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M.T. Berliguzhin*, E.H. Zhaksylykov

M. Utemisov West Kazakhstan University, Uralsk, Kazakhstan
**Corresponding author: 88_max_88.88@inbox.ru*

Geochemical state of small rivers of Syrym District of West Kazakhstan region (on the example of the Rivers Buldyrty, Yesenankaty, Shiderty, Olenty)

Despite the fact that small rivers are called Small, their importance in terms of ecology is high. This is because the condition of large rivers will depend on smaller rivers. The degradation of small rivers negatively affects the state, is an important and urgent task. The purpose of the study was to geochemically analyze the composition of the waters of small rivers in the Syryms district and assess their quality. Water samples were taken from each river ecological state of medium and large rivers, because they feed at the expense of these small rivers. It is easy to see that every day the waters of these rivers are receding and the banks are expanding. Currently, one of the main tasks that environmental science sets for itself is to monitor the ecological state of water bodies. In connection with the conditions of increasing anthropogenic factors, determining the ecological state of small rivers plays an important role in maintaining the composition of the natural ecosystem. Small rivers are very sensitive to anthropogenic factors and react to these factors in the opposite way. The study of the chemical composition of small river waters, as well as their ecological state, is an important and urgent task. The aim of the study is a geochemical analysis of the composition of small river waters in the Syrymsky district and an assessment of their quality. Water samples were taken from each river to determine the composition of the water quality. The cameral stage was held in the laboratory of environmental and biogeochemical testing of M. Utemisov West Kazakhstan University. Chemical analysis was carried out using the widely used methods GOST 26449.1 — 85. After analyzing the indicators of water samples taken from the research area, it was found that the maximum raual concentration level did not exceed, except for the total hardness.

Keywords: small river, ecological situation, Buldyrty River, Shiderty River, Olenty River, Yesenankaty River, Water Resources, anthropogenic factor, chemical analysis.

Introduction

Water-occupies 71 % of the globe. Of these, 98 % is accounted for by the oceans and seas, and only 0.46 % by fresh waters (lakes, rivers, swamps). 150,000 animal species (7 % of the total animal species) and 10,000 plant species (8 %) live in the aquatic environment. Water resources of Kazakhstan include: groundwater, glaciers, waters of the Caspian and Aral Seas on the border of Kazakhstan, rivers, lakes, ponds, reservoirs, etc. [1, 2]. And of the water arteries in the Republic of Kazakhstan, 85,022 rivers are formed. 84694 of them are up to 100 km long, 305 — 500 km long, 23 — 1000 km long. As we can see, most of the flowing rivers in Kazakhstan belong to small, even very small ones. They, like blood vessels, mesh the entire territory of Kazakhstan.

There are more than 200 rivers on the territory of the West Kazakhstan region. 65 of them are those that almost completely dry up by the end of the summer months. Most rivers do not have a channel of 10 km. Therefore, they are classified as small rivers. Small rivers also flow in the syrym district. The largest of them are the Buldyrty, Olenty, Yesenankaty, Shiderty rivers.

Buldyrty is a river in the Ural Basin. 1 km north-west of the village of Aksuat in the Syrym District of the West Kazakhstan region. From the confluence of the bylylkandyk and Zhosaly Springs, it is called Buldyrty, in the south it flows into Lake Zhaltyrkol. The length is 195 km, the catchment area is 4660 km^2. There are 8 tributaries with a total length of 258 km. The main tributaries: Shildi, Tamdy, Zhympity. The average annual water flow is 1.6 m^3/s (in the village of Abay). From the source to the village of Elmash, the river valley has a very steep slope (up to 20 m high). In some places, sand dunes stretch along its banks. The total volume of water in the basin of the buldyrty River is 0.85 million tons. 6 ponds with an area of m^3 are built. Water is used for irrigation of Meadows.

The Olenty river-crosses the middle part of the Syrym district (229 km long, of which 163 km are located just above the current of the right tributary of the Ashchysai — Olenty rivers, its area to the southern border flows within the district). It originates from the koltaban within the large floodplain of the Ural

plateau, located within the slightly undulating plain of the Cretaceous Basin. The main tributaries: Shiderty, Shkaty, Karmyssay, Marsh.

