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## HYDROLOGICAL AND HYDROCHEMICAL CHARACTERISTICS RIVERS OF AKTOBE REGION

**Annotation.** *The article presents the results of a scientific study, which studied and evaluated the main indicators of hydrological and hydrochemical analysis of natural waters in the sections of the rivers - Ilek, Uil, Kiil, Khobda, Or, Temir, Ulkayak, Telkar in the Aktobe region for 2020. The general hydrochemical indicators of the studied reservoirs are comparable due to the similarity of the main hydrological and hydrophysical factors. For all the studied reservoirs, a neutral or slightly alkaline reaction of the environment was noted. The oxygen content in most of the studied reservoirs was within the normal range. The level of biogenic compounds is low. The concentration of ammonium nitrogen is slightly increased, which indicates the eutrophication of water bodies, probably due to the inflow of organic matter from the catchment area. As a rule, this was accompanied by a high content of dissolved organic substances, low transparency and a yellowish-greenish color of the water, indicating the rapid development of microflora. The values of water salinity corresponded to the class of fresh waters (hypohaline), with the exception of the Ulkayak River, where increased mineralization was noted. Based on hydrological and hydrochemical analysis, it was found that the natural waters of the rivers - Ilek, Uil, Kiil, Khobda, Or, Temir, Ulkayak, Telkara in the Aktobe region as a whole corresponded to the fishery category of water use. However, a number of hydrochemical indicators (reduced content of dissolved oxygen, high levels of compounds of biogenic elements and organic compounds) create the possibility of oxygen deficiency and increase the risk of freezing phenomena.*

**Keywords:** *rivers of Aktobe region; hydrological analysis; hydrochemical analysis; natural waters of the Republic of Kazakhstan; dissolved oxygen; biogenic compounds, mineralization of natural waters.*

### Introduction

The development of fisheries in the reservoirs of the Aktobe Regional Reserve Fund is important for this sector of the agro-industrial complex of the Republic of Kazakhstan, since by and large, at this stage, an increase in the total catch on a national scale is possible only as a result of the development of new reservoirs from a scientific point of view. An increase in the fish productivity of these reservoirs and an increase in fish production in them contributes to a more complete supply of the population with fish and fish products. Also, an increase in fishing volumes in reservoirs of the reserve fund helps to reduce the fishing load on fish stocks in large natural reservoirs of republican and international significance [1,2].

At present, when most of the traditional objects of fishing are in a tense state of overfishing, and the need for fish production is increasing, it becomes relevant to study the state of commercial stocks and factors affecting their formation, as well as stable reproduction. In the modern management of the fishing industry, such studies make it possible to find a more balanced



compromise between the current tasks of the fishery and its interests in the long term. In this case, the tasks of restoring and preserving valuable fish populations become a priority. This makes it possible to maintain a high level of fish productivity and natural reproduction of fishery resources, and helps to avoid the need for radical measures to drastically limit fishing [3].

Aktobe region has an extensive fund of reservoirs, which is a good prospect for the development of fisheries and aquaculture. The planned management of fisheries in reservoirs of local importance assigned to nature users is important for this branch of agriculture, on a regional scale. In the summer and autumn of 2020, we carried out comprehensive studies of the water bodies of the Aktobe region assigned to nature users. This report assesses the state of fish stocks in the sections of the rivers - Ilek, Uil, Kiil, Hobda, Or, Temir, Ulkayak, Telkara.

The purpose of our scientific study was to study and evaluate the main indicators of the hydrological and hydrochemical analysis of natural waters in the sections of the rivers - Ilek, Uil, Kiil, Hobda, Or, Temir, Ulkayak, Telkara in the Aktobe region for 2020.

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#### *Materials and research methods*

Materials for the study of the hydrological and hydrochemical analysis of natural waters in the sections of the rivers - Ilek, Wil, Kiil, Khobda, Or, Temir, Ulkayak, Telkara in the Aktobe region were collected in the autumn period (September) 2020, in accordance with the work program of the research work.

