International Research Journal of Advanced Engineering and Science
ISSN (Online): 2455-9024

Ecosystems of Akdarin Reservoir (Uzbekistan)

Alimjanova Kholishon Alimzhanovna[1], Razhabova Mamura Saparovna[2], Jumaeva Diloram Sardalovna[3]
[1]Leading Researcher of the Institute of Botany of the Academy of Sciences of the Republic of Uzbekistan, Doctor of Biological Sciences, Professor
[2]Doctoral Student (PhD) of the Second Year of the National University of Uzbekistan
[3]First Year Trainee Researcher at the National University of Uzbekistan

Abstract**—** *The article covers the ecosystems of the Akdarya reservoir. They studied the first producers of micro- and macrophytes, consumers of micro- and macro-consumables, reducers and aquatic environments. As a result, 18 species were found, 4 variations and one form of diatom algae, most of the species are rare, single, some species are often found in mass; Also, 18 species of macrophytes have been identified, of which 5 are hydrophytes, 7 are helophytes, 6 are hygrophytes. Used in Fisheries Data Reservoir.* ***Consumptions****: micro-proposals are composed of rotifers (Colovratki-5 species), cladocerans (Cladocera-1 species), copepods (Copepoda-3 species; Closer to the coast in the middle part of the right side of the reservoir, the number and biomass of micro-proposals of zooplankton increases with the number of 802 thousand emgs / m „ and the biomass of 3.86 g / m3. Samples taken near the water entrance to the Akdarya reservoir zooplankton were poor. Macroconsiderations are presented with 8 species of fish. Among these are the herbivores Nemachellus malapterurus longicauda Kessler, 1872; Triplophysa Stoliczkai Steindachner 1866; lepidolocmus Kessler, 1872; Alburnoides bipunctatus eichvaldi Filippi, 1863; and others.* ***Reducers*** *of the ecosystem of the reservoir are bacteria ammonifiers - living without nitrogenous environments, phosphorus-decomposing bacteria, oligonitrophils, nitrogen fixers, micromycetes, actinomycetes were not found. They participate in the decomposition of dead organisms (plants and animals), forming mineral elements from bioorganic materials.* ***The aquatic environment*** *of the Akdarya reservoir consists of 35 chemical elements, accounting for 43.3% of the 80 found elements of the earth's crust. They are as follows: Al, As, Ba, Se, Zn, Ca, Cd, Cu, Fe, K, Li, Mg, Na, Mn, Yg, V, Si, Pb, Co, S, Cr, Mo, Ni, B , Ag, Ti, Bi, U, dry residue, Nitrites NO2, Nitrates NO3, Sulfates –SO4, Chlorides-Cl, surfactants, Petroleum products and so on. The aquatic environment with living organisms forms the bioinert materials of reservoirs. They are in close trophic connection, and participate in the circulation of matter metabolism and energy accumulation. Ecosystem and metabolism.* ***Ecosystems*** *The Akdarya reservoir is a very small ecosystem, it consists of 35 chemical elements, accounting for 43.3% of the found 80 elements of the earth's crust. Like any natural body, the ecosystems of the Akdarya reservoir consist of certain constituent parts, called ecosystem components - living and non-living. The exchange of matter and energy between living and inert components is the most important property of ecosystems.*

Keywords**—** *Ecosystems, reservoir, producers, consumers, reducers, aquatic environment, substance exchange.*

I. INTRODUCTION

Relevance of the topic. Botanical, zoological, microbiological, hydrochemical sciences are well developed in Uzbekistan. But they only exist separately [1-7], not connected or less connected with each other. There is no unifying mechanism that determines their relationship in aquatic environments. In this regard, we decided for the first time to study producers, consumers, reducers and their interrelationships in this aquatic environment in the ecosystem of the Akdarya reservoir.

Study of the ecosystem of the Akdarya reservoir. In the literature there are some data relating only to the study of algal flora [1,2] and zooplankton [4,5. 22-24]. As you can see, on the search for literary studies other than our research is not available.

In connection, the Purpose of the Study is: Ecosystem Akdarya reservoir

The Tasks of the Research are:

- Collection of materials from the Akdarya reservoir;
- Study of the chemical composition of water;
- Study of the species diversity of producers and clarification of their frequency of occurrence;
- Determination of aquatic organisms - consumers and their frequency of occurrence;
- Identification of decomposers and their growth and development of abundance and biomass;
- Ecosystem. Metabolism. The relationship of micro and macroorganisms and their importance in gas and energy exchange in the ecosystem of the Akdarya reservoir.

II. RESEARCH METHODS

We used methods in the following directions:

- Hydrobiological [10];
- Hydrochemical [11,12];
- Algological [13,14,15];
- Zoological [3,4,5];
- Microbiological [16];
- Environmental. Ecosystem analysis [17].
- Geographic and hydrological research methods [18,19,20].

Definition of a unit of ecosystems

When studying the ecosystem of the Akdarya reservoir, we collected and processed microbiological biomaterials according to the algological and hydrobiological research method. Used plankton set type GAZ No. 78. [13]. Temporary and permanent preparations were prepared and the species composition of the algoflora was determined under light microscopes of the Carl Zeiss type. Used keys of freshwater algae of the USSR [14,15]. Also identified zooplanktons, such as cyclops, daphnia, herbivorous fish and zoobenthos - molluscs and microorganisms [16], such as bacteria, ammonifiers, nitroplants and other living in aquatic environments, using appropriate research methods [3,4,5,22,23, 24].

Alimjanova Kholishon Alimzhanovna, Razhabova Mamura Saparovna, and Jumaeva Diloram Sardalovna, "Ecosystems of Akdarin Reservoir (Uzbekistan)," *International Research Journal of Advanced Engineering and Science*, Volume 6, Issue 4, pp. 39-50, 2021.

International Research Journal of Advanced Engineering and Science
ISSN (Online): 2455-9024

Zoplanktons were studied using the material published by A. Kuzmetov [22-24] and other studies by zoologists. The hydrochemical composition of water was determined by specialists of the Institute of Bioorganics of the Academy of Sciences of the Republic of Uzbekistan. Bacteria and other microorganisms were identified with specialists from the Institute of Microbiology of the Academy of Sciences of the Republic of Uzbekistan. The units of the Akdarya reservoir ecosystem, that is, producers, consumers and reducers, were taken according to V.N. Sukachev [21].

III. Results and Discussion

Results:

PRODUCERS - I-part of the ecosystems of the reservoir. During the study periods, we noted photosynthetic organisms consisting of two groups - microphytes and macrophytes in the producing layers of the Akdarya reservoir ecosystem. The producing layers of the ecosystem of reservoirs consists of producers of microorganisms, more precisely microphytes, such as algoflora in the ecosystem of the Akdarya reservoir. They are summarized in the following:

Producers of Microphytes.

Phytoplankton is one of the trophic chain units in the bio-ecosystem of the Akdarya reservoir in the middle reaches of the Zarafshan River. It is often used directly or indirectly with other representatives of aquatic organisms such as microzooplankton and macrozooplankton. In addition, it is an oxygen producer, which vitally important and urgently needed by aquatic organisms, such as zoopopulations - 1,2,3 and ... n orders of magnitude consumers of this reservoir. The last consumers of the reservoir are fish, which are needed in the next stage for human food (Fig. 1). This is often mentioned in a number of decrees of the Cabinet of Ministers of the Republic of Uzbekistan (On the development of private sectors of the fish farm of the Republic of Uzbekistan).

Phytoplanktons ----------> Zooplanktons: Microzooplanktons:
----------> and Macrozooplanktons:
---------> Fish --------> Human.

Fig. 1. Food chain diagrams

Biodiversity and its stable development in the reservoir is highly dependent on the growth and development of phytoplankton producers. In this regard, it is very necessary to carry out taxonomic studies of phytoplankton and is currently relevant.

Study of the topic. Phytoplankton and phytobenthos, periphyton of the channel part of the middle course of the Zarafshan River (Zarafshan, Okdarya, Karadarya rivers) and some mountain sais (Amankutansay, Ettiuilisay) were studied in more detail together with Kh.A. Alimzhanova and Y.Sh. Tashpulatov [1.5] during 2005-2018, on the basis of an interorganizational integration agreement (Institute of Botany of the Academy of Sciences of the Republic of Uzbekistan and Samarkand University) within the framework of the state budget program "Unique objects". However, the algal flora, in particular the phytoplankton of the Akdarya reservoir, remained unexplored. In this regard, in 2014 -2021. Years we also began to study the species composition and frequency of occurrence of phytoplankton producers of the Akdarya reservoir in order to assess the current taxonomic state. The research was carried out under the program "Unique objects" of the Institute of Botany of the Uzbek Academy of Sciences with joint research of the National University of Uzbekistan (Algological collection of the Laboratory of Mycology and Algology of the Institute of Botany of the Academy of Sciences of Uzbekistan and the Algological collection of the Algology laboratory of the Faculty of Ecology of the National University of Uzbekistan).