The Shiderty river plays a significant role as the largest tributary of the Olenty river, which originates among a group of separate Hills on the Ural plateau. The upper reaches of the river are 10 km from the source, ends on the ground and its fall height will be 21 meters. In the upper reaches of the plain of the Shiderty River, the V-shaped floodplain is not clear. In the middle and lower reaches, the intermittent floodplain moves from one bank to another. Floodplain sections have a length of no more than 300 meters and a width of up to 50 meters. The channel matures well, deepening to 8–15 meters. The collar is straight, sometimes drooping. The channel is characterized by deep bends, shallow water parts between them. The banks of the estuaries are low and the flat channel is shallow, in some places it dries up in summer. The outflow of groundwater is fragmented, accumulating mainly in the middle reaches. The bottom is muddy with sand, the spinners are muddy. In the upper and lower reaches there are formations of calcareous gravel and small toadstools.

Yesenankaty-lies in the north-west of Syrym District (total length 127 km., 77 km in the area). Its head is located on the right slope of the Ural plateau 8 km northeast of the village of Red Banner., Akkudyksai (left length 17 km.) and cover (right length 13 km. it is located at the confluence of the ravines), and in the West, in the village of Araltobe, it reaches the boundaries of the district. The floodplain, which stretches from the beginning to the village of Araltobe, is intermittent and moves from one bank to another. The main industries: Isandybulak, Yerubai, Tanas, Kuperanqaty [3].

Despite the fact that small rivers are called Small, their importance in terms of ecology is great. This is because the condition of large rivers will depend on smaller rivers. The degradation of small rivers negatively affects the ecological state of medium and large rivers, because they feed at the expense of these small rivers [4]. It is easy to see that every day the waters of these rivers are receding and the banks are expanding. Currently, one of the main tasks that environmental science sets for itself is to monitor the ecological state of water bodies. In connection with the conditions of increasing anthropogenic factors, determining the ecological state of small rivers plays an important role in maintaining the composition of the natural ecosystem. Small rivers are very sensitive to anthropogenic factors and respond to these factors in a negative way [5–7].

The main scientific and practical interest is to determine the ecological state of the water quality of these rivers. Currently, the study of small rivers is not fully considered, since not all methodologies for monitoring the ecological state of these rivers have been prepared. Protection of nature and protection of water resources from harmful waste due to lack of information, creating difficulties in research [8].

One of the main, fundamental principles of environmental monitoring is complexity. Monitoring programs consist in monitoring the environment, identifying pollutants by chemical methods, as well as biota response to anthropogenic factors. The diversity of hydrobinotes and their relationship with each other, with the environment, their response to various anthropogenic influences, all this gave rise to many natural water bodies assessment methodologies [9, 10].

Concern about the chemical and environmental condition of surface waters is growing worldwide. Many studies have been devoted to the development of integrated strategies for the protection of small river watersheds in order to improve the ecological condition of the surrounding landscapes and the quality of river waters [11–13]. To assess the quality of natural waters, there is a certain number of parameters by which the degree of pollution is determined [14].

The study of the chemical composition of the waters of small rivers, as well as their ecological state, is an important and urgent task. The purpose of the study was to geochemically analyze the composition of the waters of small rivers in the Syrym district and assess their quality.

Materials and Methods

The assessment of the ecological and chemical state of small rivers in the Syrym district was carried out based on the results of studies carried out in the summer in 2023. The water quality was assessed in accordance with the established sanitary rules and norms for the protection of surface waters from pollution for reservoirs of two categories — reservoirs for fishery purposes and reservoirs for drinking and cultural purposes.

During the study period, a total of 12 water samples were taken in order to determine the chemical and ecological state of the waters of this river. The sampling was carried out in accordance with the requirements of GOST 31861–2012 “Water. General requirements for sampling”. To determine the composition of water quality, water samples were taken from each river (Buldyrty, Olenty, Shiderty, Yesenankaty) at points № 1

near the route, № 2 near the village, № 3 near the steppe. The cameral stage was held in the laboratory of environmental and biogeochemical testing of M. Utemisov West Kazakhstan University. Chemical analysis was carried out using widely used GOST methods.

According to GOST 26449.1–85, carbonate, bicarbonate, chloride ions in the composition of water samples were determined by the method of titration of total hardness, ph by the device pH-meter I — 150, and when determining copper, iron, nickel, lead, sulfate ions by the method of photoelectrocolorimeter.

