AGENCY OF IFAS

Organization for Security and Co-operation in Europe

MONITORING OF BIODIVERSITY OF WETLANDS OF SOUTHERN PRIARALIE - 2023



Tashkent - Nurus
2023

Organization for Security and Co-operation in Europe

Karakalpak Branch of the Academy of Sciences of the Republic of Uzbekistan

Agency of the International Fund for Saving the Aral Sea

Organization for Security and Co-operation in Europe

Karakalpak Research Institute of Natural Sciences of Karakalpak Branch of the Academy of Sciences of the Republic of Uzbekistan

REPORT

on conducting field studies for the project

MONITORING OF BIODIVERSITY OF WETLANDS OF SOUTHERN PRIARALIE



TASHKENT – NUKUS – 2023

Content

List of project executors 3
Introduction 4
Aims and objectives of the project 6
Key indicators: 6
First field expedition 8
Expedition route 8
Research results 12
Lake Muynak bay (Uchsai) 12
Sarbasky bay (Fish bay) 18
Wetland Mezhdurechie 25
Lake Sarykamysh 32
Second field expedition 44
Expedition route 44
Research results 47
Sarbas bay 47
Muinak gulf lake (Uchsai) 54
Wetland Mezhdurechie (lakes Koksu, Shege) 63
Dzhiltyrbas lake 75
Wetland East Karateren 91
Reference note on total water inflow to the south priaralie zone in 2023 101
Conclusion 105
Appendix 107

LIST OF PROJECT EXECUTORS

№	Full name	Contribution to the project	Place of work
1	Sokolov V.I.	General scientific management of the project	Agency of IFAS
2	Toirov D.O.	Project Coordinator	Agency of IFAS
3	Ikromov I.I.	Financial Administrator	Agency of IFAS
4	Mambetullaeva S.M.	Scientific leader of the expedition and field research, Zoologist	Karakalpak Research Institute of Natural Sciences of KKB of AS of RUz.
5	Utemuratova G.N.	Zoologist	Karakalpak Research Institute of Natural Sciences of KKB of AS of RUz.
6	Aymuratov R.P.	Botanist	Karakalpak Research Institute of Natural Sciences of KKB of AS of RUz.
7	Kudaibergenova U.K.	Botanist	Karakalpak Research Institute of Natural Sciences of KKB of AS of RUz.
8	Allamuratova Z.B.	Ichthyologist	Karakalpak Research Institute of Natural Sciences of KKB of AS of RUz.
9	Tanirbergenov K.	Ichthyologist	Nukus branch of Tashkent State Agrarian University
10	Matekova G.A.	Ornithologist	Karakalpak Research Institute of Natural Sciences of KKB of AS of RUz.
11	Baltabaeva D.	Ornithologist	Karakalpak Research Institute of Natural Sciences of KKB of AS of RUz.
12	Asamatdinova A.	Ornithologist	Karakalpak Research Institute of Natural Sciences of KKB of AS of RUz.
13	Abdinasyrova N.A.	Water Resources Specialist	Nukus State Pedagogical Institute named after Azhiniyaz
14	Olloniyozov S.P.	ArcGIS Specialist	«Uzbekhydroenergo» JSC, Chief Engineer of «Construction Department No.1» UE
15	Aimuratov E.P.	Driver	Karakalpak Research Institute of Natural Sciences of KKB of AS of RUz.
16	Ibragimov A.M.	Driver	Karakalpak Research Institute of Natural Sciences of KKB of AS of RUz.

INTRODUCTION

At the present stage of development of human civilization, the processes of environmental degradation have acquired a threatening character. We are talking about the rapid pollution of atmospheric air in populated areas, surface and underground water, including sources of drinking water; about the reduction of fertile land due to desertification, salinization and erosion; about the decrease in species diversity of fauna and flora.

Global climate change is making adjustments to this process, increasing the negative consequences of ecosystem degradation. Such trends can be traced everywhere in different regions of the world. Central Asia is not an exception. In these conditions, the organization of systemic monitoring of the ongoing changes becomes an urgent task.

The system of state environmental monitoring of the environment in the Republic of Uzbekistan is carried out on the basis of government decisions, which approve the program of state environmental monitoring in the country for a five-year period. The relevant activities are carried out on the basis of the Regulation on Environmental Monitoring in the Republic of Uzbekistan, (Annex 1 to the Cabinet of Ministers Decision No.737, dated September 5, 2019 https://lex.uz/docs/4502814).

At the same time, the system for assessing the degree of pollution of environmental components is important for monitoring. Its main provisions are reflected in the Resolution of the Cabinet of Ministers «On Further Improvement of the System of Environmental Pollution Assessment» dated June 3, 2021 (https://lex.uz/docs/5446445).

Recently, observations of changes in the state of the environment caused by anthropogenic causes are very relevant. The system of these observations and forecasts is the essence of environmental monitoring. For this purpose, a rather effective and inexpensive method of environmental monitoring - bioindication, i.e. the use of living organisms to assess the state of the environment - is increasingly applied and used.

The effects of environmental pollution are reflected in the appearance of plants. Some plants react most sensitively to the nature and extent of atmospheric pollution. This means that they can serve as living indicators of the state of the environment. At present, the concept of integrated ecological monitoring of the natural environment, of which biological monitoring is a component part, has been developed.

Biological monitoring is a system of regular collection, accumulation and processing of biological information characterizing the dynamics of the natural

environment. It is a system of observation, assessment and forecasting of changes in the state of the biosphere and its individual elements under the influence of anthropogenic impacts using biological methods, i.e. by studying living organisms.

Methods of biota research are diverse and are often not reduced to metric characteristics. At the same time, it is biological objects that in the most relief in an integrated form not only testify to the fact of influence of this or that physical-chemical or biological phenomenon, but also characterize the strength and ecological significance of this influence. They summarize the results of a complex biogeocenotic process and represent a visual and most complete expression of the result of the action of these processes.

Reduction of biodiversity plays a special role among the major environmental problems of our time. There is intensive destruction of natural ecosystems and extinction of species of living organisms. Natural ecosystems have been completely changed on one fifth of the landmass.

Thousands of plant and animal species are under the threat of extinction - more than 9,000 animal species and almost 7,000 plant species are on the IUCN-World Conservation Union Red List. Since 1600, the extinction of 484 animal species and 654 plant species has been recorded. In reality, several times more species have disappeared and are threatened with extinction.

Preservation of the diversity of living systems on Earth is a necessary condition for human survival and sustainable development of civilization. The term biological diversity or biodiversity is relatively new. The concept of «biodiversity» came into wide use in 1972 at the UN Stockholm Conference on the Environment, where ecologists managed to convince political leaders of the world community that the protection of wildlife should be a priority in any human activity on Earth. Twenty years later, in 1992, in Rio de Janeiro during the UN Conference on Environment and Development, the Convention on Biological Diversity was adopted, which was signed by more than 180 countries, including the Republic of Uzbekistan.

Biodiversity is currently declining due to habitat degradation, declining populations and species extinction. Biological resources enable us to meet our needs for food and clothing, as well as shelter, medicine and spiritual nourishment. Nature’s gifts enable a wide variety of economic sectors to exist, such as agriculture, cosmetics, pharmaceuticals, pulp and paper, construction and waste management.

Loss of biodiversity threatens our food supply, recreation and tourism industries, as well as our sources of timber, medicines and energy. In addition, the loss of biodiversity disrupts essential ecological functions, which may render the conditions of life on the planet unsuitable for humans. Therefore, preserving the diversity of living organisms on Earth is a prerequisite for human survival and sustainable development of civilization.

A characteristic feature of most types of ecosystems in Uzbekistan is their increased fragility associated with the aridity of the climate. Resistance to external influences, in this regard, is rather low. Therefore, any human interference serves as an additional, serious factor of degradation of natural processes and complexes.

Ecological monitoring of biodiversity in 2023 was conducted on lakes Muynak Bay, Sarbas (Rybachie), Mezhdurechie, Dzhiltyrbas, Karateren, Sarykamysh (Southern Ustyurt).

Ecological monitoring of biodiversity is conducted by the Agency of IFAS jointly with the Karakalpak Research Institute of Natural Sciences, with financial support from the OSCE.

AIMS AND OBJECTIVES OF THE PROJECT

The main objectives of the research are:

- collection of data on species and quantitative composition of fauna (ichthyofauna, mammals, ornithofauna) of wetland and near-water systems of Sarba Bay, Mezhdurechie (lakes Shege and Kuksu), eastern Karateren, Sarykamysh (Southern Ustyurt).

- collection of data on species and quantitative composition of the flora of wetland and near-water systems of the Sarbas Bay, Mezhdurechie (Shege and Kuksu lakes), eastern Karateren, Sarykamysh (Southern Ustyurt).

- Identification of the main threats to the habitats of various species of flora and fauna and provision of recommendations.

The main focus of research is on biomes and rare, endangered species of flora and fauna.

Key Indicators:

- Accounting and analysis of the state of the South Prearalie branchland fauna;
- Record and analyze the status of the flora of the project area;
- Determination of the state of water resources parameters (mineralization, temperature, turbidity, water level, etc.) of the observed wetlands of the Southern Priaralie.
-



Figure 1. Expedition participants (June, 2023)

FIRST FIELD EXPEDITION

EXPEDITION ROUTE

The first expedition of the researchers on the project «Monitoring of biodiversity of wetlands of the Southern Priaralie» took place in June,

2023. Local vehicles were used.

The first route of the expedition passed from Sarbaska Bay (Rybachie), Mezhdurechie Reservoir (Shege and Kuksu lakes).

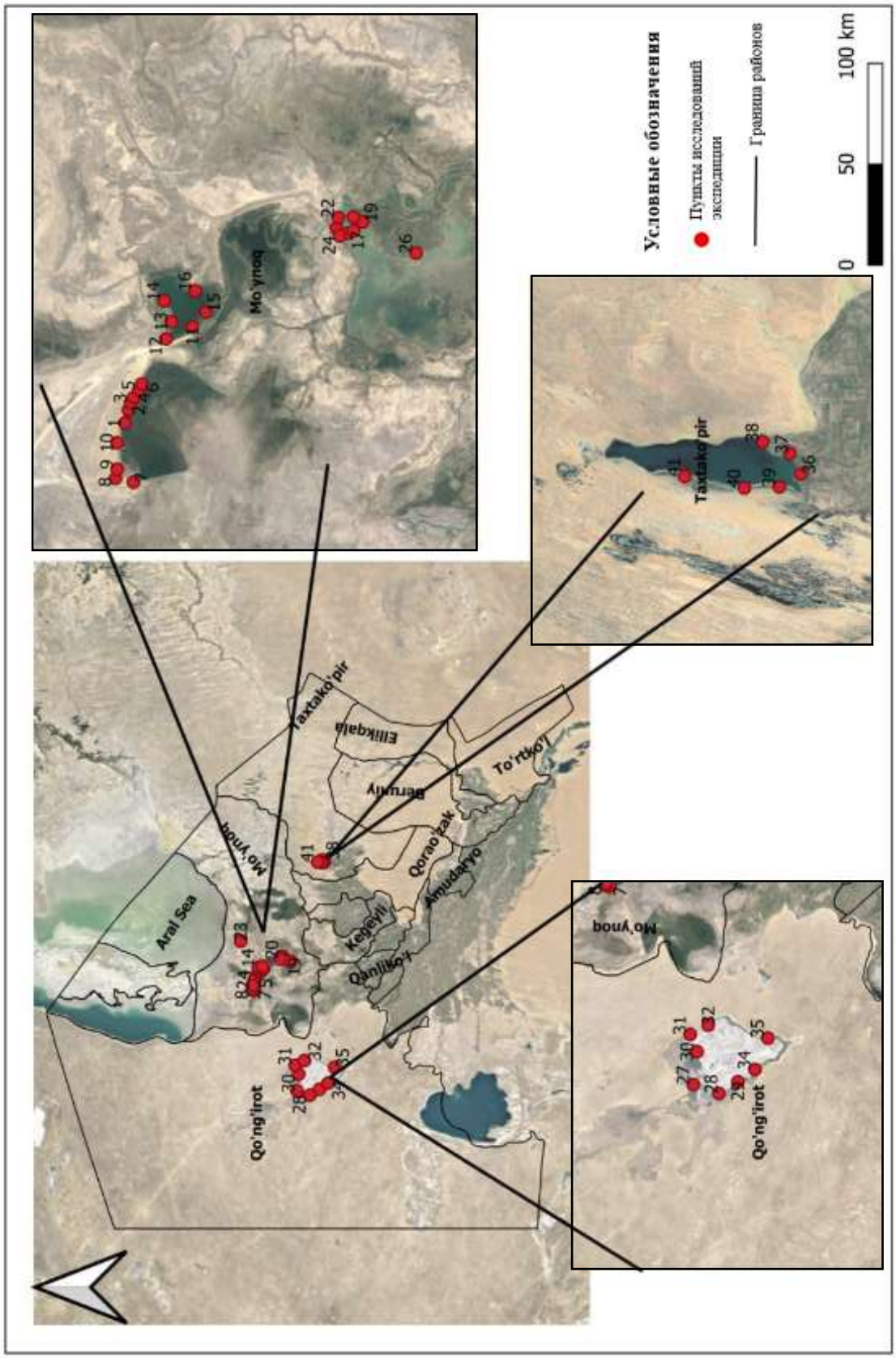
The second route is to Sarykamysh Lake (on the territory of the South Usyurt National Park).

Table 1

Research points of the expedition in the Southern Priaralie (June, 2023)

№	Latitude (N)	Longitude (E)
Lake Muynak Bay (Uchsai)		
1	43°48'55.2227"	58°55'35.7333"
2	43°48'41.1758"	58°56'46.8011"
3	43°48'32.2566"	58°57'26.6608"
4	43°48'19.7692"	58°57'56.3239"
5	43°47'59.9216"	58°58'35.5657"
6	43°47'48.1013"	58°59'08.3187"
7	43°48.354	58°50'238"
8	43°45'31"	58°51'043"
9	43°49.533	58°50'580"
10	43°49.423	58°51'410"
Sarybas Lake		
11	43°49'424	58°53'803
12	43°44'29.5879"	59°04'19.1022"
13	43°46'13.1441"	59°03'13.5962"
14	43°45'51.9459"	59°04'47.8383"
15	43°46'20.9534"	59°06'42.1648"
16	43°43'35.7815"	59°05'40.9847"

№	Latitude (N)	Longitude (E)
Wetland Mezhdurechie		
17	43°44'18.2026"	59°07'36.5471"
18	43°34'19.0802"	59°12'48.1172"
19	43°33'52.8862"	59°13'02.0217"
20	43°33'16.1646"	59°13'52.0782"
21	43°33'54.4534"	59°14'18.9604"
22	43°35'00.9391"	59°13'17.1623"
23	43°34'53.7767"	59°14'15.5615"
24	43°57'5703	59°25'95.52
25	43°55'4871	59°25'39.56
26	43°34'813	59°12'590
Sarykamysh Lake (Karakalpak part of the Ustyurt Plateau)		
27	43°55'487	59°25'395
28	43°29'46.4	59°11'0290
29	43°35'071	59°14'0036
30	43°26'21.7630"	57°38'28.1176"
31	43°19'41.1394"	57°35'17.7795"
32	43°14'38.8386"	57°39'29.9157"
33	43°25'26.1149"	57°50'24.9755"
34	43°27'13.8080"	57°56'35.7641"
35	43°22'30.1018"	58°00'03.4057"
East Karateren Lake		
36	43°15'42.8732"	43°15'42.8732"
37	43°10'09.3223"	57°43'56.7864"
38	43°06'43.6999"	57°55'19.0374"
39	43°11'59.5960"	60°22'06.7124"
40	43°12'20.7680"	60°22'58.6228"
41	43°13'11.8876"	60°23'29.2128"



Map 1. Expedition survey points (June, 2023)

The report presents the results of rapid assessment of the current state of biodiversity of plants and animals of the South Prearalie wetlands, obtained during expedition studies in June, 2023, within the framework of the IFAS GEF project «Monitoring of biodiversity of the South Prearalie wetlands». Assessments of some anthropogenic threats to the biodiversity of this region and recommendations on their compensation are also given.

All mammal sightings and tracks were recorded along the expedition route. The points of sightings were recorded using a GPS navigator. Where possible, the animals themselves and their tracks were photographed.

RESEARCH RESULTS

LAKE MUYNAK BAY (UCHSAI)

Vegetation cover of Lake Muynak Bay (Uchsai)

Muynak Bay is of great national economic, recreational and ecological importance.

According to the Ministry of Water Management of Karakalpakstan, the maximum depth reaches from 2 to 3 meters, but the water depth of most of the area is 0.3-0.4 meters. In the western part, barrier dams and temporary catchment structures have been constructed. Water mineralization has been increasing in recent years.

In the floristic composition of Muynak bay lake there are 19 species of forage plants, of them 10 species are valuable, willingly eaten, 5 species are satisfactorily eaten, 4 species are poorly eaten.

The dominant plants are perennial, woody-shrub, perennial and annual herbaceous plants.



Figure 2. Working group on Lake Muynak Bay (June, 2023)



Figure 3. Fragment of Sentinel-2 L2A satellite space image -wetland of Muynak Bay on June 25, 2023



Figure 4. View of Lake Muynak Bay



Figure 5. Reed beds

Wildlife monitoring of Lake Munaik Bay

Wetland Munaik Bay is of fishery importance and is leased to fishing brigades. Widespread fish species occur within this water area: snakehead, white amur, bream, catfish, crucian carp and carp.

