

УДК 504.453

CHEMICAL MONITORING OF HEAVY METALS IN RIVERS OF BASTAK NATURE RESERVE

Y. S. Ivanov (ITMO University)

Scientific advisor – N. V. Dinkelaker (ITMO University)

Introduction. Chemical monitoring of surface water allows to get up-to-date information about the state of water resources. In particular, it is important to monitor the concentrations of substances different from normal and maximum permissible values. The territory of the Jewish Autonomous Region has a number of chemical features, including an increased content of Fe and Mg in water. Besides, monitoring routine on conservation areas provides reference data to assess the extent of anthropogenic impact on the environment. The chemical specifics of Bastak nature reserve rivers are still poorly investigated. The data on heavy metals concentration in some rivers exists due to previous research. To extend knowledge of the conservation area's rivers and append new data to monitoring range we embarked on expedition June 2022 where several rivers were sampled and their metals concentration was analyzed.

Bastak nature reserve is located in the Far East of Russia 4,5 km to Birobidzhan. It belongs to Amur River basin and spreads from the highlands of the south-eastern spurs Khingan-Bureya mountain system to lowlands of the Sikhote-Alin Mountain fold system in the longitude direction. Climate – humid continental. In mountain region spruce-fir and cedar-broadleaf forests prevail, with lower altitude it changes to broadleaf-mixed forest and to meadows in the lowlands.

The river system of the reserve consists of dense net of small rivers and spurs of mountain origin (<10 km), small lakes (<1 km²) and several big rivers such as Bastak (63 km), Bolshoy Sorennak (43 km), Glinyanka (35 km). Some rivers are characterized by the increased concentration of Fe (Bastak: summer 2016 – 0,3-0,8 mg/l [1], 2020 – 0,18, 2021 – 0,09 [2, 3]) and Mn (Bastak: summer 2020 – 0,007, 2021 – 0,001). According to previous studies, the Fe concentration in Glinyanka river peaked 21 Maximum Permissible Concentrations (MPCs) and Mn 7 MPCs.

Main part. To establish chemical condition of the reserve's waters in June 2022 the joint research expedition of ITMO University and PGU completed 5 routes from north to south of the reserve and sampled water from rivers Bastak (2 samples), Glinyanka (1), Bolshoy Sorennak (3), Mitrofanovka (2) and spurs with different altitude (2). During expedition Glinyanka overflowed its banks due to a large amount of precipitation. Distance between samples of the same river from 0,7 to 1,5 km. 10 0,5l samples were analyzed via Solaar M6 Atomic Absorption Spectrometer to determine concentrations of 8 heavy metals (Zn, Cd, Co, Pb, Ni, Cu, Fe, Mn).

Findings. The results of chemical analysis coincide with previous research in part of exceeding MPC amounts of Fe and Mn. Fe concentration for sampled rivers (Bastak 0,377 mg/l, Bolshoy Sorennak 0,316, Glinyanka 1,343, Mitrofanovka 1,05, spurs 0,07) indicates that two of 5 rivers exceed Fe MPC (0,1 g/l) more than 10 times, all rivers exceed Fe MPC at some extend. Comparing to previous year Bastak Fe (June) increased from 0,07 to 0,37, Bolshoy Sorennak Fe (June) increased from 0,09 to 0,32, Glinyanka increased from 0,58 to 1,34. Mn concentrations 2,2 and 2,8 times higher than in summer of 2021 for Bolshoy Sorennak and Bastak respectively. The data for Mitrofanovka is obtained for the first time. Small amounts of Co found only in Mitrofanovka and Glinyanka (lowland rivers) 0,00115 and 0,0003 respectively. Cu and Zn concentrations peak in lowland rivers (1,5 times more than in highland ones for Zn, 2 times for Cu). There is no Pb, Ni and Cd in any sample as expected for nature reserve without industrial pollution.

The difference between Fe and Mn results with previous research could be attributed to different precipitation and annual river dynamics. Besides, some discrepancies could occur because of varying sampling points.

References:

1. Bebeshko T. V., Makarenko V. P. MORPHOMETRIC AND HYDROCHEMICAL CHARACTERISTICS OF THE BASTAK AND GLINYANKA RIVERS OF THE BASTAK RESERVE //XII FAR EASTERN CONFERENCE ON NATURE CONSERVATION. – 2017. – pp. 165-167.
2. Lviv I. A., Revutskaya I. L. COMPARATIVE ANALYSIS OF IRON AND MANGANESE CONTENT IN THE RIVERS OF THE BASTAK RESERVE FOR 2020-2021 //Bulletin of the Amur State University named after Sholom Aleichem. – 2022. – №. 3 (48). – Pp. 61-73.
3. Revutskaya I. L. IRON IN THE RIVER WATERS OF THE BASTAK NATURE RESERVE //MODERN SCIENTIFIC VIEWS IN THE ERA OF GLOBAL TRANSFORMATIONS: PROBLEMS, NEW VECTORS OF DEVELOPMENT. – 2021. – pp. 74-76.