Results and Discussion

Chemical analysis of water samples taken from high Rivers was carried out and the results of the study were obtained. The results of the study obtained were shown in Tables 1–5, respectively.

Table 1

Indicators of water samples taken from the Buldyrty River

Received Point	Total hardness (mmol/dm^3)	SO_4^{2-} (mg/dm^3)	CL^- (mg/dm^3)	pH	CO_3^{2-} (mg/dm^3)	HCO_3^- (mg/ m^3)	Pb^{2+} (mg/l)	Cu^{2+} (mg/l)	Ni^{2+} (mg/l)	Fe^{2+} (mg/l)
№ 1	9.4	349.7	149.1	8.01	72	463	0.01	0.77	0.08	0.19
№ 2	9	371	163.3	8.04	60	561.2	0.008	0.75	0.072	0.12
№ 3	6,4	283,1	156.2	7.8	36	280.6	0.007	0.56	0.063	0.1
Average value	8.3	334.6	156.2	7.95	56	434.9	0.008	0.69	0.072	0.14
MPC	7–10	500	350	6–9	-	-	0.03	1	0.1	0.3

As for the indicators of water samples taken from the Buldyrty River, the total hardness in the sample № 1 is equal to 9.4 mmol/3, № 2 — 9 mmol/ dm3, № 3 — 6.4 mmol/ dm3, MPC (7–10 mmol/ dm3). Sulfate ion in sample № 1 — equal to 349.7 mg/ dm3, № 2 — 371 mg/ dm3, № 3 — 283.1 mg/ dm3, MPC (500 mg/ dm3). Chloride ion in sample № 1 — equal to 149.1 mg/ dm3, № 2 — 163.3 mg/ dm3, № 3 — 156.2 mg/ dm3, MPC (350 mg/ dm3). The pH of the sample № 1 is equal to 8.01, № 2 is equal to 8.04, № 3 is equal to 7.8, does not exceed the MPC(6–9). The carbonate ion in sample № 1 is equal to 72 mg/ dm3, № 2 — 60 mg/ dm3, № 3 — 36 mg/ dm3. The bicarbonate ion in the sample № 1 is equal to 463 mg/ dm3, № 2 — 561.2 mg/ dm3, № 3 — 280.6 mg/ dm3. Lead ion in sample № 1 — 0.01 mg/l, № 2 — 0.008 mg/l, № 3 — 0.007 mg/l, MPC (0.03 mg/l). Copper ion in sample № 1 — 0.77 mg/l, № 2 — 0.75 mg/l, № 3 — 0.56 mg/l, no more than MPC (1 mg/l). Nickel ion in sample № 1 — 0.08 mg/l, № 2 — 0.072 mg/l, № 3 — 0.063 mg/l, MPC (0.1 mg/l). Iron ion in sample № 1 — 0.19 mg/l, № 2 — 0.12 mg/l, № 3 — 0.1 mg/l, MPC (0.3 mg/l).

Table 2

Indicators of water samples taken from the Olenty River

Received Point	Total hardness (mmol/dm3)	SO_4^{2-} (mg/ dm^3)	CL^- (mg/ dm^3)	pH	CO_3^{2-} (mg/ dm^3)	HCO_3^- (mg/ dm^3)	Pb^{2+} (mg/l)	Cu^{2+} (mg/l)	Ni^{2+} (mg/l)	Fe^{2+} (mg/l)
№ 1	17	404.2	355	7.92	84	207	0.017	0.82	0.09	0,2
№ 2	15	386	426	7.86	72	183	0.01	0.71	0.087	0.17
№ 3	13	350	203	7.74	68	170.8	0.009	0.7	0.08	0.13
Average value	15	380	328	7.84	74.7	186.9	0.012	0.74	0.085	0.16
MPC	7–10	500	350	6–9	-	-	0.03	1	0.1	0.3