During the observation period 26 species of birds belonging to 11 orders, 21 families were identified; 24 of them are migratory-nesting, 16 wintering, 12 sedentary, 28 migratory species.

Birds are distributed by orders: *Podicipediformes* – 4 species, Ciconiiformes – 3, Anseriformes – 5, *Falconiformes* – 4, *Galliformes* – 1, *Gruiformes* – 1, *Charadriiformes* – 3, *Columbiformes* – 4, *Strigiformes* – 1.



Figure 6. Ornithofauna of Lake Munaik Bay



Figure 7. Water sampling of Lake Muynak Bay



Figure 8. Ornithofauna of Lake Munaik Bay
(Green grouse **Merops *superciliosus*)**

SARBASKY BAY (FISH BAY)

This is one of the largest fishery reservoirs of the Amudarya delta zone, located in its left-bank part. It is located to the east of Muynak town.

The river water was accumulated in the bowl of the reservoir by means of barrier dams from the north and west and an outlet structure. The total area of Rybachy Bay is 6.4 thousand hectares.

Water mineralization in the bay at the level of river flow is up to 1.5 g/l. But when water inflow decreases, the water body starts to dry out, water mineralization increases up to 4-6 g/l.



Figure 9. View of Sarbas Bay - June, 2023.



Figure. 10: Fragment of the Sentinel-2 L2A satellite image of Sarbas Bay - wetland on June 25, 2023



Figure 11: Working Group at Sarbas Lake (June, 2023)

Monitoring of vegetation cover of Sarbas Lake

In the floristic composition of Sarbas Lake there are 12 species of wild higher plants, including 4 species of shrubs, 1 species of shrubs, 6 species of perennial herbaceous plants, 1 species of annual herbaceous plants. There are also 12 species of fodder plants, of which 9 species are valuable, willingly eaten, 2 species are satisfactorily eaten, 1 species is poorly eaten.

The dominant plants are perennials, woody shrubs, annuals, and ephemerals.

In areas of wide distribution (north-western part of the dried seabed). Here several thousand tons of valuable reed fodder for farm animals can be harvested annually.

Ornithofauna. As a result of ornithological surveys during the fall monitoring period, 23 species of birds belonging to 6 orders and 14 families were **recorded in** Sarbatsky (fishing) Bay. Birds were distributed by orders: *Falconiformes* – 1 species, Galliformes – 1, *Columbiformes* – 1, *Strigiformes* – 1, *Coraciformes* – 2, *Passeriformes* – 17. Of them sedentary – 14, migratory – 9, migratory-nesting – 4, wintering – 2 species.





Figure. 12. Vegetation communities of Sarbas lake



Figure. 13. Ornithorfauna of Sarbas lake



Figure 14: Jackal tracks



Figure. 15. Burrows of jerboas

We recorded sedentary birds: Common Kestrel *Falco tinnunculus*, Blue-winged Dove *Columba livia*, House Owl *Athene noctua*, Mayfly *Acridotheres tristis*, Black Crow *Corvus corone*, Tufted Lark *Galerida cristata*, Willow Tit *Panurus biarmicus*, Field Sparrow *Passer montanus and* others.

Theriofauna. During the monitrong we observed many traces of life activity (burrows, tracks, excrement, etc.) of predatory mammals, including jackal (*Canis aureus), feline* (*Felis chaus*). The Tolai Hare (*Lepus tolai*) is numerous. A large number of rodent burrows were found, including marmosets, gerbil and others.

Monitoring of wildlife in coastal areas of Sarbas Lake



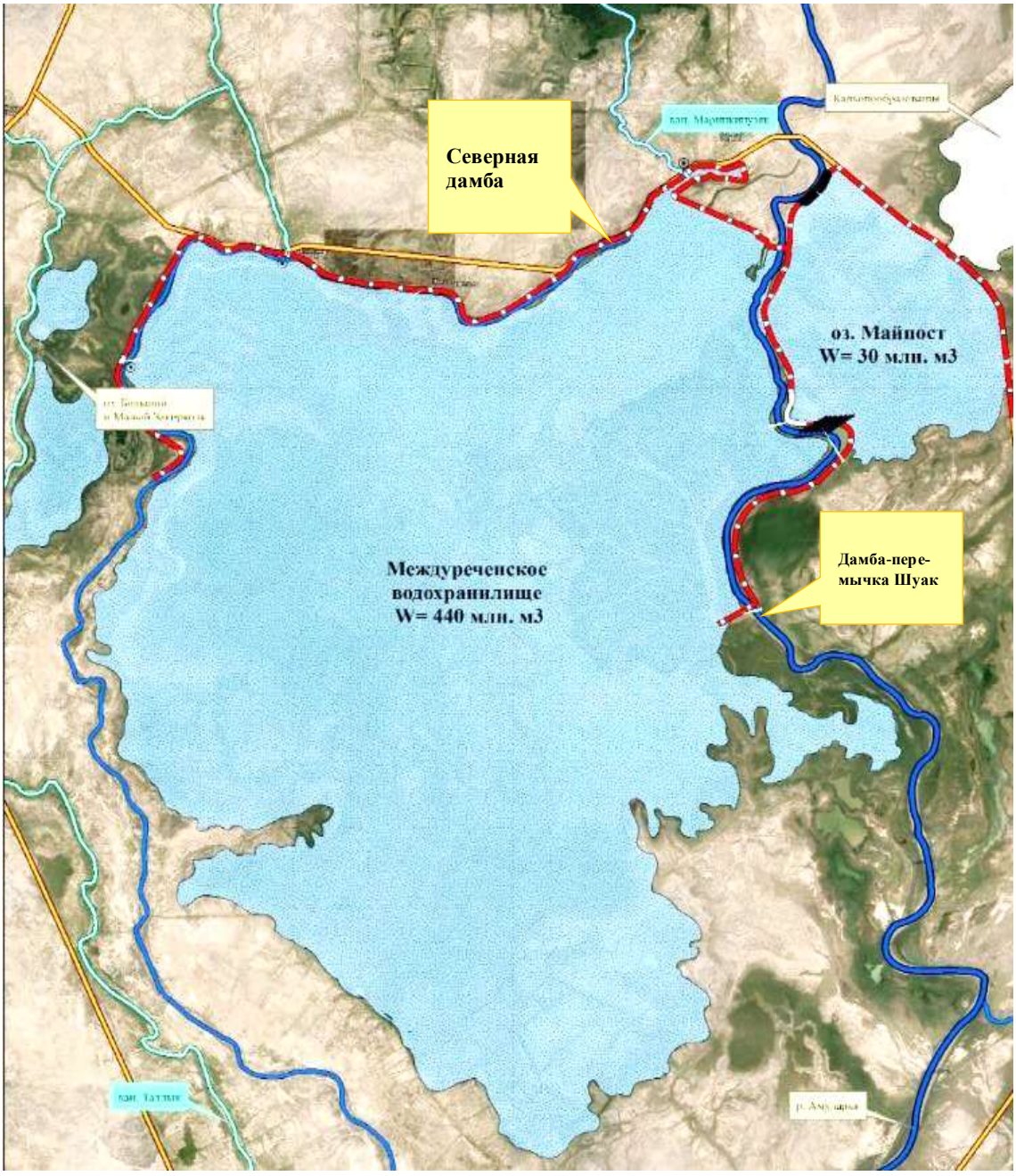
Figure. 16. Lake frog *(Rana ridibunda)*



Figure 17: Small jerboa

WETLAND MEZHDURECHIE

At the end of 1970, based on the project of the Institute «Uzgiprovodkhoz», the creation of the Mezhdurechenskoye reservoir in the center of the Amudarya delta began. The Shuak dam was built on the Akdarya channel, directing Amudarya water along the Kipchak and Akdarya channels to the zone of shallow lakes Shegekul, Koksu, Koshpelyadin, Baltaketken, Autel, Nogai, Zhidelizyak. The western and northern dams were built along the Kichakdarya channel, and the eastern dam was built along the Akdarya channel, **which formed the Mezhdurechenskoye reservoir (in 1978).**



Map 2. Zone of the Mezhdurechenskoye Reservoir

The Mezhdurechenskoye Reservoir is a reservoir for regulation and control of water supply to the Muynak and Rybachie Reservoirs, as well as to Lake Maipost and the Akdarya River.

In order to accumulate water in the Mezhdurechenskoye reservoir with a volume of up to 440 million meters^3 at the mark of the normal background level (NPL) of 57.0, the crest of the Northern and Eastern dams is arranged at the mark of 59.0.

Water salinity ranges from 1.45 to 3.75 g/l.

As the results of the research have shown, the riparian community has a four-tier structure:

- The first tier is made up of turangi, with trees reaching a height of 10-12 meters;
- The second tier is occupied by Turkmen elk, the height of trees is 3-4 m;
- The third tier is dominated by crested grebe;
- The fourth tier represents herbaceous plants.

Coastal vegetation is widely represented by akbash and hornwort along the entire coast. The comb association and comb and saltwort association is well developed. Vegetated pasture around the Mezhdurechie Reservoir consists of turang – jingleberry and motley grass associations.



Figure 18. Fragment of Sentinel-2 L2A satellite image -wetland of Mezhdurechenskoye reservoir on June 25, 2023

Vegetation cover of Mezhdurechie Lake

Around the lake there are many Turanga trees, many thickets of reeds, reeds and cattail.

There are 20 species of wild fodder plants, of which 11 species are valuable, willingly eatable, satisfactorily eatable – 3, poorly eatable – 3. The main species are perennial, woody-shrub, perennial and annual herbaceous plants. This year, with water falling on the Mezhdurechie reservoir in spring, the composition of plants has grown into the flowering phase.





Figure 19: Field studies of botanists



Figure. 20: Conducting monitoring

This year, with the inflow of water into Lake Mezhdurechie in the spring, the plant composition has grown into the flowering phase.

Monitoring of fauna of the coastal territories of the Mezhdurechie wetland

Reptiles occupy an important place in the biocenoses of the Southern Priaralie, but until recently the herpetofauna of this region has been studied insufficiently. At present, the composition of the herpetofauna of the South Prearalie wetlands, peculiarities of territorial distribution and biotopic distribution, abundance and other aspects of the ecology of individual species need to be clarified and detailed.

Data on species composition, spatial distribution, biotopic distribution and relative abundance (occurrence) of amphibians and reptiles were collected along automobile and foot routes. Only turtles, large lizards (agamas) and sometimes snakes could be seen from a moving vehicle.

The total length of the motorized routes was about 1,200 km. The main herpetological information was collected during walking routes in the places where the expedition vehicles stopped. The average approximate length of such routes per day was about 5 km per day.

Entomofauna. On the territory of the Mezhdurechie Wetland there are representatives of the Coleoptera or beetles: Gyrinidae (Gyrinidae: *Gyrinus cuspius, G. distiactus),* Hemiptera or bugs: Gladyschias (Notonectidae: Notonecta *glauca L., Notonecta viridis L.*), Floaters (Corixidae: *Corix sp.*), Swimmers (Naucoridae: *Ilyocoris cimicoides L.*), Waterflies (Gerridae: *Gerris costae, Gerris argentatus, Heterobates dohrandti*),

Ornithofauna. Wetland Mezhdurechie is a key ecosystem for the central delta zone of the Amudarya River, as well as an important habitat and resting and feeding area for many wetland and various bird species. In addition, elk trees and shrubs located near the lake are a good foraging base for terrestrial and riparian birds.

In the coastal zones of the Kipchakdarya and Akdarya riverbeds, riparian vegetation of sucker, comb and turanga is developed. The total projective coverage reaches up to 90%.

Riparian and reed thickets created favorable conditions for resting places, overnight stays, energy accumulation for further flight of birds. The following birds were found in these habitats: Pink starling (*Sturnus roseus)*, *Feather-billed* Flycatcher *Ficedula hypoleuca,* Common *Remiz penduilinus* Reed Buntings (*Emberiza schoeniclus)* and others.

Birds can be divided into 4 groups according to the nature of their stay. These are sedentary, nesting migratory, migratory and wintering species, which are more numerous than species in the fauna of the surveyed area due to the fact that many nesting and wintering species are also migratory for more northern geographical populations.





Figure. 21. Ornithofauna of wetland Mezhdurechie



Figure. 22. Water sampling of Mezhdurechie Lake

LAKE SARYKAMYSH

Sarykamysh Lake (**Sarykamysh)** is a drainless bitter-salt lake located in the Turan Lowland in the central part of the Sarykamysh Basin north of the Kara-kum Desert.

It is the largest lake in Turkmenistan, accounting for three quarters of the total lake area (Uzbekistan accounts for a quarter of the area). The Sarykamysh Basin is a physiographic natural areas of Dashoguz Viloyat of Turkmenistan. The surface area is 5,000 km$^{2.}$

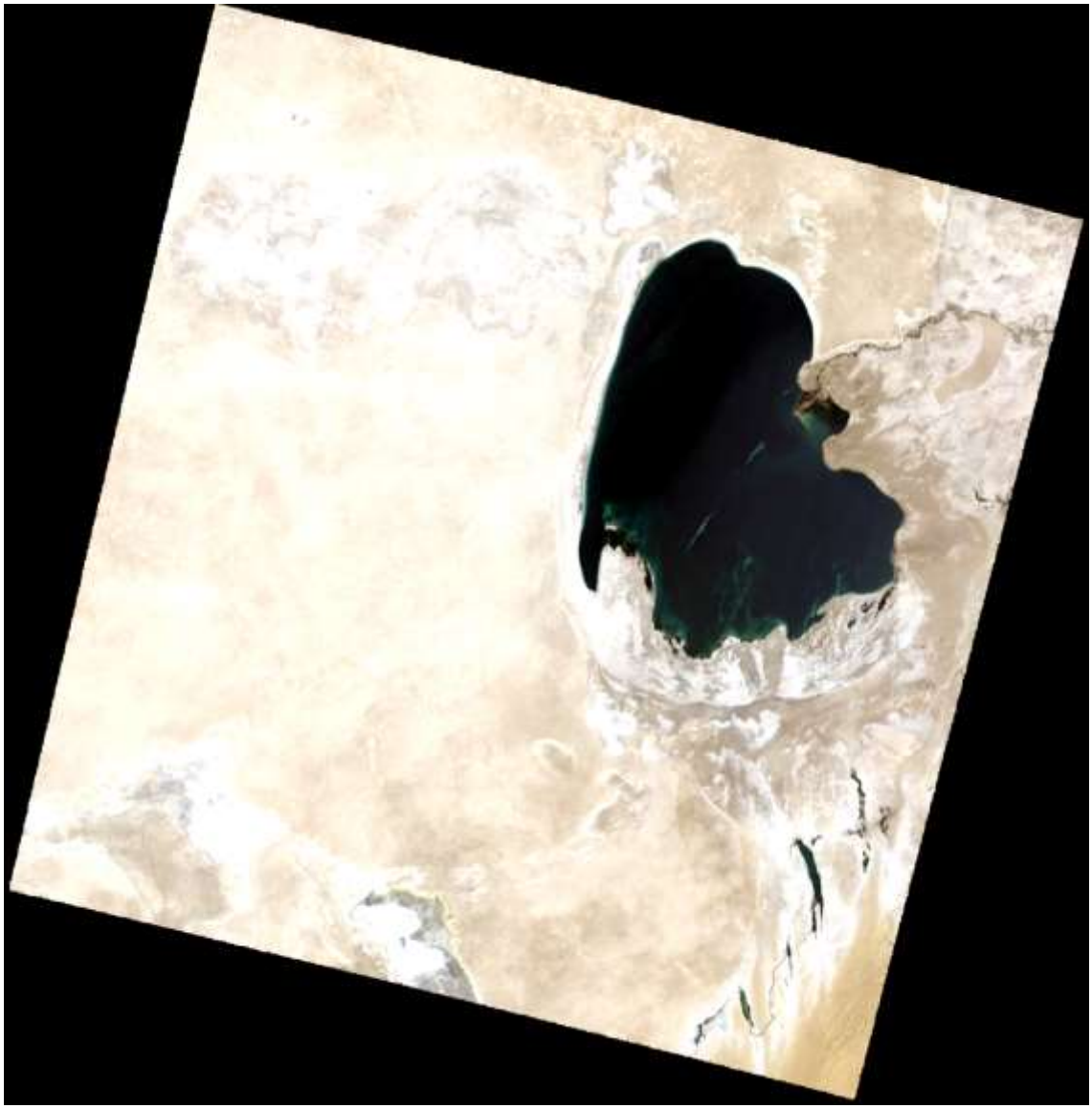


Figure. 23. Landsat8 satellite image - Lake Sarykamysh and adjacent area on June 26, 2023

During its history, the lake disappeared and reappeared several times depending on the inflow of Amu Darya water. Periods of drying up of Sarykamysh Lake were related to the river's flow into the Aral Sea.

In the past, Sarykamysh lake was filled with water from the Amu Darya, and to the west of it, in the territory of Dashoguz Viloyat of Turkmenistan, numerous beds of ancient Amu Darya channels have been preserved, the largest of them being Daryalyk and Daudan. Daryalyk covers the northern part of the delta with its channels, and Daudan, which has a more branched system of channels, occupies the middle and southern parts of the Prisarykamysh delta. Further, a river flowed out of the former southern bay of the lake in the direction of the Caspian Sea, the bed of which has been preserved to this day.

The lake existed at the end of the Neogene period, in the Upper Quaternary (at 58 meters above sea level), when its area covered, among others, the modern Assake-Audan depression, and then in the XIV-XVI centuries AD (at 50-62 meters above sea level).

