INFLUENCE OF TRANSBOUNDARY WATER COURSES TO THE URAL RIVER ECOSYSTEM CONDITION

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ABSTRACT

This work is dedicated to evaluation of ecological condition of hydro chemical regime and analysis of anthropogenic pollution of Ural's river reservoir. Received results of the research of natural water are compared with permissible concentrations of chemical pollutions in water reservoir pools of fish farm meaning. The results show, that chemical structure of Ural's river reservoir pool is stable and doesn't impose toxicological impact on hydrobionts.

Keywords: water reservoir, pollution, ecological-analytical monitoring

INTRODUCTION

Ural River is one of the most important fishery water bodies of Kazakhstan. In recent years, here there is a tendency to a sharp decrease in the number of the most valuable species of fish (including sturgeon), which is an indirect evidence of adverse changes in their habitat. However, the extent and nature of human impact on surface water is currently not well understood. Current knowledge does not allow us to get a fairly reliable forecast of the water quality in the conditions of growing economic activity (Tursunov, 1998).

Currently, lack of fresh water is experiencing not only the territories of that nature has deprived of water resources, but also many regions, more recently, have been considered in this regard. Today, the demand for fresh water is not met in 20% of urban and 75% of the rural population of the planet. Human intervention in natural processes affected even large rivers (such as the Volga, the Don, the Dnieper), changing in the direction of reducing the volume of transferable water masses (runoff) (Chibiloyv, 2008). Water used in agriculture, for the most part consumed by evaporation and the formation of plant biomass and, therefore, does not return to the river. Transboundary watercourses on the territory of the West Kazakhstan Oblast (WKO) are presented by the Ural River, its tributaries the Shagan, the Derkul and undrained rivers –the Big and Small Uzen'.

The Ural River is the main transboundary watercourse, so the increase in water intake and water pollution by neighboring regions of Russia and the Republic of Kazakhstan to create a negative and crisis situation in the basin, especially in the territories of the West Kazakhstan and Atyrau regions.

The main sources of water resources of West Kazakhstan region are surface and underground water, the number of which is quite limited.

During the research a comprehensive study of the composition of the river water was conducted on priority cation-anion indicators and estimationof ecological status of the Ural River was made.

MATERIALS AND METHODS

The studies were conducted at the Chair of Ecology and Biotechnology of West Kazakhstan Engineering and Humanities University. To perform the tasks of monitoring the aquatic environment carried out the analysis of natural water taken in different areas (Trekino village, Kushum village, Budarino village) of West Kazakhstan.

The results obtained during the monitoring of a particular component, a phenomenon and a process, from environment in which the researches were conducted, are available for financing other resources as well, using different monitoring methods, such as distance, physical, chemical, biological, statistical and mathematical data processing (Morossanova et al., 1988).

Physico-chemical methods of analysis, based on dependence of physical substance properties from its nature, the analytical signal is present a measure of physical property functionally related with concentration or mass of determined component. Physico-chemical methods of analysis can include chemical transformations of defined compound, dissolved sample, concentration of analyzing component, masking of interfering substances, and others. Unlike from “classical” chemical methods of analyze, where analytical signal is substance mass or its volume, we used radiation intensity, current strength, electro conductivity, potential difference in physical chemical methods of the analyze in the capacity of analytic signal (Novikov et al., 1990).

Electrometric methods of analyze were based on measurement of electromotive forces (EF). Electrometric methods, including line potentiometry and potentiometrical titration, based on measurement of potential difference of indicator electrode and electrode comparison or faithfully, electromotive forces (EF) of different chains, as far as measures experimentally EF, which is potential difference (Zolotov et al., 1999).

RESULTS AND DISCUSSIONS

The results of chemical analysis shown in the Table 1. Obtained results in natural waters werecompared with the maximum permissible concentrations of chemical contaminants in the water

reservoirs of fishery. Analyzed water has a pH from 6.7 to 7.9, that is medium-slightly alkaline, which complies with requirements for fishery waters.

Oxidation ability characterizesthe total content of reducing agents in water - organic and inorganic, reactive with oxidants. The content of such spring substances amounts 2.4 mg/dm^3 - 2.9 mg/dm^3, which are within the maximum allowed concentrations (MAC) (St.Pet. S.2.1.4.1175-02, 2003). In the autumn, there is some increase in the permanganate oxidation till 3.6 mg/dm^3 - 3.9 mg/dm^3.

The total hardness of water was between 4,5-6,4 mg/dm^3, which corresponds to a moderately hard water classification.

The content of ammonia nitrogen, nitrate ions, nitrites and phosphates, chlorides are within the permissible concentration. Strong changes in the content of these components are not observed in autumn period.

