## THE STUDY OF REDOX CONDITIONS IN THE DNIESTER RIVER

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The Dniester is a trans-boundary river crossing the countries of Moldova and Ukraine, discharging into the Black Sea. In 1981 in the middle part of the river on the territory of Ukraine a barrage was constructed, creating the Dniestrovsk Hydropower Station. The newly formed storage pond is 194 km long. The main purpose of the reservoir construction was for power supply and flood control. In 1985 another dam was constructed downstream of the Dniestrovsk barrage in order to create a 20-km buffer reservoir. The second barrage also serves as a frontier between Moldova and Ukraine. The main purpose of the second barrage construction was to regulate the water discharge from the first barrage and also to generate electric power.

The Dniester reservoir is a canyon-type, deep-water lake with a 54 m maximum depth near the dam. Low water temperature, a deficiency in dissolved oxygen, and the presence of hydrogen sulfide and ammonium are typical for the hypolimnion of such reservoirs. Once the reservoir was filled with water, organic-rich sediments have accumulated, and the decomposition of this organic material creates low red-ox conditions.

Since the beginning of full-capacity operation of the Dniestrovsk Hydroelectric Power Plant, dramatic changes in the water quality occurred in the river emerging from the buffer reservoir. The temperature regime of the river has been changed as follows: the mean temperature value decreased by 8-10$^0$C in summer time. Severe changes in the aquatic ecosystem occurred: the diversity of hydrobiont species was decreased, fish stocks also decreased, and mass fish kills were often observed. Ichthyologists have pointed out the negative effects of the dam on the ichthyo-fauna. Some fish species have stopped spawning, and fish stocks have been 18-fold reduced. Reproduction of some species has decreased 30-fold. Certain studies revealed that 80% of the sturgeon sampled showed signs of spawn reabsorption.

It was hypothesized that the main reason for these changes is the modified temperature regime. However, the studies performed by our team in 2003 have shown that this might be not the only reason. In the framework of ecological expedition “Dniester 2003”, in which the researchers from the State University of Moldova were involved, the red-ox state of Dniester River water was determined, along with the other conventional hydrochemical parameters. According to our investigations carried out from July till September, the red-ox state of water was unstable. The red-ox state of surface natural waters is a parameter that characterizes the ecological state of the water body and its auto-purification capacity. Biologically healthy fresh water is determined by the presence in it of hydrogen peroxide within the limits of $10^{-6}$ mol/l.

In the samples collected from the upper layers of the river portion starting from Naslavcha village till the Dubossary City, hydrogen peroxide was not detected; at the same time the reducing equivalents titrated by hydrogen peroxide are present in concentrations $3{,}5 \cdot 10^{-7}$-$4{,}5 \cdot 10^{-7}$ mol/l. The dissolved oxygen content in upper layers was normal. The state of water environment could be characterized as quasi-reducing. It is possible that the hypolimnion of the reservoir is anoxic due to thermal stratification, and the water discharging at the bottom to the dam is anoxic, thus introducing these reduced species into the river downstream of the dam.

The presence of reducing substances in the amounts exceeding quite often the contents in oxidizers (hydrogen peroxide), provoke the unbalance of these processes in water environment. It is known that the reductive, quasi-reducing and super oxidative conditions of natural waters are destructive for the development of hydro-bionts, including fish. Quasi-reducing conditions are toxic for certain bacteria, infusoria and fish larvae.