Since the early 1960s, the Sarykamysh lake has been filled with collector-drainage water. The present-day lake was formed in 1971 after the breakthrough of water through the Daryalyk collector, using water from agricultural lands on the left bank of the Amu Darya - runoff from the surrounding irrigated lands containing large amounts of pesticides, herbicides and heavy metals. In the early 1970s, the lake had an area of 1,000 km², a water volume of about 12 km³ and a depth of up to 30 meters.

Lake Sarykamysh is located in the southern part of the Sarykamysh depression. Most of the reservoir is located in Turkmenistan, and only a quarter of it in Uzbekistan. The basin is bounded on the east by the Amu Darya delta and on the other sides by the Ustyurt Chinks. In hydrogeological terms, the Neogene and Quaternary sediments of the Sarykamysh basin represent a single water-bearing complex with the Amu Darya delta and valley, the South-Eastern Karakums, and the river deltas of Turkmenistan.

At present, the Sarykamysh area is variable and depends on collector water inflow, mainly from the territory of Dashoguz Viloyat of Turkmenistan. The lowest marks of the bottom of the Sarykamysh basin are 28.5 m below sea level. There is a source of mineral thermal waters on the eastern shore of the lake.



Figure 24. Working group on Lake Sarykamysh (June, 2023)



Figure 25. View of Lake Sarykamysh (June, 2023)

Floristic composition of Lake Sarykamysh

The natural vegetation cover of the southern part of the Ustyurt plateau consists of only 43 species of higher plants and is formed by the associations **as** follows: **biyurgunovo - boyalyshevo-mortukovy, chernosaksaulovo - keireukovo - biyurgunovy, biyurgunovo - keireukovo - chernosaksaulovo - chernosaksaulovo - wormwood - biyurgunovy**. Biyurgun communities dominate here, occupying more than 60-70% of the territory.

The composition of the vegetation cover of the southern part is less diverse compared to other areas. This sub-area is characterized by a large number of herbaceous plants (24 species), here are widely spread: leafless saxaul, keireuk, Khiva saltwort, tasbiyurgun, among ephemerals Ferulla, Malkalomia, Tauscheria.

According to the number of genera, the family Chenopodiaceae *(10) takes the* first place, followed by *Apiaceae (4), Brassicaceae (4), Rutaceae (4).* Next are *Fabaceae (3); then - Asteraceae (2), Poaceae (2), Cariyophyllaceae (2)* and last - *Boracinaceae (1), Ranunculaceae (1), Nymhaceae (1), Zigophyllaceae (1), Solanaceae (1), Cannobaceae (1), Frankeniaceae (1), Alliaceae (1), Cyperaceae (1), Apocynaceae (1).* According to life forms there are 1 – tree species, 9 – shrubs, 8 – semi-shrubs, 1 – semi-small-shrubs, 24 – herbaceous plants.

№1-contour N43°26'21.7630" E57°38'28.1176" biyurgunovoye-boyurgunovoye-boyalishevoye-mortuary association -- anabasetum salsae eremopyrum. The natural vegetation cover of this association is mainly formed by boyalishevoye-biyurgunovoye communities. The total degree of soil coverage in the area of 5 km south of the soda plant is 60%, of which 50% is occupied by *Anabasis salsa, 5% by Salssola orientalis,* 5% by *Eremoðirium orientale*. The landscape aspect of this area is greenish brown. The landscape at a distance of 25 km from the soda plant to the lake Sarykamysh is occupied by pure biurgun, followed by keireuk - biurgun association, at a distance of 20-28 km occasionally occurs turmeric, then very rarely extend artemisia - keireuk - biurgun - saxaul communities. The height of vegetation cover is from 3 to 65 cm.

The species composition is small, with 14 species recorded. Herbaceous plants dominate in this association – 24 species (perennials, annuals). The dominant plants are *Anabasis salsa* (cop_2), *Salsola orientalis* (cop_3), Eremopurum *orientale* (cop_1) differ in the degree of abundance, a significant place belongs to shrubs, semi-shrubs.

№2-contour N43°19'41.1394'' E57°35'17.7795'' **biyurgunovo-boyalyshevoye - mortucca** association involves 3 species of shrub, 8 – semi-shrubs, 2 – semi-small-shrubs, 6 – perennials, 4 – annuals.

As part of the **biurgunovo - boyalyshevoye - mortucca** association *Anabasis salsa* (cop_2) is distinguished by *Salsola orientalis (sp), Atraphaxis spinosa* by height and degree of abundance, *Gypsophila perfoliata, Ferula assa - foetida,*

Chorispora tenella, Eremopurum orientale, Artemizia terrae - albae, Lepidium perfoliatum (biennial), *Ceratocarpus utriculosus* (annual), *Halimocnemis villosa* do not differ in height and abundance.

№3-contour N43°14'38.8386'' E57°39'29.9157'' Black Saxaul **- *keireuk - biurgun association - anabasetum salsae - aphylli haloxyloso - orientalis salsolosum*.** They can be found 75-80 km between the soda plant and the eastern shore of Lake Sarykamysh. It occupies a wide-waved plain. The soil is gray-brown dry. The vegetation cover consists of black saxaul - keireuk groupings, where black saxaul occurs rarely, singly or in groups. Purely keireuk association dominates from the soda plant to Sarykamysh Lake. The landscape aspect of this area is greenish-brown. The total degree of soil coverage is 40-50%: 30-35% of soil is occupied by *Haloxylon aphyllum*, 5-7% by Salsola *orientalis*, 5-8% by Anabasis *salsa*.

The following are involved in the formation of the **Black Saxaul-Ceyreuca biyurgunova** association: 1 tree species, 3 shrubs, 8 semi-shrubs, 2 semi-small-shrubs, 6 species of perennial herbaceous plants and 4 annuals. The height of the vegetation cover is from 2 to 90 cm.

***№4-contour N43°25'26.1149 E57°50'24.9755'' Biyurgunovo - keireuk - black salsaul association - Halohyletum aphylli salsae anabasoso - orientalis salsolosum*.** It is distributed on the eastern shore of Lake Sarykamysh. The soil is gray-brown dry. In many places mother rock is denuded. Soil surface is gypsiferous, gypsum of crystal form, loamy horizon reaches the depth of 9-120 cm, then limestone is gypsiferous. The soil surface in 0.5-1.8 km from the eastern chink to the lake shore is covered with loam 1.0-1.40 cm thick.

The following are involved in the formation of the **biurgunov-keireuca-blacksaxaul** association: 1 tree species, 3 shrubs, 3 semi-shrubs, 1 semi-small-shrub, 6 species of perennial herbaceous plants and 3 annuals.

The floristic composition is not rich, consisting of 20 plant species. Vegetative herbage is formed by 3 tiers: the first tier – Haloxylon aphyllum, the second tier – *Salsola orientalis – Anabasis salsa*, the third tier – *Anabasis brachiata*. The aspect is greenish-brown. Total soil coverage is 45-50%, of which saxaul occupies 30-35%, biurgun – 3-5%, keireuk – 4-6%.

Haloxylon aphyllum (cop_1); Salsola *orientalis (*semishrub), *Chorispora tenella (*annual), *Londesia eriantha (*annual), *Tamarih hispida (*shrub) differ in height and abundance (sp). *Sisymbrium subspenescens (*perennial), *Lycium ruthenicum (*shrub), *Salsola arbuscula* are few in number (*sol)* but differ in height.

In the vegetation cover of this association *Haloxylon aphyllum is* widely spread, the following plants – *Zygophyllum pinnatum, Gypsophila perfoliata, Artemizia terrae – albae, Lycium ruthenicum, Zosima orientalis, Scorzonera pusilla, Salsola abuscula, Atraphaxis spinosa, Haplophyllum Bungei, Sisymbrium subspenescens, Allium borszczowii* are characterized by small numbers. Most of black saxaul bushes are in a half-dead state, young saxaul thickets stand out;

growth - development of keireuk, turmeric, dereza is normal, tamarix chokolaks are rarely found.

№5-contour N43°27'13.8080 E57°56'35.7641". Blacksaxaulov - ***artemisia-biurgun association - Anabasetum salsae aphylli haloxloso - artemisiosum.*** The vegetation cover is formed by blacksaxaulov - wormwood - biurgun communities. The relief of the described area Dautata (neighborhood of the soda plant) represents fixed sands.

The following species of trees, 3 shrubs, 3 semi-shrubs, 4 semi-small-shrubs, 5 herbaceous plants are involved in the formation of this association. The floristic composition is very poor. In 2007 there were 13 species, the herbage is formed by 3 tiers: the first tier – *Haloxylon aphyllum*, the second – *Artemizia terrae - albae*, the third – *Anabasis salsa,* Astragalus *ammodendron*. The aspect of the landscape is gray-brown. The degree of soil coverage is 50-60%, of which saxaul occupies 20-25%, wormwood – 10-15%, biurgun – 10-13%.

Haloxylon aphyllum (cop) is distinguished by height and abundance, *Artemizia terrae - albae*, Carex *physoides* by abundance; *Astragalus ammodendron (*shrub), *Salsola arbuscula* (semi-shrub), *Atraphaxis spinosa (*sol), *Calligonum microcarpa* (sp) are distinguished by height, not high abundance (sp).

According to our observations, *Anabasis salsa, Artemisia terrae-albae* (semi-shrubs), *Eremopyrum orientalis* (annual) participate in all four associations. Among shrubs *Lycium ruthenicum was* recorded only in the **biurgunov-keyureukov-blacksaxaulov** association. *Convolvulus fruticosa, Colligonum aphyllum, Colligonum microcarpa* (shrubs), *Salsola chivensis* - red-listed species (semi-shrub) - in the **blacksaxaulov-keyureukovo-biyurgunov** association; 2 species of annuals - *Chorispora tenella*, *Londesia eriantha* in the **black-saxaul-keyreukov-black-saxaul** association; of annuals - *Halimocnemis sclerosperma* only in the black-saxaul-byurgun association.

№6-contour N43°22'30.1018", E58°00'03.4057" According to the descriptions of the southern **biyurgunovo-boyalyshevoye-mortuary** association differs from the 3 associations of the sub-area by the absence of a tree. One species of *Londesia eriantha* should be emphasized from all annuals of the Karakalpak part of Ustyurt, and from perennials *Carex physoides was* found only in the southern sub-area of Ustyurt.

Monitoring of the fauna of Lake Sarykamysh

A total of 14 mammal species were recorded during the expedition in June, 2023: long-eared hedgehog, wolf, jackal, Karaganka fox, gazelle, yellow gopher, red-tailed gerbil, noon gerbil, great gerbil, house mouse, and tolai hare.

In recent years, relatively high precipitation has resulted in good vegetation development and optimal habitat conditions for herbivorous animals. This includes rodents and hares.

As a result of the survey we recorded 31 bird species, of which four species: flamingo *Phoenicopterus roseus,* swan *Cygnus olor,* vulture *Neophron percnopterus and* saker *falcon Falco cherrug are* included in the Red Data Book of RUz. The latter two species also have a high threat status in the IUCN Red Lists.

As a result of the survey, we recorded 15 mammal species, five of which: Indian honeyeater *Mellivora capensis buechneri,* Turkmen caracal Caracal caracal michaelis, Turkmen *kulan Equus hemionus kulan,* gazelle *Gazella subgutturosa are included* in the Red Data Book of the Republic of Uzbekistan (2019). Kulan, gazelle and urial are included in the IUCN Red Lists.

According to the survey of fishermen - in the northern part of Sarykamysh kulans come to watering even near the lodges, where herds of 15-20 heads were observed. The main threat to the kulan is poaching.



Figure 26. Kulans



Figure. 27. Black-winged stilt





Figure 328. Flamingo (*Phoenicopterus roseus*)

Flamingos (*Phoenicopterus roseus*) - on Lake Sarykamysh are found on migration, a small number sometimes remain all summer. The main food objects of flamingos inhabiting Lake Sarykamysh are aquatic invertebrates (artemia, bocoplave, etc.). Threats are: poaching, abandoned synthetic fishing nets.

The presence of Caracal was detected by the presence of excrement in several places - old, semi-fresh and fresh, indicating that Caracal regularly visited the area.

The main food objects of Caracal living in the study area include - tolai hare, yellow gopher, gerbils - big and noon gerbils; gerbils. In addition, the food spectrum includes various lizards and snakes.

Threats are: poaching, harsh weather conditions (especially in winter) reduction of forage base, possible competitive relations with wolf and fox, development of road network of roads.

Thus, as a result of the expedition to conduct monitoring of flora and fauna in the territory of Sarykamysh wetland (South Ustyurt National Park), various vertebrate species, including 9 species of reptiles, 31 species of birds and 15 mammals were reliably observed.



Figure. 29. Excrement of Caracal



Figure 30. The small jerboa



Figure. 31. Steppe cat with prey (camera trap)



Figure 32. Jerboa (camera trap)



Figure 33. Small jerboa



Figure 34. Working group at Lake Sarykamysh (June, 2023)

We made an initial assessment of the distribution, nature of stay, number and condition of such rare species as the Central Asian turtle, sand boa, flamingo, chimpanzee swan, vulture, saker falcon, caracal, gazelle and kulan. As part of the expedition, the staff of the Institute of Zoology trained the staff of the scientific department of the national park in field methods of observation of various animals.

SECOND FIELD EXPEDITION

EXPEDITION ROUTE

Expedition of researchers on the project «Monitoring of biodiversity of wetlands of the Southern Priaralie» took place in September, 2023. Local vehicles were used.

All routes of the expedition were organized from Muynak town along seven directions towards water bodies of lake systems and reservoirs.

The first route of the expedition went from Muynak and Sarbas gulfs to Mezhdurechie Lake (Shege and Kuksu lakes).

The second route – to the lake Dzhiltyrbas.

The third route – to Vostochny Karateren Lake (Takhtakupyrsky rayon)

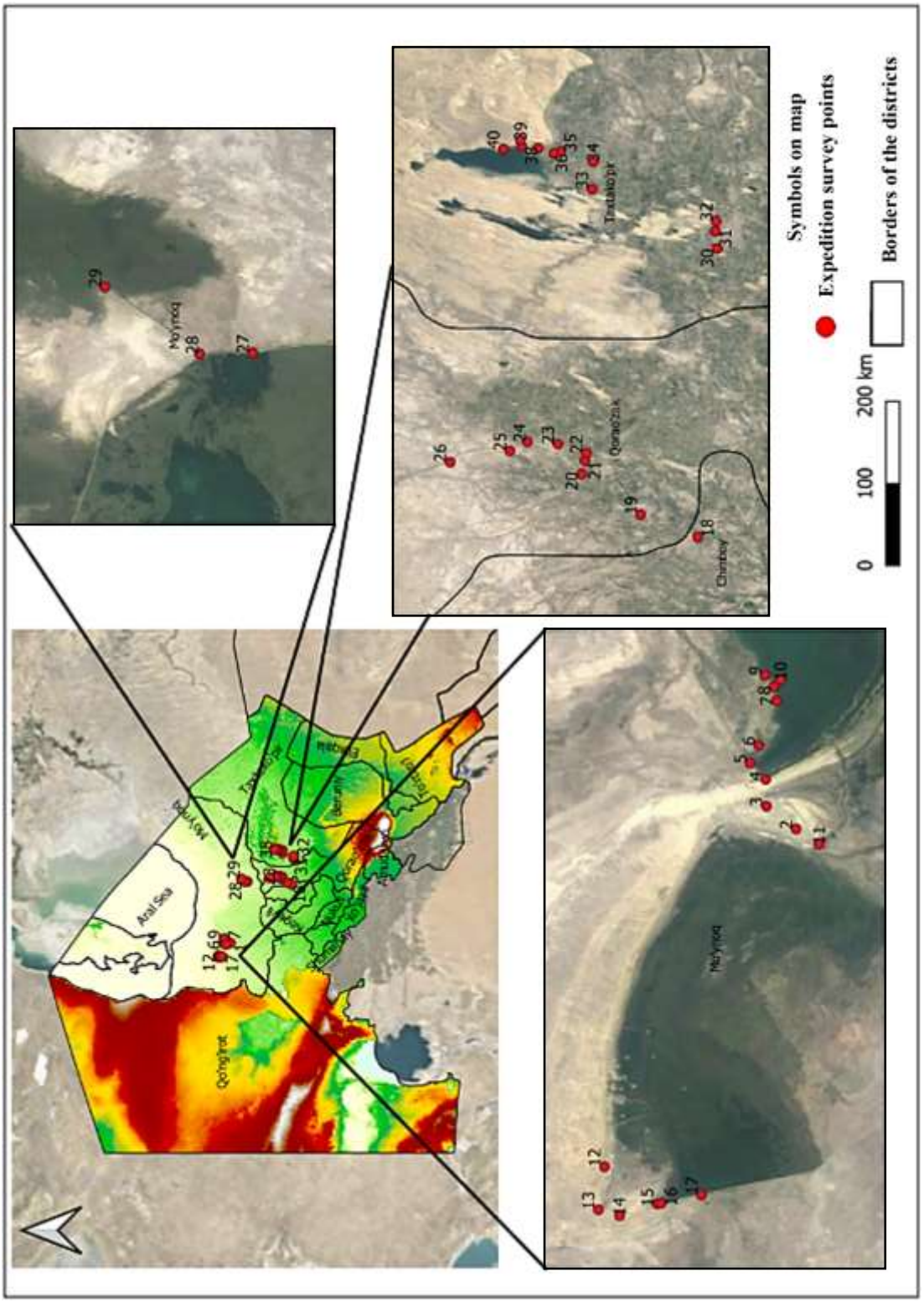
The expedition route, key points and locations of field camps are presented in Table 2.