As for the indicators of water samples taken from the Olenty River, the total hardness is equal to mmol/ dm3 in sample № 1, mmol/ dm3 № 2, mmol/dm3 № 3 — 13 mmol/ dm3, MPC (7–10 mmol / dm3). Sulfate ion in sample № 1 — equal to 404.2 mg/ dm3, № 2 — 386 mg/ dm3, № 3 — 350 mg/ dm3, MPC (500 mg/ dm3). Chloride ion in sample № 1 is equal to 355 mg/ dm3, № 2 — 426 mg/ dm3, № 3 — 203 mg/ dm3, samples № 1, № 2 are higher than MPC (350 mg/ dm3). pH in sample № 1 is equal to 7.92,

№ 2 is equal to 7.86, № 3 is equal to 7.74, does not exceed the MPC (6–9). The carbonate ion in sample № 1 is equal to 84 mg/ dm3, № 2 — 72 mg/ dm3, № 3 — 68 mg/ dm3. The bicarbonate ion in sample № 1 is equal to 207 mg/ dm3, № 2 — 183 mg/ dm3, № 3 — 170.8 mg/ dm3. Lead ion in sample № 1 — 0.017 mg/l, № 2 — 0.01 mg/l, № 3 — 0.009 mg/l, MPC (0.03 mg/l). Copper ion in sample № 1 — 0.82 mg/l, № 2 — 0.71 mg/l, № 3 — 0.7 mg/l, no more than MPC (1 mg/l). Nickel ion in sample № 1 — equal to 0.09 mg/l, № 2 — 0.087 mg/l, № 3 — 0.08 mg/l, does not exceed MPC (0.1 mg/l). The Iron ion in sample № 1 is equal to 0.2 mg/l, № 2 — 0.17 mg/l, № 3 — 0.13 mg/l, does not exceed MPC (0.3 mg/l).

Table 3

Indicators of water samples taken from the Shiderty River

Received Point	Total hardness (mmol/dm^3)	SO_4^{2-} (mg/ dm^3)	CL^- (mg/ dm^3)	pH	CO_3^{2-} (mg/ dm^3)	HCO_3^- (mg/ dm^3)	Pb^{2+} (mg/l)	Cu^{2+} (mg/l)	Ni^{2+} (mg/l)	Fe^{2+} (mg/l)
№ 1	9.2	327.1	85.2	7.75	48	305	0.01	0.71	0.083	0.17
№ 2	6.4	318.9	78.1	7.74	36	256	0.009	0.68	0.076	0.12
№ 3	5.8	253.7	71	7.7	24	183	0.006	0.59	0.061	0.1
Average value	7.1	299.9	78.1	7.73	36	248	0.008	0.66	0.073	0.13
MPC	7–10	500	350	6–9	-	-	0.03	1	0.1	0.3

As for the indicators of water samples taken from the Shiderty River, the total hardness in the sample № 1 is equal to mmol/ dm3, № 2 — mmol/dm3, № 3 — mmol/dm3, MPC (7–10 mmol/dm3). Sulfate ion in sample № 1 — equal to 327.1 mg/ dm3, № 2 — 318 mg/ dm3, № 3 — 253.7 mg/ dm3, MPC (500 mg/ dm3). Chloride ion in sample № 1 — equal to 85.2 mg/ dm3, № 2 — 78.1 mg/ dm3, № 3 — 71 mg/ dm3, MPC (350 mg/ dm3). pH in sample № 1 — 7.75, № 2 — 7.74, № 3 — 7.7, no more than MPC (6–9). The carbonate ion in sample № 1 is equal to 48 mg/ dm3, № 2 — 36 mg/ dm3, № 3 — 24 mg/ dm3. Hydrocorbanate ion in sample № 1 — equal to 305 mg/ dm3, № 2 — 256 mg/ dm3, № 3 — 183 mg/ dm3. Lead ion in sample № 1 — 0.01 mg/l, № 2 — 0.009 mg/l, № 3 — 0.006 mg/l, MPC (0.03 mg/l). Copper ion in sample № 1 — equal to 0.71 mg/l, № 2 — 0.68 mg/l, № 3 — 0.59 mg/l, does not exceed MPC(1 mg/l). Nickel ion in sample № 1 — equal to 0.71 mg/l, № 2 — 0.68 mg/l, № 3 — 0.59 mg/l, does not exceed MPC (0.1 mg/l). Iron ion in sample № 1 — 0.17 mg/l, № 2 — 0.12 mg/l, № 3 — 0.1 mg/l, MPC (0.3 mg/l).

