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Hydro biological indicators of reservoirs of the Akmola and Karaganda regions for 2017

On the territory of Akmola and Karaganda regions, hydro biological indicators were studied in the lakes Korgalzhinskoe, Esey, Kokai; in the reservoirs of Samarkand and Kengir; in the rivers Nura, Sherubainura, Kara Kengir. In 2017, selected phytoplankton species, zooplankton, periphyton, and benthos were studied in selected surface waters that are experiencing increasing anthropogenic pressure. A list of phytoplankton species, zooplankton, periphyton, and benthos has been compiled, the characteristic features of their distribution are noted. The dominant phyto, zooplankton and periphyton species were also identified. Also indexes of Sladechek's saprobity were calculated and compared, and a general ecological assessment of reservoirs and watercourses was given. It was revealed that the studied surface waters of the Akmola and Karaganda regions belong to the 3rd class of water quality, mesotrophic, β-mesasaprobic in terms of the quality of water. For water bodies of the beta-mezasaprobic zone of the Akmola and Karaganda regions, coenotic communities of aquatic organisms differ in varying species composition, which does not depend on the same landscape and climatic conditions. The periphyton and benthic community in rivers has a tendency to higher rates of saprobity compared to other hydrobiont communities: the periphytonsaprobity indices and the Woodwiss index are higher than the phytoplankton saprobity indices.

Keywords: saprobity, hydrobionts, test objects, indicators, zooplankton, phytoplankton, periphyton, zoobenthos.

The ecological health of natural waters is determined by many factors, among which an important role is played by the composition of the aquatic community, which provides up to a certain level the possibility of a reservoir to self-sustain in it the purity of the aquatic environment. Organisms are interdependent both in species diversity and in their abundance, therefore, the change of one component of the biocenosis invariably leads to changes in the other. A change in the trophicity of the reservoir affects the ratio of all species. Since saprobity can characterize such abilities of hydrobionts as resistance to organic pollution, lack of oxygen, the presence of hydrogen sulfide compounds, the determination of saprobity indices by indicator species remains the most informative for assessing the quality of water bodies.

The purpose of this work was: to provide an environmental assessment of a number of reservoirs and watercourses of the Akmola and Karaganda regions in terms of hydrobionts.

Materials and research methods

Study of phytoplankton and zooplankton samples. Establishment of the species status of organisms was carried out in the spring, summer and autumn months of 2017.

Water samples for the study of phytoplankton were taken by the Epstein's project network. The number of the sieve is No. 77. The preservation of the samples was carried out immediately after sampling by adding to them 40 % formalin. The concentration of the phytoplankton sample was carried out by the sittation method [1].

Periphyton from water bodies was studied by direct research by washing off various substrates from 3–4 sites of a water body, thickening and further fixation with formalin [1].

Zooplankton samples were taken quantitatively, the Jedi network is total, since most of the lakes under study are shallow, the depth of which does not exceed 3–4 m. Zooplankton sample was recorded with 40 % formalin.

The identification of algae and zooplankton was carried out using microscopy using an immersion objective 90 (2 mm) under magnification of 40 and 100 times on an *Olympus CX-31* microscope according to determinants of zooplankton [1]. Pictures of organisms were taken using the program *L-micro.*

Benthos samples were taken from several parts of the river or lake depending on the abundance of organisms. Animals were collected by a bottom grab at a depth of 1 meter and from the coast. Then washed soft soils (silt, sand, detritus) and water plants. Next, the animals were picked out of the bottom grab with tweezers and placed with a pair of tweezers in a jar with a retainer. A 4 % formalin solution was used as a fixing fluid. Identification of species was carried out using a magnifying glass [2].

The saprobity of reservoirs according to the composition of the species was determined by the method of Pantle and Bucca in the modification of V. Sladechek [3]. For this, a list of organisms of pollution indicators was used [4]. For indicator species of macrozoobenthos, the Woodwiss index was calculated [1].

