№ AP09259969 «Environmental monitoring of water bodies in Northern Kazakhstan»

Main results (2022)

1. Research work was carried out to assess the state of benthic organisms and soil, to identify specific and general reactions of hydrobionts to pollutants, to establish cause-and-effect relationships between the recorded biological effects and impact factors in the reservoirs of Akmola, North Kazakhstan, Pavlodar and Kostanay regions. To carry out research work on the reservoirs of Northern Kazakhstan, permits for research fishing were obtained (in the State Institution "Department of Natural Resources and Environmental Management of the Akimat of Kostanay region" (KZ44VEP00128254, KZ01VEP00128252, KZ55VEP00128250); in the Municipal state institutions "Management of natural resources and regulation of natural use of the Akimat of the North Kazakhstan region" (KZ44VEP00129806, KZ17VEP00129807, KZ87VEP00129808, KZ81VEP00129819 KZ54VEP00129820). In accordance with the above documents, the physicochemical properties of water and soil of 14 reservoirs of Northern Kazakhstan were studied. 133 hydrobiological, 120 hydrochemical and 54 ichthyological samples were selected and examined.

2. The evaluation of the data of Kazhydromet on the reservoirs of Akmola, North Kazakhstan, Pavlodar and Kostanay regions for 2020-2021 was carried out. Observations of surface water quality in Akmola region and Nur-Sultan were carried out on 59 sites of 25 water bodies (Yesil, Akbulak, Sarybulak, Bettybulak, Zhabai, Silety, Aksu, Kylshykty, Shagalaly, Nura and Nura-Yesil canal, Lakes Zerendy, Kopa, Burabai, Ulken Shabakty, Shchuchye, Kishi Shabakty, Sulukol, Karasye, Zhukey, Katarkol, Tekekol, Maybalyk, Lebyazhye, Vyacheslavoye reservoir). Water bodies located on the territory of the Akmola region for 2020 are estimated at an average of class 4 pollution (class 3 – Vyacheslavskoye reservoir; Class 4 – Nura, Bettybulak, Zhabai rivers, Nura-Yesil canal; not standardized (>Class 5) – Yesil, Sarybulak, Akbulak, Aksu, Silety, Kylshykty, Shagalaly rivers). In 2021, the quality of surface water in the Akbulak, Sarybulak, Zhabai, Aksu, Kylshykty rivers, on the Nura-Yesil canal and the Vyacheslavoye reservoir has not changed significantly. The water quality in the Yesil rivers from above contaminating class 5 moved to above contaminating class 4, Bettybulak from contaminating class 4 to contaminating class 1, Silety, Shagalaly from above contaminating class 5 moved to contaminating class 4 – improved. In the Nura River, it went from contaminating class 4 to contaminating class 5 above - it worsened. The main pollutants in the water bodies of the city of Nur-Sultan and Akmola region are total phosphorus, calcium, magnesium, mineralization, chlorides, total iron, COD. Exceeding the quality standards according to these indicators is mainly characteristic of urban wastewater discharges in conditions of a large population. Monitoring of surface water quality in the North Kazakhstan region was carried out in the Yesil River at 5 sites. In the Nura River, it went from

contaminating class 4 to contaminating class 5 above - it worsened. The main pollutants in the water bodies of the city of Nur-Sultan and Akmola region are total phosphorus, calcium, magnesium, mineralization, chlorides, total iron, COD. Exceeding the quality standards according to these indicators is mainly characteristic of urban wastewater discharges in conditions of a large population. Monitoring of surface water quality in the North Kazakhstan region was carried out in the Yesil River at 5 sites. Observations of surface water quality in the territory of Pavlodar region were carried out in 16 sites on 5 water bodies (Ertis, Usolka rivers, Sabyndykol, Zhasybai, Toraigyr lakes). In comparison with 2020, the quality of surface waters of the Yertis and Usolka rivers has not changed. The water quality belongs to the best quality class (Class 1*). Visual observations also showed that the Sabyndykol, Zhasybai, Toraigyr lakes are quite clean and do not exceed the standard water quality indicators (34 indicators). Observations of surface water quality in Kostanay region were carried out on 16 sites of 11 water bodies (Tobyl, Ayet, Togyzak, Uy, Obagan, Zhelkuar, Torgay rivers, Shortandy, Amangeldy, Karatomar and Zhogargy Tobyl reservoirs). In comparison with 2020, the quality of surface waters of the Tobol, Obagan, Zhelkuar, Torgai, Togyzak rivers, Karatomar reservoirs has not changed significantly. The quality of the surface waters of the Uy and Aet rivers from the 4th contaminating class moved to the 5th contaminating class, the Zhogargy Toyl reservoir from the 5th contaminating class moved to the higher 5th contaminating class - deteriorated. The surface water quality of the Amangeldy reservoir from above contaminating class 5 has moved to contaminating class 5, the Shortandy reservoir from above contaminating class 5 has moved to contaminating class 3 – has improved. The main pollutants in the water bodies of Kostanay region are magnesium, chlorides, suspended solids, COD, sulfates, mineralization. The excess of quality standards according to these indicators is mainly of a natural nature.