Geographical location: The Akdarya reservoir is located at 390995'N (north latitude) and 0660382'E (east longitude), 485 m h above sea level, on the Akdarya river of the Samarkand region of the Ishtikhan region. She feeds with Akdarya water. The volume of water is 131.8 million m3. Has been used since 1989 (figure 2, 3) [4]. As a result of hydrophysical and hydrochemical studies, we revealed in the spring of 15.04., 1630 hours of the day, the air and water temperature was + 18-200C, pH 6.5-7.0, transparency 2 m, total mineralization - 450-500 mg / l.

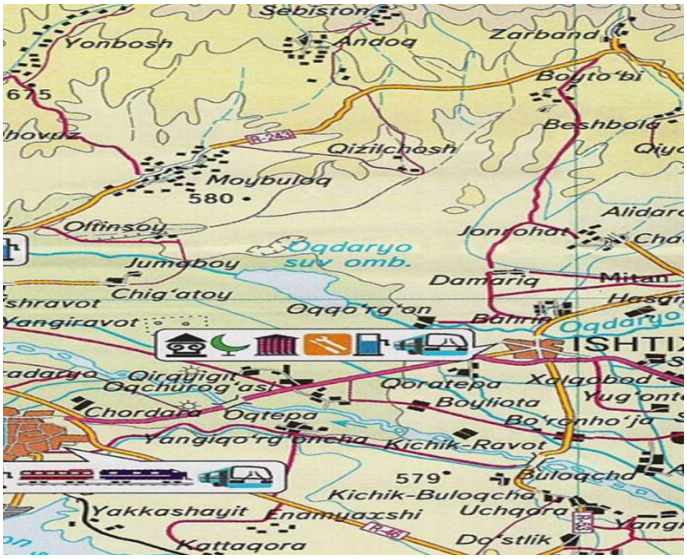

Fig. 2. Location of the Akdarya reservoir in Samarkand region

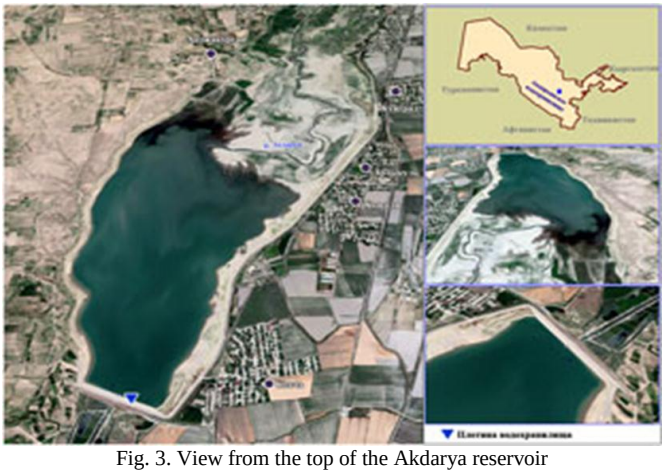

Fig. 3. View from the top of the Akdarya reservoir

Alimjanova Kholishon Alimzhanovna, Razhabova Mamura Saparovna, and Jumaeva Diloram Sardalovna, "Ecosystems of Akdarin Reservoir (Uzbekistan)," *International Research Journal of Advanced Engineering and Science*, Volume 6, Issue 4, pp. 39-50, 2021.

International Research Journal of Advanced Engineering and Science
ISSN (Online): 2455-9024

In spring, 15 algological samples were collected and processed from the Akdarya reservoir according to the generally accepted methods of algology and hydrobiology [2,3,6]. In laboratory conditions, preparations were made from algological samples and the species composition of phytoplankton was determined and the frequency of occurrence in one field of view of the objective was established. In the course of the work, we used a light microscope of the Carl Zeiss type, an eyepiece micrometer 7+, dyes, an identifier for diatoms [3], monographs [1], and others.

In such aquatic environments, as a result of hydrobiological studies, we have identified 23 species and varieties of diatoms that are producers in the ecosystem of the Akdarya reservoir, presented in the following table 1 below.

TABLE 1. Spring algal flora (Bacillariophyta) of the Akdarya reservoir

The name of the algae and their systematic position	Cage dimensions			Frequency of occurrence, h, score	№			Determinant source, page, figure numbers
	length, μm	width, micron	diameter, micron		laboratory journal page	samples	drugs	
Class Centrophyceae Order Discoidales Family Coscinodiscaceae Kuetz. Genus Cyclotella Kuetz.								
Cyclotella ocellata Pont.			6-20	unit, rarely	5	9p	1	D *-4, P.94 Fig.49,6a,б [4]
Class Pennatophyceae Order Araphinales Family Fragilariaceae Lyngb. Genus Diatoma D.C.								
Diatoma hiemale (Lyngb.) Heib.	37,8	6,30		unit	1	2b	3	D-4, P.123, Fig..67,5[4]
Genus Fragilaria Lyngb.								
Fragilaria capucina Desm.	192,2	6,30-12,60		unit	1	2b	1	D-4, P.127, Fig.69,2a [4]
Genus Synedra Ehr.								
Synedra ulna (Nitzsch.) Ehr.	308,7	6,30		often	1	2b	2	D-4, P.144-145, Fig.79,1a [4]
Synedra ulna (Nitzsch.) Ehr.	179,6	9,45		unit	1	2b	3	D-4, P.144-145, P Fig.79,1a [4]
Synedra ulna var.aequalis (Kuetz.)Hust.	85,05	4,73		unit	1	2b	1	D-4, P.145-146, Fig.79,2 [4]
Synedra ulna var.amphirhynchus (Ehr.) Grun.	144,9	6,30		unit	2	4b	3	D-4, P.144-146 Fig.79,4 [4]
Synedra pulchella (Ralfs) Kuetz.	129,2	6,30		unit	2	3p	2	D-4, P.142-143, Fig.78,1 [4]
Order Raphinales Suborder Diraphineae Family Naviculaceae West. Genus Navicula Bory								
Navicula cryptocephala var.veneta (Kuetz.) Grun.	18,90	6,30		often, weight or mass	1	1p	2	D-4, P.308-309 Fig.172,4 [4]
Navicula subtilissima var.baicalensis Skv.	31,5	12,6		unit	1	2b	1	D-4, P.293, Fig.167,7 [4]
Genus Neidium Ag.								
Neidium distincte-punctatum Hust.	78,75	12,60		unit	2	4б	3	D-4, P.384-385 Fig.235,3 [4]
Genus Amphora Ehr.								
Amphora commutata Grun.	40-85	20-30		Rarely, unit	1	1p	2	D-4, P.423, Fig.263,1a,б [4]
Amphora lineolata Ehr.	30-60	13-28		rarely, unit	1	1p	2	D-4, P.425, Fig.265,2
Amphora lineolata Ehr.	34,65	15,75		unit	1	2b	1	D-4, P.423, Fig.263,1a, б [4]
Genus Cymbella Ag.								
Cymbella lacustris (Ag.) Cl. f.baicalensis Skv.	78,75	15,75		often	1	2b	3	D-4, P.443, Fig.274,5 [4]
Cymbella parva (W.Sm.) Cl.	50,4	12,6		rarely, unit	1	2b	1	D-4, P.449-450, Fig.279,1 [4]
Cymbella helvetica Kuetz.	94,5	22,05		unit	1	2b	3	D-4, P.452, Fig.281,3 [4]

Alimjanova Kholishon Alimzhanovna, Razhabova Mamura Saparovna, and Jumaeva Diloram Sardalovna, "Ecosystems of Akdarin Reservoir (Uzbekistan)," *International Research Journal of Advanced Engineering and Science*, Volume 6, Issue 4, pp. 39-50, 2021.