Table 2

Research points of the expedition in the Southern Priaralie (September, 2023)

№	Latitude (N)	Longitude (E)
Muynak		
1	43°42'01.0"	59°02'15.8"
Lake. Sarbas (Fisherman's Bay)		
2	43°42'01.0"	59°02'15.8"
3	43°45'19.2"	59°01'25.5"
4	43°45'57.4"	59°02'06.1"
5	43°45'58.4"	59°02'53.9"
6	43°46'18.2"	59°03'22.9"
7	43°46'07.3"	59°03'54.8"
8	43°45'44.3"	59°05'14.2"
9	43°45'47.4"	59°05'39.2"
10	43°45'59.0"	59°05'60.0"
11	43°45'39.1"	59°05'51.2"
Muynak Bay, Uchsai		
12	43°44'49.7"	59°00'58.5"

№	Latitude (N)	Longitude (E)
13	43°49'25.8"	58°51'22.5"
14	43°49'33.5"	58°50'05.6"
15	43°49'06.4"	58°49'55.1"
16	43°48'17.8"	58°50'15.6"
17	43°48'13.0"	58°50'16.8"
18	43°47'20.9"	58°50'32.2"
Lake. Dzhiltyrbas		
19	43°03'18.4"	59°53'04.5"
20	43°06'33.5"	59°54'50.0"
21	43°09'56.9"	59°58'01.3"
22	43°09'46.0"	59°59'03.5"
23	43°09'40.4"	59°59'39.8"
24	43°11'18.3"	60°00'23.2"
25	43°13'03.0"	60°00'33.2"
26	43°14'02.8"	59°59'49.9"
27	43°17'28.1"	59°58'56.7"
28	43°31'27.3"	59°55'40.2"
29	43°32'50.2"	59°55'37.9"
30	43°35'17.8"	59°58'02.3"
Lake. Karateren		
31	43°02'10.5"	60°15'44.6"
32	43°02'17.5"	60°17'06.0"
33	43°02'14.4"	60°17'53.3"
34	43°09'21.0"	60°20'22.9"
35	43°09'17.0"	60°22'34.1"
36	43°11'09.2"	60°23'20.7"
37	43°11'31.7"	60°23'12.1"
38	43°12'26.2"	60°23'37.7"
39	43°13'22.8"	60°23'46.4"
40	43°13'26.9"	60°24'14.5"
41	43°14'25.2"	60°23'33.9"



Map 3. Expedition survey points (September, 2023)

RESEARCH RESULTS

SARBAS BAY

The water body was formed on the site of Sarbas Bay, which had dried up by 1974. The bay is fed through the Marinkin canal from the Mezhdurechie and has an outflow through the Gonchar-uzyak into the Inzhener-uzyak (Amu Darya channel). The water belonged to sulfate class, sodium group, by the value of mineralization – to slightly brackish waters, suitable for all kinds of fishery activities. However, here, as well as in Muynak Bay, last year's total fishing resulted in complete loss of fishery importance of this water body.

The level of water regime of Sarbas lake and its area depend on the volume of water inflow to the Mezhdurechie (Amu Darya delta). In dry years, the lake water area is usually divided into two isolated parts: a small part near the dam and the main part in the central part of the bay. In periods of sufficient water supply, both parts merge into a single water surface up to 8 km long, more than 6 km wide, with prevailing depths of 1.5-4 meters.

In 2019, the area of the reservoir sharply decreased due to water shortage in the Amu Darya. In 2202 water mineralization was 4.7 g/l., in 2023 – 5.2 g/l.

The water body is in a dried up state. The coastal part of the zone is mainly occupied by reed thickets and to a small extent cattail thickets. Further along the coast of the dam there is a slightly undulating, arid plain covered with associations of comb, juzgun, carabarak (saltwort), cemysh, Russian dereza and Karelinia caspianis

Monitoring of vegetation cover of Sarbas Lake

In the fall period in the floristic composition of the Sarybas wetland only 14 species of wild higher plants were iden tified, including 5 species of shrubs, 1 species of shrubs, 6 species of perennial herbaceous plant, 1 species of annual herbaceous plant. There are also 14 species of fodder plants, of which 11 species are valuable, willingly eaten, 2 species are satisfactorily eaten, 1 species is poorly eaten.

The dominant plants are perennials, woody shrubs, annuals, and ephemerals.



Figure 35. Working group on the dried bottom of the Sarbas Bay (September, 2023)



Figure 36. Fragment of Sentinel-2 L2A satellite image - Muynak city and Sarbas Lake (Rybachie) on October 23, 2023

Table 3

List of dominant plants in the western part of Lake Sarybas

Plant name	Height	Life form	Abundance	Distribution	Vegetal condition	Phenophase
Coastal water mirror						
Tamarix pentandra	120	Sh	cop_1	Рн	nl	Pe
Tamarix hispida	100	Sh	sol	нр		Pe
Tamarix laxa	71	suSh	cop_1	Рн	nl	Pe
Holostachus caspica	48	Sh	cop_3	рн	nl	Pe
Convolvulus fruticosus	50	Sh	cop_1	Рн	nl	Pe
Pragmites astrales	90	Pg	cop_3	рн	nl	Pe
Pragmites adans	10	Pg	cop_3	рн	nl	Pe
Aeleropis literalis	5	Ap	cop_3	рн	nl	Pe
Solsola foliosa	3	Pg	cop_3	рн	nl	Pe
Karelina caspia	20	Pg	Sp_3	рн	nl	Pe
Lycyum Rutheum	30	Sh	cop_1	Рн	nl	Pe
Halimodendron holidendron	50	Sh	cop_1	Рн	nl	Pe
Capparis spinosa	12	Pg	Sp_3	рн	nl	Pe
Zyophyllum oxianum	10	Pg	Sp_3	рн	nl	Pe

Note: *Tr – tree, Sh – shrub, sSh – semi-shrubt, ssSh – semi-small-shurb, suSh - subshrub, Pg – perennial grass, Bp – biennial plant, Ap – annual plant, Wa – willingly eaten, Sa – satisfactorily eaten, Pe – poorly eaten, ev – evenly, bl –blossom, nl – normal,* sol - sporadic, cop – abundantly, cop_3 – very abundantly, sp_3 – infrequent.



Figure 37. Vegetation cover



Figure 38. Capers (Capparis) (flowering and fruiting phases)

During the fall 2023 monitoring period at Sarybas Lake, most of the reservoir dried up.

Fishing used to be very developed on Sarbas lake. The fish population used to include such fish species as *carp Cyprinus carpio,* snakehead *Channa argus,* white amur *Ctenopharyngodon idella,* and fathead *carp Hypophthalmichthys molitrix*.

Ornithofauna. Sarbas lake is the main habitat of migratory and nesting waterfowl. It should be noted that during the study period we noted the continuation of fall migration of migratory bird species: Black-headed Gull, Common Curlew, Red-backed Curlew and others.



Figure 39. Ornithofauna of Sarbas Bay (September, 2023)

We recorded sedentary birds: Common Kestrel *Falco tinnunculus,* Blue-winged Dove *Columba livia,* House Owl *Athene noctua,* Mayfly *Acridotheres tristis,* Black Crow *Corvus corone,* Tufted Lark *Galerida cristata,* Willow Tit *Panurus biarmicus,* Field Sparrow *Passer montanus and* others.

The dominant species are the Southern Crested Grouse *Larus cachinnans*, Mallard *Anas platyrhynchos*, Coot *Fulica atra,* and Mustached Tit *Panurus biarmicus.*

During the survey period we monitored Sarbas Bay and found 42 species of birds belonging to 10 orders and 22 families. Birds are distributed by orders: Podicipediformes – 2 species, Pelecaniformes – 3, Ciconiiformes – 4, Anseriformes – 5, Falconiformes – 2, Gruiformes – 2, Charadriiformes – 4, Columbiformes – 1, Strigiformes – 1, Passeriformes – 18. Of these, 12 were sedentary, 29 were migratory, 20 were migratory-nesting, and 14 were wintering species.

Table 4

Список видов птиц, отмеченных на Сарбаском заливе

№	Title	Status of their protection	Nature of stay
1	Great Grebe or Chomka *Podiceps cristatus*		h,tr,n,in
2	Grey-cheeked grebe *Podiceps grisegena*		tr,n,in
3	Pink pelican *Pelecanus onocrotalus*	2(VU:D):[LC]	tr,n
4	Great Cormorant *Phalacrocorax carbo*		h,tr,n,in
5	Little cormorant *Phalacrocorax pygmaeus*	3(NT): [LC].	tr,n
6	Great white heron *Egretta alba*		h,tr,n,in
7	Small White Heron *Egretta garzetta*	2(VU:D):[LC]	tr,n
8	Grey heron *Ardea cinerea*		h,tr,n,in
9	Red Heron *Ardea purpurea*		n, in
10	Bewick’s swan *Cygnus olor*	2(VU:D):[LC]	tr,n
11	Grey goose *Anser anser*		h,tr,n,in
12	Mallard *Anas platyrhynchos*		n,tr,h,in
13	Red-nosed Diver *Netta rufina*		n,tr,h,in
14	Red-headed Diver *Aythya ferina*		tr,in
15	Marsh harrier *Circus aeruginosus*	CITES-II	h,tr,n
16	Common Kestrel *Falco tinnunculus*	CITES-II	s
17	Gray crane *Grus grus*		tr
18	Bald eagle *Fulica atra*		h,tr,n,in
19	Redshank *Tringa totanus*		tr,n
20	Lake gull *Larus ridibundus*		n,tr,h
21	Crested Gulls *Larus cachinnans*		n,tr,h
22	Sea pigeon *Larus* genei		tr
23	Blue pigeon *Columba livia*		s
24	House owl *Athene noctua*	CITES-II	s

№	Title	Status of their protection	Nature of stay
25	Crested lark *Galerida cristata*		s
26	Gray skylark *Calandrella rufescens*		n,tr,h
27	White wagtail *Motacilla alba*		tr,h
28	Rustic swallow *Hirundo rustica*		tr,n
29	Myna *Acridotheres tristis*		s
30	Magpie *Pica pica*		s
31	Rook *Corvus frugilegus*		s
32	Gull *Corvus monedula*		s
33	Black crow *Corvus corone*		s
34	Black-headed chaser *Saxicola torquata*		tr
35	Common greenfinch *Phoenicurus phoenicurus.*		tr
36	Red-backed Bluethroat *Phoenicurus erythronota*		tr
37	Bluethroat *Luscinia svecica*		tr,n
38	Moustached tit *Panurus biarmicus*		s
39	Field Sparrow *Passer montanus*		s
40	House sparrow *Passer domesticus*		s
41	Indian sparrow *Passer indicus*		tr,n
42	Reed bunting *Emberiza schoeniclus*		tr,h

Notation: [] *– species category in the IUCN Red List (2012);*
0-4 () – species category in the Red Data Book of the Republic of Uzbekistan (2019)
CITES-I, II, III – CITES Appendices in which species are included.
tr – migratory, h – wintering, s – sedentary, n – nesting,
in – commercial species.

И Red-listed species include the pink pelican *Pelecanus onocrotalus*, little cormorant *Phalacrocorax pygmaeus*, little white heron *Egretta garzetta*, mute swan *Cygnus olor.*

Teriofauna. During the monitoring we observed many traces of life activity (burrows, tracks, excrement, etc.) of predatory mammals, including jackal (*Canis aureus), feline* (*Felis chaus*). The Tolai Hare (*Lepus tolai*) is numerous. A large number of rodent burrows were found: marmosets, comb gerbil, etc.

MUINAK GULF LAKE (Uchsai)

Muynak Bay is an artificial water body, recreated by the mid-1980s on the site of a natural Aral Sea bay for fishery and recreational purposes (the bay is located within the city limits of Muynak) due to watering with river water through a canal from the Mezhdurechie River.



Figure 40. Working Group at Muinak Bay (September, 2023)

The total area of the bay bed is about 10 thousand ha. Depending on incoming water volumes, from 1.5 to 5 thousand ha are flooded.

Ten years ago (2002-2003), the length of the dammed section of the reservoir reached 6.5 km, width 150-200 m, the length of the central slough – 2.0 km, width – 1.0-1.2 km. The water depth at the dam reached 2.5-3.0 m, and on the open channel it did not exceed 0.7-0.9 m. The northern part of the bay up to Muynak was flooded with water forming numerous shallow spills, while the southern part remained dry.



Figure 41. Fragment of Sentinel-2 L2A satellite space image - Muynak city and Muynak Bay Lake on October 23, 2023

Water mineralization reached 3.5-3.8 g/dm. Water belonged to sulphite class, sodium group, moderately brackish water by the value of mineralization, suitable for all kinds of fishery activities. However, due to the total trapping that took place last year, the reservoir lost its fishery importance. No waterfowl were observed in the bay.

The water body is not flowing. Maximum depths are up to 3,5 m but most of the bay is shallow with depths of 0.5-7 m,0 waterlogged and heavily overgrown with reeds and cattail. High overgrowth of soft submerged vegetation (pondweed, cattail) is observed in the open shoulders. Water mineralization at different sites in different years and seasons fluctuates greatly and depends on the level of watering.

According to our studies, water mineralization has been increasing in recent years (especially in low-water years) and reaches up to 3.5-4.0 g/l, and in high-water years it decreases to 2.5-3.0 g/l.



Figure 42. View of Muynak Bay (autumn, 2023)

Vegetation cover of the lake Muynak bay (Uchsai)

The formation of vegetation cover of the dried sea bottom was thoroughly studied by S. Kabulov (1990) in Muynak bay of Uchsai Lake, after sea drying 1-2 years grows pure saltwort, then with saltwort with participation of Bassia (Salicornia europea+Suaeda crassifolia+Bassia hyssopifolia). In the next 2-3 years halophytes *Tamarix hispida, Climocoptera aralensis, Atriplex fominii* appear. *Karelina caspia, then Tamarix pentandra, Lycym ruthenicum* appear in depressions.

At present, jinggil chokalaki, most of the area without vegetation, a solonchak consisting of mobile saline sand, has been formed. In the shoreline, growing reed thickets can be used as hayfield. The floristic composition by life forms consists of only 25 species of wild plants. Of these, tree – 1, shrubs – 6 species, bushes – 1, semi-shrubs – 1, perennial herbaceous plant – 9, annual herbaceous plant – 7 species.

Table 5

Флористический состав «Муйнакской залива»

Plant name	Height	Life form	Abundance	Distribution	Vegetal condition	Phenophase
Береговой линии мокрый солончак						
Haloxylon aphyllum	300	Tr	cop_3	нр	nl	Pe
Halimodendron holidodendron	90	Sh	Sol	нр	nl	Pe
Amodendron conulii	100	Sh	Sol	нр	nl	Pe
Tamarix pentandra	120	Sh	cop_1	Pe	nl	Pe
Tamarix hispida	100	Sh	cop_1	нр	nl	Pe
Tamarix laxa	71	suSh	cop_1	Pe	nl	Pe
Lycym rutheum	80	Sh	cop_3	Нр	nl	Pe
Holostachus caspica	48	Sh	cop_3	рн	nl	Pe
Kaelina caspia	30	Мн	sol	нр	nl	Pe
Aeleropis literalis	5	Ap	cop_3	Pe	nl	Pe
Alyum savulosum	20	Ap	sp	нр	nl	Pe
Zygophyllum oxianum	10	Ap	sp	нр	nl	Pe
Karelina caspia	13	Ap	sol	нр	nl	Pe
Climocoptera aralensis	10	Ap	sol	нр	nl	Pe
Solsola foliosa	13	Pg	sol	нр	nl	Pe
Lycium rutheum	15	Pg	Sp	нр	nl	Pe
Capparix spinosa	10	Pg	Sp	Pe	nl	Pe

Plant name	Height	Life form	Abundance	Distribution	Vegetal condition	Phenophase
водной части						
Pragmites astrales	90	Pg	cop_3	Pe	nl	Pe
Pragmites adans	10	Pg	cop_3	Pe	nl	Pe
Typha angustifolia	120	Pg	Cop	Pe	nl	Pe
Xara	5	Ap	cop	Pe	nl	Pe
100 м от береговой линии мокрый солончак						
Haloxylon aphyllum	300	Tr	cop_3	нр	nl	Pe
Tamarix hispida	90	Sh	sol	Hp	nl	Pe
Tamarix pentondra	120	Sh	sol	Hp	semi-dried	Pe
Holostachus caspica	40	sSh	sol	Hp	nl	Pe
Solsola foliosa	7	Pg	cop	P	nl	Pe
Solsola nitraria	8	Pg	cop	P	semi-dried	Pe
Climocoptera aralensis	9	Ap	sol	Hp	nl	Pe
Climocoptera bracyata	11	Ap	sol	Hp	nl	Pe
Bassia hyssopifolia	12	Ap	sol	Hp	nl	Pe

Note: *Tr – tree, Sh – shrub, sSh – semi-shrubt, ssSh – semi-small-shurb, suSh - subshrub, Pg – perennial grass, Bp – biennial plant, Ap – annual plant, Wa – willingly eaten, Sa – satisfactorily eaten, Pe – poorly eaten, ev – evenly, bl –blossom, nl – normal,* sol - sporadic, cop – abundantly, cop_3 – very abundantly, sp_3 – infrequent.