Analyzes for the values of general hydrochemical parameters (pH, permanganate oxidizability and total water hardness, dry residue) and nutrients (ammonium ions, nitrates, nitrites and phosphates) were carried out in an accredited laboratory of Oral-Zher LLP. Sampling and processing of samples were carried out in accordance with the generally accepted methodological guidelines adopted in the environmental monitoring system in Kazakhstan. [4-15].

#### *Research results*

Hydrological characteristics of the Ilek River. The length of this section of the river is 61 km. From the village of Akkemir begins a chain of vast reaches with a width of 20 to 35 m, a length of 400 to 1500 m and an average depth of 3.4-5.2 m. The reaches are interspersed with wetlands densely overgrown with reeds and reeds. Closer to the city of Alga there is an open channel up to 30 m wide and up to 5 m deep, weak flow is observed only here. The speed of water flow in low water is 0.5 m/s. The banks and the channel are composed of loose sandy-clayey mixtures. The riverbed is winding, washed out in the Tamdy-Bestamak section, and divided into separate reaches upstream. The weak flow of the reservoir downstream and the complete absence of flow upstream contribute to the occurrence of dead water phenomena and therefore it is necessary to pay constant attention to water aeration in winter.

The river Uil originates from a spring located 2.5 km south of the village of Imbek, Temir region, and flows into Lake Aktobe, the total length of the river is 800 km, within the Aktobe region 522 km. Main tributaries: the Shiyli River (left bank, 735th km, length 27km), the Dagger River (left bank, 719th km, length 64km), the Shigyrylkumdy River (right bank, 710th km, length 71km), Kumdy River (right bank, 698th km, length 57 km), Babatai River (right bank, 655th km, length 59 km), Kaindy River (right bank, 587th km, length 52 km), Kiil River (right bank, 528th km, length 193 km), Aschiuil River (left bank, 361st km, length 114 km). Most of these tributaries in the mouth sections of more than 15 drying streams (length 10-20 km, width 2-6 m) with an incision depth of 2-6 m. The hydrological regime of 1, 3, 4, 5 commercial sections of the Wil River is unstable. The low floods of recent years did not ensure the leaching and water filling of the channel.

The Kiyl River originates near the border with the Orenburg region, 34 km north of the village of Novonadezhdinsky, Khobdinsky district, from the junction of several beams (sais); flows into the river Wil on the right, at the 528th km from the mouth, 11 km south-southwest of the village of Saralzhina, Khobdinsky district. The length of the river is 193 km, the catchment area is



4720 km<sup>2</sup>. Main tributaries: Itassay rivers (left bank, 162nd km, length 20 km), Sholakmola rivers (left bank, 139th km, length 19 km), Karaganda rivers (left bank, 127th km, length 44 km), Batpakty rivers (left bank, 67th km, length 51 km), Shiyli rivers (right bank, 58th km, length 24 km). The right-bank part of the basin is heavily dissected by ravines and gullies 5-8 m deep in the upper part of the catchment and up to 3 m in the lower part. The river valley is wide (2-3 km), weakly expressed for a considerable extent. The bottom of the valley is uneven, crossed by ravines in the upper reaches (4-10 m wide at the top, 15-25 m at the approach to the river bed, 3-5 m deep with steep banks), in the lower reaches it is cut by narrow thalwegs of short temporary streams. The speed of the water flow in low water is 0.2 m/s. The hydrological regime of section 1 of the Kiil River is unstable. Due to weak spring floods, the channel is not washed. The maximum depth reaches 5 m on separate stretches. The average depth along the channel is 1.9-2.0m.