Cymbella tartuensis Mölder	65	15,75		unit	1	2b	3	D-4, P.438, Fig.271,3 [4]
Suborder Aulonoraphineae Family Nitzschiaceae Hass. Genus Nitzschia Hass.								
Nitzschia distans Greg.	100,8	18,9		rarely, unit	1	2b	1	D-4, P.509, Fig.322,1 [4]
Nitzschia vermicularis (Kuetz.) Grun	50,40	3,15-4,73		unit	1	2b	1	D-4, P.527-528, Fig.333,4a, б [4]
Nitzschia vermicularis (Kuetz.) Grun.	78,75	6,90		rarely	1	2b	2	D-4, P.527-528, Fig.333,4a, б [4]
Nitzschia regula Hust.	63	4,73		unit	2	3p	2	D-4, P.521-522, Fig.329,9a [4]
Nitzschia sigmoidea (Ehr.) W.Sm.	236,3	6,30-7,85		unit	2	3p	2	D-4, P.527-528, Fig.333,2б [4]
Nitzwschia filiformis (W.Sm.) Hust.	129,2	15,75		unit	1	3p	2	D-4, P.530-531 Fig.335,4в [4]
Family Surirellaceae Turp. Genus Surirella Turp.								
Surirella linearis W.Sm.	53,55	6,30		unit	1	2b	2	D-4, P.551-552, Fig.350,1б [4]
Surirella linearis W.Sm.	113,4	15,75		unit	2	3p	2	D-4, P.551-552, Fig.350,1б [4]
Surirella linearis W.Sm.	47,25	11,03		unit	1	2b	3	D-4, P.551-552, Fig..350,1б [4]
Surirella didyma Kuetz.	69,3	22,05		unit	1	2b	2	D-4, P.554-555, Fig.353,1 [4]

Note: u - unit, r - rarely, o - often, vo – very often, wm – weight or mass. p - plankton, b - benthos.
* Zabelina M.M., Kiselev I.A., Proshkina-Lavrenko A.I., Sheshukova V.A. Keys to freshwater algae of the USSR. Issue 4. Diatoms. - M.: Soviet science, 1951. - 619 p.

As producers of the ecosystem - *microphytes* of the Akdarya reservoir, the spring phytoplankton of diatoms is represented by a total of 18 species, 4 variations and one form of algae, which systematically belong to 2 classes (Centrophyceae, Pennatophyceae), 3 orders (Discoidales, Araphinales, Raphinales), 5 families Coscinodiscaceae Kuetz., Fragilariaceae Lyngb., Naviculaceae West., Nitzschiaceae Hass., Surirellaceae Turp.), 10 genera (Cyclotella Kuetz., Diatoma DC, Fragilaria Lyngb., Synedra Ehr., Navicula Bory, Amphohrium Ag. Cymbella Ag., Nitzschia Hass., Surirella Turp.).Most types of products are found singularly and rarely in one lens. A very small number of algal producer species occurs frequently or in mass development, such as Synedra ulna (Nitzsch.) Ehr., Navicula cryptocephala var.veneta (Kuetz.) Grun., Cymbella lacustris (Ag.) Cl. f. baicalensis Skv. *Producers of Macrophytes*. According to A.A. Nurniyozov, Y.Sh. Tashpulatov. and others (2020) [32,33] it can be seen that the Akdarin, Katakurgan, Karasu reservoirs are characterized by very poor species composition of higher plants and their number.

In the Samarkand region, fish farming has been organized and developed. Reservoirs are formed from river water, temporary mudflows or rain flows, and the water level is unstable. Sometimes, the level of some reservoirs drops sharply. The low-water years of the reservoir are different. In this regard, a permanent and stable flora of higher plants is not formed. Despite this, some plants develop, due to the rivers and other channels. The characteristic plants of the reservoir are the following:

• hydrophytes - Zannichellia palustris L., Nayas marina L. Ceratophyllum demersum L., Potamogeton perfoliatus L., Myriophyllum spicatum L.;

• helophytes - Phragmites australis (Cav) Trin., Typha. laxmannii Lepech., T. angustata Bory & Chaub., Cynodon dactylon Pers., Glyceria plicata Fries., Poa trivialis L.

The amount of dissolved salts in the reservoir water is much greater than in other reservoirs. In connection, mainly salt-loving plants or freshish-brackish-water, brackish-water plants develop here. For example, Nayas marina L., Ceratophyllum demersum L., Potamogeton perfoliatus L., Myriophyllum spicatum L. and others are valuable plants. It is acceptable to use them for development in fish farming (Table 2).

TABLE 2. Cultivation of higher plants on the territory of the Republic of Uzbekistan and their use in the national economy

No.	Plant species	Life forms	Quantity (according to Druda)	Tiers
I.	Hydrophytes			
1	Zannichellia palustris L.	Many flying	Sp	I
2	Nayas marina L.	Many flying	Sp	I
3	Ceratophyllum dermersum L.	Many flying	Sp	I
4	Potamogeton perfoliatus L.	Many flying	Cop[1]	I
5	Myriophyllum spicatum L.	Много летные	Cop[1]	I
II	Helophytes			
6	Phragmites australia (Cav) Trin.	Many flying	Cop[1]	I
7	T.laxmannii Lepech.	Many flying	Sol	II
8	T.angustata Bory&Chaub.	Many flying	Sp	II
III	Hygrophytes			
9	Cynodon dactylon Pers.	Many flying	Sp	I
10	Glyceria plicata Fries.	Many flying	Sp	II
11	Poa trivialis L.	Many flying	Sp	II

Alimjanova Kholishon Alimzhanovna, Razhabova Mamura Saparovna, and Jumaeva Diloram Sardalovna, "Ecosystems of Akdarin Reservoir (Uzbekistan)," *International Research Journal of Advanced Engineering and Science*, Volume 6, Issue 4, pp. 39-50, 2021.

International Research Journal of Advanced Engineering and Science
ISSN (Online): 2455-9024

Fish farms mainly take water from rivers, sai, irrigation ditches and canals, and also receive water from groundwater. In connection with this, the composition of the flora is different. Fish pond waters consist of the following higher aquatic plants: Typha laxmannii Lepech., T. minima Funck., T. angustata Bory & Chaub., Sparganium microcarpum Celak., Potamogeton pectinatus L., P. crispus L., P. natans L., Nayas marina L., Triglochin palustris L., Sagittaria trifolia L., Alisma lanceolatum L., Cynodon dactylon Pers., Phragmites australis (Cav) Trin., Glyceria plicata Fries., Schoenoplectus lacustris (L.) Palla., Bolbos marbos (L.) Palla., Ceratophyllum demersum L., Rorippa palustris (L.) Besser., Trachomitum scabrum (Russanov) Pobed., Epilobium hirsutum L., Plantago major L., Mentha longifoilia (L.) L. and others (Table 3).

TABLE 3. Hydrophilic composition of fish pond water.

No.	Plant species	Plant species	Quantity (according to Druda	Tiers
1	Hydrophytes			
1	Potamogeton pectinatas L.	Many flying	Cop[1]	I
2	P.crispus L.	Many flying	Cop[1]	I
3	P.natans L.	Many flying	Cop[1]	I
4	Nayas marina L.	Many flying	Cop[1]	I
5	Ceratophyllum demersum L.	Many flying	Cop[1]	I
II	Helophytes			
6	Typha laxmannii Lepech	Many flying	Cop[2]	II
7	T.minima Funck.	Many flying	Cop[1]	III
8	T.angustata Bory&Chaub.	Many flying	Cop[1]	II
9	Phragmites australis (Cav)Trin.	Many flying	Cop[2]	I
10	Schoenoplectus lacustris (L.)Palla.	Many flying	Cop[2]	IV
11	Bolboschoenus martimus (L.)Besser.	Many flying	Cop[2]	IV
12	Rorippa palustris (L.)Besser.	Many flying	sp	IV
III	Hygrophytes			
13	Cynodon dactylon Pers.	Many flying	Cop[2]	IV
14	Gliceria plicata Fries	Many flying	Cop[1]	IV
15	Trachomitum scabrum (Russanov) Pobed.	Annuals	Cop[1]	III
16	Epilobium hirsutum L.	Many flying	Cop[1]	V
17	Plantago major L.	Many flying	Cop[1]	V
18	Mentha longifoilia (L.)L.	Many flying	Cop[1]	III

The listed species in this table 3, types of hydrophytes and helophytes, are edible for fish. Fish ponds contain 18 species or 25.00% hydrophytes. In fish ponds, the number of higher plant species is greater than in reservoirs. From the above, the following conclusion follows that the flora of fish ponds is richer than reservoirs, because the water is kept at the same level, shallow (3-5 m), algae and higher plants are constantly cultivated and not collected for other purposes.

