



Anthropopression markers in lake bottom sediments

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Lakes are vulnerable to various types of anthropogenic disturbances. Responses of lake ecosystems to environmental stressors are varied and depend not only on the type of a factor but also on the lake natural resistance to degradation. Within the EULAKES project an evaluation of anthropogenic stress extent in a flow-through, post-glacial, ribbon lake (Lake Charzykowskie) was carried out. It was assumed, that this impact manifests unevenly, depending on a type and degree of the pressure on the shore zones, water quality of tributaries, lake basin shape and dynamics of a water movement. It was stated, that anthropogenic markers are substances accumulated in bottom sediments as a result of allochthonous substances inflow from the catchment and atmosphere. Along the selected transects 105 samples from the top layer of sediments (about 20 cm) was collected representing the contemporary accumulation (about 15 years). The content of selected chemical elements and compounds was examined, including nutrients (TN and TP), heavy metals (arsenic, cadmium, lead, chromium, nickel, copper, zinc, mercury, iron, and manganese) and pesticides (DDT, DDD, DDE, DMDT, γ -HCH). The research was conducted in the deepest points of each lake basin and along the research transects - while choosing the spots, the increased intensity of anthropogenic impact (ports, roads with heavy traffic, wastewater discharge zones, built-up areas) was taken into consideration. The river outlets to the lake, where there are ecotonal zones between limnic and fluvial environment, were also taken into account. Analysis of the markers distribution was carried out against the diversity of chemical characteristics of limnic sediments.

Ribbon shape of the lake basin and the dominant wind direction provide an opportunity of easy water mixing to a considerable depth. Intensive waving processes cause removal of the matter from the littoral zone towards lake hollows (separated by the underwater thresholds), where the top layer of sediments consists of organic sediment ("sapropel" type). The littoral zone is dominated by sandy material from the shores denudation. In river mouths sandy deltas are formed. The most contaminated sediments are deposited in the central pool, which is a natural trap for the substances flowing with the river that is draining wastewaters from urban areas. At its mouth the sediment samples were significantly contaminated with chromium, zinc, cadmium, copper, nickel, lead and mercury. A high content of total phosphorus was also detected. A different role is played by a large river flowing through the lake. While flushing the sediments it reduces their pollution. The lowest content of markers was detected in headwater areas and in littoral zones exposed to waving.