The Or river is formed by the confluence of the Shiyli (left component) and Terisbutak (right component) rivers 5 km northeast of the village of Kumsay, Alga region. It flows into the Ural River on the left, near the city of Orsk, Orenburg Region. The length of the river is 314 km, from the source of the river. Shiyli - 356 km, catchment area 18600 km<sup>2</sup>. Within the Aktobe region there is an upper and middle course of the river with a length of 200 km. Main tributaries: Aksu River (left bank, 286 km, length 72 km), Uletta River (left bank, 283 km, length 37 km), Kokpekty River (left bank, 266 km, length 44 km), Tamdy River (right bank, 229th km, length 55 km), Damde River (right bank, 224th km, length 30 km), Uysylkara River (left bank, 219th km, length 113), R. Katynadyr (left bank, 180th km, length 54 km), Mendybai River (left bank, 36th km, length 61 km). The floodplain in the upper reaches gradually widens from 0.8 to 3 km. The surface of the floodplain is indented by numerous, dry channels in summer (50-60m long, 20-30m wide, incised by 1.5-2.5m) old rivers and pits. The speed of water flow in low water is 0.3 m/s. The width of the channel is 50-60 m, and at the end of the section it expands to 120-200 m. The river has a pool character; its width varies from 5 to 80 m, prevailing 25-30 m. Depths in shallow areas are 0.5-1 m, in stretches 2-3 m, the greatest - 5-6 m. The hydrological regime of the river is not stable. The maximum depth here reaches 3 m in some deep water areas.

The Bolshaya Khobda River is formed by the confluence of the Karakhobda (right component) and Sarykhobda (left component) rivers 5 km northeast of the village of Koksay, Khobdinsky District, flows into the Ilek River on the left near the village of Pokrovki, Orenburg Region. In the estuary section, it flows for 14 km along the border of Aktobe and Orenburg regions. The length of the river is 225 km. Main tributaries: Tersakkan river (right bank, 188th km, length 63 km), Saukain river (left bank, 176th km, length 46 km), Tamdy river (right bank, 112th km, length 20 km), river Mal. Khobda (right bank, 35th km, length 116 km), Ishkargan river (left bank, 24th km, length 66 km). The Tersokkan and Malaya Khobda rivers have a constant flow, in the other tributaries the flow occurs only in spring, and in summer they break into short reaches, the water in which is often stored throughout the year (Saukain River). The riverbed is winding. The channel width varies from 15-40m to 200-250m. The width of the water stream is 20-30m. Depths are uneven: on rifts 0.4-0.8m, on short stretches 2-3m, in some places up to 5-6m. The hydrological regime is relatively stable due to constant flow. At the same time, the risk of blockages is quite high. The speed of water flow in low water is 0.3 m/s.

The Temir River has practically dried up above the Temir village and is a swampy overgrown river valley. From the village of Sagashili and further to the village of Kenkiyak, the water content is noticeably better. This section of the river is a chain of extensive reaches with a width of 20 to 30 m, a length of 300 to 1000 m and an average depth of 3.3-4.7 m. The weak flow of the reservoir downstream and the complete absence of flow upstream contribute to the occurrence of dead water phenomena and therefore it is necessary to pay constant attention to water aeration in winter. Thickets of trees and shrubs are occasionally found on the banks and floodplain terrace of the river. The overgrowing of the river channel with higher hard vegetation (reeds, reeds) is about 50% of the water area. Submerged aquatic vegetation (pondweed, hornwort) occupies up to



10% of the water area. Thus, the reservoir is characterized by a rather high overgrowth. The speed of the water flow in low water is 0.2 m/s.

The Ulkayak River flows within the drainage basin of the Turgai River. The sources of the river are located in the Kostanay region. At present, the upper course of the river is regulated due to the water management needs of large industrial centers in the north-west of the Kostanay region. The Ulkayak River flows into the system of the Irgiz-Turgay lakes in the southeast of the Aktobe region. The first in the chain of lakes is Lake Kyzylkol. The regulation of the river in the upper reaches greatly affected the water content of the river. So, on the territory of the Aktobe region, with the exception of the last 10-12 km, the river is a rare chain of small reaches. Only during the period of spring snowmelt does the river fill for a short time, as evidenced by the slight overgrowth of vegetation in the water-free sections of the channel. Insufficient water supply also affected the reservoirs fed by the Ulkayak River. At the ten-kilometer pre-estuary section, the hydrological conditions are quite stable. Depths here are on average 3 m. The coastal strip, due to the steep nature of the coast, is insignificant and ends abruptly.