The data on the species diversity of hydrobionts in the following reservoirs were analyzed: on the Nura, Sherubainura, Kara Kengir rivers, Samarkand and Kengir reservoirs, Korgalzhinskoe, Sholak, Yessey, Kokai, Sultankeldy and Balkash lakes. Phytoplankton algoflora is mainly represented by diatoms, green, blue-green algae (Table 1). Diatoms prevailed in most water bodies: the Nura River (65 %), Lake Esey (72 %), Lake Balkash (82 %), the River Kara Kengir (58 %), Lake Korgalzhinskoe (57 %), Lake Kokai (50 %), Sherubainura River (53 %).

Green algae also made up a large group: the Nura River (30 %), Lake Esey (22 %), Lake Balkash (16 %), the Kara Kengir River (33 %), Lake Korgalzhinskoye (33 %), the Sherubainura River (45 %).

Blue-green algae were found in relatively large quantities in the rivers Kara Kengir (9 %), Nura (10 %), in the lakes Korgalzhinskoe (10 %), Esey (6 %).

Table 1

Dominant classes of phytoplankton in water bodies and streams, %

Algae	Nura River	Sherubai-nura River	Kara Karagir River	River Samarkand Reservoir	Kengir Reservoir	Lake Korgal-zhinskoe	Lake Esey	Lake Kokai	Lake Balkash
Diatoms	65	53	58	+	–	57	72	50	82
Greens	30	45	33	–	49	33	22	–	16
Blue-green	10	–	9	–	–	10	6	–	–

According to the data of the RSE Kazhydromet, in 2017 the rivers and lakes of the Akmola and Karaganda oblasts mainly belong to the 3rd class water quality.

In summer, quantitative indicators of algal flora were determined: total abundance and total biomass, saprobity of the reservoir (Table 2). Pantle-Buck index of saprobity was calculated by the types of zooplankton, phytoplankton and periphyton.

The water bodies and watercourses had the highest primary productivity: the Sherubainura river (total number — 0.47 thousand tons/cm³, total biomass — 0.267 mg/dm³), the Nura river (total number — 0.38 thousand cells/cm³, total biomass — 0.278 mg/dm³). Relatively low productivity of phytoplankton differed water bodies: Lake Balkash (total number — 0.08 thousand c/cm³, total biomass — 0.049 mg/dm³), Kengir reservoir (total number 0.19 thousand c/cm³ total biomass — 0.148 mg/dm³).

All studied surface waters were assigned to the β-mesosaprobic zone (Table 2). Thus, most rivers and lakes have a tendency to eutrophic water, and therefore have low self-purification potential. Despite the overall high productivity of algae in water bodies, the function of saprophytes appears to remain low, since sewage is discharged in most water bodies.

However, in terms of the total number of algal flora, the trophicity of the surface waters of the selected territories is mesotrophic, since it is in the range of 3.85–20 million c/l [5].

Table 2

Quantitative indicators of phytoplankton in water bodies and streams

Indicators	Nura River	Sherubai-nura River	Kara Karagir River	Samar-kand Reservoir	Kengir Reservoir	Lake Korgal-zhinsky	Lake Yessey	Lake Kokai	Lake Balkash
The total number of algal flora (thous. cl/cm³)	4.58	6.47	5.42	3.79	12.19	10.65	12.46	9.23	4.08
Total biomass mg/dm³	2.28	1.26	1.101	2.244	3.1	2.93	3.21	2.66	2.04
Saprobity Index	1.82	1.89	1.81	1.74	1.70	1.80	1.85	1.67	1.71

Periphyton was studied in spring, summer and autumn. In the studied conditions of the Nura River, periphyton diatoms dominated such as: *Cymatopleura*, *Nitzschia, Rhoicosphenia, Synedra*. Among green algae dominated: *Cosmarium, Pediastrum, Rhizoclonium*, among blue-green ones: *Gloeocapsa, Gomphosphaeria, Oscillatoria* (Table 3).