Table 4

Indicators of water samples taken from the Yesenankaty River

Received Point	Total hardness (mmol/dm^3)	SO_4^{2-} (mg/ dm^3)	CL^- (mg/ dm^3)	pH	CO_3^{2-} (mg/ dm^3)	HCO_3^- (mg/ dm^3)	Pb^{2+} (mg/l)	Cu^{2+} (mg/l)	Ni^{2+} (mg/l)	Fe^{2+} (mg/l)
№ 1	10,8	402,3	241	7,75	120	378,2	0,012	0,8	0,09	0,19
№ 2	10	378,1	208,3	7	84	207,4	0,01	0,76	0,083	0,14
№ 3	9,4	363,3	149,1	6,83	78	204,5	0,009	0,61	0,059	0,01
Average value	10,1	381,2	199,4	7,2	94	263 ,4	0,01	0,72	0,08	0,11
MPC	7–10	500	350	6–9	-	-	0,03	1	0,1	0,3

As for the indicators of water samples taken from the yesenankaty River, the total hardness is equal to 10.8 mmol/ dm3 in sample № 1, № 2 — 10 mmol/ dm3, № 3 — 9.4 mmol/ dm3, and MPC(7–10 mmol/ dm3) in sample № 1. Sulfate ion in sample № 1 — equal to 402 mg/ dm3, № 2 — 378.1 mg/ dm3, № 3 — 363.3 mg/ dm3, MPC (500 mg/ dm3). Chloride ion in sample № 1 — equal to 241 mg/ dm3, № 2 — 208.3 mg/ dm3, № 3 — 149.1 mg/ dm3, MPC (350 mg/ dm3). pH in sample № 1 is equal to 7.75, № 2 is equal to 7, № 3 is equal to 6.83, does not exceed the MPC (6–9). The carbonate ion in sample № 1 is equal to 120 mg/ dm3, № 2 — 84 mg/ dm3, № 3 — 78 mg/ dm3. The bicarbonate ion in sample № 1 is equal to 378.2 mg/ dm3, № 2 — 207.4 mg/ dm3, № 3 — 204.5 mg/ dm3. Lead ion in sample № 1 — 0.012 mg/l, № 2

— 0.01 mg/l, № 3–0.009 mg/l, MPC (0.03 mg/l). Copper ion in sample № 1 — equal to 0.8 mg/l, № 2 — 0.76 mg/l, № 3 — 0.61 mg/l, does not exceed MPC(1 mg/l). Nickel ion in sample № 1 — equal to 0.09 mg/l, № 2 — 0.083 mg/l, № 3 — 0.059 mg/l, does not exceed MPC (0.1 mg/l). Iron ion in sample № 1 — 0.19 mg/l, № 2 — 0.14 mg/l, № 3 — 0.01 mg/l, MPC (0.3 mg/l).

Table 5

Average indicators of water samples taken from the Rivers Buldyrty, Olenty, Shiderty, Yesenankaty

River	Total hardness (mmol/dm^3)	SO_4^{2-} (mg/ dm^3)	CL^- (mg/ dm^3)	pH	CO_3^{2-} (mg/ dm^3)	HCO_3^- (mg/ dm^3)	Pb^{2+} (mg/l)	Cu^{2+} (mg/l)	Ni^{2+} (mg/l)	Fe^{2+} (mg/l)
Buldyrty	8,3	334,6	156,2	7,95	56	434,9	0,008	0,69	0,072	0,14
Olenty	15	380	328	7,84	74,7	186,9	0,012	0,74	0,085	0,16
Shiderty	7,1	299,9	78,1	7,73	36	248	0,008	0,66	0,073	0,13
Yesenankaty	10,1	381,2	199,4	7,2	94	263,4	0,01	0,72	0,08	0,11
MPC	7–10	500	350	6–9	-	-	0,03	1	0,1	0,3

