EUROPEAN JOURNAL OF LIFE SAFETY AND STABILITY (EJLSS)
ISSN 2660-9630
www.ejlss.indexedresearch.org Volume 12, 2021 ||

Changes in Zooplankton Communities of Some Lakes of the Republic of Karakalpakstan in an Ecologically Changed Environment

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Annotation: The article talks about the unfavorable situation in zooplankton communities of some lakes of the Republic of Karakalpakstan.

Key words; rotifer, vetland epibiont ciliates, fauna, endemic taxa, mosses, mollusks, crustaceans, fish.

Date of Submission: 20-11-2021 ***Date of Acceptance: 25-12-2021***

Introduction

Previously, the Aral Sea and its delta reservoirs had a unique hydro fauna. They included a number of endemic taxa of mosses, mollusks, crustaceans, and fish. Until the mid-30s of the last century, the zooplankton of the lake. Sudochie was completely freshwater. It included 38 species of rotifers, 32 species of branchous and 9 species of copepods. As a result of hydro geographic changes in the delta of the Amu Darya River, the biotic population of the Aral Sea and the northwestern delta lakes of the Amu Darya River have changed. So, the variety of branchous in Sudochie has halved.

The purpose of the study

The aim of the study is that hydro biological monitoring of lakes was carried out against the background of their progressive shallowing, which was accompanied by a reduction in the lake area and an accelerated increase in water mineralization.

In 2016-2019, the 5 largest reservoirs of Vetlandasudochye were investigated: Lake Bolshoe Sudochye (2250 ha), Karateren (360 ha) and Begdulla-Aydin (600 ha) – Akushpa (4500 ha) together with Lake Tayly (500 ha), which were dead-end accumulators of the Kungrad collector runoff; lakes drained to varying degrees by the Kungrad and Ustyurt collectors.

Material and methodology

The material was collected by us starting from October 2016 and further during 2018-2019 three times a year (April, June, October). A total of 50 quantitative samples were taken. Water (100 liters)

was filtered through a conical plankton network of nylon gas No. 76 and fixed with formalin. The calculation was carried out using a stamp pipette and a Bogorov camera. The individual weight of zooplankters was calculated using allometric growth formulas linking length and weight.

In total, 66 taxa of planktonic animals were marked during the monitoring period - 1 type of infusoria, 1 type of turbellaria, 1 type of annelids, 28 species of Rotifera, 12 species of Cladocera, 21 species of Copepoda, 2 species of Ostracoda.This is noticeably more than was known for Sudochie Lake in the previous periods of the study. For example, in 1933, 50 species of planktonic animals were noted, and in 1970-1986 - 48. The large diversity of zooplankton identified is mainly due to more detailed studies.

For the first time, 24 zooplankter species were observed for the lake. 8 species are new to the fauna of Karakalpakstan: Testudinellaelliptica, Euchlanisincise, Cephalodellasp., Lecaneplesia, L. Stenroosi, L. thalera, Lophochariskutikovae, Diacyclopslonguides. A new species for the fauna of Uzbekistan is the rotifer Euchlanisincisa. Compared with previous studies, such representatives of the northern Palearctic fauna as Sidacristallina Diaphanosomabrachyurum, Ceriodaphniaquadrangular, C. affinis, C. reticulate, C. have disappeared from the plankton of the lake. pulchella, Scapholeberismucronata, Bosminalongirostris, Polyphemuspediculus, Leptodorakindtii, as well as a representative of the Aral-Caspian fauna Podonevadnecamptonyx.

There are relatively many (6 species) harpacticids in the reservoir, which is not typical for the lakes of Central Asia and is probably due to the influence of the Aral Sea fauna. Some species (Cletocamptus retrogressus, Schizoperaaralensis) have epibiont ciliates from the marine genus Cothurnia. Of the other representatives of the Aral fauna (now extinct due to salinization in the Aral Sea itself), the marine cyclops Halicyclopsrotundipes and larvae of polychaete Nereisdiversicolor were noted in the Sudochie plankton. Marine species have been recorded mainly in the more saline lakes of Akushpa (including its northern part of Tyla) and Karateren.

The least mineralized lakes Begdulla-Aydin, Bolshoe Sudochye, and Karateren were characterized by the greatest diversity of zooplankton compared to the more saline Lake Akushpa (Table 1). The general trend during the monitoring was a significant decrease (2-4 times) in the zooplankton diversity of Begdulla-Aydin, Bolshoe Sudochye and Karateren lakes, which is associated with their progressive salinization during drought. Previously, there was also a significant decrease in zooplankton diversity during periods of salinization of Lake Sudochie. At the same time, the zooplankton of Lake Akushpa was more stable, which is associated with the formation of a stable complex of 8-10 halophilic species here. However, the drying up of this lake apparently led to the loss of a number of representatives of the Aral fauna from its hydro fauna, primarily harpacticids.

