an assessment of the isolated effects of chemicals on living organisms, while in real conditions they are influenced by multicomponent mixtures of substances.

Biological methods are based on behavioral, physiological and biochemical reactions of organisms to a particular type of pollution. The use of biotesting has a number of advantages over physico-chemical analysis, which often fails to detect unstable compounds or quantify ultra-low concentrations of ecotoxicants.

Biotesting makes it possible to quickly obtain an integrated assessment of toxicity, which makes its use in screening studies very attractive. Bioindication makes it possible to detect impacts on the reservoir preceding the time of analysis, the consequences of one-time or intermittent pollution, whereas the results of the physico-chemical method relate only to the time of sampling.

The composition of aquatic communities characterizes the quality of the environment over a long period of time. At the same time, different groups of organisms represent, as it were, recording devices of varying degrees of sensitivity. Many bioindication techniques have been developed in relation to water bodies polluted by organic household and agricultural runoff. In case of pollution of the reservoir by industrial effluents, they are not applicable. In addition, the disadvantage of bioindication is often the need for detailed processing of samples of aquatic organisms, which requires time and qualified specialists in the systematics of aquatic flora and fauna.

However, data on the species composition and quantitative development of aquatic organisms allow us to judge not only the degree and duration of pollution of the reservoir, but also its ability to self-purify. Unfortunately, there is currently no single generally accepted system of biological analysis. Thus, it is necessary to use biological assessment methods together with hydrochemical methods. They make it possible to characterize a water body by the totality of the action of all substances and predict the changes that await the biota at a given level of pollution.

In the coming years, it is necessary to continue a comprehensive and interdisciplinary program of large-scale monitoring of the Aral Sea ecosystems. The main attention should be paid to the interaction of hydrophysical, hydrochemical, meteorological and biological components of the ecosystem.

Results and discussion

Based on the use of the Aral sea algae flora, it is possible to ensure that the Aral sea water bodies are stable. Even for the remains of the island's fauna, drying out of water bodies (almost all the lakes in the Aral Sea are shallow) and their excessive desalination can be fatal. As a result of the drought of 2000-2001, the fact that the ecosystems of most of the lakes of the islet region (e.g. Sudoche, Sarbas lakes) are extremely unstable in conditions of lack of water poses a risk of extinction of a number of refugium [7,8].

Another risk factor is anthropogenic changes in the hydrological regime and increased pollution. For example, a significant decrease in the mineralization level of a significant amount of water from Lake Ayozkol was responsible for the disappearance of most plankton species of the island complex. Not only is drought dangerous for the fauna of the island, but a significant decrease in mineralization is also explained by the fact that some species are species typical of brackish waters and cannot live in freshwater conditions. Due to the high clarity and shallow waters of the Aral Sea, most of the organic matter was produced not at the expense of phytoplankton, but by phytobenthos. This suggests that the ecosystem of the reservoir is different from that of other inland seas. The share of phytobenthos biomass in general reached 90%, while phytoplankton biomass - only 10%. Hair algae account for about 75% of phytobenthos biomass and green algae 13%.

From the main benthic algae, information is provided about the occurrence of green and red algae. Almost all of these species disappeared between 1990 and 1995.

In the 1950s and 1960s, the Aral Sea was dominated by phytoplankton diatom algae. According to Alladin and Kotov (1989), from 1972 to 1983, most species of planktonic algae have disappeared from the Island Sea, including dominant species such as blue-green and diatom. In the 1980s, when salinity reached 24 PT, evrigaline algae also began to die in the Aral Sea.

159 species of periphyton algae were observed in 1999-2002 and 167 species in plankton. It is an aging half of the phytoplankton Variety previously noted. According to analysis, in the 1920s Kiselyov (1927) recorded 375 species in the Aral sea plankton, while in the 1960s and 70s Pichkili (1981) and Elmuratov (1981) recorded 306 and 278 species [1,2].

Phytoplankton diversity is stable in 2002-2005, but much lower than in the previous period, with 159 species of algae observed in the Aral Sea in 1999-2001, while only 81 species were observed in 2002-2005. Almost only marine and galophilic species remain in the reservoir. Not all recorded algae are typical of plankton. Many of the algae recorded due to shallow waters (2-4 m) are phytobentos and periphyton algae.

