SPATIAL DISTRIBUTION OF EPIPHYTIC DIATOMS IN RELATION TO ENVIRONMENTAL FACTORS IN THE LAKE LADOGA

Alexander G. Rusanov[1] & Éva Ács[2]

[1]Institute of Limnology of the Russian Academy of Sciences
[2]Institute of Ecology and Botany of the Hungarian Academy of Sciences, Hungarian Danube Research Station

In this study, epiphytic diatom assemblages were assessed in the Lake Ladoga, Northwestern Russia, to determine which environmental variables best explained spatial distributions of diatom taxa, and whether SPI (Specific Polluosensitivity Index) and BDI (Biological Diatom Index) could be applicable for water quality assessment in the Lake Ladoga. Diatom samples were collected from emergent macrophytes (mainly reeds) at 35 wetland sites in 2006 and 2010. Canonical correspondence analysis (CCA) revealed two major ecological gradients. The first was an eutrophication gradient integrating total phosphorus (TP) concentration and electric conductivity. The second was a latitudinal gradient related to water temperature and geomorphology of shoreline, which separated open wetlands of north-eastern and western coasts from more protected wetlands of shallower southern coast. CCA divided all the sites into three groups along the eutrophication gradient: small group of hypertrophic sites (mean TP 143 μg l^{-1}) and two large groups of eutrophic (mean TP 55 μg l^{-1}) and oligo-mesotrophic (mean TP 24 μg l^{-1}) sites. Each group was characterized by specific diatom assemblage. Hypertrophic group consisted of riverine wetlands proximal to the major inflow river Volkhov. *Cocconeis placentula* var. *euglypta*, *Ctenophora pulchella* and *Navicula veneta* were identified by the indicator value method as the most characteristic taxa of this group. The two large groups were further divided into subgroups along the latitudinal gradient. Mesotrophic sites of the southern coast were characterized by *Brachysira neoexilis*, *Encyonopsis subminuta* and *Eunotia intermedia*, while oligo-mesotrophic sites of the northern coast were indicated by *Achnanthidium lineare*, *Diatoma moniliformis* and *Fragilaria capucina* var. *mesolepta*. For eutrophic group, *Eunotia bilunaris*, *Ulnaria ulna* and *Placoneis clementis* were among indicator species of the southern coast, whereas *Aulacoseira ambigua*, *Ulnaria ulna* var. *acus* and *Gomphonema olivaceum* characterized the north-eastern and western coasts. Relative abundance of motile and low profile diatom taxa significantly correlated with latitude suggesting that distributional patterns of these functional groups were driven by changes in hydrogeomorphic features of coastal wetlands. The diatom indices SPI and BDI classified the wetland groups defined by CCA as having an excellent and good status and, thereby, overestimated water quality in nutrient-rich waters. Despite the fact that both indices were significantly correlated with TP concentration, they failed to differentiate between the group of eutrophic sites of the north-eastern and western coast and the group of oligo-mesotrophic sites. These results indicate the need for development of the regional biomonitoring system on the base of a diatom phosphorus inference model.