

Heavy Metals in the Water of Lakes in the 'Bory Tucholskie' National Park of Biosphere Reserve

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Abstract : Bory Tucholskie (Tucholskie Forest) is one of the largest pine forest complexes in Poland. It occupies approx. 3,000 square kilometers of land in the Brda and Wda basin and the Tuchola Plain and the Charzykowskie Plain. Since 2010 it has transformed into The Bory Tucholskie Biosphere Reserve, according to the UNESCO decision. The area of the Bory Tucholskie National Park (BTNP), the park area, has been designated in 1996. There is little data on the presence of heavy metals in the Park's lakes. Concentration of heavy metals in the water of 19 lakes in the BTNP was examined. The lakes were divided into two groups: subglacial channel lakes of Struga Siedmiu Jezior (the Seven Lakes Stream) and other lakes. Heavy metals (transition metals) belong to d-block of elements. The part of these metals plays an important role in the function of living organisms as metalloproteins (enzymes, hemoproteins, vitamins, etc.). However, heavy metals are also typical; heavy metals are typical anthropogenic pollutants. Water samples were collected at the deepest points of lakes during spring and during summer stagnation. The analysis of metals was performed in an atomic absorption spectrophotometer Varian Spectra A300/400 in electric atomizer (GTA 96) in graphite cuvette. In the waters of the Seven Lakes Stream (Ostrowite, Zielone, Jelen, Belczak, Glowka, Plesno, Skrzyńka, Mielnica) the increase in the concentration of the manganese and iron from outflow to inflow of Charzykowskie lake was found, while the concentration of copper (approx. $4 \mu\text{g dm}^{-3}$) and cadmium ($< 0.5 \mu\text{g dm}^{-3}$) was similar in all lakes. The concentration of the lead also varied within $2.1\text{-}3.6 \mu\text{g dm}^{-3}$. The concentration of nickel was approx. 3-fold higher in Ostrowite lake than other lakes of Struga. In turn the waters of the lakes Ostrowite, Jelen and Belczak were rich in zinc. The lowest level of heavy metals was observed in Zielone lake. In the second group of lakes, i.e., Krzywce Wielkie and Krzywce Małe the heavy metal concentrations were lower than in the waters of Struga but higher than in oligotrophic lakes, i.e., Nierybno, Gluche, Kociol, Gacno Wielkie, Gacno Małe, Długie, Zabionek, and Sosnowek. The concentration of cadmium was below $0.5 \mu\text{g dm}^{-3}$ in all the studied lakes from this group. In the group of oligotrophic lakes the highest concentrations of metals such as manganese, iron, zinc and nickel in Gacno Małe and Gacno Wielkie were observed. The high level of manganese in Sosnowek and Gacno Wielkie lakes was found. The lead level was also high in Nierybno lake and nickel in Gacno Wielkie lake. The lower level of heavy metals was in oligotrophic lakes such as Kociol, Długie, Zabionek and α -mesotrophic lake, Krzywce Wielkie. Generally, the level of heavy metals in studied lakes situated in Bory Tucholskie National Park was lower than in other lakes of Bory Tucholskie Biosphere Reserve.

Keywords : Bory Tucholskie Biosphere Reserve, Bory Tucholskie National Park, heavy metals, lakes

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