There are 25 species of fodder plants in the floristic composition of the lake «Uchsai», of which 17 species are valuable, willingly eatable, satisfactorily eatable – 6, poorly eatable – 2. *Sarracnichus spinosa* and *Lycium rutheum are* rarely found in the floristic composition.

This year, with water fall on the lake «Uchsai» in the fall period, the composition of plants has grown into the fruiting phase. The penological observation continues.



Figure 43. General view of the vegetation cover of the territory

Ornithofauna. Muynak Bay is also a habitat for migratory and nesting waterfowl, as well as a good foraging ground at feeding grounds.

In the course of our research we identified and recorded the following wintering bird species: Bar-tailed Godwit (*Buteo rufinus),* Lake Gull *Larus ridibundus*, Fieldfare Lark *Alauda arvensis,* White Wagtail *Motacilla alba,* Grey Crow *Corvus cornix*, Reed Buntings *Emberiza schoeniclus and* others.

During the study period we recorded migrations of migratory bird species in this area: Red-headed Duck *Aythya ferina*, Teal *Anas crecca*, Teal *Anas querquedula and* others.



Figure 44. Ornithofauna of Lake Muynak Bay (September, 2023)

We recorded sedentary birds: Common Kestrel *Falco tinnunculus,* Blue-throat *Columba livia,* House Owl *Athene noctua,* Tufted Lark *Galerida cristata,* Mayfly *Acridotheres tristis,* Magpie *Pica pica,* Jackdaw *Corvus monedula,* Rake Corvus *frugilegus,* Black Crow *Corvus corone,* Ruffed Nightingale *Erythropygia galactotes,* Musty Tit *Panurus biarmicus.* Field Sparrow *Passer montanus,* etc.

As a result of ornithological studies in Muynak Bay 33 species of birds belonging to 8 orders and 19 families were **recorded.** Birds are distributed by orders: Ciconiiforme – 3, Anseriformes – 5, Falconiformes – 3, Gruiformes – 1, Charadriiformes – 3, Columbiformes – 1, Strigiformes – 1, Passeriformes – 16. If we divide them by the nature of stay, there is a predominance of migratory species – 19 species, nesting – 14, wintering – 14 and sedentary – 13 species of birds.

Table 6

List of bird species recorded at Lake Muynak Bay

№	Title	Status of their protection	Nature of stay
1	Great white heron *Egretta alba*		h,tr,n,in
2	Grey heron *Ardea cinerea*		h,tr,n, in
3	Red Heron *Ardea purpurea*		n, in
4	Mallard *Anas platyrhynchos*		n,tr,h, in
5	Red-nosed Diver *Netta rufina*		n,tr,h, in
6	Red-headed Diver *Aythya ferina*		tr,in
7	Whistling Teal *Anas crecca*		tr,h, in
8	Teal *Anas querquedula*		tr,in
9	Marsh harrier *Circus aeruginosus*	CITES-II	h,tr,n
10	Barrow *Buteo rufinus*		n,tr,h
11	Common Kestrel *Falco tinnunculus*	CITES-II	s
12	Bald eagle *Fulica atra*		h,tr,n, in
13	Herbalist *Tringa totanus*		tr,n
14	Crested Gulls *Larus cachinnans*		n,tr,h
15	Lake gull *Larus ridibundus*		n,tr,h
16	Blue pigeon *Columba livia*		s
17	House owl *Athene noctua*	CITES-II	s
18	Crested lark *Galerida cristata*		s
19	Field lark *Alauda arvensis*		n,tr,h
20	Rustic swallow *Hirundo rustica*		tr,n
21	White wagtail *Motacilla alba*		tr, h
22	Gray magpie *Lanius excubitor*		n,tr,h
23	Myna *Acridotheres tristis*		s
24	Magpie *Pica pica*		s

№	Title	Status of their protection	Nature of stay
25	Gull *Corvus monedula*		s
26	Rook *Corvus frugilegus*		s
27	Black crow *Corvus corone*		s
28	Gray crow *Corvus cornix*		tr,h
39	Streaked scrub warbler *Scotocerca scotocerca inquieta*		s
30	Riparian nightingale *Erythropygia galac-totes*		s
31	Moustached tit *Panurus biarmicus*		s
32	Field Sparrow *Passer montanus*		s
33	Reed bunting *Emberiza schoeniclus*		h,tr

Notation: [] *– species category in the IUCN Red List (2012);*
0-4 () – species category in the Red Data Book of the Republic of Uzbekistan (2019)
CITES-I, II, III – CITES Appendices in which species are included.
tr – migratory, h – wintering, s – sedentary, n – nesting,
in – commercial species.

WETLAND MEZHDURECHIE (LAKES KOKSU, SHEGE)

Wetland Mezhdurechie was one of the largest massifs of flooded lands in the Amu Darya (Akdarya) – Kipchak Darya Mezhdurechie with the system of lakes Shege, Koksu.

Water mineralization in the reservoir was 0.6-0.9 g/dm3. Sulfates and chlorides dominated the mineralization of water from anions, sodium and magnesium – from cations. Water belonged to the sulfate-chloride class, sodium and magnesium group, by the value of mineralization – to fresh waters suitable for various purposes of household and drinking and industrial water use, as well as for all types of fishery activities.

In low-water years, the lake water area is usually divided into two isolated parts: a small part near the dam and the main part in the central part.

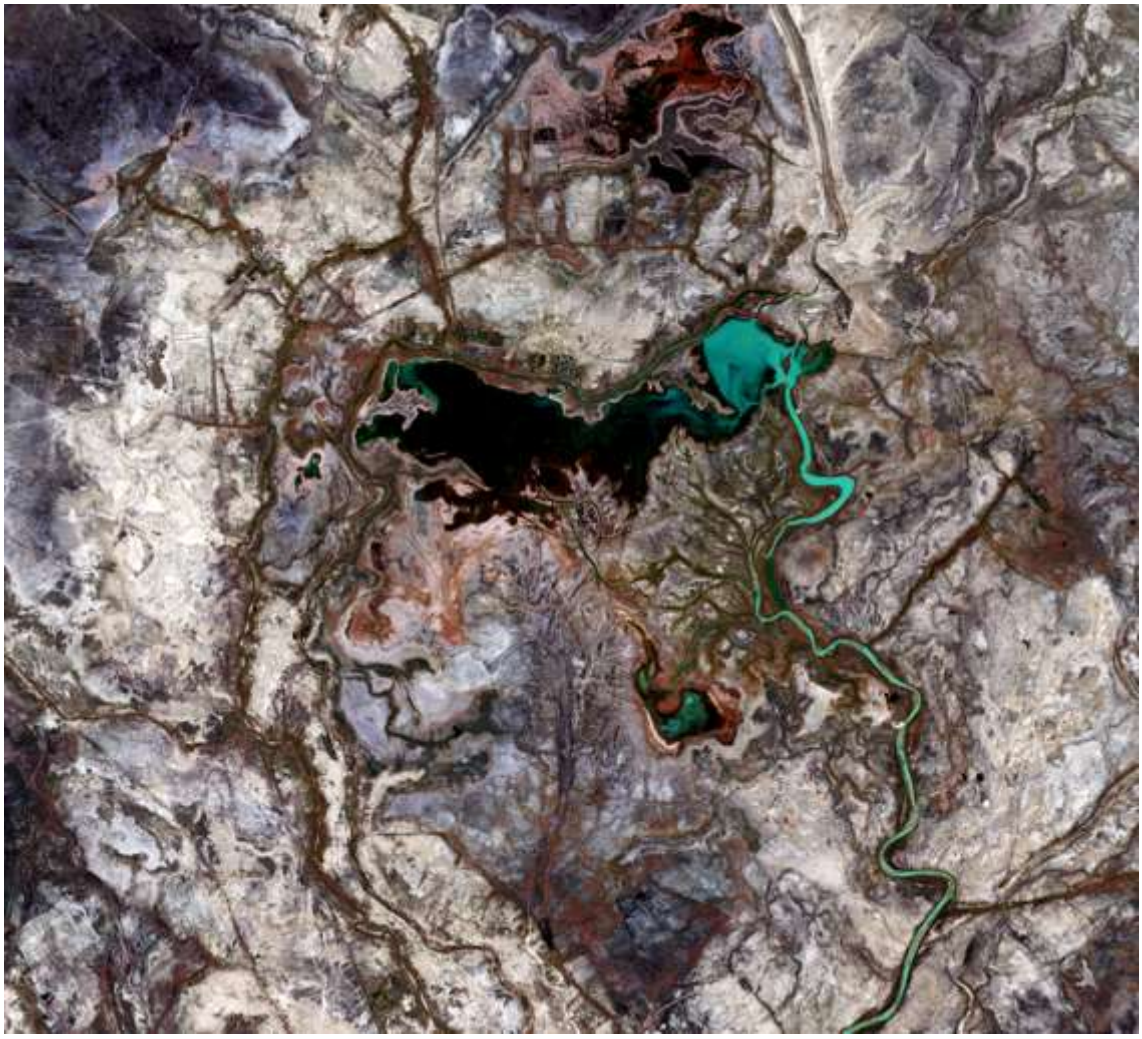


Figure 45. Fragment of Sentinel-2 L2A satellite image - zone of Mezhdurechenskoye reservoir on October 23, 2023

Vegetation cover of lake Mezhdurechie

В недавнем прошлом оз. Междуречье было богато водопогруженной растительностью, но береговая зона не имела сомкнутых зарослей тростника и произрастание тростника было на относительно небольших, разрозненных участках береговой линии водоема.



Figure 46. General view of Lake Mezhdurechie (September, 2023)

In previous years the water surface was flat, dark green color. In this year (2023) water level in the reservoir sharply decreased due to water shortage in Amudarya river. There was no water at all along the whole channel that stretched to the reservoir. The riverbed was dry. In the residual reservoir, the water was polluted. Since the end of September, 2023, water started to flow and the estimated volume of water in the reservoir by the end of November 2023 is expected to be 250 million m^3.

Around the lake there are many Turanga trees, many thickets of reed and cattail. In the coastal zones of the Kipchakdarya and Akdarya riverbeds, riparian vegetation, which consists of elk, comb and turanga, grows strongly. The total projective cover reaches up to 90%.

The riparian community has a four-tier structure. The first tier is made up by turangi, the height of trees reaches 10-12 m. The second tier is occupied by Turkmen elk, the height of trees is 3-4 meters. The third tier is dominated by comb, the lowest tier is represented by herbaceous plants. Coastal vegetation is widely represented by akbash and hornwort along the entire coast. The comb association and comb and saltmarsh are well developed. Vegetated pasture around the Mezhdurechie Reservoir consists of turang-jingleberry and motley grass associations.



Figure 47. Vegetation of the Mezhdurechie

The floristic composition of the vegetation cover of the Mezhdurechie Reservoir consists of 21 species in total. By life forms tree – 3, shrubs – 4, bushes – 1, perennial – 8, annual herbaceous plant – 2.

Table 7

State of vegetation cover of the Mezhdurechie Reservoir

Plant name	Height	Life form	Abundance	Distribution	Vegetal condition	Phenophase
Coastal part						
Populus ariana	600	Tr	cop$_1$	Рн	nl	Pe
Populus pruinosa	580	Tr	cop$_1$	Рн	nl	Pe
Elagnus turcmnica	850	Tr	cop	нр	nl	Pe
Halimodendron holidodendron	90	Sh	Sol	нр	nl	Pe
Tamarix pentandra	120	Sh	cop$_1$	Рн	nl	Pe
Tamarix hispida	100	Sh	sol	нр	nl	Pe
Tamarix androssovii	80	Sh	sol	нр	nl	Pe
Tamarix laxa	71	suSh	cop$_1$	Рн	nl	Pe
Lycyum Rutheum	80	Sh	sol	нр	nl	Pe
Convolvulus fruticosus	50	Sh	cop$_1$	Рн	nl	Pe
Pragmites adans	10	Pg	cop$_3$	рн	nl	Pe
Pragmites australis	100	Pg	cop$_3$	рн	nl	Pe
Karelina caspia	30	Pg	sol	нр	nl	Pe
Aeleropis literalis	5	Од	cop$_3$	рн	nl	Pe
Carex pshoydes	3	Од	sol	нр	nl	Pe
Alhagi pseudo alhagi	30	Pg	sp	нр	nl	Pe

Plant name	Height	Life form	Abundance	Distribution	Vegetal condition	Phenophase
Capparis spinosa	10	Pg	sol	нр	nl	Pe
Zygophylum oxianum	5	Pg	sol	нр	nl	Pe
Climocoptera lanata	10	Pg	sol	нр	nl	Pe
Climocoptera brachyata	8	Pg	sol	нр	nl	Pe

Note: *Tr – tree, Sh – shrub, sSh – semi-shrubt, ssSh – semi-small-shurb, suSh - subshrub, Pg – perennial grass, Bp – biennial plant, Ap – annual plant, Wa – willingly eaten, Sa – satisfactorily eaten, Pe – poorly eaten, ev – evenly, bl –blossom, nl – normal,* sol - sporadic, cop – abundantly, cop_3 – very abundantly, sp_3 – infrequent.

There are also 21 species of wild forage plants, of which 14 species are valuable, willingly eatable, satisfactorily eatable – 5, poorly eatable – 2. The dominant species are perennial, woody-shrub, perennial and annual herbaceous plants.

This year, with the fall water fall on the Mezhdurechie pond, the plant composition has moved into the fruiting phase.

No.2 contour N43°33'52.8862'' E59°13'02.0217'' Vegetation pasture of Mezhdurechie Reservoir consists of turang-grass and mixed grasses. The floristic composition of the vegetation cover of Mezhdurechie Reservoir consists of only 14 plant species. According to life forms floristic composition tree – 3, bushes – 5, shrubs – 1, perennials – 4, annual herbaceous plant – 2.

There are also 14 species of wild forage plants, of which 8 species are valuable, willingly eaten by animals, and 4 species are satisfactorily eaten. The dominant species are perennial woody and shrubby plants, perennial and annual herbaceous plants. *Capparis spinosa is* very rare in the floristic composition.

This year, with the influx of water into the Intermountain Reservoir in the fall, the plant composition has grown into the fruiting phase.

Table 8

State of vegetation cover of the Mezhdurechie Reservoir

Plant name	Height	Life form	Abundance	Distribution	Vegetal condition	Phenophase
Coastal part						
Populus ariana	600	Tr	cop_1	Рн	н	пл
Populus pruinosa	580	Tr	cop_1	Рн	н	пл.
Elagnus turcmnica	850	Tr	cop	нр	н	пл.
Tamarix hispida	100	Sh	sol	нр	н	пл.
Tamarix pentandra	90	Sh	sol	нр	н	пл.
Tamarix laxa	700	Sh	sol	нр	н	пл.
Lycyum Rutheum	80	Sh	sol	нр	н	пл.
Tamarix laxa	71	suSh	cop_1	Ре	н	пл.
Convolvulus fruticosus	50	Sh	cop_1	Ре	н	пл.
Pragmites adans	10	Pg	cop_3	Ре	н	пл.
Aeleropis literalis	5	Ap	cop_3	Ре	н	пл.
Carex pshoydes	3	Ap	sol	нр	н	пл.
Alhagi pseudo alhagi	30	Pg	sp	нр	н	пл.
Capparis spinosa	10	Pg	sol	нр	н	пл.
Zygophylum oxianum	5	Pg	sol	нр	н	пл.

Note: *Tr – tree, Sh – shrub, sSh – semi-shrubt, ssSh – semi-small-shurb, suSh - subshrub, Pg – perennial grass, Bp – biennial plant, Ap – annual plant, Wa – willingly eaten, Sa – satisfactorily eaten, Pe – poorly eaten, ev – evenly, bl –blossom, nl – normal,* sol - sporadic, cop – abundantly, cop_3 – very abundantly, sp_3 – infrequent.

No.3 contour N43°33'54.4534'' E59°14'18.9604'' The vegetation of pastures around the Mezhdurechie Reservoir consists of turanium-hornbeam and mixed grasses.

The floristic composition of the vegetation cover of the Mezhdurechie Reservoir consists of 13 species of wild plants: of these, trees – 3, shrubs – 2 species, bushes – 1, perennial herbaceous plants – 5, annual herbaceous plants – 2 species.

The dominant plants are perennial, woody-shrub, perennial and annual herbaceous plants. Camel thorn *Alhagi pseudo alhagi is* rarely found in this countour.

Monitoring of fauna of the coastal territories of the wetland Mezhdurechie

Ichthyofauna. In the year under study, the ichthyofauna in the Mezhdurechie has a diverse composition. Many fish species of the Amu Darya River are found here: carp, crucian carp, roach, redfin, zander, white and mottled fatheads, white amur, snakeheads, etc. The lake is inhabited by carp, crucian carp, roach, redfin, redfish, pike-perch, and others. According to interviews with fishermen, residents of settlements, the lake is inhabited by *carp* (*Cyprinus carpio*), white amur (*Ctenopharyngodon idella*), common pikeperch (*Stizostedion lucioperca) and* others. Studying the general composition of ichthyofauna, we came to the conclusion that the fish potential in this lake is very rich – about 15 species of ichthyofauna.

There are several residential settlements in the vicinity of Mezhdurechie. Almost the entire population is engaged in fishing. According to interviews with fishermen, fish catches are highly variable, which is a consequence of the instability of the water body itself.

Amphibians. Two amphibian species inhabit the coastal area: green toad (*Bufo viridis*) and lake frog (*Rana ridibunda*).