Table 3

Periphyton types of water bodies and streams

Algae	River Nura	Sherubainura River	Sherubainura River Reservoir	Korgalzhin-skoe lake	Yessey lake	Sultankeldy lake	Kokai lake
1	2	3	4	5	6	7	8
Diatoms							
Cymatopleura ((Brébisson) W.Smith	+				+		
Nitzschia (sp.)	+			+			
Rhoicosphenia (sp.)	+						
Synedra (sp.)	+						
Cyclotellameneghiniana (Kützing)		+					
Meloziravarians (C.Agardh)		+	+				
Stephanodiscushantzschii(in Cleve &Grunow)		+					
Cymbellalanceolata(C.Agardh)			+				+
Nitzschiavermicularis (Kützing) Hantzsch in Rabenhorst			+				
Stephanodiscusastraea(Kützing) Grunow			+				
Amphora ovalis (Amphora ovalis (Kützing))			+				
Gyrosigmaacuminatum(Kützing) Rabenhorst)		+	+				
Naviculagracilis (Ehrenberg)			+				
Nitzschiaacicularis (Kützing) W.Smith			+				
Caloneis(sp.)				+			
Gomphonema(Bacillariophyta)				+			
Navicula(Bacillariophyta)				+			
Cymatopleurasolea(Brébisson&Godey)				+			
Diatomavulgaris (Bory)				+			
Rhopalodiagibba(Ehrenberg)				+			+
Gomphonemaangustatum (Kützing) Rabenhorst					+		
Naviculacuspidata (Kutzing)					+		
Staurastrumcommutatum (Kützing) G.L. Rabenhorst					+		
Cymbella(C. Agardh)					+		
Navicula (Bacillariophyta),					+		
Rhopalodiagibba(Ehrenberg) Otto Müller					+		
Diatomaelongatum(Lyngbye) Elmore						+	
Naviculaviridula (Grun.)						+	
Stauroneisphoenicenteron(Nitzsch)						+	
Epithemiasorex (Kützing)							+
Rhoicospheniacurvata(Kützing) Grunow							+
Green algae							
Cosmarium (sp.)	+			+	+		
Pediastrum (Meyen)	+		+	+			
Rhizoclonium (Rhizoclonium)	+						
Closterium (Closterium)		+		+			
Scenedesmus (sp.)		+	+	+	+		
Blue-green algae							
Gloeocapsa (sp.)	+			+			
Gomphosphaeria(Kützing)	+			+			
Oscillatoria (sp.)	+					+	
Gloeocapsasanguinea(C.Agardh) Kützing			+				
Gomphosphaeriapusilla(Van Goor) Komárek			+				
Oscillatorialimnetica(N.L. Gardner) Anagnostidis			+				
Oscillatoriasubtilissima (Kützing ex Forti)			+				
Microcystis (Kutz) Elenk. emend				+			
Euglenicalgae							
Euglenaspirogyra (Ehrenberg)			+				

Among the diatoms of periphyton, the Sherubainura River was dominated by such species as*: Cyclotella meneghiniana, Gyrosigma acuminatum, Melozira varians* and *Stephanodiscus hantzschii*. Of the representatives of green algae, the most common were the genera: *Closterium and Scenedesmus.*

In spring Samarkand reservoir was dominated by diatoms, represented by the following species of *Cymbella lanceolata, Melozira varians*, *Nitzschia vermicularis*, *Stephanodiscus astraea*. The following species were predominant in the diatoms; *Amphora ovalis*, *Cymbella lanceolata*, *Gyrosigma acuminatum, Navicula gracilis, Nitzschia acicularis, from green: Pediastrum* and *Scenedesmus, among the blue-green algae dominated: Gloeocapsa sanguinea, Gomphosphaeria pusilla, Oscillatoria limnetica and Oscillatoria subtilissima Oscillatoria subtilissima,* among the euglenes — *Euglena spirogyra*.