Macrophytes are higher aquatic plants, there are only 11 species of them in the reservoir itself, where fish-breeding parts are developed, there are 18 species of them. Among them, hydrophytes consist of 5 species - Potamogeton pectinatas L, P. crispus L., P.natans L., Nayas marina L., Ceratophyllum demersum L; helophytes - 7: Typha laxmannii Lepech, T.minima Funck., T.angustata Bory & Chaub., Phragmites australis (Cav) Trin., Schoenoplectus lacustris (L.) Palla., Bolboschoenus martimus (L.) Besser., Rorippa palustris (L .) Besser .; hygrophytes - 6 species: Cynodon dactylon Pers., Gliceria plicata Fries, Trachomitum scabrum (Russanov) Pobed., Epilobium hirsutum L., Plantago major L., Mentha longifoilia (L.) L. hydrophytes and heliophytes are edible plants for fish. They are cultivated in the private sector of the Akdarya reservoir.

CONSUMENTS. II-part of ecosystems reservoir. The following are the consumers in the ecosystem of the Akdarya reservoir, the following are presented, micro-claims and macro-claims or consumers of the 1,2,3, ... n order.

Microconsumptions. During the study period of micro-proposals, 7 species of animals were found in the plankton fauna, of which 5 species of Rotifera, 1 species of cladocerans. Zooplankton consisted of rotifers, cladocerans, and copepods. Cladocera consisted of only one species, Bosmina longirostris [22]. The following species were recorded from the Rotifer: Asplanchna priodon, Filmia longiseta, Keratella tropica, Hexarthra mira; Copepods: Cyclops vicinus, Thermocyclops sp. (Table 4).

TABLE 4. Micro consumers of Akdarya and Karaterinsky reservoirs

No	Taxa	Akdarya reservoir	Karatepa reservoir
I	Colovratki - rotifer		
1	Asplanchna priodonte	+	+
2	Filinia longiseta	+	+
3	Keratella quadrata	+	+
4	Hexarthra mira	+	+
5	Trichotria pocillum	-	+
II	Cladocera - Cladocera crustaceans		
1	Bosmina longirostris	+	+
III	Copepoda - Copepod crustaceans		
1	Cyclops sp.	+	+
2	Thermocyclops sp.	-	+
3	Копеподитная стадия циклопов	+	+
4	Nauplii	+	+

The Akdarya reservoir had 3-4 developments. In the middle part of the reservoir, a significant development of zooplankton was noted: 708 thousand specimens / m^3 with a biomass of 5.42 g / m^3 due to copepods.

Closer to the coast, the abundance and biomass of zooplankton increases with the abundance of 802 thousand sample / m^3 and the biomass of 3.86 g / m^3. Zooplankton samples taken near the water entrance to the Akdarya reservoir were poor. The same species are in small quantities, 120 thousand sample / m^3, and the biomass is 0.86 g / m^3.

The Karatepinsky water reservoir is located in the Urgut district of the Samarkad region. This reservoir is not connected with the Zarafshan River. The zooplankton of the reservoir consists of rotifers, cladocerans, and lop-legged crustaceans. They were mainly found from the beespods: Thermocyclops sp. Which constituted the main biomass of 2.5 g / m^3 with a population of 99 thousand units / m^3. The zooplankton of the reservoir consists of rotifers, cladocerans,

Alimjanova Kholishon Alimzhanovna, Razhabova Mamura Saparovna, and Jumaeva Diloram Sardalovna, "Ecosystems of Akdarin Reservoir (Uzbekistan)," *International Research Journal of Advanced Engineering and Science*, Volume 6, Issue 4, pp. 39-50, 2021.

and copepods. They were mainly found from the cannibalized crustaceans: Thermocyclops sp., Which constituted the main biomass of 0.5 g / m^3 with an abundance of 99 thousand individuals / m^3.
Macro-proposals. The reservoir also noted the presence of the following fish species from the macroconsumptions:
1. Turkestan sand fish - Gobio lepidolocmus Kessler, 1872; feeds on zoobenthos.
2. Eastern speed walker - Alburnoides bipunctatus eichvaldi Filippi, 1863; feeds on zooplanton.
3. Black ribs - Schizothorax intermediateus McClelland, 1842; marinka feeds on zoobenthos.
4. Aral thorns - Sabanejewia aurata aralensis Kessler, 1877; feeds on zoobenthos.
5. Bukhara char - Nemachellus amudarjensis Rass, 1929; feeds on zoobenthos.
6. Eastern crown char - Nemachellus malapterurus longicauda Kessler, 1872; feeds on zoobenthos and herbivores.
7. Amudarya char - Nemacheilus oxianus Kessler, 1877; feeds on zoobenthos.
8.Tibetan char - Triplophysa Stoliczkai Steindachner, 1866. Feeds vrdgae, herbivores.

These ribs are widespread in this reservoir. They quickly appear on the water surface and quickly sink to the bottom. Ribs range in length from 2.7 to 9.8 cm, and their weight reaches from 6.3 to 14 grams. They form a group and live among higher plants; their morphology has also been studied [23].

Thus, *Macro-consumers* are presented with 8 species of fish. Among these are the herbivores Nemachellus malapterurus longicauda Kessler, 1872 Triplophysa Stoliczkai Steindachner 1866; and carnivores - Gobio lepidolocmus Kessler, 1872; Alburnoides bipunctatus eichvaldi Filippi, 1863; other. Widespread species, length 2.7-9.8 cm, weight - 6.3-14 grams. They live among aquatic plants. They are involved in regulating the balance of the food chain of the ecosystem of this reservoir.
EDITORS. III-part of ecosystems reservoir. Reducers of the Akdarya reservoir were studied together with S.I. Zakiryaeva, PhD, senior researcher of the laboratory of soil microbiology and biotechnology of the Institute of Microbiology of the Academy of Sciences of the Republic of Uzbekistan. For this, the following stages of the study were carried out: We took samples from reservoirs in the amount of 6 samples from three monitoring stations in duplicate. Used microbiological research methods [29,30,31]. Determined ammonifiers, bacteria decomposing phosphorus, bacteria oligonitrophils, nitrogen fixing agents, Micromycytes, Actinomycetes.
Materials.
Sample quantity - 6 water samples
Place of sampling - Akdarya reservoir, 2021. May
1. 1-monitoring station, samples No. 3 benthos;
2. 1-monitoring station, samples no. 6 plankton;
3. 2-monitoring station, sample no. 8 benthos;
4. 2-monitoring station, sample No. 11 plankton;
5. 3- monitoring station, samples No. 13 plankton;
6. 3- monitoring station, samples # 17 benthos;

Methods for microbiological analysis of waters (conducted in August 2021).

Microbiological analysis of waters was carried out by the generally accepted microbiological research method [29,30,31] (Zvyagintsev DG Methods of soil microbiology and biochemistry. Moscow, 1991, Jozsef Szegi Methods of microbiology and biochemistry of soils. Budapest, 1986, Large workshop on microbiology, ed. G.L.Selibera, Moscow, 1962).

During the study of the decomposers of this reservoir, samples of phytobenthos and phytoplankton were taken from the water.

During the study of the decomposers of this reservoir, samples of phytobenthos and phytoplankton were taken from the water. Seed materials and nutrient media were prepared for the study of microorganisms, bacteria: ammonificators (medium - MPA), phosphorus-decomposing bacteria (medium - Pikovsky solid nutrient medium), oligonitrophylls (medium - Ashby), micromycetes and actinomycetes (Czapek medium). The bacteria were studied on a solid agar medium.
Process:

For microbiological analysis, suspensions were prepared from the reservoir sample. Took 1 ml from the suspension and poured into water, 9 ml sterilized test tubes, according to the method of microbiological techniques and diluted 1 ml of the suspension in 1: 1000 fold and the following repetitions.

From the diluted suspension, 1 ml of planting material was taken and it was planted on solid agar elective medium in Petri dishes, three replicates each. In Petra's dishes, MPA media were prepared for ammonifiers, Pikovsky's medium - for phosphorus-decomposing bacteria, Ashby's medium - for oligonitrophils, Czapek's - for actinomycetes and micromycetes. Sowing is done and tested for a “dilution” basis of culture media.
Ashby's medium composition:
Sucrose 20 g
Potassium phosphate 0.2 g
Magnesium sulfate 0.2 g
Sodium chloride 0.2 g
Potassium sulfate 0.1 g
Calcium carbonate 0.5 g
Agar 20 g
Water 1000 ml
The composition of the Czapek medium:
Glucose 20 g
Sodium nitrate 2.0 g
Potassium hydrogen phosphate 1.0 g
Magnesium sulfate + 7 water 0.5 g
Potassium chloride 0.5 g
Calcium carbonate 3 g
Agar 20 g
Water 1000 ml
As a result, the following is obtained, indicated in tables 5.