Comparing the indicators of water samples taken from the rivers Buldyrty, Olenty, Shiderty, Yesenankaty, we can conclude that the total hardness is higher than that of the Olenty River — 15 mmol/dm3, the MPC is higher than 5 mmol/ dm3, the lower content is 7.1 mmol/ dm3. A high sulfate ion content was recorded in water samples from the Yesenankaty River (381.2 mg/ dm3), a lower content in the Shiderty River — 299.9 mg/ dm3. The high content of chloride ion is 328 mg/ dm3 in the Olenty River, the lower content is 78.1 mg/ dm3 in the Shiderty River. The high pH of the river is 7.95, the low pH of the river is 7.2. The high content of carbonate ions in the Yesenankaty River is 94 mg/ dm3, the lower content in the Shiderty River is 36 mg/ dm3. The high content of the bicarbonate ion in the turbid River is 434.9 mg/ dm3, the low content in the Olenty River is 186.9 mg/ dm3. The high content of lead ions in the river of poetry is 0.012 mg/l, the low content of the river of poetry is 0.008 mg/l. the high content of copper ions in the river of poetry is 0.74 mg/l, the low content of the river of poetry is 0.66 mg/l. the high content of nickel ions in the river of poetry is 0.085 mg/l, the low content in the river of poetry is 0.072 mg/l. The high content of iron ions in the river Olenty is 0.16 mg/l, the low content in the river Yesenankaty is 0.11 mg/l.

Conclusion

After analyzing the indicators of water samples taken from the research area, we found that the total hardness did not exceed the MPC level, except for the size. Comparing the indicators of water samples of the studied small rivers of the Syrym district, we can conclude that the content of the Olenty River (carbonate, bicarbonate, chloride ion, ph, copper, iron, nickel, lead, sulfate ions) is much higher than the indicators of water samples of the remaining rivers. This suggests that the ecological situation of the Olenty River is more dangerous than the turbid, Shiderty and Yesenankaty rivers.

References

1 Достайұлы Ж. Жалпы гидрология / Ж. Достайұлы. — Алматы, «Білім», 1996. — 247 б.

2 Қуатбаев А.Т. Жалпы экология / А.Т. Қуатбаев — Алматы, ЖШС РПБК «Дәуір», 2012. — 342 б.

3 Батыс Қазақстан облысының тарихи-мәдени және табиғат мұралары ескерткіштері = Памятники природного и историко-культурного наследия Западно-Казахстанской области [14 т.] // Жалпы ред. басқ. М.Н. Сдыков. — Орал, 2006. — II т. Сырым ауданы / Сырымский район. — 320 б.

4 Онаев М.К. Гидрохимический режим реки Урал и ее притоков / М.К. Онаев // Поиск — Ізденіс. — 2011. — № 3. — С. 75–79.

5 Ребрик И.М. О воде и водоемах / И.М. Ребрик // Экологическое образование Казахстана. — 2005. — С. 33–34.

6 Спенглер О.А. Слово о воде / О.А. Спенглер. — Л.: Наука, 1980. — 173 с.

7 Янчук М.С. Геохимические особенности и экологическое состояние малых рек Приангарья (на примере рек Боханского района) / М.С. Янчук // Изв. Иркут. гос. ун-та. Сер. Науки о Земле. — 2018. — Т. 26. — С. 125–138. https://doi.org/10.26516/2073–3402.2018.26.125

8 Guidelines for drinking-water quality //Recommendations // 3rd edition. — Geneva. — WHO. — 2008. — Vol. 1. — 140 p.

9 Новиков Ю.В. Практическое руководство по комплексному исследованию экологического состояния малых рек / Ю.В. Новиков, М.М. Сайфутдинов. — Тула: Наука, 2001. — 302 с.

10 Пугал Н.А. Комплексное исследование реки / Н.А. Пугал, И.Д. Зверев, В.Н. Лаврова // Газета «Биология». — 1995. — № 34. — С. 12–14.

11 Beman J.M. Agricultural runoff fuels large phytoplankton blooms in vulnerable areas of the ocean / J.M. Beman, K.R. Arrigo, P.A. Matson // Nature. — 2005. — № 434. — P. 211–214. https://doi.org/10.1038/nature03370

12 Boyer E.W. Riverine nitrogen export from the continents to the coasts / E.W. Boyer, R.W. Howarth, J.N. Galloway, F.J. Dentener, P.A. Green, C.J. Vorosmarty // Global Biogeochemical Cycles. — 2006. — 20 p.