Table 1. Average concentrations of priority pollutants in the Ural River basin during 2014-2015 years.

Time	No.	Cation-anion content, mg/l								
		pH	Cl^-	SO_4^{2-}	HCO_3^{2-}	NO_3^-	NO_2^-	NH_4^+	PO_4^{3-}	ХПК
Autumn	1	6,9	145	455	239	41	0,006	0,9	0,028	3,6
	2	7,46	136	312	178,4	35	0,007	1,3	0,013	1,6
	3	6,7	175	480	240	26	0,004	1,7	0,025	3,9
Spring	1	6,8	220	396	219,6	43	0,004	1,6	0,035	2,4
	2	7,9	185	360	170, 8	40	0,005	1,2	0,008	1,9
	3	6,7	160	408	197,6	39	0,007	1,9	0,005	2,9
	MPC	**6-8**	**350**	**500**	**250**	**45**	**3,3**	**2,0**	**0,05**	**5,0**

Note: 1 - the Ural River near the Trëkino village, 2 –Kushum village, 3 - Budarin village

According to the study of anthropogenic pollution of watercourses, there are significant changes in the hydrochemical regime and the accumulation of water in the different organic-pollution, manifested in different ways over time and with the flow of the rivers, especially the Ural River. The occurrence of high pollution in summer low water, when the water is unfit for drinking purposes, can be explained by the intensification of economic activities in the catchment area.

Transboundary watercourses on the territory ofWest Kazakhstan Oblast (WKO) presented by the Ural River, its tributaries the Shagan, the Derkul and drainless rivers –the Big and Small Uzen'river (Bryzgalo et al., 2001). The Big Uzen' river during the autumn-winter low is often significantly increased water salinity, and increases chloride ion content. In September-November 2014 yearit was increase in water salinity reached 2.28 g /l, and thus the chlorine ion - up to 808-1138 mg / l (2,3-3,2 MPC). In December 2011 year, the increase of chloride ion concentration was up to 651 mg/l (1.8 MPC).

The Small Uzen' river increase in salinity in the autumn and winter low-water period (September-December) from 1.04 to 2.63 g/l, due to the increase in the concentration of chlorine ions

to 401-600 mg/l (1.1-1.7 MPC). In the Small Uzen' river water has a simple chlorine-sodium composition.

Table 2. Evaluation of the number of contaminants

Chemical components	Average composition inwater, mg/l	Average annual flow quantity, mln/m^3	Amount of substance, bringing by river, t/year	MPC, mg/l
1	2	3	4	5
Chloride	291	126,2	36724	350
Azothammonium	0,08	126,2	10,1	0,5
Nitrite	0,08	126,2	6,31	3,3
Nitrite	14,7	126,2	1855,1	45

38,694 tons per year of pollutants annually receive and spent on environmental pollution according to calculations in the Ural river basin in content of water-salt flow, including 36,724 tons of chlorine, 1,87 tons of organic pollutants and 98,44 tons of heavy metals.

Calculations showed that the Ural River basin as part of the supply from the Russian Federation annually receives 38,694 thousand tons of contaminants, including chlorine ions – 36, 72 thousand tons; organic pollutants - 1, 87 tons; heavy metals – 98, 44 tons, thus polluting an environment.

Obtained results showedcorrelation between the amounts of the dissolved salts and the impurities thatinflow into cross-border watercourses, thus creating environmental pollution due to consumption and use of water resources and submitted water-salt flow of the Ural River in West Kazakhstan region.

Table 3. Volume ratio of dissolved salts and impurities

Water flow	The volume of mineral salts and impurities, million tons					
	coming to the region		creating the pollution in watersheds		submitted outside the region	
	total	harmful impurities	total	harmful impurities	total	harmful impurities
Ural River	0,055	0,079	0,055	0,079	-	-

In connection with the regulation of the dams on the territory of the Russian Federation, almost all the flow of transboundary the Ural, the Ilek river, the actual volume of water supply to the Ural River in the last six years has averaged 68% of the estimated number. This dramatically understated and extremely irregular water supply has led to severe environmental, social and environmental consequences in the bottom of the Kazakhstan part of the river basin.

CONCLUSIONS

To increase the productivity of reservoirs of the Ural-Kushum and the Kamysh-Samara systems it is necessary to carry out a number of measures for fisheries reclamation, in particular, the removal of excessive vegetation and stabilization of the level regime in spring-summer period. As many reservoirs of West Kazakhstan region are characterized by excessive overgrowing, including higher aquatic plants, you need to study the issue of the universe in which young fish. Fish productivity of reservoirs depends entirely on the reclamation works.

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