Alimjanova Kholishon Alimzhanovna, Razhabova Mamura Saparovna, and Jumaeva Diloram Sardalovna, “Ecosystems of Akdarin Reservoir (Uzbekistan),” *International Research Journal of Advanced Engineering and Science*, Volume 6, Issue 4, pp. 39-50, 2021.

International Research Journal of Advanced Engineering and Science
ISSN (Online): 2455-9024

TABLE 5. The number of the main physiological groups of microorganisms in an aqueous sample, in 1 ml of water

No samples	Types of microorganisms and their number					
	Ammonify	Phosphorus-decomposing bacteria	Oligonitrophiles	Nitrogen fixator	Micromycytes	Micromycytes
1.	$4,3x10^4$	Not found	$4,0x10^3$	$1x10^2$	$1x10^1$	Not found
2.	$1,7x10^5$	$2x10^3$	$7,0x10^3$	$2x10^2$	Not found	Not found
3.	$3x10^2$	Not found	$5x10^2$	Not found	Not found	Not found
4.	$2x10^2$	Not found	Not found	Not found	$1x10^2$	Not found
5.	$2x10^2$	Not found	$4x10^2$	Not found	Not found	Not found
6.	$1,0x10^4$	$1x10^3$	$3x10^2$	Not found	Not found	Not found

The results of the conducted microbiological analysis show that, in 1 ml of suspension in the first sample, the number of ammonifier bacteria is high - 1.7 x 105 cells / ml than the number of other bacteria. On samples 1 and 6, ammonifiers were found in the same order - in 1 ml of water, the amount of ammonifiers was 1.0-4.3x104 cells / ml. And in the 3,4 and 5 samples, the number of ammonifiers was found - 2-3x102 cells / ml.

Phosphorus-decomposing bacteria were found in samples 2 and 6. Their number is 1-2x103 cells / ml. Other samples of phosphorus-decomposing bacteria were not found.

Microorganisms oligonitrophils grow without nitrogenous media. They are marked on samples 1 and 2 more than other samples. Their number is 4.0-7.0x103 cells / ml, and 3, 4 and 6 samples, their number is equal and is 3-5x102 cells / ml.

Nitrogen-fixing bacteria were noted only on samples 1 and 2, their number is 1-2x103 cells / ml).

Micromycetes were noted on samples 1 and 4. On the first sample, their number is 1x101 cells / ml, and on the fourth - 1x102 cells / ml. In other samples, they are not marked.
Actinomycetes were not found.

They are involved in the decomposition of dead organic matter in the ecosystem of the Akdarya water storage.

WATER ENVIRONMENT. IV-part of ecosystems reservoir. The aquatic environment of the Akdarya reservoir is the habitable ecological conditions for the life of a unit of ecosystems: producers, consumers and decomposers. It consists of geographic location, temperature, pH, transparency, water level, seasonality, hydrology and water chemistry. The environment for living organisms is a house, living conditions and the existence of the reservoir itself, because reservoirs can age and disappear.

The aquatic environment of the Akdarya reservoir was studied by us with specialists of hydrochemistry A.D. Matchanov, PhD, senior researcher at the Institute of Bioorganics of the Academy of Sciences of the Republic of Uzbekistan

This part is divided into two (2): 1 - Methods for the quantitative determination of macro and microelements by inductively coupled plasma mass spectrometry (ICP-MS). 2 - Hydrochemistry of Akdarya reservoir water.

1 - Methods for the quantitative determination of macro and microelements by inductively coupled plasma mass spectrometry (ICP-MS)

In the process of research, the study of the chemical composition used the following instruments, equipment and reagents:

0.5000-0.5000 grams of an exact sample of the test substance is weighed on an analytical balance and transferred to Teflon autoclaves. The autoclaves are filled with an appropriate amount of purified concentrated mineral acids (nitric acid (c / h) and hydrogen peroxide (c / h). The autoclaves are closed and placed on a Berghoff microwave decomposition device with MWS-3 + software or a similar type of microwave decomposition device. Determine the program of decomposition of the outcome of the type of test substance, indicate the degree of decomposition and the number of autoclaves (up to x pcs.).

After decomposition, the contents in the autoclaves are quantitatively transferred into 50 or 100 ml volumetric flasks and the volume is adjusted to the mark with 2% nitric acid.

In the construction of the sequence of analyzes, indicate the amount in mg. After receiving the data, the true quantitative content of the substance in the test sample is automatically calculated and entered by the device in the form of mg / kg or μg / g with error limits - RSD in%.

Appliances and utensils used:

ICP MS Nexion - 2000 (Perkin Elmer, USA) or similar microwave decomposition device Berghoff (Germany) or similar Teflon autoclaves, volumetric flasks (Table 6).

Reagents used:

Multi-element standard No. 3 (for 29 elements for OES);
Standard for - Hg (mercury for ECO);
Nitric acid (c / h);
Hydrogen peroxide (c / h);
Double-distilled water;
Argon (gas purity 99, 995%).
Apparatus and equipment (Table 6).

TABLE 6. Apparatus and equipment

No	Devices and equipment	Their technical condition
1	ICP MS Nexion - 2000 (Perkin Elmer USA)	workers
2	Microwave digestion system Berghoff	workers
3	Teflon autoclaves DAP 60+	workers
4	Analytical balance	workers
5	Double distiller	workers

2 - Hydrochemistry of Akdarya reservoir water

The water molecule consists of hydrogen and oxygen atoms, between which there is a covalent bond. The electron cloud of the molecule has the form of a four-bladed propeller that can be placed in an irregular cube. The oxygen atom is in the center, and two hydrogen atoms are in opposite corners from the sides of the cube. The angle H - O - H is 104.30, not 109.50, as in a regular tetrahedron. Two of the six valence electrons of an oxygen atom are bonded to hydrogen atoms. Two lone pairs of electrons form branches stretching to the corners of that face of the cube, which is opposite the face

Alimjanova Kholishon Alimzhanovna, Razhabova Mamura Saparovna, and Jumaeva Diloram Sardalovna, "Ecosystems of Akdarin Reservoir (Uzbekistan)," *International Research Journal of Advanced Engineering and Science*, Volume 6, Issue 4, pp. 39-50, 2021.

occupied by hydrogen atoms. These branches are areas of concentration of negative charges.

Two of the six valence electrons of an oxygen atom are bonded to hydrogen atoms. Two lone pairs of electrons form branches stretching to the corners of that face of the cube, which is opposite the face occupied by hydrogen atoms. These branches are areas of concentration of negative charges. Thus, the molecule has a polar structure (dipole) with a relatively large dipole moment μ, reaching 1.62. 10 -8 Ohm. m.

The abnormal properties of water indicate its unusually high resistance to external factors caused by the presence of additional forces between the molecules, called hydrogen bonds. The essence of the hydrogen bond boils down to the fact that a hydrogen ion bound to an ion of another element is capable of an electron - statically attracting an ion of the same element from another molecule. Each water molecule is capable of forming four hydrogen bonds: due to two pairs of unshared oxygen electrons and two positively charged hydrogen atoms [33].

Natural waters are complex solutions containing all known chemical elements in water, simple and complex ions, complex compounds, dissolved or gaseous molecules, stable and radioactive isotopes. Even V.I. Vernadsky [34] pointed out that in each drop, as in a microcosm, the composition of the cosmos is reflected. There is no doubt that all the other elements will also be established by increasing the sensitivity of analytical methods [34]. Due to this using new research methods and instruments, the following results were obtained (Table 7).

As noted above, 87 elements are known in the natural environment, of which 80 were found in the earth's crust, including 38 elements were studied in the Akdarya reservoir and 35 water elements were found, they make up 43.3% of the total found elements of the earth's crust. Of these, no Ag and phenols were found. They are as follows: Al - found in the amount of 0.011 mg / l in plankton samples in the second Monitoring Station (MS), 0.010 mg / l per 1 MS; As - 0.006 were found on 2MS and 0.007 mg / L - on the first MS. A number of chemical elements have been found - Ba, Se, Zn, Ca, Cd, Cu, Fe, K, Li, Mg, Na, Mn, Yg, V, Si, Pb, Co, S, Cr, Mo, Ni, B, Ag , Ti, Bi, U, dry residue, Nitrite NO2, Nitrate NO3, Sulfate –SO4, Chloride-Cl, surfactant, Petroleum products and so on.

The dry residue was found on 2 MS - 641.0 mg / L, and on 1 MS - 0.074 mg / L.

The dry residue was found on 2 MS - 641.0 mg / L, and on 1 MS - 0.074 mg / L.