The Telkara River is a right-bank tributary of the Torgai River. The river itself is formed at the confluence of the smaller rivers Zhaksa Telkara and Zhaman Telkara. The mouth of the river is located in the vicinity of the village. Nura, Irgiz region. The length of the river is 61 km. The tortuosity coefficient of the channel is 1.53, which characterizes it as a very tortuosity. The river is fed mainly by snow, however, given that the level of the river is very stable, there is a significant recharge from groundwater. The survey of the reservoir took place in changeable weather. The air temperature was +23-+33°C. A western and north-western wind was blowing at a speed of 3-6 m/s. The water temperature near the surface was 23-24°C, and in the bottom layers it was 19°C. The river flows in a very deep hollow. The average width of the river was 30m. The average depth was 5m, but there are areas with depths up to 13m.

Scientific management of fisheries with hydrochemical analysis of natural waters in such reservoirs is important for the conservation and development of the ichthyofauna.

In 2020, the depth of the Kiil River at sampling sites varied from 3 to 5 m, with an average of 3 m. The transparency of the water in the river varied from 1.3 to 1.5 m, averaging 1.4 m. The water temperature during the survey in the surface layer was 23.3°C, in the near-bottom area 12.6°C. The oxygen content at the surface was satisfactory 7.3 mg/dm<sup>3</sup>.

The depth of the Wil River in 2020 at sampling sites varied from 4 to 7 m, with an average of 5 m. The transparency of the water in the river varied from 1.1 to 1.5 m, averaging 1.3 m. The water temperature was 25 0°C in the surface layer, in the near-bottom area 12.4°C. The oxygen content of this reservoir was generally satisfactory and amounted to 7.3 mg/dm<sup>3</sup>.

The Bolshaya Khobda River, in 2020 near the village of Zharyk, at the sampling sites, the depth varied from 3 to 4 m. The transparency of river water is up to 1.5 m. The water temperature during the survey in the surface layer was 27.6°C, in the near-bottom region 13.0°C. The value of total mineralization on the Bolshaya Khobda River reaches the lowest value among the studied rivers and amounted to 445.0 mg/dm<sup>3</sup>. The value of the active reaction (pH) in the waters of the reservoir for 2020. was within the normal range - 8.26.

The depth of the Or River at sampling sites reached up to 5 m. The transparency of the water in the river was 1.2 m. The water temperature during the survey in the surface layer was 15.5°C, in the near-bottom area 15.2°C. The oxygen content at the surface was satisfactory - 6.3 mg/dm<sup>3</sup>.

In 2020, the depth of the Temir River at sampling sites varied from 5 to 7.0 m. The transparency of the river water is 1.3m. The water temperature during the survey in the surface layer was 23.1°C, in the near-bottom area 17.7°C. The value of the active reaction (pH) in the waters of the reservoir for 2020. was within the normal range - 8.11. His other results are presented in the table 1.

Table 1 - Results of hydrochemical analysis of natural waters from fixed fishery areas of the rivers of the Aktobe region, 2020