In the spring Korgalzhinskylake, algocenosis of fouling wore a diatom character and was represented by such genera as: *Caloneis, Gomphonema, Navicula, Nitzschia*. In summer fouling dominated by diatoms: *Cymatopleura solea, Diatoma vulgaris, Rhopalodia gibba*; among green: *Closterium, Cosmarium, Pediastrum, Scenedesmus;* among blue-greens: *Gloeocapsa, Gomphosphaeria* and *Microcystis.*

In the periphyton of Esei Lake, diatoms of the following species dominated in spring: *Gomphonema angustatum, Navicula cuspidata, Staurastrum commutatum*, *Cymatopleura*. Green algae were rare and were represented by the genera *Cosmarium* and *Scenedesmus*. The species composition of the autumn periphyton was rich in diatoms and was represented by such genera as: *Cymatopleura*, *Cymbella*, *Navicula*, *Rhopalodia.*

In the spring, among the periphyton diatoms, Lake Sultankelda dominated: *Diatoma elongatum*, *Navicula viridula, Stauroneis phoenicenteron*. Green algae were absent. Of the blue-green algae, the genus *Oscillatoria* was of various species.

In May-June, Lake Coca was poor and was mainly represented by diatoms of such genera as: *Cymbella lanceolata, Epithemia sorex, Rhoicosphenia curvata and Rhopalodia gibba.* Green algae in the studied reservoir were very rare, blue-green algae were absent.

The index of saprobity of reservoirs by types of periphyton varied from 1.67 to 1.89. All of these species belonged to indicators of β-mezosaprobic zone contamination. Water quality is assessed by class 3 «moderately polluted» waters.

Zooplankton was studied in water samples from these lakes and rivers. On average, 3–4 samples of zooplankton dominated in each sample. The saprobity index for the studied species of zooplankton in water bodies and rivers was varied from 1.66 to 1.87, which is also located in the 3rd class interval «moderately polluted waters» (Table 4).

Table 4

Dominant classes of zooplankton in ponds and streams

Zooplankton	Nura River	Sherubai-nura River	Kara Karagir	Samar-kand Reservoir	Kengir Reservoir	Lake Kor-galzhin-skoe	Lake Esey	Lake Kokai	Lake Balkash
Crustaceans, %	44	38	37	12	25	22.07	54	41	7
Rotifers, %	5	28	38	1	6	0.03	3	1	0.3
Copepods, %	51	34	25	87	69	77	43	58	92.7
Total number of thousands of copies/m³	3.33	2.08	2.81	4.61	4.89	3.02	4.38	4.53	5.17
Biomass, mg/m³	42.37	15.14	29.78	45.79	50.29	44.1	50.75	61.69	85.06
Saprobity index	1.83	1.85	1.87	1.66	1.73	1.72	1.67	1.66	1.75

The number of branching crustaceans in the Nura River was 44 %, in the Sherubainura River — 38 %, in the Kara Kengir River — 37 %, Samarkand Reservoir — 12 %, Kengir Reservoir — 25 %; and in the lakes: Korgalzhinskoe — 22.07 %, Yessey — 54 %, Kokai — 41 %, Balkash — 7 %.

The content of rotifers was in the rivers: Nura — 5 %, Sherubainura — 28 %, Kara Kengir — 38 %, and reservoirs: Samarkand — 1 % and Kengir — 6 % and in lakes: Korgalzhinskoye — 0.03 %, Yessey — 3 %, Kokay — 1 %, and Balkash — 0.3 %.

By the number of species, copepods prevailed in Lake Balkash — 92.7 %, then Samarkand reservoir — 87 %, Lake Korgalzhinskoe — 77 %, Kengir reservoir — 69 %, and in Kokai rivers — 58 %, Nura — 51 %, Yessey — 43 %, Sherubainura — 34 % and Kara Kengire — 25 %.