Nitrite NO2 - 0.046: 0.074, respectively;
Nitrates-NO3 - 3.5: 3.8, respectively;
Sulfates –SO4 - 310.0: 290.0, respectively;
Chlorides-Cl - 85.0: 87.0, respectively;
Surfactant - 0.100: 0.100; respectively;
Oil products - 0.100: 0.100, respectively;
Na - 110.964: 106.520, respectively;
Mn - 0.081: 0.083, respectively;
S - 103.334: 96.676, respectively;
Mg - 99.458: 96.106, respectively;
Na - 110.964: 106.520, respectively;
Ca - 93.131: 90.983, respectively;
Fe - 2.423: 2.444, respectively;
K - 11.836: 11.564, respectively;

TABLE 7. Quantitative determination of the content of micro- and macroelements of samples by ICP-MS, 12 07 2021

No	The elements	Plant samples, mg / l	
		Akdarya water reservoir, No. 2 Monitoring station, sample No. 12 - plankton.	Akdarya water reservoir No. 1 Monitoring station, sample No. 5 - plankton
1	Ag	0,0	0,0
2	Al	0,011	0,010
3	As	0,006	0,007
4	Ba	0,022	0,021
5	Se	0,008	0,008
6	Zn	0,001	0,002
7	Ca	93,131	90,983
8	Cd	0,0001	0,0001
9	Cu	0,003	0,004
10	Fe	2,423	2,444
11	K	11,836	11,564
12	Li	0,059	0,058
13	Mg	99,458	96,106
14	Na	110,964	106,520
15	Mn	0,081	0,083
16	Yg	0,0	0,001
17	V	0,003	0,003
18	Si	1,388	1,543
19	Pb	0,0001	0,0001
20	Co	0,001	0,001
21	S	103,334	96,676
22	Cr	0,001	0,002
23	Mo	0,002	0,002
24	Ni	0,035	0,035
25	B	0,283	0,279
26	Ag	0,0001	0,0001
27	Ti	0,162	0,159
28	Bi	0,0001	0,0001
29	U	0,0001	0,0001
30	Dry residue	641,0	652,0
31			
32	Nitrite NO2	0,046	0,074
33	Nitrates-NO3	3,5	3,8
34	Sulfates – SO4	310,0	290,0
35	Chloride-Cl	85,0	87,0
36	Surfactant (IIAB)	0,100	0,100
37	Petroleum products	0,100	0,100
38	Phenols	0,0	0,0

The amount of nitrites NO2, nitrates-NO3, sulfates-SO4, chlorides-Cl, surfactants, oil products, Na is greater than the elements Al, As, Ba, Se, Zn, Ca, Cd, Cu, Fe, K, Li, Mg, Na , Mn, Yg, V, Si, Pb, Co, S, Cr, Mo, Ni, B, Ag, Ti, Bi, U.

Thus, the aquatic environment of the Akdarya reservoir is rich in elements that are involved in the exchange of matter and energy in the bio-inert system. Without these elements, there is no life for living organisms.

Discussion

Ecosystem and Exchange Of Substance
V-parts of ecosystems reservoir.

Alimjanova Kholishon Alimzhanovna, Razhabova Mamura Saparovna, and Jumaeva Diloram Sardalovna, "Ecosystems of Akdarin Reservoir (Uzbekistan)," *International Research Journal of Advanced Engineering and Science*, Volume 6, Issue 4, pp. 39-50, 2021.

International Research Journal of Advanced Engineering and Science
ISSN (Online): 2455-9024

Ecology is a science that studies the structure, functions and development of supraorganism bioinert systems - ecosystems (biogeocenosis) and their constituent components. An ecosystem is understood as any set of living organisms in their environment in interaction. Distinguish between terrestrial and aquatic ecosystems. Although terrestrial ecosystems are named by the names of the dominant plants, and aquatic ones by the characteristics of the reservoir, they mean all living organisms that live in them, as well as the inanimate environment. Ecosystems can be very small or very large. Ecosystems The Akdarya reservoir is a very small ecosystem.

Like any natural body, ecosystems are made up of certain constituent parts called ecosystem components.

The living components of the ecosystems of this reservoir are producers - organisms synthesizing organic substances from inorganic substances (green plants, photo- and chemosynthetic microorganisms) such as diatoms and other microphytes and macrophytes (see Part I); consumers - consumers of living organic matter (herbivores and predatory animals, parasites), such as micro- and macro-consumers (see Part II); decomposers - organisms that feed on dead organic matter (saprophytic microorganisms and invertebrates), such as ammonifiers, organic phosphorus, oligonitrophils, nitrogen fixers, micromycytes, actinomycetes (see Part III) and others; inanimate - the atmosphere, rocks, soil, water and soil - the chemical composition of water (see Part IV).

Since the ecosystems of reservoirs include living and nonliving components, they are bioinert systems. The living components of reservoir ecosystems are represented by populations of various species. The totality of the living components of an ecosystem makes up its biota. Ecosystems differ from each other in the morphological features of the components (composition, structure) and the nature of the interactions of the components with each other [17].

Living organisms should be considered in unity with inanimate bodies that make up their environment. Without inert components, the existence of living is unthinkable, which take from the environment the substances and energy necessary for life and return into it various substances they do not need, which are formed in the process of life. Thus, the exchange of matter and energy between living and inert components is the most important property of ecosystems.

Organic substances are synthesized from these simple substances in a green leaf exposed to light. The reactions taking place in the process of photosynthesis are endothermic, and the resulting substances contain more energy than the original ones.

$$6\,CO_2 + 12\,H_2O \xrightarrow[\text{chlorophyll}]{\text{light}} C_6H_{12}O_6 + 6\,H_2O + 6\,O_2$$

For the process of photosynthesis, they are expressed by separate equations:

$$12\,H_2O \xrightarrow[\text{chlorophyll}]{\text{light}} 12\,H_2 - 6\,O_2 + \text{ATP energy (light process)}$$

Part of the organic matter created by the plant is used by it as a building material (the formation of various organelles of cells), and the other part is used as energy. In this case, organic matter is oxidized with the release of energy necessary for the implementation of various life processes. The end products of oxidation of organic substances (for example, water, carbon dioxide, ammonia) enter the external environment.

$$6\,CO_2 + 12\,H_2 + \text{energy ATP} \longrightarrow C_6H_{12}O_6 + 6H_2O \text{ (dark process)}$$

Part of the organic substances created by plants, in the process of feeding, enters the bodies of animals and is also used by them in the process of life, as a result, the same oxidation products are formed as in plants. The organic matter contained in the dead bodies of plants and animals is fed by microorganisms, with the participation of which complex organic substances decompose from simple ones and return them to the external environment. In these processes, inert substances such as chemical elements, CO_2 and others are returned. For example, decomposition of dead rotting organisms, consisting of carbon and nitrogen (in 10: 1)

Part of the organic substances created by plants, in the process of feeding, enters the bodies of animals and is also used by them in the process of life, as a result, the same oxidation products are formed as in plants. The organic matter contained in the dead bodies of plants and animals is fed by microorganisms, with the participation of which complex organic substances decompose from simple ones and return them to the external environment. In these processes, inert substances such as chemical elements, CO2 and others are returned. For example, decomposition of dead rotting organisms, consisting of carbon and nitrogen (in 10: 1)

$$\text{Decaying matter} + n\,O_2 \longrightarrow + H_2O + NH_3$$

The metabolism of matter is also known in the inanimate bodies of nature. As an example of exchange reactions between inert bodies, we can name the processes occurring during weathering of granites. At the same time, the substances that make up the granite enter into chemical reactions with water and oxygen in the air and new substances are formed - sand and clay. But, in contrast to the metabolism in living organisms, in this case the renewal of granite itself does not occur, and the accumulation of energy, on the contrary, the granite is destroyed with the formation of substances that are simpler in their structure and have a smaller energy reserve.

Living organisms are able to perceive information from the external environment, process it and rebuild their organization and functions in connection with it. Information is currently understood as any variety stored in the structure of a substance. Information from the external environment enters the body, and in accordance with it, the processes that counteract external influences are intensified in organisms (negative feedback) or weakened (positive feedback). An example of negative feedback is the impact of a predator population on a prey population. An example of negative feedback is the impact of a predator population on a prey population. As a result of eating prey, for example, algae with herbivorous fish, their numbers decrease or decrease, which entails a decrease in the number of the predator of herbivorous fish. Also an example of positive feedback is the interaction

Alimjanova Kholishon Alimzhanovna, Razhabova Mamura Saparovna, and Jumaeva Diloram Sardalovna, "Ecosystems of Akdarin Reservoir (Uzbekistan)," *International Research Journal of Advanced Engineering and Science*, Volume 6, Issue 4, pp. 39-50, 2021.

between nitrogen-fixing blue-green algae with the atmosphere and plants. Azotobacteria - living on among the root nodes of plants, associate it with the atmosphere; fixed nitrogen is used for itself and transferred to macrophytes and aquatic envir onments. Feedback is the main self-regulation of biological systems.

