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Influence of Acid Mine Drainage (AMD) on recent phyto- and zooplankton in "the Anthropogenic Lake District" in south-west Poland

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In south-west Poland (central Europe) many the post-mining lakes formed so-called "the Anthropogenic Lake District". Areas, where water comes in contact with lignite beds characterized by high concentration of sulfide minerals are called Acid Mine Drainage (AMD). Pyrite oxidation and other sulfide compounds caused release sulfuric acids and heavy metal ions. These processes caused decline of water pH, sometimes to extremely low pH < 2.8. Presently, pit lakes located in south-west Poland have water pH ranged between 2.7 and 8.9. Differences of water reaction in the mine lakes depend on many factors, such as bedrock buffer capacity, geological structure of carboniferous area, exploitation technique of lignite, methods of filling and water supply of reservoirs and their age. During the evolution of lakes' ecosystems, sulfate-iron-calcium type of waters occurring in acid lakes will transform in alkaline hydrogen-carbonate-calcium type of waters. Due to the different time of the completion of lignite exploitation, lakes' age varied between forty and over one hundred years. Studies showed that younger lakes are more acidic in compare to older. To estimate impact of AMD we analyzed recent diversity of diatoms and Cladocera remains and water chemistry from extremely acidic, relatively young lakes and from alkaline, older water bodies. As we expected, flora and fauna from acidic lakes have shown very low diversity and species richness. Among diatoms, Eunotia exigua (Bréb. ex Kütz.) Rabenhorst and/or E. paludosa Grunow were dominated taxa, while fauna Cladocera did not occurred in lakes with water pH < 3. On this area, exploitation of lignite continued up to 1973. Older lakes were formed in the region where the mine started work in 1880 and lignite mining stopped in 1926. Measurements of pH value in situ point to neutral or alkaline water, but because of the possibility of hysteresis phenomenon, the studies of phyto- and zooplankton have shown if there has already been a widespread neutralization of lake ecosystems, what encompassing both recovery of water chemistry and rebuilding of biota communities. Studies have confirmed, that phyto- and zooplankton living nowadays in lakes located on this area, where exploitation of lignite ended at the beginning of 20th century, indicate completely recovery from acidification caused by coal mine activities. Presently, the lakes were dominated by planktonic diatoms and Cladocera taxa, such as Discostella pseudostelligera (Hust.) Houk & Klee and Bosmina longirostris, respectively.