The herpetofauna consists of the following species: Takyr Roundworm (*Phrynocephalus helioscopus*), Sand Roundworm **(***Phrynocephalus interscapularis)***,** *Reticulated* Roundworm (*Phrynocephalus reticulatus*), Squeaky Gecko (*Alsophylax pipiens)*, Caspian Gecko (Cyrtopodion caspium (*Eichwald)*, Grid Lizard (*Eremias grammica*), Linear Lizard (*Eremias lineolata*), Fast Lizard (*Eremias velox)*, Sand Udachnik (*Eryx miliaris)*, Four-banded Creeper (*Elanhe quatuorlineata)*, Water *Eel (*Natrix tesselata).

Entomofauna. On the territory of the Mezhdurechie Wetland there are representatives of Coleoptera or beetles: Waterfowl (Dytiscidae: *Dytiscus marginalis, D. dimidiatus, D. circumflexus), Gyrinidae* (Gyrinidae: *Gyrinus cuspius, G. distiactus),* Hemiptera or bugs: Gladys (Notonectidae: Notonecta *glauca L., Notonecta viridis L.*), Floaters (Corixidae: *Corix sp.*), Swimmers (Naucoridae: *Ilyocoris cimicoides L.*), Waterflies (Gerridae: *Gerris costae, Gerris argentatus, Heterobates dohrandti*).

Theriofauna. In this area we observed a lot of mammal tracks - foxes (*Vulpes vulpes*), jackals (*Canis aureus)*, cats (*Felis chaus)* and cats (*Felis caracal*). There are a lot of traces of life activity of the tolai hare (*Lepus tolai*). The badger also finds suitable conditions for itself, choosing more humid areas with bushes.

Ornithofauna. This system is the key for the central delta zone of the Amu Darya. It can be said that Mezhdurechie: Koksu and Shege lakes are important habitats and resting and feeding places for many wetland and various bird species. In addition, elk trees and shrubs located near the lake are a good forage base for terrestrial and riparian birds.

On the northern shore of the lake there is *Elaeagnus angustifolia*, which creates favorable conditions for pheasants and small passerines. Analysis of the dynamics of the structure of numerous bird species shows a great species diversity characteristic of chymysh, reed, saltwort and tamarisk thickets occupying the banks of the Kipchakdarya.

We met sedentary birds, which is associated with woody vegetation. Among sedentary birds were: golden eagle, common kestrel, Khiva pheasant, blue pigeon, house owl, white-winged woodpecker, tufted lark, jackdaw, grackle, black crow, scotocerca, riparian nightingale, ustaya tit, Bukhara tit, field sparrow and others.

White-winged Woodpecker *Dendrocopos leucopterus is an* indicator of forest condition. The occurrence of the species depends on the number of pests and a large life period (old riparian) of the forest.

In the autumn period the most numerous birds we can name Red-nosed Duck and Bald Eagle. Riparian and reed thickets created favorable conditions for resting places, overnight stays, accumulation of energy for further continuation of birds' flight. The following birds were found in these habitats: Pink Starling *Sturnus roseus*, Broad-tailed Reed Warbler *Cettia cetti,* Common Tit *Panurus biarmicus,* Reed Buntings *Emberiza schoeniclus and* others.

Small islands or bumps on the dried areas of the Kipchadarya River have become habitats of different species. We observed darias and islets with vegetation on open spaces, small dried areas of shallow waters and islets with vegetation. Among them we noted the gray heron *Ardea cinerea,* eagle *Tadorna ferruginea,* coot *Fulica atra,* herbivore *Tringa totanus,* gulls *Larus cachinnans,* lake gull Larus *ridibundus and* others**.**



Figure 48. Working group at Mezhdurechie Lake (September, 2023)



Figure 49. Ichthyofauna of Mezhdurechie Lake

As a result of ornithological studies in the Mezhdurechie, 60 species of birds belonging to 13 orders and 26 families were **recorded**. Birds are distributed by orders: Podicipediformes – 3 species, Pelecaniformes – 2, Ciconiiformes – 5,

Anseriformes – 11, Falconiformes – 4, Galliformes – 1, Gruiformes – 3, Charadriiformes – 3, Columbiformes – 3, Strigiformes – 2, Coraciformes – 1, Piciformes – 1, Passeriformes -21. Of these, 21 were sedentary, 39 were migratory, 27 were migratory-nesting, and 17 were wintering species. Among the red-listed species, such species as Small Cormorant *Phalacrocorax pygmaeus*, Small White Heron *Egretta garzetta*, Bewick's Swan *Cygnus olor* and Golden Eagle *Aquila chrysaetos were* recorded.

Birds can be divided into 4 groups according to the nature of their stay. These are sedentary, breeding migratory, migratory and wintering species. There are more species than species in the fauna of the surveyed area due to the fact that many nesting and wintering species are also migratory for more northern geographical populations.

Table 9

List of bird species recorded in the Mezhdurechie area

№	Title	Status of their protection	Nature of stay
1	Little grebe *Tachybaptus ruficollis*		tr,n
2	Great Grebe or Chomka *Podiceps cristatus*		h,tr,n,in
3	Grey-cheeked grebe *Podiceps grisegena*		tr,n, in
4	Great Cormorant *Phalacrocorax* carbo		h,tr,n,in
5	Little cormorant *Phalacrocorax* pygmaeus	3(NT):[LC].	tr,n
6	Quaqua *Nycticorax nycticorax*		tr,n
7	Great white heron *Egretta alba*		h,tr,n,in
8	Small White Heron *Egretta garzetta*	2(VU:D):[LC].	tr,n
9	Grey heron *Ardea cinerea*		h,tr,n, in
10	Red Heron *Ardea purpurea*		n, in
11	Bewick's swan *Cygnus olor*	2(VU:D):[LC].	tr,n
12	Grey goose *Anser anser*		n,tr,h,in
13	Mallard *Anas platyrhynchos*		n,tr,h,in
14	Red-nosed Diver *Netta rufina*		n,tr,h,in
15	Red-headed Diver *Aythya ferina*		tr,in
16	Crested *nigger Aythya fuligula*		tr,in
17	Whistling Teal *Anas crecca* Churrak		n, tr

№	Title	Status of their protection	Nature of stay
18	Grey duck *Anas strepera ўngir* ўrdak		n, tr
19	Ogal *Tadorna ferruginea*		n,tr,in
20	Pegana *tadorna tadorna*		h,tr,n,in
21	Teal *Anas* querquedula		tr
22	Marsh harrier *Circus aeruginosus*	CITES-II	h,tr,n
23	Barrow *Buteo rufinus*		n,tr,h
24	Golden eagle *Aquila* chrysaetos	2(VU:R):[LC]. CITES-II	s
25	Common Kestrel *Falco tinnunculus*	CITES-II	s
26	Khiva pheasant *Phasianus colchicus chrysomelas*		s
27	Gray crane *Grus grus*		tr
28	Whooping crane *Antropoides virgo*		tr
29	Bald eagle *Fulica atra*		h,tr,n, in
30	Herbalist *Tringa totanus*		tr,n
31	Crested Gulls *Larus cachinnans*		n,tr,h
32	Lake gull *Larus ridibundus*		n,tr,h
33	Blue pigeon *Columba livia*		s
34	Ringed turtle *Streptopelia decaocto*		s
35	Little turtle *Streptopelia senegalensis*		s
36	Owl *Bubo bubo*		s, tr
37	House owl *Athene noctua*	CITES-II	s
38	Green grouse *Merops superciliosus*		tr,n
39	White-winged Woodpecker *Dendrocopos leucopterus*	CITES-II	s
40	Rustic swallow *Hirundo rustica*		tr,n
41	Crested lark *Galerida cristata*		s
42	White wagtail *Motacilla alba*		tr,h
43	Pink starling *Sturnus roseus*		tr
44	Myna *Acridotheres tristis*		s
45	Magpie *Pica pica*		s
46	Jackdaw *Corvus monedula*,		s
47	Rook *Corvus frugilegus*		s
48	Black crow *Corvus corone*		s

№	Title	Status of their protection	Nature of stay
49	Gray crow *Corvus cornix*		tr,h
50	Broad-tailed reed warbler *Cettia cetti*		tr,h
51	*Sylvia curruca.*		tr,n
52	Streaked scrub warbler *Scotocerca scotocerca inquieta*		s
53	Riparian nightingale *Erythropygia galac-totes*		s
54	Bluethroat *Luscinia svecica*		tr,n
55	Moustached tit *Panurus biarmicus*		s
56	Bukhara tit *Parus bokharensis*		s
57	House sparrow *Passer domesticus*		s
58	Indian sparrow *Passer indicus*		tr , n
59	Field Sparrow *Passer montanus*		s
60	Reed bunting *Emberiza schoeniclus*		tr,h

Notation: [] – *species category in the IUCN Red List (2012);*
0-4 () – species category in the Red Data Book of the Republic of Uzbekistan (2019)
CITES-I, II, III – CITES Appendices in which species are included.
tr – migratory, h – wintering, s – sedentary, n – nesting,
in – commercial species.



Figure 50. Ornithofauna of the Wetland Mezhdurechie (September, 2023)

DZHILTYRBAS LAKE

Wetland Dzhiltyrbas represents one of the most significant wetlands and fisheries against the background of catastrophic drying up of the Aral Sea lakes. It was formed on the site of the Aral Sea bay of the same name, which was completely drained in 1968, is shallow and consists of a large number of splashes and reed beds.

The northern and northeastern part of the lake is covered with sands, and at present there is a process of shallowing and sharp reduction of the water area, and as a consequence – reduction of fish stocks, loss of importance of the water body as a nesting and migratory bird habitat. The maximum depth is 4 meters, the minimum depth is 0.8-1 m.



Figure 51. Fragment of Sentinel-2 L2A satellite space image - area of Jaltyrbas lake system on October 23, 2023

The degradation of the bay was suspended in the early 1980s due to the supply of collector-drainage water from KC-1 and KC-3 to the Kazakhdarya runoff. In 1997 and 2003-2010, as a result of implementation of the ASBP-1 (Aral Sea Basin Program) and ASBP-2 programs, construction of a facility to regulate the lake's hydroregime was carried out.

Due to the construction of a dam, the water level in the lake stabilized a few years ago and this water body represented one of the most significant wetlands and fish grounds against the background of catastrophic drying up of lakes in the Aral Sea region. However, during low-water years (2000-2002), the water level in the lake dropped sharply. Siltation, shallowing and sharp reduction of water area took place.

The bottom is silty-sandy. The shoreline is indented. Reed (*Phragmites australis Trin*.), hornwort (*Typha angistifolia L.*) and reed (Schoenoplectus litoralis (Schrad.) Palla) were found in areas of shallow flooding.

The shallow water is heavily overgrown with *spiny* urutia (*Myriophyllum spicatum* L.) and hydrohalophilic species of *pondweed (Potamogeton pectinatus L.)* and curly pondweed (*Potamogeton crispus* L.). The results of observations show that the water of Lake Dzhiltyrbas is characterized by higher mineralization (8.79 g/l).



Figure 52. Working group at Lake Dzhiltyrbas (September, 2023)



Figure 53. View of Lake Dzhiltyrbas (September, 2023)

The Zhaltyrbas lake system is located in the Kazakdarya massif of Muynak district on the former bay of the Aral Sea. It consists of many lakes of different sizes. Water color is yellowish-blue, less saline, not suitable for drinking.

Currently, the water surface is more than 2 thousand hectares, the average water depth is 0.70-3.80cm. The water body is covered with reed thickets, with a height of 3.5-4.5 meters. The bottom is covered with floating and shiny rdesta, in some places submerged hornwort, whorled and spikey uruta can be found.

In the coastal flooded zone we described: *Tamarix hispida, Tamarix pentandra, Tamarix laxa, Pragmites australus, Aeleropis literalis,* along the coastal wetland line, except for reeds, we described *Tupha angustustifolia* and others.

The phytocenological character of reed beds varies depending on various ecological factors, i.e. the depth of flooding and the degree of surface water salinity. In this area, reed beds occupy huge areas and are of industrial importance. Harvesting for fodder is possible in the summer period, for industry only in the fall-winter period.

Table 10

Species composition of the vegetation of Lake Zhaltyrbas

Plant name	Height	Life form	Abundance	Distribution	Vegetal condition	Phenophase
Coastal water mirror						
Pragmites astrals	220		cop3	рн	н	пл
Tyha angutitolia	70		cop1	рн	н	пл
Schoenoplectus	35		sp	нр	н	пл
Potamogeton perfoliatus	35		sol	нр	н	пл
Shoreline wetland						
Pragmites astrales	180		cop2	ph	н	пл
Tyhpa angutitolia	45		sp	нр	н	пл
Tyhpa laxmannii	39		sol	нр	н	пл
Tamarix hispida	120		sol	нр	н	пл
150 m from the shorelineWet salt marsh						
Tamarix hispida	90		*sol*	*нр*	*н*	пл

Plant name	Height	Life form	Abundance	Distribution	Vegetal condition	Phenophase
Tamarix pentondra	120		*sol*	*нр*	*н*	пл
Holostachus caspica	40		*cop*	*ph*	*н*	пл
Solsola foliosa	7		*cop*	*ph*	*н*	пл
Solsola nitraria	8		*sol*	*нр*	*н*	пл
Climocoptera aralensis	9		*sol*	*нр*	*н*	пл
Climocoptera lanata	10		*sol*	*нр*	*н*	пл
Halimodendron holodendron	23		*sol*	*нр*	*н*	пл
Licyum Rutheum	25		*sol*	*нр*	*н*	пл
Bassia hyssopifolia	12		*sol*	*нр*	*н*	пл

Note: *Tr – tree, Sh – shrub, sSh – semi-shrubt, ssSh – semi-small-shurb, suSh - subshrub, Pg – perennial grass, Bp – biennial plant, Ap – annual plant, Wa – willingly eaten, Sa – satisfactorily eaten, Pe – poorly eaten, ev – evenly, bl –blossom, nl – normal,* sol - sporadic, cop – abundantly, cop_3 – very abundantly, sp_3 – infrequent.

In this area, only the shoreline reed beds can be used as hayfields.

Floristic composition of Lake Dzhiltyrbas consists of only 16 species of wild plants of which shrubs are 7 species, shrubs – 1, perennial herbaceous plant – 5, annual herbaceous plant 3 species.

The floristic composition of Lake Dzhiltyrbas includes fodder plants, of which 9 species are valuable, willingly eatable, satisfactorily eatable – 6, poorly eatable – 1. Dominant are perennial, woody-shrub, perennial and annual herbaceous plants. Phenological observations are ongoing.







Figure 54. Vegetation cover

Ornithofauna. Lake Zhaltyrbas is the main habitat of many hydrophilic species and stopover of migratory birds during migration, among which there are rare and endangered species of birds. During seasonal migrations, several thousand individuals of hydrophilic bird species gather and hold.

On the located dam and the edge of the lakes there are crested thickets, reed thickets along the shoreline are of special importance for habitats and resting places for various bird species.

The Broad-tailed Reed *Cettia cetti*, Wheatear Tit *Panurus biarmicus and* Reed Buntings *Emberiza schoeniclus were* observed on the survey route during the day in coastal reed-horn thickets.

We recorded sedentary birds: Khiva pheasant *Phasianus colchicus chrysomelas,* house owl *Athene noctua*, tufted lark *Galerida cristata,* mayfly *Acridotheres tristis,* jackdaw *Corvus monedula*, grackle *Corvus frugilegus,* black crow *Corvus corone,* riparian nightingale *Erythropygia galactotes,* musty tit *Panurus biarmicus,* field sparrow *Passer montanus* and others. During the night observation period the following species were recorded: *Bubo bubo* owl, House Owl *Athene noctua*.

Flying species of birds were seen on the lake in search of food: These meadows are also a good feeding ground. The Great Cormorant *Phalacrocorax carbo,* Pegan *Tadorna tadorna*, Loon *Tadorna ferruginea*, Red-necked Duck *Netta rufina,* Grey Heron *Ardea cinerea and* others were observed feeding here.

The following bird species were recorded on roofs and attics of fishermen's residential houses located on leased fishing grounds: Blue-winged Dove *Columba livia*, Ring-necked Dove *Streptopelia decaocto*, Mayfly *Acridotheres tristis*, House Sparrow *Passer domesticus* and Field Sparrow *Passer montanus,* Village Swallow *Hirundo rustica*.

As a result of ornithological studies on Lake Dzhiltyrbas 56 species of birds belonging to 11 orders, 25 families were observed; 25 of them are migratory-breeding, 17 wintering, 17 sedentary, 31 migratory species. Birds are distributed among the following orders: Podicipediformes – 2 species, Pelecaniformes – 2, Ciconiiformes – 3, Anseriformes – 11, Falconiformes – 6, Galliformes – 1, Gruiformes – 5, Charadriiformes – 4, Columbiformes – 3, Strigiformes – 2, Passeriformes – 17. Among them are included in the National Red Data Book of the Republic of Uzbekistan (2019): Little *Cormorant Phalacrocorax pygmaeus*, Bewick's Swan *Cygnus* olor, Osprey *Pandion haliaetus* and Golden Eagle *Aquila chrysaetos*.