Water	pH	Dissolved gases, mg/dm <sup>3</sup>	Biogenic compounds, mg/dm <sup>3</sup>				Organic matter, mg equiv. O/dm <sup>3</sup>	Mineralization of water, mg/dm <sup>3</sup>
			O <sub>2</sub>	NH <sub>4</sub>	NO <sub>3</sub>	NO <sub>2</sub>		
r.Kiyl	8,03	7,3	1,4	8,7	0,040	0,07	11,2	3175,0
r.Will	8,13	7,3	He обн.	7,8	He обн.	0,26	10,4	1785,0
r.B.Khobda	7,95	6,3	0,25	7,0	0,14	0,28	2,8	445,0
R. Or	8,26	6,3	6,65	1,25	0,075	0,48	13,6	1635,0
r. Temir	8,11	3,8	1,4	2,8	He обн.	0,04	9,2	985,0
r. Ilek	8,27	6,2	2,8	4,10	0,027	0,80	12,0	1295,0
Ulkayak r.	7,8	6,8	7,0	0,50	He обн.	0,30	24,4	7005,0
Telkara r.	7,44	6,0	3,15	0,25	0,005	0,05	5,2	810,0
MPC	6,5-8,5	≥6,0	<2,0	<45,0	<3,3	<1,0	<35,0	<2000

The depth in the studied section of the Ilek River near the village of Tamdy at the sampling sites varied from 3 to 5 m. The transparency of river water varied from 0.5 to 0.6 m. The water temperature during the survey in the surface layer was 22.8°C, in the near-bottom area 19.0°C. The oxygen content at the surface was satisfactory - 6.2 mg/dm<sup>3</sup>.

The depth in the studied section of the Ulkayak River near the settlement of Duken at the sampling sites varied from 2 to 4 m. The transparency of river water varied from 0.5 to 0.6 m. The water temperature during the survey in the surface layer was 19.8°C, in the bottom layer 18.5°C. The oxygen content at the surface was satisfactory (67% saturation).

At the time of sampling the Telkara River, the water temperature was 22-24°C in the surface layer, and 18-19°C in the bottom layer. The transparency of the water at the mouth was low - up to 0.5 m, and upstream the river - high, up to 2 m. Such a significant difference is most likely due to the fact that the pre-estuary section is dominated by the waters not of the Telkara proper, but of the Torgai River. The oxygen content near the surface was satisfactory (81% saturation).

The general hydrochemical indicators of the table of the studied reservoirs are comparable due to the similarity of the main hydrological and hydrophysical factors. For all the studied reservoirs, a neutral or slightly alkaline reaction of the environment was noted. The oxygen content in most of the studied reservoirs was within the normal range. The level of biogenic compounds is low. The concentration of ammonium nitrogen is slightly increased, which indicates the eutrophication of water bodies, probably due to the inflow of organic matter from the catchment area. As a rule, this was accompanied by a high content of dissolved organic substances, low transparency and a yellowish-greenish color of the water, indicating the rapid development of microflora. The probable reason for this is the degradation of organic matter that entered the water bodies from the catchment area during the flood period. The values of water salinity corresponded to the class of fresh waters (hypohaline), with the exception of the Ulkayak River, where increased mineralization was noted.

#### Conclusion

Based on the results of hydrological and hydrochemical analysis, it was found that the natural waters of the rivers - Ilek, Uil, Kiil, Khobda, Or, Temir, Ulkayak, Telkara in the Aktobe region as a whole corresponded to the fishery category of water use. However, a number of hydrochemical indicators (reduced content of dissolved oxygen, high levels of compounds of



biogenic elements and organic compounds) create the possibility of oxygen deficiency and increase the risk of congestion.

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АҚТӨБЕ ОБЛЫСЫ ӨЗЕНДЕРІНІҢ ГИДРОЛОГИЯЛЫҚ ЖӘНЕ  
ГИДРОХИМИЯЛЫҚ СИПАТТАМАСЫ**