13 Jordan P. Technical Note: Assessing a 24/7 solution for monitoring water quality loads in small river catchments / P. Jordan, R. Cassidy // Hydrol. Earth Syst. Sci. — 2011. — № 15. — P. 3093–3100. https://doi.org/10.5194/hess-15–3093–2011

14 Jarvie H.P. Measuringin-stream productivity: the potential of continuous chlorophyll and dissolved oxygen monitoring for assessing the ecological status of surface waters / H.P. Jarvie, A.J. Love, R.J. Williams, C. Neal // Water Sci. Technol. — 2003. — № 48. — P. 191–198.

М.Т. Берлигужин, Е.Х. Жаксылыков

Батыс Қазақстан облысы Сырым ауданының кіші өзендерінің геохимиялық жағдайы (Бұлдырты, Есенаңқаты, Шідерті, Өленті өзендерінің мысалында)

Кіші өзендер кіші деп аталғанымен, олардың экология тұрғысынан алғандағы маңызы жоғары. Себебі, ірі өзендердің жағдайы кіші өзендерге байланысты болады. Кіші өзендердің деградацияға ұшырауы орта және ірі өзендердің экологиялық жағдайына кері әсерін тигізеді, себебі олар осы кіші өзендер есебінен қоректенеді. Күн сайын осы өзендердің суының тартылып, жағасының кеңейіп келе жатқанын байқау қиын емес. Қазіргі уақытта экология ғылымының алдына қойған басты міндеттерінің бірі су нысандарының экологиялық жағдайын бақылау. Антропогендік факторлардың арту жағдайына байланысты, кіші өзендердің экологиялық жағдайын анықтау, табиғи экожүйенің құрамын сақтап қалуда маңызды рөл атқарады. Кіші өзендер антропогендік факторларға өте сезімтал және бұл факторларға кері әсерде жауап қайтарады. Кіші өзендер суларының химиялық құрамын, сондай-ақ олардың экологиялық жағдайын зерттеу маңызды және өзекті міндет. Зерттеудің мақсаты Сырым ауданының кіші өзендері суларының құрамын геохимиялық талдау және олардың сапасын бағалау. Су сапасының құрамын анықтау үшін әр өзеннен су сынамалары алынды. Камералдық кезеңі М. Өтемісов атындағы Батыс Қазақстан университетінің экология-биогеохимиялық сынақ зертханасында өткізілді. Химиялық талдау кеңінен қолданылатын МемСТ 26449.1–85 әдістері арқылы өткізілді. Зерттеу аймағынан алынған су сынамаларының көрсеткіштерін саралай келе, жалпы кермектілік мөлшерінен басқалары ШРК деңгейінен аспағандығы анықталды.

Кілт сөздер: кіші өзен, экологиялық жағдай, Бұлдырты өзені, Шідерті өзені, Өленті өзені, Есенаңқаты өзені, су ресурстары, антропогендік фактор, химиялық талдау.

М.Т. Берлигужин, Е.Х. Жаксылыков

Геохимическое состояние малых рек Сырымского района Западно-Казахстанской области (на примере рек Булдырты, Есенанкаты, Шидерты, Оленты)

Хотя малые реки называются малыми, они имеют большое значение с точки зрения экологии. Это связано с тем, что состояние крупных рек будет зависеть от малых. Деградация малых рек отрицательно сказывается на экологическом состоянии средних и крупных рек, поскольку они питаются за счет этих малых рек. Нетрудно заметить, что с каждым днем вода этих рек высыхает, а берега расширяются. В настоящее время одной из главных задач, поставленных перед экологической наукой, является контроль за экологическим состоянием водных объектов. В связи с состоянием возрастания антропогенных факторов определение экологического состояния малых рек играет важную роль в сохранении состава природной экосистемы. Малые реки очень чувствительны к антропогенным факторам и реагируют на эти факторы в обратном направлении. Изучение химического состава вод малых рек, а также их экологического состояния является важной и актуальной задачей. Целью исследования является геохимический анализ состава вод малых рек Сырымского района и оценка их качества. Были взяты пробы воды из каждой реки, чтобы определить состав качества воды. Камеральный этап проводился в эколого-биогеохимической испытательной лаборатории Западно-Казахстанского университета имени М. Утемисова. Химический анализ проводился по широко применяемым методам

ГОСТ 26449.1–85. Дифференцируя показатели проб воды, взятых из зоны исследования, установлено, что все, кроме величины общей жесткости, не превышали уровень ПДК.