Table 11

Список видов птиц, отмеченных на оз. Жылтырбас

№	Title	Status of their protection	Nature of stay
1	Большая поганка или чомга *Podiceps cristatus*		h,tr,n,in
2	Серощекая поганка *Podiceps grisegena*		tr,n,in
3	Большой баклан *Phalacrocorax carbo*		h,tr,n,in
4	Малый баклан *Phalacrocorax pygmaeus*	3(NT):[LC].	tr,n
5	Большая белая цапля *Egretta alba*		h,tr,n,in
6	Серая цапля *Ardea cinerea*		h,tr,n,in
7	Рыжая цапля *Ardea purpurea*		n, in
8	Лебедь-шипун *Cygnus olor*	2(VU:D):[LC].	tr,n
9	Серый гусь *Anser anser*		n,tr,h,in
10	Огарь *Tadorna ferruginea*		n,tr, in
11	Пеганка *Tadorna tadorna*		h,tr,n,in
12	Кряква *Anas platyrhynchos*		n,tr,h,in
13	Красноносый нырок *Netta rufina*		n,tr,h,in
14	Красноголовый нырок *Aythya ferina*		tr,in

№	Title	Status of their protection	Nature of stay
15	Хохлатая чернеть *Aythya fuligula*		tr,in
16	Савка *Oxyura leucocephala*		tr,n
17	Чирок-свистунок *Anas crecca* Чуррак		n, tr
18	Серая утка *Anas strepera* Қўнғир ўрдак		n, tr
19	Скопа *Pandion haliaetus*	2(VU:R):[LC] . CITES-II	tr
20	Болотный лунь *Circus aeruginosus*	CITES-II	h,tr,n
21	Зимняк *Buteo lagopus*		h,tr
22	Курганник *Buteo rufinus*		n,tr,h
23	Беркут *Aquila chrysaetos*	2(VU:R):[LC] . CITES-II	s
24	Обыкновенная пустельга *Falco tinnunculus*	CITES-II	s
25	Хивинский фазан *Phasianus colchicus chrysomelas*		s
26	Серый журавль *Grus grus*		tr
27	Журавль-красавка *Antropoides virgo*		tr
28	Малый погоныш *Porzana parva*		tr, in
29	Камышница *Gallinula chloropus*		tr,n, in
30	Лысуха *Fulica atra*		h,tr,n,in
31	Травник *Tringa totanus*		tr,n
32	Чайки хохотуньи *Larus cachinnans*		n,tr,h
33	Озерная чайка *Larus ridibundus*		n,tr,h
34	Морской голубок *Larus genei*		tr
35	Чернобрюхий рябок *Pterocles orientalis*		tr,n, in
36	Сизый голубь *Columba livia*		s
37	Кольчатая горлица *Streptopelia decaocto*		s
38	Филин *Bubo bubo*		s, tr
39	Домовый сыч *Athene noctua*		s
40	Хохлатый жаворонок *Galerida cristata*		s

№	Title	Status of their protection	Nature of stay
41	Деревенская ласточка *Hirundo rustica*		tr,n
42	Белая трясогузка *Motacilla alba*		tr,h
43	Майна *Acridotheres tristis*		s
44	Сорока *Pica pica*		s
45	Галка *Corvus monedula*,		s
46	Грач *Corvus frugilegus*		s
47	Черная ворона *Corvus corone*		s
48	Широкохвостая камышевка *Cettia cetti*		tr,h
49	Серая славка *Sylvia communis*		tr
50	Тугайный соловей *Erythropygia galactotes*		s
51	Обыкновенная горихвостка *Phoenicurus phoenicurus*		tr
52	Устая синица *Panurus biarmicus*		s
53	Полевой воробей *Passer montanus*		s
54	Домовый воробей *Passer domesticus*		s
55	Индийский воробей *Passer indicus*		tr,n
56	Тростниковая овсянка *Emberiza schoeniclus*		tr,h

Notation: [] – *species category in the IUCN Red List (2012);*
0-4 () – species category in the Red Data Book of the Republic of Uzbekistan (2019)
CITES-I, II, III – CITES Appendices in which species are included.
tr – migratory, h – wintering, s – sedentary, n – nesting,
in – commercial species.





Figure 55. Ornithofauna of Lake Dzhiltyrbas (September, 2023)



Figure 56. Gray heron *Ardea cinerea*



Figure 57. Great Cormorant *Phalacrocorax carbo*



Figure 58. White heron *Ardea alba*



Figure 59. Crested gulls





igure 60. General view of Lake Dzhiltyrbas (September 9, 2023). The process of eutrophication









Figure 61. Field studies (September, 2023)

Theriofauna. During the monitoring we observed a lot of traces (tracks, burrows, excrement, etc.) of various predatory mammals, including *felines (Felis chaus*), jackals (*Canis aureus)*, and tolai hare (*Lepus tolai).*

A large number of rodent burrows were found: gerbils and others.

WETLAND EAST KARATEREN

The Karateren lake system is located in the Takhtakupyr massif of the Takhtakupyr district at the foot of the Beltau upland. The nearest settlement is Daukara. The feeding river or source of East Karateren Lake is the end discharge of the main irrigation canal Kuanyshzharma and two collector discharges.

Lake Karateren is located 55 km from the district center of Tahtakupyra district. The area is 15,000 hectares. Maximum depth is 11 meters, minimum depth is 1m. maximum depth is 30 m. prevailing depths are 3-5 m. Length 11.1 km, width 2.9 km. Water mineralization was 2.47-3.48 g/l. Water color was yellowish-blue, less saline, not suitable for drinking.



Figure 62. View of East Karateren Lake



Figure 63. Landsat 8 satellite image fragment - Lake Karateren area on October 18, 2023



Figure 64. Working group at East Karateren Lake (September, 2023)

Monitoring vegetation cover of the lake Eastern Carateren

In the coastal flooded zone we described the following *species*: *Haloxylon aphyllum, Tamarix hispida, Tamarix laxa, Tamarix androsisa, Pragmetus adans, Pragmetus australus, Aeleropis literalis,* along the coastal wetland line, except for reeds, various shrubs described *Tulipha angustustifolia.*

The floristic composition of Lake Karateren consists of only 22 species of wild plants of which tree – 1, shrubs are 5 species, bushes – 1, perennial herbaceous plant – 7, annual herbaceous plant – 8 species.

The floristic composition of Lake Karateren includes 22 species of forage plants, of which 14 species are valuable, willingly eaten, 6 are satisfactorily eaten, and 2 are poorly eaten.

The dominant plants are perennial, woody-shrub, perennial and annual herbaceous plants.

Table 12

Species composition of the vegetation of Lake Karateren

Plant name	Height	Life form	Abundance	Distribution	Vegetal condition	Phenophase
Coastline-wet salt marsh Karateren						
Haloxylon aphyllum	300	Tr	cop$_3$	нр	nl	пл
Halimodendron holidodendron	90	Sh	Sol	нр	nl	Пл
Tamarix pentandra	120	Sh	cop$_1$	Рн	nl	Пл
Tamarix hispida	100	Sh	cop$_1$	нр	nl	Пл
Tamarix laxa	71	suSh	cop$_1$	Рн	nl	пл
Lycym rutheum	80	Sh	cop$_3$	Нр	nl	Пл
Holostachus caspica	48	Sh	cop$_3$	рн	nl	Пл
Kaelina caspia	30	Pg	sol	нр	nl	пл
Aeleropis literalis	5	Ap	cop$_3$	рн	nl	Пл
Capparis spinosa	15	Pg	sol	нр	nl	Пл

Plant name	Height	Life form	Abundance	Distribution	Vegetal condition	Phenophase
Alyum savulosum	20	Ap	sol	нр	nl	Пл
Zygophyllum oxianum	10	Ap	sp	нр	nl	Пл
Eremopyrum orientale	10	Ap	sol	нр	nl	Пл
Climocoptera aralensis	10	Ap	sol	нр	nl	пл
Solsola foliosa	13	Pg	sol	нр	nl	пл
The water part of Karateren						
Pragmites astrales	90	Pg	cop_3	рн	nl	bl
Pragmites adans	10	Pg	cop_3	рн	nl	bl
Typha angustifolia	120	Pg	Cop	рн	nl	пл
Xara	5	од	cop	рн	nl	bl
250 m from the shoreline wet salt marsh						
Tamarix hispida	90	Sh	*sol*	*Hp*	nl	*Пл*
Tamarix pentondra	120	Sh	*sol*	*Hp*	semi-dried	*Пл*
Holostachus caspica	40	sSh	*sol*	*Hp*	nl	*Пл*
Solsola foliosa	7	Pg	*cop*	*P*	nl	*Пл*
Solsola nitraria	8	Pg	*cop*	*P*	semi-dried	*Пл*
Climocoptera aralensis	9	Ap	*sol*	*Hp*	nl	*вег*
Bassia hyssopifolia	12	Ap	*sol*	*Hp*	nl	*вег*

Note: *Tr – tree, Sh – shrub, sSh – semi-shrubt, ssSh – semi-small-shurb, suSh - subshrub, Pg – perennial grass, Bp – biennial plant, Ap – annual plant, Wa – willingly eaten, Sa – satisfactorily eaten, Pe – poorly eaten, ev – evenly, bl –blossom, nl – normal,* sol - sporadic, cop – abundantly, cop_3 – very abundantly, sp_3 – infrequent.

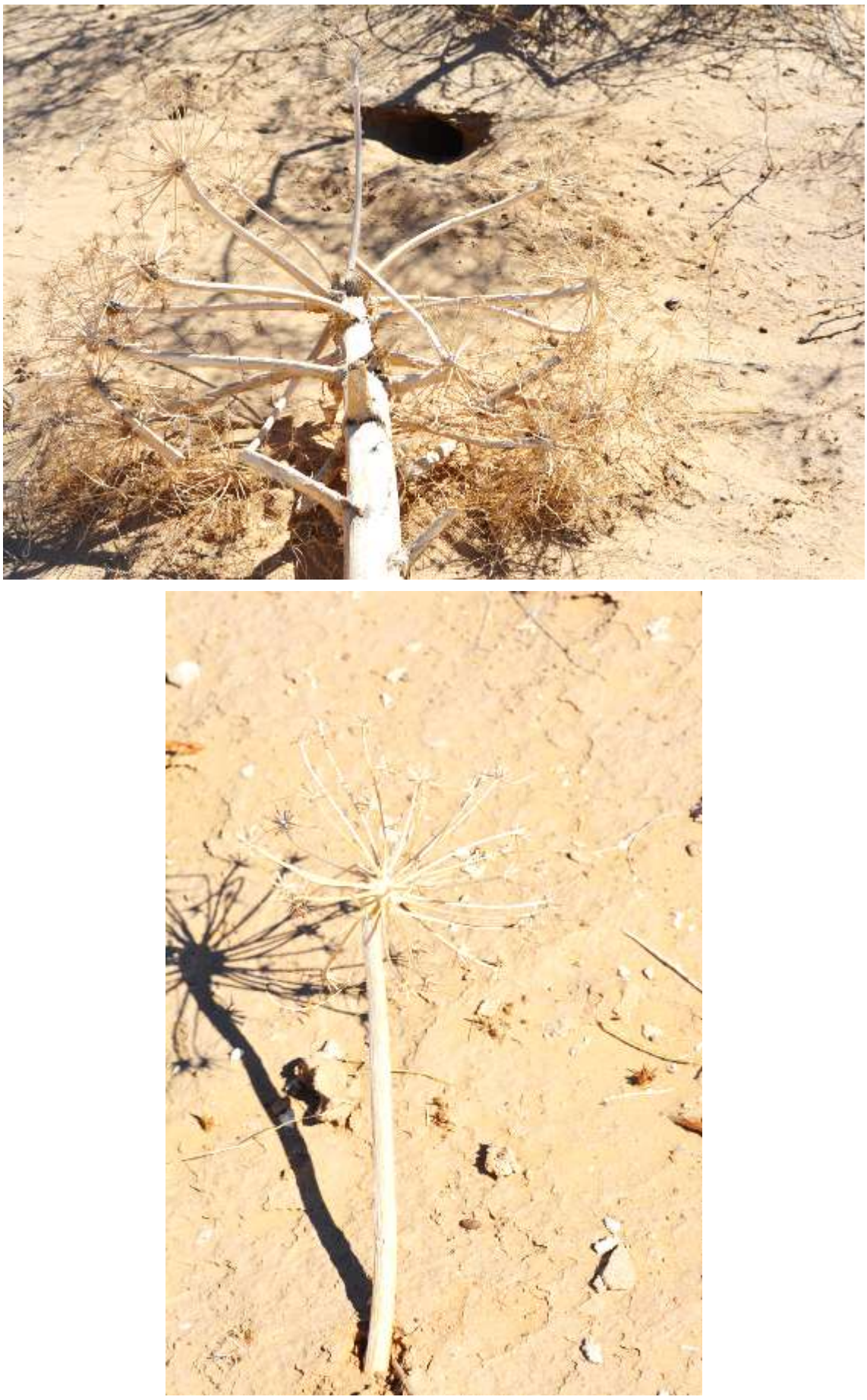


Figure 65. Ferula stinking (*Ferula assa-foetida*)

Monitoring of the state of the fauna of lake Karateren and its shores

Ichthyofauna. At present, Lake Karateren is of great fishery importance. According to the data of the local population survey, within this water area there are widespread fish species: snakehead, white amur, bream, carp.

Ornithofauna. Lake Karateren and its shores is one of the most preserved ecological zones of the Amudarya delta, a place of preservation and maintenance of biological diversity of this region.

The main group of desert bird species is concentrated in saxauls, chinks and cliffs at the foot of the Beltau upland. Here on chinks and bluffs and in the desert zone around the lake there live Steppe Harrier Circus *macrourus*, Bar-tailed God-wit *Buteo rufinus*, *Pintail Alectoris chukar*, White-bellied Grouse *Pterocles alchata*, Black-bellied Grouse *Pterocles orientalis*, Pleasant *Stonechat Oenanthe pleschanka*.

The characteristic vegetation cover was also observed here – saxaulniki, motley grass and shrub thickets. This biogeocenosis is favorable and of special importance for habitats and resting places for various bird species (*riparian* night-ingale *Erythropygia galactotes*, gray magpie *Lanius excubitor*, etc.).

During the observation period 45 species of birds belonging to 11 orders, 22 families were identified; 28 of them were migratory-nesting, 19 wintering, 12 sed-entary, 31 migratory species. Birds are distributed by orders: Podicipediformes – 4 species, Pelecaniformes – 2, Ciconiiformes – 3, Anseriformes – 6, Falconi-formes – 5, Galliformes – 1, Gruiformes – 1, Charadriiformes – 3, Columbiformes – 4, Strigiformes – 1, Passeriformes – 15. Among the red-listed species such spe-cies as little cormorant *Phalacrocorax pygmaeus*, steppe harrier Circus *macrourus*, white-bellied grouse *Pterocles alchata* were noted.

Table 13

List of bird species recorded in Lake eastern Karateren

№	Title	Status of their protection	Nature of stay
1	Little grebe *Tachybaptus ruficollis*		n,tr
2	Great Grebe or Chomka *Podiceps cristatus*		h, tr,n, in
3	Grey-cheeked grebe *Podiceps grisegena*		tr,n, in
4	Black-necked grebe		n,tr
5	Great Cormorant *Phalacrocorax* carbo		h,tr,n,in
6	Little cormorant *Phalacrocorax* pygmaeus	3(NT): [LC].	tr,n

№	Title	Status of their protection	Nature of stay
7	Great white heron *Egretta alba*		h,tr,n,in
8	Grey heron *Ardea cinerea*		h,tr,n, in
9	Red Heron *Ardea purpurea*		n, in
10	Grey goose *Anser anser*		n,tr,h,in
11	Mallard *Anas platyrhynchos*		n,tr,h,in
12	Red-nosed Diver *Netta rufina*		n,tr,h,in
13	Red-headed Diver *Aythya ferina*		tr,in
14	Ogal *Tadorna ferruginea*		n,tr, in
15	Pegana *tadorna tadorna*		h,tr,n,in
16	Black kite *Milvus migrans*		tr,n
17	Marsh harrier *Circus aeruginosus*	CITES – II	h,tr,n
18	Steppe harrier *Circus macrourus*	3(NT); [LC]. CITES – II	tr,n
19	Barrow *Buteo rufinus*		h,tr,n
20	Common Kestrel *Falco tinnunculus*	CITES – II	s
21	Pintail *Alectoris chukar*		s, in
22	Bald eagle *Fulica atra*		h,tr,n, in
23	Crested Gulls *Larus cachinnans*		n,tr,h
24	Lake gull *Larus ridibundus*		n,tr,h
25	Sea pigeon *Larus genei*		Tr
26	Black-bellied Grouse *Pterocles orientalis*		tr,n, h
27	White-bellied Grouse *Pterocles alchata*	2(VU:D):[LC]	tr,n
28	Blue pigeon *Columba livia*		s
29	Ring-necked turtle *Streptopelia decaocto*		s
30	House owl *Athene noctua*	CITES-II	s
31	Crested lark *Galerida cristata*		s
32	Gray skylark *Calandrella rufescens*		tr,n,h
33	Rustic swallow *Hirundo rustica*		tr,n
34	White wagtail *Motacilla alba*		tr,h
35	Gray magpie *Lanius excubitor*		tr,n,h

№	Title	Status of their protection	Nature of stay
36	Gull *Corvus monedula*		s
37	Black crow *Corvus corone*		s
38	Gray crow *Corvus cornix*		tr,h
39	Scotocerca *scotocerca inquieta*		s
40	Pied wheatear *Oenanthe pleschanka.*		n
41	Riparian nightingale *Erythropygia galactotes*		s
42	House sparrow *Passer domesticus*		s
43	Indian sparrow *Passer indicus*		tr , n
44	Field Sparrow *Passer montanus*		s
45	Reed bunting *Emberiza schoeniclus*		tr,h

Notation: [] – *species category in the IUCN Red List (2012);*
0-4 () – species category in the Red Data Book of the Republic of Uzbekistan (2019)
CITES-I, II, III – CITES Appendices in which species are included.
tr – migratory, h – wintering, s – sedentary, n – nesting,
in – commercial species.

