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Establishing the Ecological Status of Mining-Impacted Freshwaters from Abrud River Catchment Area Using Benthic Diatom Communities (Roșia Montană, Romania)

Adriana Olenici (1), Calin Baciu (1), Laura Momeu (2), Alexandra Cozma (1), Dorian Brahaita (1), Cristian Pop (1), Laura Lazar (1), Gabriela Popita (1), and Gabriela Teodosiu (3)

(1) Babes-Bolyai University, Faculty of Environmental Science and Engineering, Cluj-Napoca, Romania (calin.baciu@ubbcluj.ro), (2) Babes-Bolyai University, Faculty of Biology and Geology, Cluj-Napoca, Romania, (3) Institute of Biology Bucharest, Romanian Academy, Romania

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Diatoms are a very distinct group of algae, identifiable under the light microscope by their yellow - brown coloration and by the presence of a thick silica cell wall. The potential for freshwater organisms to reflect changes in environmental conditions was first noted by Kolenati (1848) and Cohn (1853), who observed that biota in polluted waters were different from those in non-polluted situations. Diatoms are widely used to monitor river pollution because they are sensitive to water chemistry, especially to ionic content, pH, dissolved organic matter and nutrients. Wide geographic distribution and well-studied ecology of most diatom species are mentioned as major advantages of using diatoms as indicator organisms. At the same time water quality has begun to deteriorate increasingly, mainly as a result of the physical, chemical and bacteriological alterations, and the aquatic ecosystems are evermore affected by various types of pollution, the anthropic one being almost always included. A good example is Abrud River and its main tributaries (Roșia Montană and surrounding areas, Romania), which has suffered along the years because of the mining waters discharge.

In this context, this study presents data on benthic diatom communities from the Abrud River catchment area. Sixteen sites have been sampled seasonal and the best represented diatom genera were Navicula, Nitzschia, Cymbella, Gomphonema, Achnantes, Surirella and Fragilaria. Qualitatively, the number of diatom species exhibited significant variation among sampling sites, also suggesting seasonal dynamics. For instance, in some sampling sites, algal assemblages were absent, as diatom communities were strongly affected by acid mine waters, released from old mining works and waste rocks depots. Some dominant taxa have been observed as well, suggesting critical saprobic levels of the Abrud River and some of its tributaries.

The large quantity of organic matter, originating from untreated municipal water, together with the high concentrations of NO_3-, draw attention to the mediocre quality of water in the area. Moreover, the values of the measured physical and chemical parameters (i.e. pH, salinity, conductivity, O_2) and the concentrations of SO42-, Fe, Pb, Ni, Cu, Cd and Zn also indicates quality alterations caused by the mine waters flowing into some tributaries and the river.

Besides diatoms, the study also referrs to the determination of bacterial communities existing in the same sampling area, that revealed the presence of the main groups of microorganisms involved in the biogeochemical cycles of C, N, Fe and S, and the absence of pathogenic bacteria such as total and faecal coliforms and faecal streptococci. The heterotrophic bacteria strains obtained which are highly adapted to the heavy metals occuring in the investigated habitats could be used as new microorganisms in the bioremediation processes of this water resource in future studies.

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