In terms of abundance and biomass, zooplankton prevailed in Lake Balkash (total number — 5.17 thousand specimens/m³, total biomass — 85.06 mg/m³) and Kengir reservoir (total number — 4.89 thousand specimens/m³, total biomass — 50.29 mg/m³).

Relatively low productivity of zooplankton was distinguished by water bodies: the Sherubainura River (total number — 2.08 thousand ind./m³, total biomass — 15.14 mg/m³) and the Kara Kengir River (total number — 2.81 thousand specimen/m³, total biomass — 29.78 mg/m³).

The species composition of the zoobenthos of the river Nury consisted of: from crustaceans — *Gammarus pulex, from mollusks: Planorbis, complanata, Pl.contortus, Pl.planorbis, Sphaerium corneum, Valvata piscinalis, Lymnaea auricularia, Lymnaea ovata, Pisidium casertanum, Pisidium obtusale, Sphaerium corneum, Sphaerium solidum* and insect larvae: *Chaoborus sp., Hydroporus sp., Rhantus sp*.

The following representatives were present in the zoobenthos samples in the Samarkand reservoir: crustaceans — *Gammarus pulex, caddis-Stenophylax stellatus* and mollusks: *Lymnaea ovata, Pisidium obtusale, Sphaerium corneum, Sphaerium solidum* and *Unio pictorum* (Table 5).

In Lake Sholak, the zoobenthos is represented by mollusks, crustaceans and insect larvae. Among mollusks: *Anodonta cygnea, Pisidium pusillum, Planorbis planorbis and Planorbis spirorbis*, from crustaceans — *Gammarus pulex*, among the insect larvae the order *Diptera* (*Endochironomus tendens, Tipula sp.*) *Trichoptera (Hydropsyche sp., Mollana sp., Glyphotaelius punctatineatus)*. During the autumn period, zoobenthos was represented only by mollusks (*Bivalvia and Gastropoda): Hippeutis (Planorbis*) complanata, *Margaritanamargaritifera, Pisidium casertanum, Sphaerium corneum, Lymnae aauricularia* and *Lymnaea stagnalis.*

In the zoobenthos of Lake Esey, various species of mollusks *Planorbis vortex, P. spirorbis, P. complanata, P. Planorbis, Lymnaea auricularia, L. ovata, L. stagnalis, L. truncatula*.

The zoobenthos of Lake Kokai was represented by gastropods: *Lymnae aauricularia, L.pereger, L. stagnalis, L. ovata, Planorbiscomplanata, P.vortex.*

All these indicator species of saprobity were within the β-mesosaprobic zone. The biotic index for Woodiwess was –5. Water quality corresponded to class 3 of «moderately polluted» waters.

Table 5

Types of zoo benthos ponds and streams

Zoo benthos	Nura River	Water reservoir Samarkand	Lake Sholak	Lake Esey	Kokai Lake
1	2	3	4	5	6
Crustaceans					
Gammaruspulex (Linnaeus)	+	+	+		
Shellfish					
Planorbiscomplanata (Draparnaud)	+		+	+	+
Pl.contortus (Rudolphi)	+				
Pl.planorbis (Muller)	+		+	+	
Sphaeriumcorneum (Linnaeus)	+	+			
Valvatapiscinalis (Müller)	+				
Lymnaeaauricularia (Linnaeus)	+		+	+	+
Lymnaeaovata (Draparnau)	+	+		+	+
L. pereger					+
Pisidiumcasertanum (Poli)	+		+		
Pisidiumobtusale (Lamarck)	+	+			
Sphaeriumsolidum (Normand)	+	+			
Uniopictorum (Linnaeus)		+			
Anodontacygnea (Linnaeus)			+		
Pisidiumpusillum(Jennyns)			+		
Planorbisspirorbis (Linnaeus)			+	+	
Lymnaeastagnalis (Linnaeus)			+	+	+
Sphaeriumcorneum (Linnaeus)			+		
Margaritanamargaritifera (Linnaeus)			+		
Planorbis vortex				+	+
L. truncatula				+	