Faunal diversity (number of species) of zooplankton in some lakes of the Republic of Karakalpakstan.

Table 1

Lake	2016	2017			2018			2019		
	October	April	June	October	April	June	October	April	June	October
Midwife	8	13	9	10	11	6	-	3	5	3
Tiles	9	12	10	9	9	5	-	2	8	4
Karateren	12	16	17	12	8	6	4	6	9	5
Begdulla-Aydin	10	11	14	4	8	5	-	4	7	12
Big Sudachye	20	24	23	6	9	10	9	13	8	31
TOTAL	59	76	73	41	45	32	13	28	37	55

The share of halophilic species increased in 2017-2018 and began to decline in 2019 due to the desalination of reservoirs (Table 2). For lakes Begdulla-Aydin, Bolshoe Sudochye, Karateren, Brachionusangularis, Hexarthraoxyuris, Keratellatropica, K. valga, Synchaetasp., Chydorus sf can be considered indicator species. Sphaericus, Eucyclops serrulatus, Cyclops vicinus (in spring), Onychocamptusmohammed. For the more saline lakes of Tyla and Akushpa, these are Brachionus plicatilis, Hexarthraoxyuris (in summer), Synchaetasp., Apocyclopsdengizicus, Halicyclopsrotundipes, Cletocamptusretrogressus, Onychocamptusbengalensis, Schizoperasaralensis.

The proportion of halophilic species in the qualitative composition of zooplankton, %

Table 2

Lake	2016	2017			2018			2019		
	October	April	June	October	April	June	October	April	June	October
Midwife	72	60	100	100	63	89	-	53	100	100
Tiles	63	57	100	100	44	88	-	67	45	22
Karateren	7	16	20	50	33	50	100	44	45	41
Begdulla-Aydin	15	22	33	75	50	-	-	67	18	7
Big Sudachye	11	38	50	80	67	-	-	50	25	6

The arrival of a large amount of fresh water in 2017 led to a sharp increase in the diversity of zooplankton – the number of species in autumn 2017 even exceeded the corresponding figures in autumn 2017-2018 (see Table1). This was due to the intensive development of freshwater species. At the same time, the drying up of Lake Akushpa apparently led to the loss of a number of representatives of the Ural fauna from its hydrofauna, primarily harpacticids, which caused a further decrease in zooplankton diversity here.

Taxonomically, rotifers are the most diverse. During the salinization of the lake, the proportion of rotifers and cladocerans in the diversity of zooplankton was constantly decreasing, and the proportion of copepods was increasing (Table 3). Due to the desalination of the lakes, there was a significant restoration of the original taxonomic structure of the zooplankton of Wetland.

Taxonomic structure of zooplankton of vetland Sudochie (percentage of individual taxonomic groups, %)

Table 3

Taxa	2016	2017			2018			2019		
	October	April	June	October	April	June	October	April	June	October
Rotifera	55	33	60	19	38	23	25	36	48	53
Cladocera	17	22	10	12	0	0	0	0	10	15
Copepoda	28	18	30	56	48	69	75	45	38	30

The diversity of zooplankton, as a rule, decreased from spring to autumn, which is due to both the seasonal dynamics of lake mineralization and the appearance in summer of a large number of juvenile fish actively consuming zooplankton. In 2017, however, the opposite trend was observed – an increase in the diversity of zooplankton from spring to autumn, obviously due to the desalination of lakes during 2017 and a decrease in the zooplankton of the fish press.

Research results

In 2016-2019, due to the increase in the mineralization of reservoirs, there was a noticeable convergence of the zooplankton composition of all the studied reservoirs, which was associated with the gradual loss of most freshwater species from plankton communities and the formation of homogeneous halophilic and halotolerant fauna. In 2017, due to the increase in the diversity of zooplankton, there was also a decrease in the similarity of the species composition of zooplankton between different lakes of Wetland.

Conclusions

Thus, in conclusion, it should be noted that the differences in the species composition of the lake are divided into two groups. The closest to each other, on the one hand, are the saline lakes Akushpa and Tayly, and on the other – the more freshwater lakes Karateren, Begdulla-Aydin and Bolshoe Sudochye. At the same time, the zooplankton of the Begdulla-Aydin and Bolshoe Sudochye lakes were qualitatively more similar to each other than the Karateren lakes. This is due to a greater similarity in the morphology and hydrology of the Begdulla-Aydin and Bolshoe Sudochye lakes. A noticeable difference in the zooplankton of Lake Karateren is also probably associated with a large variety of its biotopes, and as a consequence, with a large variety of zooplankton.

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