The **herpetofauna** consists of such species as the Takyr Roundworm (*Phrynocephalus helioscopus*), Sand Roundworm (*Phrynocephalus interscapularis)*, *Reticulated* Roundworm (*Phrynocephalus reticulatus*)**,** Squeaky gecko (*Alsophylax pipiens*), Caspian gecko (Cyrtopodion caspium (*Eichwald*), Fast lizard (*Eremias velox)*, Sand boa *constrictor* (*Eryx miliaris*), Four-banded creeper (*Elaphe quatuorlineata),* Water beetle (Natrix tesselata)**,**

Entomofauna. The reservoir is inhabited by representatives of the Coleoptera (Coleoptera) or beetles: Gyrinidae (Gyrinidae: *Gyrinus cuspius, G. distiactus)*, Hemiptera (Hemiptera), Gladys (Notonectidae: Notonecta *glauca L.*, *Notonecta viridis L.*), Floaters (Corixidae: *Corix sp.*), Waterflies (Gerridae: *Gerris costae, Gerris argentatus, Heterobates dohrandti*), Waterflies (Dytiscidae: *Dytiscus marginalis, D. dimidiatus, D. circumflexus*).



Figure 66. Great gerbil *Rhombomys opimus*

Theriofauna. During the monitrong we observed a lot of traces of life activity (burrows, tracks, excrement, etc.) of predatory mammals, including fox (*Vulpes vulpes),* jackal (*Canis aureus)*, *feline* (*Felis chaus),* corsak. The Tolai Hare (*Lepus tolai*) was numerous. A large number of rodent burrows were found: muskrat (*Ondatra zibethica*), marmosets, gerbil and others.



Figure 67. Lake frog (*Rana ridibunda*)

REFERENCE NOTE ON TOTAL WATER INFLOW TO THE SOUTH PRIARALIE ZONE IN 2023

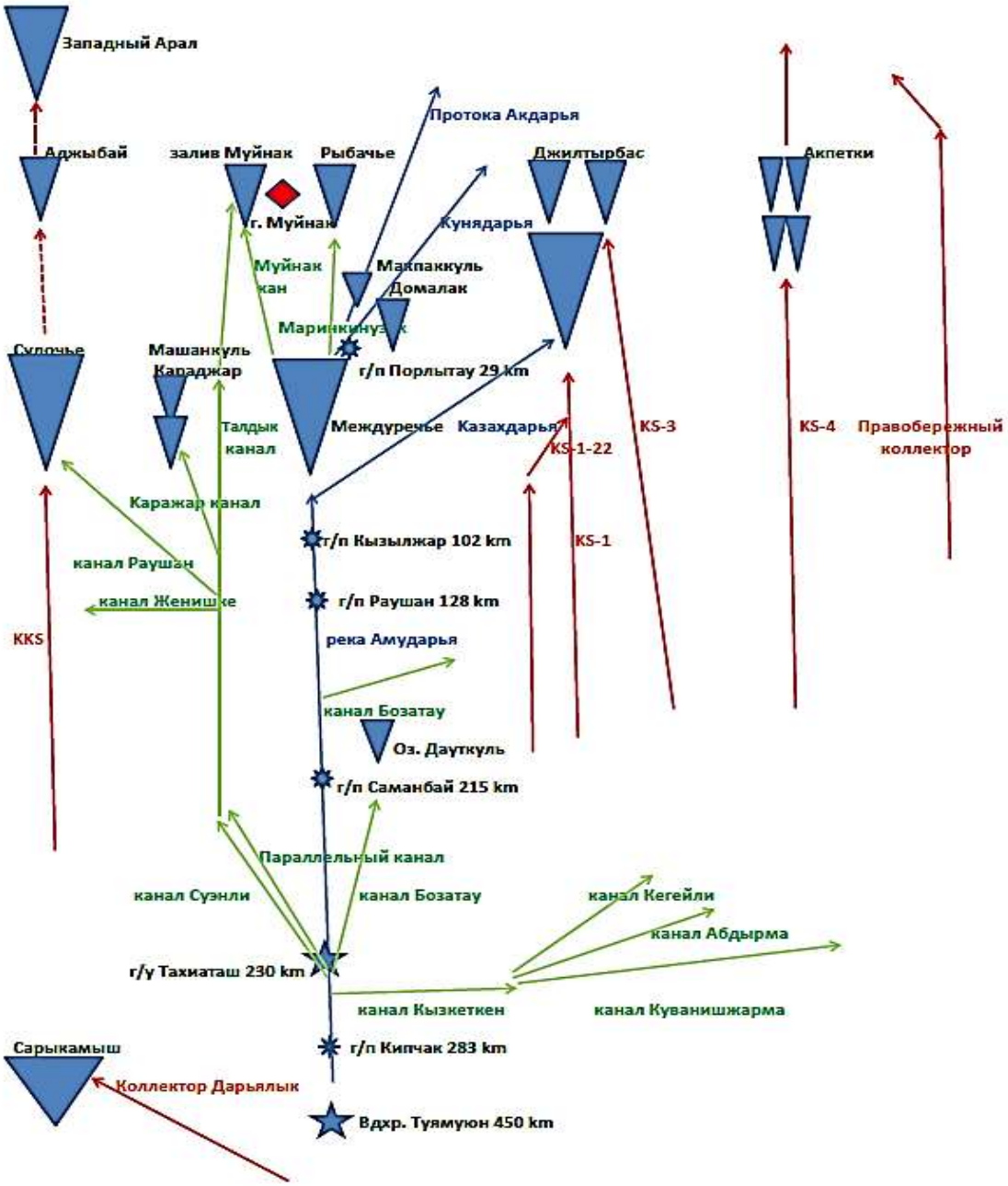


Figure 68: Linear scheme of water inflow to the South Priaralie

Table 14

Water inflow to the South Priaralie zone

http://www.cawater-info.net/aral/data/index

Период времени (гидрологический год)	Суммарный сток, млн. м^3
April-September, 2011 (V)	617
October, 2011 – March, 2012 (N)	1048
April-September, 2012 (V)	7186
October, 2012 – March, 2013 (N)	3570
April-September, 2013 (V)	924
October, 2013 – March, 2014 (N)	938
April-September, 2014 (V)	2820
October, 2014 – March, 2015 (N)	990
April-September, 2015 (V)	5367
October, 2015 – March, 2016 (N)	2996
April-September, 2016 (V)	1404
October, 2016 – March, 2017 (N)	1505
April-September, 2017 (V)	9423
October, 2017 – March, 2018 (N)	1411
April-September, 2018 (V)	461
October, 2018 – March, 2019 (N)	503
April-September, 2019 (V)	1943
October, 2019 – March, 2020 (N)	2034
April-September, 2020 (V)	1040
October, 2020 – March, 2021 (N)	1050
April-September, 2021 (V)	538
October, 2021 – March, 2022 (N)	847
April-September, 2022 (V)	938
October, 2022 – March, 2023 (N)	1354
April-September, 2011 (V)	1191

The total water inflow to the South Prearalie region for the period 2011-2023 (12 hydrological years) was 50.91 km^3 or an average of 4.24 km^3 per year. For individual years, the value varies from 0.96 km^3 per year (2018-19) and 1.38 km3 per year (2021-22) to 10.75 km^3 per year (2012-13) and 10.83 km^3 per year (2017-2018).

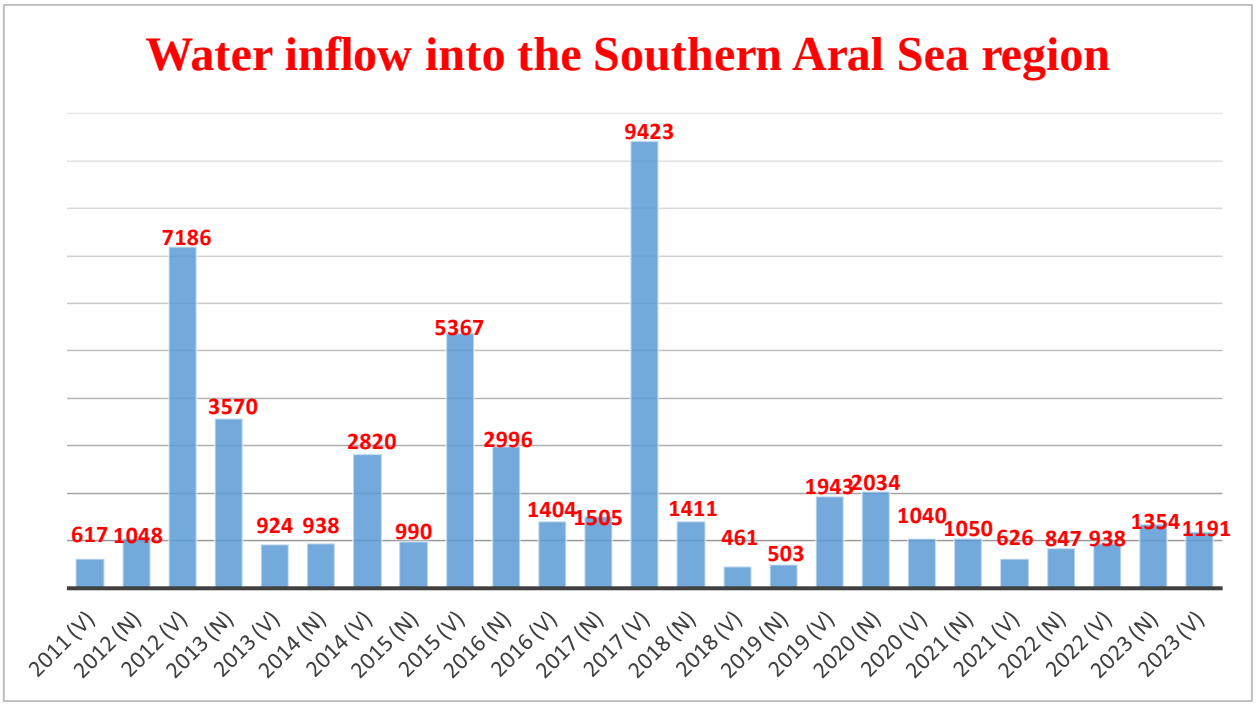


Diagram 1. Water inflow to the South Priaralie zone

Such a large variation of annual inflow has a negative impact on the hydrological stability of water bodies, which leads to the destruction of ecology in the zone of individual water bodies and disturbance of biodiversity.

Therefore, fish, fauna and flora of these water bodies are unstable due to instability of water-salt regime, which is formed uncontrollably, under the influence of random factors.

Unfortunately, there is still no regular, systematic, instrumental monitoring of both the residual water bodies of the former Aral Sea and the entire dried seabed zone.

Table 15

Information on parameters of key water bodies of Southern Priaralie

(based on SIC ICWC data http://www.cawater-info.net/aral/data/monitoring_amu)

Date of assessment	Western Aral	Eastern Aral	Sudochie lake system	Fisher-man's Bay	Muynak Bay	Jiltyrbas Lake System
Water surface area, hectares						
November, 2011	–	–	10948,9	3082,6	3587,9	7682, 3
October, 2012	369659,2	215986,1	12002	5231,8	1161,9	4646,8
October, 2013	361979	139963	10327,3	2673	1014	5920
November, 2014	324003	96829	9183,4	1046,7	111,4	5509,8
October, 2015	300707	313037	14645,5	3794,3	1698,9	7503,1
September, 2016	291583	125457	21987,3	3137,2	1272,5	6247,3
October, 2017	270788	251351	17466	3588,5	1018,4	6582,9
November, 2018	268399,2	128291	9860	2740,6	395	5567
June, 2019	264967	34965	12977	2332,9	295,5	5233,1
July, 2020	255799	166507	14672,1	2601,2	606,2	5731,7
October, 2020	253406	54962	12276,3	2186,2	431,3	6332,9
April, 2021	291875	78369	13411	2383,7	602,5	6021,1
August, 2021	241290	31469	9634,9	1263,3	151,3	5570
September, 2021	235023	18113	8822	140	108	5125
October 6, 2022	211800	–	4325	0,18	5,31	213
January 18, 2023	209 733	364	6906	1574	2754	451
May 26, 2023	210294	2588	9473	1871	129	5300
July 13, 2023.	208318	406	3101	531	16	890
October 17, 2023	200885	15	4981	0	12	2326
Water level, m (Baltic altitude system) for the Western Aral according to data of Aktumsuk Hydromet station (45.0809.8; 58.1732.4)						
2011 (May 31)	27,74	27,8				
2021 (May 31)	21,13	N/A	51,06	50,62	50,77	50,83
2022 (Dec. 31) Delta department	19,57 (29.12.22)	N/A	49,85	49,0	49,9	47,8
2023 (June 30) Delta department	19,26	N/A	49,85	49,61	49,9	47,8
Mineralization (2021), G/L	180	60,0	7,5	10,0	10,0	15,0

As can be seen from this table, the state of the residual water bodies of the Southern Priaralie is very unstable - due to unstable water inflow to this zone.

CONCLUSION

The existing wetlands of the Priaralie react very strongly to changes in water supply, temperature and precipitation. Frequent drying up of the studied lakes leads to large losses of fish adapted to life in these water bodies, as well as to damage to fishery farms.

Based on the results of monitoring studies, an assessment of threats to the wetlands of the Southern Priaralie was carried out.

The main factor - low water content of lakes is caused by lack of Amudarya river water inflow into canals and water bodies, including collector networks. Drought, illegal hunting and poaching among the local population were also identified among the threats.

Deterioration of the hydrological regime led to an increase in salinity of many lakes, which caused an increase in water salinity and changes in hydrochemical indicators, entailed a change in vegetation and the disappearance of many species of water-loving plants.

The conducted studies have shown impoverishment of the flora of aquatic higher vegetation of Karakalpakstan. Out of 21 families, representing 60 species, 15 species of higher aquatic plants from different genera remained at present.

Drought is caused by the lack or complete absence of water supply to water bodies, as well as by the drying up of most of the wetlands in the region. In order to eliminate drought, it is necessary, first of all, to carry out measures at the level of local authorities' representatives to fill all lake systems, canals and collector-drainage network with water.

Illegal hunting and poaching are caused by the fact that the majority of the population, mostly men, are unemployed. Therefore, in order to feed their families, they are forced to engage in illegal hunting and poaching, grazing, illegal fishing, as they have no means of income other than livestock.

In our opinion, it is necessary to more actively create new jobs for the local population in Muynak and Kungrad districts of Karakalpakstan.

Under conditions of water scarcity in the South Prearalie region, the surveyed lakes are the most vulnerable ecosystems. One of the «dangerous» threats to all wetlands is the burning of last year's reeds in order to obtain young shoots suitable for cattle eating. However, the biggest, the main threat to the biodiversity of flora and fauna is the complete drying up of water bodies.

Thus, the South Prearalie region with its vast territory, diversity of ecosystems and species composition needs the development of special studies aimed at inventory, assessment of the state of biodiversity, development of

environmental monitoring system, development of principles and methods of conservation of natural ecosystems. In this regard, constant monitoring and improvement of conservation measures are necessary.

We believe that in the future it is necessary to expand the biodiversity monitoring areas to include desert **and / or** riparian ecosystems of the Southern Priaralie region.

Protection of water bodies and wetlands is still formal. Therefore, it is necessary to temporarily prohibit hunting on the Reserve's lands for ecosystem restoration, and poaching for fishing on water bodies and campfires on wetlands, to strengthen control over poaching, to regulate spring grazing in shallow waters, and to work on informing the local population.

The Agency of IFAS and the team of specialists of this project express their gratitude to the Office of the Project Co-ordinator of the Organization for Security and Co-operation in Europe (OSCE) operating in Uzbekistan for support and partnership in this direction.

Leader of the expedition

V.Sokolov



Scientific leader of the expedition

S.Mambetullaeva



Project coordinator

D.Toirov



APPENDIX

On the basis of the Agreement between Karakalpak Research Institute of Natural Sciences and Xinzan Institute of Ecology and Geography of Chinese Academy of Sciences the full Reconstruction of Muynak Biological Station located in the territory of settlement Tik uzyak of Muynak district started.

Muynak station is located in the vicinity of Muynak city, Karakalpak Republic of Uzbekistan, 200 km away from Nukus city. The reconstruction project includes housing for specialists, laboratories, conference hall, canteens, fencing, experimental irrigation wells, drinking water, furniture, internet and other works, the total area of the building is 550 square meters and the total construction period of the project is 10 months.



Facade of Muynak Biological Station of Karakalpak Research Institute of Natural Sciences

Full reconstruction of Muynak biostation is of great importance for solving issues on sustainable development of ecological environment in the region of Southern Priaralie.







Figure 68. Construction works at Muynak biostation (September-October, 2023)

Photos:

Agency of the International Fund for Saving the Aral Sea

Karakalpak Research Institute of Natural Sciences of Karakalpak Branch of the Academy of Sciences of the Republic of Uzbekistan.

© Agency of IFAS

Questions and comments to be addressed to:

Agency of IFAS in Uzbekistan

5 floor, 11, Karasu 4, Mirzo Ulugbek district,

Tashkent, 100187, Uzbekistan

Phone: +998 555-031-356

Fax: +998 555-031-357

E-mail: info@aral.uz, vadim_sokol@mail.ru

Web: www.aral.uz