Life on Earth exists in the form of self-regulating systems of varying degrees of complexity. There are the following levels of organization of biological systems: 1) molecular; 2) cellular; 3) organismic; 4) population; 5) biogeocenotic; 6) biosphere.

Self-regulating systems that exchange matter and energy with the environment are called open, for closed systems only energy exchange is characteristic. Our planet as a whole is a closed system, because it receives only energy from the outside from the Sun, while organisms, populations, ecosystems are open - they are characterized not only by energy, but also by material exchange with the external environment.

V.I. Vernadsky pointed out that in each drop, as in a microcosm, the composition of the cosmos is reflected. In recent years, this position has been confirmed: out of 87 stable chemical elements known in the earth's crust, about 80 elements are found in natural waters. There is no doubt that all other elements will also be established with an increase in the sensitivity of analytical methods. At present, with the use of new methods and instruments, 35 elements of the Akdarya reservoir have been identified, which constitute 43.3% of the total bone crust and they are involved in the exchange of the cycle of substances in water environments and with the atmosphere. In the aquatic environment, it has chemical elements that are important in the life of producers, consumers, decomposers. They are linked to each other along the trophic chain.

Thus, in nature, there is a continuous exchange of substances between living organisms and an inert environment. As a result of the exchange, self-formation of the organism takes place and free energy accumulates, due to which the organism resists the destructive action of external forces. With the termination of the metabolism of matter, the life of the organism also ceases, and the ecosystems of the reservoir may cease to exist.

In the reservoir, some types of microproducers are in poor condition, their frequency of occurrence is single and rare. This is due to the activities of consumers. They eat them quickly. Only a few species often make up the mass. Macrophytes are at a sufficient level, mainly live in the edge of the coast of reservoirs. Algae and higher aquatic plants assimilate chemical micro- and macroelements during photosynthesis and form organic substances in the body. Thus, chemical substances in the reservoir are formed from simple mineral substances to complex - organic. Organic matter passing in the body of the primary herbivorous consumers - to fish, Eastern crown char - Nemachellus malapterurus longicauda Kessler, and through them - to carnivorous fish Turkestan sand fish - Gobio lepidolocmus Kessler, Eastern walker - Alburnoides bipunctatus eichvaldi. Further, in this food chain, hydrobionts microconsuments of rotifers - Colovratki, cladocerans - Cladocera, and copepods - Copepoda participate. In them, the body forms more complex organic substances. It goes on to the next body of consumers along the food chain, ecosystems accumulates. Due to the presence of decomposers - ammonificator bicteria, phosphorus-decomposing bacteria, oligonitrophils, nitrogen-fixing agents, micromycetes of the reservoir, dead organic bodies are destroyed and micro and macroelements are formed from new ones and return to aquatic environments,

So it can be repeated. that the reservoir has a food chain and the exchange of matter and energy. The exchange of matter and energy between living and inert components is the most important property of ecosystems.

The results of our research suggest that in the future, a positive forecast is expected for the existence of the ecosystems of the Akdarya reservoir, due to the exchange of matter and energy in the bio-inert self-government system.

IV. Conclusion

During the period from 2014 to 2021, we were the first to study the ecosystems of the Akdarya reservoir. Collected biomaterials from water bodies and analyzed producers, consumers, decomposers and aquatic environments.

Producers of the reservoir, is a photosynthetic organisms, consists of micro- and macrophytes. Microphytes contain diatoms, which are composed of 18 species, 4 variations and one form of algae, belonging to 2 classes, 3 orders. 10 childbirth. Most types of products are found singularly and rarely in the same field of view of the lens. There are few microphytes, it is explained that they are edible and they are quickly eaten by aquatic organisms. A very small number of algal producer species occur frequently or in mass development. Macrophytes are higher aquatic plants, there are only 11 species, and where fisheries are developed - 18. Hydrophytes are 5, helophytes - 7, hygrophytes - 6 species. Hydrophytes and heliophytes are edible plants for fish. They are cultivated in the private sector of the reservoir. They are producers - they form organic from mineral substances.

Consumptions consists of micro and macro proposals. Microconsumptions are mainly of rotifer species (Colovratki-5 species), cladocera (Cladocera-1 species), copepod (Copepoda-3 species). Zooplankton samples taken near the water entrance to the Akdarya reservoir were poor. The same species in small quantities, 120 thousand egs / m3, and the biomass 0.86 g / m3. Closer to the coast, in the middle part of the right side of the reservoir, the abundance and biomass of microconsiderations of zooplankton increases with the abundance of 802 thousand emz / m3, and the biomass is 3.86 g / m3.

Macro-proposals are presented with 8 types of fish. Among these are the herbivores Nemachellus malapterurus longicauda Kessler; Triplophysa Stoliczkai Steindachner; and the carnivores Gobio lepidolocmus Kessler; Alburnoides bipunctatus eichvaldi Filippi and others. Widespread species, length 2.7-9.8 cm, weight - 6.3-14 grams. They live among aquatic plants. They are involved in regulating the balance of the food chain of the ecosystem of this reservoir. There are

Alimjanova Kholishon Alimzhanovna, Razhabova Mamura Saparovna, and Jumaeva Diloram Sardalovna, "Ecosystems of Akdarin Reservoir (Uzbekistan)," *International Research Journal of Advanced Engineering and Science*, Volume 6, Issue 4, pp. 39-50, 2021.

private fish farming sectors. The consumables eat the organic substances of the producer.

Reducers. In the ecosystem of the Akdarya reservoir, decomposers are: ammonificator bacteria - living without nitrogenous media, phosphorus-decomposing bacteria, oligonitrophils, nitrogen fixers, micromycetes. Actinomycetes were not found. The results of the microbiological analysis show that, in 1 ml of suspension, in the first sample, the amount of bacteria ammonifiers is high - 1.7 x 105 cells / ml than the number of other samples. Phosphorus-decomposing bacteria, oligonitrophils, nitrogen-fixing bacteria, micromycetes are noted. They participate in the decomposition of dead organisms (plants and animals), forming mineral elements from bioorganic materials.

The aquatic environment of the Akdarya reservoir consists of 35 chemical elements, accounting for 43.3% of the 80 elements of the earth's crust found.

They are as follows: Al, As, Ba, Se, Zn, Ca, Cd, Cu, Fe, K, Li, Mg, Na, Mn, Yg, V, Si, Pb, Co, S, Cr, Mo, Ni, B, Ag, Ti, Bi, U, dry residue, Nitrites NO2, Nitrates NO3, Sulfates –SO4, Chlorides-Cl, surfactants, Petroleum products and so on. The aquatic environment with living organisms forms the bioinert materials of reservoirs. They are in close trophic connection, and participate in the circulation of matter metabolism and energy accumulation.

Ecosystem and substance exchange. Ecosystems The Akdarya reservoir is a very small ecosystem, it consists of 35 chemical elements, accounting for 43.3% of the found 80 elements of the earth's crust. Like any natural body, the ecosystems of the Akdarya reservoir consist of certain constituent parts, called ecosystem components - living and non-living.

The living components of the ecosystems of this reservoir are *producers* - organisms synthesizing organic substances from inorganic substances (green plants, photo- and chemosynthetic microorganisms) such as diatoms and other microphytes and macrophytes; *consumers* - consumers of living organic matter (herbivores and carnivores, parasites), such as micro- and macro-consumables; *decomposers* - organisms feeding on dead organic matter (saprophytic microorganisms and invertebrates), such as ammonifiers, organic phosphorus, oligonitrophils, nitrogen fixers, micromycytes, actinomycetes and others; *inanimate* - atmosphere, rocks, soil. water and soil.

In nature, there is a continuous exchange of substances between living organisms and an inert environment. As a result of the exchange, self-formation of the organism takes place and free energy accumulates, due to which the organism resists the destructive action of external forces. With the termination of the metabolism of matter, the life of the organism also ceases, and the ecosystems of the reservoir may cease to exist.

