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# THE INFLUENCE OF LONG-TERM CHANGES IN THE SALINITY OF THE ARAL SEA ON THE DYNAMICS OF MICRO-AND MACROALGAE

The article provides a brief bibliographic review of literature on studies of Aral macrophytes and data on changes in the distribution and productivity of species of higher aquatic vegetation and macroalgae found in aquatic phytocenoses of the Aral Sea during different periods of salinization from the end of the 19th to the beginning of the 21st century.

From the beginning of research to the middle of the last century, the Aral Sea was a relatively shallow, well-heated, oligotrophic, weakly brackish water body with a very high transparency of water, with numerous shallow-water and saline bays. Salinity in the central regions was 10–12 ‰, in open shallow water ranged from 5 to 10 ‰, in the bays adjacent to the deltas of the Syr Darya and Amudarya rivers, it did not exceed 5 ‰, but in some bays of the southeastern coast it was higher than 30 ‰ [1-3]. At the beginning of studies in the main water area, extreme uniformity of vegetation and the poverty of the flora of aquatic and coastal aquatic plants were noted [1]. Only 2 species and 2 plant communities dominated everywhere.

Changes in salinity led to changes in the composition of aquatic vegetation communities, which were traced from literature data, herbarium materials, and the author's observations.

The first herbarium specimens from the Aral were collected by A.N. Butakov in 1849 (herbarium of the BIN RAS, LE), and then I.G. Borshchov during the first Aral-Caspian expeditions of St. Petersburg Academy of Sciences and the Society of Naturalists in 1858 and 1874. [1-5]. All known historical, physical-geographical, as well as zoological and botanical data on the Aral Sea were summarized at the beginning of the last century by Acad. L.S. Berg (1908). The following information on the distribution and productivity of macrophyte communities was obtained during hydrobiological and ichthyological studies carried out in different years on the Aral Sea.

When compiling the list, herbarium materials stored in the herbarium and in the laboratory of algology of the Botanical Institute of the Republic of Uzbekistan, Tashkent, the author’s own collections and data from publications by geobotanists, zoologists, and hydrobiologists were used.

Data are analyzed only for aquatic phytocenoses, i.e. most closely related to and dependent on the aquatic environment, therefore, the list below includes only species found in communities of formation classes of submerged hydrophytic vegetation - *Aquiphytosa immersa* (higher plants and macroalgae) and air-aquatic helophytic vegetation - *Aquiherbosa helophyta*, found in the very Aral. Communities of coastal-aquatic vegetation and vegetation of the deltas of the Amu-Darya and Syr-Darya rivers are not considered in this paper, since they are less dependent on changes in water salinity in the Aral Sea.

In the period from 1849 to 2005, various authors identified 30 species of macrophytes in the water communities of the Aral Sea, including 24 species of flowering plants (17 hydrophytes, 7 helophytes) and 6 species of char algae [1-5].

Of the macroscopic filamentous algae widespread in the Aral Sea, they are most noticeable in the communities *Cladophora glomerata (L.) Kütz., Cl.fracta (OF Müller ex Vahl) Kütz., Chaetomorpha linum (OF Müller) Kütz., Enteromorpha prolifera Ag., Vaucheria d. L.) Martius.*

From the beginning of the 60s to the end of the 90s of the XX century. sea level fell by almost 23 m, the area of the mirror decreased by 2 times, the average depth decreased by 2.5 times, salinity increased by more than 8 times, the transparency of water and its saturation with oxygen decreased significantly. Such catastrophic changes caused the death of most biocenoses. Based on the literature, the following is a reconstruction of the changes. Freshwater and freshwater-brackish complexes of submerged higher aquatic plants were not the first to withstand.

New rapidly saline, shallow-water biotopes were quickly overgrown with halophilous annuals *Zanichellia spp., Ruppia spp*. And haricot alga *Lamprothamnium papulosum*. With an increase in salinity above 25–26 ‰, the thickets of these species also disappeared [3;4].

By the end of the 80s, only the species of *Ruppia* and the *Cladophore* remained, since they are able to tolerate high salinity. The generalized ranges of salinity tolerance of some species of higher plants and macroalgae dominant in the Aral Sea.

As in BM, the role of microphytobenthos increased here, and macroalgae *Chaetomorpha linum, Cladophora glomerata, Cl.fracta* took precedence in the production of macrophytobenthos. Macrophyte communities were formed by 4 species of flowering plants (*Phragmites australis, Ruppia cirrhosa, R. maritima, Zostera noltii*) and 2 species of char algae - *Lamprothamnium papulosum* and *Chara aculeolata*.

Until the middle of the last century, the Aral Sea was a macrophytic type oligotrophic reservoir. The share of macrophytes in primary

production exceeded 50%. Unfortunately, few studies of the productivity of phytoplankton and microphytobenthos communities have been performed, but the proportion of phytoplankton was estimated to be about 10%, and microphytobenthos accounted for about 4 times more.

In shallow water, the initial period of salinization was characterized by the fragmentation of several existing biocenoses that were homogeneous in composition and occupy vast areas into a larger number of new ones, small in area and more diverse in species composition. The leading role in submerged macrophytobenthos was occupied by char and green macroalgae.

In the period from the 60s to the 80s, the death of most plant communities occurred, which entailed the eutrophication of the reservoir and a strong decrease in water transparency.

Currently, the Eastern Aral Sea has split into several hyperhaline reservoirs, and the Northern Aral Sea has turned into a brackish-water β-mesosaprobic water body with a predominance of microphytobenthos and phytoplankton production over macrophytobenthos production.

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