Ключевые слова: малая река, экологическое состояние, река Булдырты, река Шидерты, река Оленты, река Есенанкаты, водные ресурсы, антропогенный фактор, химический анализ.

References

1 Dostaiuly, Zh. (1996). Zhalpy gidrologiia [General hydrology]. Almaty, “Bilim” [in Kazakh].

2 Kuatbayev, A.T. (2012). Zhalpy ekologiia [General ecology]. Almaty, ZhShS RPBK “Dauir” [in Kazakh].

3 Sdykov, M.N. (Ed.). (2006). Batys Qaza stan oblysynyn tarikhi-madeni zhane tabigat muralary eskertkishteri = Pamiatniki prirodnogo i istoriko-kulturnogo naslediia Zanadno-Kazakhstanskoi oblasti [Monuments of historical, cultural and natural heritage of the West Kazakhstan region]. (Vols. 1-14). T. II. Syrym audany / Syrymskii raion — Vol. 2. Syrym district. Oral [in Kazakh, in Russian].

4 Onaev, M.K. (2011). Gidrokhimicheskii rezhim reki Ural i ee pritokov [Hydrochemical regime of the Ural River and its tributaries*]. Poisk-—Izdenis — Search*, 3, 75–79 [in Russian].

5 Rebrik, I.M. (2005). O vode i vodoemakh [About water and reservoirs]. *Ekologicheskoe obrazovanie Kazakhstana — Environmental education in Kazakhstan*, 33–34 [in Russian].

6 Spengler, O.A. (1980). Slovo o vode [A word about water]. Leningrad [in Russian].

7 Yanchuk, M.C. (2018). Geokhimicheskie osobennosti i ekologicheskoe sostoianie malykh rek Priangaria (na primere rek Bokhanskogo raiona) [Geochemical features and ecological state of the small rivers of the Angara region (on the example of the rivers of the Bokhansky district)]. *Izvestiia Irkutskogo gosudarstvennogo universiteta — Proceedings of Irkutsk State University, 26*, 125–138. https://doi.org/10.26516/2073–3402.2018.26.125 [in Russian].

8 Guidelines for drinking-water quality. Vol. 1, Recommendations // 3rd edition. — Geneva. — WHO. — 2008.

9 Novikov, I.V., & Saifutdinov, M.M. (2001). Prakticheskoe rukovodstvo po kompleksnomu issledovanii ekologicheskogo sostoianiia malykh rek [A practical guide to the comprehensive study of the ecological state of small rivers]. Tula: Nauka [in Russian].

10 Pugal, N.A., Zverev, I.D., & Lavrova, V.N. (1995). Kompleksnoe issledovanie reki [A comprehensive study of the river]. *Gazeta «Biologiia» — Newspaper Biology*, 34, 12–14 [in Russian].

11 Beman, J.M., Arrigo, K.R., & Matson, P.A. (2005). Agricultural runoff fuels large phytoplankton blooms in vulnerable areas of the ocean. *Nature*, 434, 211–214. https://doi.org/10.1038/nature03370

12 Boyer, E.W., Howarth, R.W., Galloway, J.N., Dentener, F.J., Green, P.A., & Vorosmarty, C.J. (2006). Riverine nitrogen export from the continents to the coasts. *Global Biogeochemical Cycles*, 20.

13 Jordan, P., & Cassidy, R. (2011). Technical Note: Assessing a 24/7 solution for monitoring water quality loads in small river catchments. *Hydrol. Earth Syst. Sci.*, 15, 3093–3100. https://doi.org/10.5194/hess-15–3093–2011

14 Jarvie, H.P., Love, A.J., Williams, R.J., & Neal, C. (2003). Measuringin-stream productivity: the potential of continuous chlorophyll and dissolved oxygen monitoring for assessing the ecological status of surface waters. *Water Sci. Technol.*, 48, 191–198.

Information about the authors

Berliguzhin Maxot Tynyshtykovich — Master of natural sciences, Senior lecturer of M. Utemisov West Kazakhstan University, Uralsk, Kazakhstan; e-mail: 88_max_88.88@inbox.ru;

Zhaksylykov Ergazy Hairollaevich — Master of natural sciences, Senior lecturer of M. Utemisov West Kazakhstan University, Uralsk, Kazakhstan; e-mail: dedim01@mail.ru