**Аңдатпа.** Мақалада 2020 жылы Ақтөбе облысы бойынша Елек, Ойыл, Киіл, Қобда, Ор, Темір, Ұлқаяқ, Телқара өзендерінің учаскелеріндегі табиғи суларды гидрологиялық және гидрохимиялық талдаудың негізгі көрсеткіштерін зерттеу және бағалау жүргізілген ғылыми зерттеу нәтижелері келтірілген. Зерттелетін су объектілерінің жалпы гидрохимиялық көрсеткіштері негізгі гидрологиялық және гидрофизикалық факторлардың ұқсастығына байланысты салыстырылады. Зерттелген барлық су объектілері үшін ортаның бейтарап немесе сәл сілтілі реакциясы байқалды. Зерттелген су объектілерінің көпшілігінде оттегі мөлшері қалыпты шектерде болды. Биогендік қосылыстардың деңгейі төмен. Аммоний азотының концентрациясы біршама жоғарылайды, бұл су қоймаларының эвтрофиясын көрсетеді, мүмкін су жинау аймағынан Органикалық заттардың түсуіне байланысты. Әдетте, бұл еріген органикалық заттардың көп мөлшерімен, мөлдірлігінің төмендігімен және судың сарғыш-жасыл түсімен бірге жүрді, бұл микрофлораның қарқынды дамуын көрсетті. Судың минералдану мәндері минералданудың жоғарылауы байқалған Ұлқаяқ өзенінен басқа Тұщы су класына (гипогалинді) сәйкес келді. Гидрологиялық және гидрохимиялық талдау негізінде Ақтөбе облысы бойынша Елек, Ойыл, Киіл, Қобда, Ор, Темір, Ұлқаяқ, Телқара өзендерінің табиғи сулары жалпы су пайдаланудың балық шаруашылығы санатына сәйкес келетіні анықталды. Алайда бірқатар гидрохимиялық көрсеткіштер (еріген оттегінің төмендеуі, биогендік элементтер мен органикалық қосылыстардың қосылыстарының жоғары деңгейі) оттегінің жетіспеушілігін тудырады және шетелдік құбылыстардың қаупін арттырады.

**Кілтсөздер:** Ақтөбе облысының өзендері; гидрологиялық талдау; гидрохимиялық талдау; ҚР Табиғи сулары; еріген оттегі; биогендік қосылыстар, табиғи сулардың минералдануы.

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ГИДРОЛОГИЧЕСКАЯ И ГИДРОХИМИЧЕСКАЯ ХАРАКТЕРИСТИКА  
РЕК АКТЮБИНСКОЙ ОБЛАСТИ**

**Аннотация.** В статье представлены результаты научного исследования, где проведено изучение и оценка основных, показателей гидрологического и гидрохимического анализа природных вод на участках рек – Илек, Уил, Киил, Хобда, Ор, Темир, Улькаяк, Телькара по Актюбинской области за 2020 год. Общие гидрохимические показатели изучаемых водоемов сравнимы ввиду сходности основных гидрологических и гидрофизических факторов. Для всех исследованных водоёмов была отмечена нейтральная или слабощелочная реакция среды. Содержание кислорода в большинстве исследованных водоёмах было в пределах нормы. Уровень биогенных соединений невысокий. Несколько повышена концентрация аммонийного азота, это свидетельствует об эвтрофировании



водоёмов, вероятно обусловленным поступлением органики с площади водосбора. Как правило, этому сопутствовало высокое содержание растворённых органических веществ, низкая прозрачность и желтовато-зеленоватый цвет воды, свидетельствующий о бурном развитии микрофлоры. Значения минерализации воды соответствовали классу пресных вод (гипогалинных), за исключением реки Улькайяк, где отмечалась повышенная минерализация. На основании гидрологического и гидрохимического анализа было установлено, что природные воды рек - Илек, Уил, Кишл, Хобда, Орь, Темир, Улькайяк, Телькара по Актюбинской области в целом соответствовали рыбохозяйственной категории водопользования. Однако ряд гидрохимических показателей (пониженное содержание растворённого кислорода, высокий уровень содержания соединений биогенных элементов и органических соединений) создают возможность дефицита кислорода и повышают риск заморных явлений.

**Ключевые слова:** реки Актюбинской области; гидрологический анализ; гидрохимический анализ; природные воды РК; растворённый кислород; биогенные соединения, минерализация природных вод.