Continuation of Table 5

1	2	3	4	5	6
Insect larvae					
Chaoborussp.	+				
Hydroporussp.	+				
Rhantussp.	+				
Corixasp.	+				
Tipulasp.			+		
Hydropsychesp.			+		
Mollanasp.			+		
Insects					
Insecta	+				
Leeches					
Hirudinea	+				
Caddisflies					
Stenophylaxstellatus (Curtis)		+			

Research results and discussion

Based on the calculation of saprobity indices for different groups of hydrobionts (Table 6), we can conclude that all lakes and streams belong to selected areas in terms of water quality can be attributed to moderately saprobic (β-mesosaprobic), where the mineralization process is relatively active, and water bodies cope with organic pollution. However, if in the reservoirs and lakes the indices of saprobity are almost the same for both phytoplankton and zooplankton and periphyton, then in the rivers the periphyton community shows a higher saprobity than planktonic organisms: Sph = 1.82, Sc = 1.83, Sp = 1.91 (along the Nura River); Sph = 1.89, Sz = 1.85, Sp = 2.02 (along the Sherubainura River). A similar trend is also observed in the Samarkand reservoir: Sph = 1.74, Sc = 1.66, Sp = 1.91. This observation suggests that periphyton organisms are more sensitive for determining saprobity in a pond.

In the rivers of benthic species, on the basis of the biotic Woodiwiss index, a higher saprobity was also revealed: Ib = 5 in the Nura and Kengir rivers, which corresponds to the alpha mesapaprobic zone.

Thus, the saprobity of rivers is more accurately determined by the attached periphyton and benthic indicator species, while plankton is flowing, more provided with oxygen and lives in a less saprobic environment.

As the results of our work show, in each reservoir or watercourse the composition of species varies, despite the fact that the studied lakes and rivers are within the same landscape-climatic zone of the Akmola and Karaganda regions, and all of them are characterized as β-mesosaprobic. Thus, it is difficult to isolate specific cenotic communities of hydrobionts.

Table 6

Indicators of hydrobionts of reservoirs and watercourses of Akmola and Karaganda regions

The name of the river, reservoirs	Indicators of hydrobionts							
	Phytoplankton			Zooplankton			Perefiton	Zoo benthos
	The total number of algal flora (thous. cl/cm³)	Total biomass mg/dm³	Saprobity Index, S ph	The total number of algal flora (thous. cl/cm³)	Total biomass mg/dm³	Saprobity Index, Sz	Saprobity Index, Sp	Biotic index, Iв
Nura River	0.38	0.278	1.82	3.33	42.37	1.83	1.91	5
Sherubainura River	0.47	0.267	1.89	2.08	15.14	1.85	2.02	–
Kara Karagir River	0.23	0.101	1.81	2.81	29.78	1.87	–	5
River Samarkand Reservoir	0.31	0.244	1.74	4.61	45.79	1.66	1.91	–
Kengir Reservoir	0.19	0.148	1.70	4.61	45.79	1.66	1.93	–
Lake Korgalzhinskoe	0.25	0.193	1.80	4.89	50.29	1.73	1.77	–
Lake Esey	0.264	0.21	1.85	3.02	44.1	1.72	–	–
Lake Kokai	0.232	0.166	1.67	4.38	50.75	1.67	1.66	–

Conclusions

1. The studied surface waters of the Akmola and Karaganda regions of the Nura River, Sherubainura, Kara Kengir, Samarkand and Kengir reservoirs, Korgalzhinskoe, Esey, Kokai and Balkash lakes belong to the 3rd class of water quality, mesotrophic, β-mezasaprobic by water quality.