Before 2002, the decrease in the Aral sea level averaged around 1 m per year, while the total decrease for the period from the start of monitoring (2002) to the current year 2021 was only around 3 m. Shows that the growth of mineralization in the western basin is still ongoing.

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The chemical regime of the Aral Sea is closely related to its hydrophytic state. The inn-salt content of sea water has changed significantlyand continues to change due to the deposition of carbonates and gypsum.

If, in the" conditional natural " state, the Aral Sea was considered a sulphate-type water reserve, now the amount of sulfate ion in comparison with chlorine is much reduced. Especially radical changes affect calcium content, indicating a decrease of almost 7 times. The decrease in water compared to calcium can be a limiting factor for further deposition of gypsum. If the mineralization is not taken, then in the near future the precipitation of mirabilites (especially at low temperatures in winter) will begin, which will lead to further changes in sodium consumption and salt content. Changes in water ion composition lead to changes in all major physical dependencies, such as density dependence on salinity and temperature by 127 (equation of state), freezing temperature dependence on salinity (freezing temperature for the modern Aral

Sea around -5 S0), and electrical conductivity dependence on salinity. The study of these correlations between Aral Sea hydrophysics and Hydrochemistry is among the important tasks of future research [3,4,5].

O.A. According to the Alekin classification, the waters of the Aral See are part of the sodium-containing group Type III of the chloride class. Under the conditions of the natural regime of the sea, chlorine and sulfate ions prevail among the anions. On average, 35 and 32%, respectively, sodium ions - 20% and magnesium -7%. calcium content 4% and bicarbonate content 1%.ga is equal to.

Continuing changes in the physicochemical regimes of the Aral Sea also affects the current state of its biological systems. It should be noted that, despite the huge losses in the species diversity of the biota during the ecological crisis, modern biological communities of the Aral Sea cannot be considered dead or dying. A very clear but very active ecosystem has developed in the sea, and plankton and benthos are formed at the expense of species. Their total biomass is very important. Even from the dominant species of the large Aral Sea zooplankton, the evolution of biological communities, in which sea buckthorn artemia is mainly determined by changes in the physico-chemical regime of the sea, should be at the center of further research.

In the coming years, it is necessary to continue a comprehensive and interdisciplinary program of large-scale monitoring of the ecosystems of the Aral Sea. The focus should be on the interaction of the hydrophysical, hydrochemical, Meteorological and biological components of the ecosystem [7, 8].

Conclusion

Choosing the right indicator is extremely important. It is believed that in bioindication of pollutants, an indicator showing a close linear relationship (modulo a high correlation coefficient) between the level of a pollutant and the body's reaction (or its accumulation) will be optimal.

The use of some structural and functional characteristics of these communities (especially phyto-, zoo- and bacterioplankton and benthos) to assess the quality of the aquatic environment (along with abiotic indicators) is already traditional and is fixed in state standards.

The practical significance of our study is to assess the quality of the ecosystem by the ratio of abundance indicators; by indices of species diversity; classification of reservoirs by the degree of saprobity; to assess the quality of the ecosystem by the ratio of the number of species resistant and unstable to pollution; integral criteria (assessment of ecosystem quality by several parameters).

The areas free from seawater but before scientists such an important problem as a comprehensive study of its flora and vegetation cover. The structure of the emerging natural complexes, and the directions of development, and the activity and successions of plants, and changes in landscapes, created the need to carefully study the drier part of the island. In this regard, it is necessary to study the dynamics (migration) of plant penetration into empty lands.

Accordingly, R & D is carried out on the scientific basis of the introduction of varieties with Ready-Made plants or types of crops that contain seeds adapted to ecological, soil-climatic conditions of the dry bottom of the Aral Sea in a way that corresponds to the degree of salinity of the soil of the territory and the requirements of the optimal biological environment, consists in

From the studies, a map of the natural - geographical location of the Aral Sea and its dry-bottomed water bodies is determined and a description of natural object capabilities; during the seasonal conduct of scientific expeditions, the chemical composition of water samples from the Aral Sea and its dry-bottomed water bodies is determined; samples are collected for laboratory analysis during the Year seasons and on the basis of which promising algae are established, and the prospects for efficient commercialization of their effective use in various fields of

Pharmacology, medicine and agriculture are determined, and scientifically based practical recommendations are developed in this regard.

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