In the reservoir, some types of microproducers are in a deplorable state, their occurrence is rare and rare. This is due to the activities of consumers. Only a few species often make up the mass. Macrophytes are at a sufficient level, mainly living on the edge of the coast of water bodies. Algae and higher aquatic plants assimilate chemical micro- and macroelements in the process of photosynthesis and form organic matter in the plant body. Thus, chemical substances in the reservoir are formed from simple mineral substances to complex - organic. Organic matter passing in the body of the primary herbivorous consumers - to fish Eastern crown char - Nemachellus malapterurus longicauda Kessler, and through them - to carnivorous fish Turkestan sand fish - Gobio lepidolocmus Kessler, Eastern walker - Alburnoides bipunctatus eichvaldi, further the food chain is attended by hydrobionts microconsumed rotifers - Colovratki, cladocerans - Cladocera, copepods - Copepoda. In them, the body forms more complex organic substances. It goes on to the next body of consumers along the ecosystem food chain and accumulates. Dead organics are formed in the reservoir. Due to the presence of reducers - bacteria, ammonifiers, phosphorus-decomposing bacteria, oligonitrophils, nitrogen-fixing, micromycetes of the reservoir, dead organic bodies are destroyed and micro and macroelements are formed with new ones and return to the water of reservoirs.

Thus, the reservoir has a food chain and the exchange of matter and energy. The exchange of matter and energy between living and inert components is the most important property of ecosystems.

The results of our research suggest that in the future, a positive forecast is expected for the existence of the ecosystems of the Akdarya reservoir, due to the exchange of matter and energy in the bio-inert self-government system.

Recommendations

We recommend the materials of this article to use the Ecology and nature protection of Uzbekistan, the organization of the educational institution of the Ministry of Higher Education, in the system of research institutions of Uzbekistan, researchers, doctoral students, students, entrepreneurs in fisheries, and others interested in this field of science.

Thanks

1. We are sincerely grateful to A.A. Kuzmetov, Doctor of Biological Sciences, for consultations on consumers, the second part of this topic;
2. We are sincerely grateful to S.I. Zakiryaeva for help in the study of reducers – the microbiological part of this topic;
3. We are sincerely grateful to A.D. Matchanov for his help in the study of hydrochemistry, the fourth part of this topic.

REFERENCES

[1] Muzafarov A.M. Flora of algae in water bodies of Central Asia. - Tashkent: Science, 1965. -571 p.
[2] Ergashev A.E. Patterns of development and distribution of algal flora in artificial reservoirs. -Tashkent: Fan, 1976. - 400 p.
[3] Izatullaev ZI, Boimurodov X.T. Zarafshon daryoshi kavzasi ikki pallali Molluskalari. –Samarkand, 2009. - 95 p.
[4] Karaev R.M., Atabaeva N.K. Diversity and ecology of wildlife. Tutorial. - Tashkent: University, 2011. - 48 p.
[5] Kamilov B.G., Karimov B.K., Salikhov T.V. Lake commodity economy as promising aquaculture system in Uzbekistan. - Tashkent: Chinor ENK, 2014. - 104 p.
[6] Water bodies of Uzbekistan (excluding Karakalpak) and their fishery significance. 1st book.- Tashent, 1994. - 136 p.

Alimjanova Kholishon Alimzhanovna, Razhabova Mamura Saparovna, and Jumaeva Diloram Sardalovna, "Ecosystems of Akdarin Reservoir (Uzbekistan)," *International Research Journal of Advanced Engineering and Science*, Volume 6, Issue 4, pp. 39-50, 2021.

[7] Water bodies of Uzbekistan (excluding Karakalpak) and their fishery significance. 2nd book.- Tashent, 1994. - 126 p.
[8] Gromov B.V., Pavlenko G.V. Ecology of bacteria. - Leningrad: Leningrad Publishing House University, 1989. - 248 p.
[9] Alimjanova Kh.A., Razhabova M.S. Spring phytoplankton Bacillariophyta of the Akdara reservoir // The 5ft International scientific and practical conference "Dynamics of the development of world science" (January 22-24, 2020) Perfect Publishing, Vancouver, Canada. 2020. 1111 p. – R. 300-306.
[10] Unified water quality research methods. Part III. Methods biological analysis of waters. - Moscow: CMEA, 1976. - 185.
[11] Shishkina L.A. Hydrochemistry. - Leningrad: Gidrometeoizdat, 1974. - 287 p.
[12] Handbook of Hydrochemistry. - Leningrad: Gidrometeoizdat, 1989. - 392 p.
[13] Gollerbakh M.M., Polyansky V.I. Freshwater algae and their study. - Moscow: Soviet science, 1951. - 200 p.
[14] Zabelina M.M., Kiselev I.A., Proshkina-Lavrenko A.I., Sheshukova V.S. Keys to freshwater algae of the USSR. Issue 4. Diatoms. - Moscow: Soviet Science, 1951, 614 p.
[15] Dedusenko-Shchegoleva I.T., Hollerbakh M.M. Keys to freshwater algae THE USSR. Issue 5. Yellow-green algae. Xanthophyta. - M.: L.: AN SSSR, 1962. – 271.p.
[16] General bacteriology methods. In three volumes. 1 volume. - Moscow: Mir, 1983. - 536 p.;2 volume. - Moscow: Mir, 1984. - 472 p. Volume 3. - Moscow: Mir, 1984. - 264 p.
[17] Tarasov A.O. Ecology and nature protection. Tutorial. T.19. - Saratov: Saratov. Univer., 990.- 248 p.
[18] Shultz V.L. Rivers of Central Asia. – L.: Hydromet., 1965. - 692 p.
[19] Shultz V.L., Masharipov R. O'rta Osiyo Gydrographiyasi. - Toshkent: O'kituvchi, 1969. –328 p.
[20] Rasulov A.R., Khikmatov F.Kh., Ayitboyev D.P. Gydrographiya asoslari. - Toshkent: University, 2003. - 328 b.
[21] Sukachev V.I. Basic concepts of forest biogeocenology // Fundamentals of forest biogeocenology. - M., 1964.
[22] Kuzmetov A.R. Zooplankton of reservoirs in the Middle reaches of the Zarafshan River //Materials of the scientific-practical conference "Actual problems of biology and ecology "dedicated to the 70th anniversary of Professor Almatov Karim Tazhibaevich, 14 September 2015. - Tashkent: UzMU, 2015. - S. 198-200.
[23] Kuzmetov A.R., Mirzaev U.T., Golubenko Yu.A. Zarafshon o'rta oqimi suv khavzalari ikhthyofaunasi va zooplanktoni // Biologiya fanlari doctori, professor Almatov Karim Tazhibaevichning 70 yillik tavalludiga bag'ishlangan "Biologiya va Ecologiyaning dolzarb muammolari" mavsusidagi ilmiy-amaliy anjumani materialari. - Tashkent: UzMU, 2015. -B.114-116.
[24] Kuzmetov A.R., Abdunazarov H.H., Ismoilov H.F. Production of Cyclops vicinus Uljanin, 1875 // European journal of Biomedical and pharmaceutical sciences. Volume: 3, Issue: 12, 2016. - P. 17-18. http://www.ejbps.com
[25] Alimianova Kh.A. Regularities in the distribution of algae in the Chirchik river basinand their importance in determining the ecological and sanitary state of water bodies. -Tashkent: Fan, 2007. - 265 p.
[26] O'zME. Birinchi jild. Toshkent, 2000.
[27] Tashpulatov Y.Sh., Alimjanova Kh.A. Distribution of indicator-saprobic algae along the streams (for example, the middle course of the Zarafshan River) // Actual problems of biodiversity conservation: Proceedings of the international scientific practical conference // Bulletin of Osh State University. Special issue. - Osh, 2014. - B. 38-40.
[28] Alimjanova Kh.A., Razhabova M.S. Spring phytoplankton Bacillariophyta Akdara reservoir // The 5th International scientific and practical conference "Dinamics of the development of world science (January 22-24)" Perfect Publishing. - Vancouver. Canada. - P.300-307.
[29] Zvyagintsev D.G. Methods of soil microbiology and biochemistry. - Moscow, 1991.
[30] Jozsef Segi. Methods of soil microbiology and biochemistry. Budapest, 1986.31. Big workshop on microbiology / ed. G.L. Seliber. - Moscow, 1962.
[31] A.A. Nurniyozov, Y.Sh. Tashpulatov. Samargand vilyatidagi ayrim suvomborlari va baliqchilik hovuzlarining Gydrophil o'simliklari //"O'zbekiston Respubliki xududidagi suv khavzalarida o'suvchi tuban wa yuksak suv o'simliklarini ko'paytirish, ularni khalq kho'aligida qo'llash" mauzusidagi respublika ilmiy-amaliy anjumani materiallari to'plami, 13 noyabr, 2020 yil. – Bukhoro: BukhDU, 2020. - B.3-5.