3. Scientific research was carried out to study the biodiversity of benthic organisms of reservoirs of Akmola, North Kazakhstan, Pavlodar and Kostanay regions, the species composition of benthic organisms of the studied reservoirs was determined. Benthos of reservoirs of Northern Kazakhstan is represented by 23 taxa. The number of taxa in zoobenthos varied from 2 to 5. Mollusks (*Lymnaea stagnalis, Lymnaea truncatula*) and *Tubifex tubifex* worms were most common. The ichthyofauna of the Akmola region was distinguished by species diversity: Maybalyk lake (7 species), Zhaltyrkol lake (5 species), 3-4 species of fish were found in other reservoirs. Priority groups of pollutants (pollutants) of reservoirs of Akmola, North Kazakhstan, Pavlodar and Kostanay regions have been identified. It was found that in the organisms of the studied fish samples (pike, perch) caught in the autumn period of 2022, the content of toxic elements and radionuclides were found in significantly smaller quantities than the established regulatory indicators, violations of veterinary and sanitary rules and safety requirements were not revealed. The data obtained indicate a low content of these toxic and harmful elements in the waters and soil of the studied reservoirs. Nitrites and nitrates are biogenic elements and an important source of nitrogen for plants and complex

organisms that consume them. The data on these indicators also did not exceed the norms of maximum permissible concentrations.

4. As a result of the research carried out, no specific reactions of hydrobionts (zooplankton, zoobenthos, necton) at the organismal and population levels to external environmental factors in the studied water bodies were revealed. There are no deviations from the norm in all the samples studied, which shows the general reaction of organisms to the current state of the environment. The data obtained indicate that in 2022 there is no deterioration in the ecological condition of the studied water bodies. The stable condition of the reservoirs, apparently, is due to the absence of sources of pollution (large industrial and agricultural enterprises). According to geolocation data, only settlements are located near reservoirs, in this regard, the excess of water and soil quality standards is of a natural contour. Thus, the positive dynamics of causal relationships between biological effects (morpho-physiological parameters of the ichthyofauna, species diversity of aquatic organisms, etc.) and environmental factors have been confirmed.

Published works
Published 1 article in the domestic edition recommended in CQAFSHE RK:
1. Species composition and morpho-biological data of fish from the Solontsy lake (North Kazakhstan region). Bulletin of Al-Farabi KazNU, biological series, No. 4(89)2021. – pp. 150-162. G. Satybaldieva.K., Sharakhmetov S.E., Sapargalieva N.S., Zhanabergenov A.O., Chupshibaev K.K. Aubakirova G.A., Utarbayeva A.Sh., Bekpergenova Zh.B.

Published 1 article in the international edition:
1. Ecological Assessment of the State of Water Bodies in Northern Kazakhstan on the Example of Lake Maibalyk. Academics World International Conference, Prague, Czech Republic. 2022. S. 15-19. A.Sh.Utarbaeva, G.K.Satybaldieva, Zh.B.Bekpergenova, K.K.Shupshibaev, G.A.Aubakirova, A.O.Zhanabergenov, E.G. Krupa, M.O. Aubakirova, S.E.Sharakhmetov, N.S.Sapargaliyeva