2. For water bodies of the β-mesasaprobic zone of the Akmola and Karaganda regions, coenotic communities of aquatic organisms differ in varying species composition, independent of the same landscape and climatic conditions.

3. The periphytonic and benthic community in rivers shows higher indices of saprobity compared with other aquatic communities.

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2017 жылғы Ақмола және Қарағанды облыстарының су нысандарының гидробиологиялық көрсеткіштері

Ақмола мен Қарағанды облыстары аймағындағы Қорғалжын, Есей, Қоқай көлдерінде, Самарканд және Кенгір су қоймаларында, Нұра, Шерубайнұра, Қара Кеңгір өзендерінде гидробиологиялық көрсеткіштер зерттелді. Өспелі антропогендік жүктемені өткеретін беткі суларда 2017 ж. бентос, перифитон, зоопланктон, фитопланктонның көрнекілік жиынтықтары анықталды. Перифитон, зоопланктон, фитопланктонның, сондай-ақ бентостың түрлерінің тізімі құрастырылған, олардың таралуының ерекшелігі белгіленген. Сонымен қатар фито-, зоопланктон мен перифитонның басымды түрі анықталып бөлінген. Сладечек сапромдық индексі салыстырылып, есептелді, су қоймалары мен су ағындарына жалпы экологиялық баға берілді. Ақмола мен Қарағанды облыстарының беткі суларының зерттеулері су сапасының 3 класына жатады, мезотрофты, су сапасы бойынша β-мезосапромдық. Ақмола мен Қарағанды облыстарының β-мезосапромдық зонаның сулы нысандары үшін гидробиоттардың ценотиналық жиынтығы климаттық және ланшафтық бірдей жағдайларға байланысты емес ауытқымалы көрненілік құрамымен ерекшеленеді. Өзендердегі перифитон және бентосты жиынтық гидробионттардың салыстырғанда сапромдығы жоғары қарқынына бейім келеді: перифитонның соққылық индексі және Вудивисс индексі фито- және зоопланктонның соққылық индекстеріне қарағанда жоғары.

Кілт сөздер: гидробионттар, сапромдық, сынақ-нысандар, көрсеткіштер, зоопланктондар, фитопланктондар, перифитондар, зообентос.

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Гидробиологические показатели водоемов Акмолинской и Карагандинской областей за 2017 год

На территории Акмолинской и Карагандинской областей были изучены гидробиологические показатели в озерах Коргалжинское, Есей, Кокай, в водохранилищах Самарканд и Кенгир, в реках Нура, Шерубайнура, Кара Кенгир. В выбранных поверхностных водах, которые испытывают возрастающую антропогенную нагрузку, в 2017 г. были изучены видовые сообщества фитопланктона, зоопланктона, перифитона, бентоса. Составлен перечень видов фитопланктона, зоопланктона, перифитона, также бентоса, отмечены характерные особенности их распределения. Также выделены доминирующие ви-

ды фито-, зоопланктона и перифитона. Также были вычислены и сопоставлены индексы сапробности Сладечека, и дана общая экологическая оценка водоемов и водотоков. Выявлено, что изученные поверхностные воды Акмолинской и Карагандинской областей относятся к 3 классу качества воды, мезотрофные, по качеству воды β-мезосапробные. Для водных объектов бета-мезосапробной зоны Акмолинской и Карагандинской областей ценотические сообщества гидробионтов отличаются варьирующим видовым составом, который не зависит от одинаковых ландшафтных и климатических условий. Перифитонное и бентосное сообщество в реках имеет тенденцию к более высоким показателям сапробности по сравнению с другими сообществами гидробионтов: индексы сапробности по перифитону и индекс Вудивисса выше, чем индексы сапробности по фито- и зоопланктону.

Ключевые слова: сапробность, гидробионты, тест-объекты, индикаторы, зоопланктон, фитопланктон, перифитон, зообентос.

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