

39. LARGE AND DEEP LAKES: ECOLOGICAL FUNCTIONS AND RESOURCE MANAGEMENT

39-O Biomonitoring of Lake Onego and assessment of watershed role in the ecosystem functioning.

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Lake Onego is the second largest lake in Europe, with a surface area of 9 690 km² and a volume of 291 km³. With the exception of several bays, the lake still preserves its natural state and high water quality. Lake Onego is invaluable ecological resource and the largest public drinking water supply. It requires organization of regular monitoring especially considering observed changes in anthropogenic load and climate changes. Due to Lake Onego morphometric heterogeneity and high variability of biota characteristics, studies of the lake ecosystem demands special methodological approaches. Slow warming during the spring period determines significant variations in phenology of plankton in different parts of the lake. Anomalies in the chemical composition of sediments associated with zones of tectonic faults predetermine a non-uniform benthos distribution. Anthropogenic factors increase the heterogeneity of Lake Onego ecosystem. Most deep water parts of the lake are oligotrophic. The main sources of pollution (pulp and paper sewage waters and municipal wastes) are located along the north-western bays. Observed structural changes of aquatic communities reflect the eutrophication of the bays. To assess the spatial and temporal variability of the biota, original methods have been proposed. The timing and duration of plankton phenological phases and their interannual variability were determined using the 40-year series of observations. To assess the sustainability of the lake ecosystem, the regression models were created on the base of Orthogonal Distance Regression method. To assess the distribution of benthos, the benthic biotic indices were proposed. Three zones which reflect specific features of benthic communities were identified: i) areas with anthropogenic influence; ii) areas with groundwater discharges; iii) deep parts of the lake with geochemical anomalies. The proposed methods can be used in the biomonitoring of large lakes of the boreal zone. The flows of organic carbon in plankton net were modeled. Revealed high degree of heterotrophy of Lake Onego defines a significant excess of carbon dioxide emissions over its consumption within intra-lake processes of organic matter mineralization. The reason of heterotrophic metabolism of the lake is a large number of allochthonous organic matter that enter from swampy areas. To evaluate the watershed changes during the last 20 years and to assess their influence on the Lake Onego ecosystem, remote sensing data were used. The study has been financially supported by the Russian Science Foundation (#14-17-00766).

39-O Using 3D modelling for understanding spatio-temporal heterogeneities of phytoplankton abundance in Lake Geneva (France/ Switzerland).

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The quality of ecosystem services provided by lakes is related to the ecosystem structure and functioning. Protecting water bodies is becoming a global goal that requires monitoring for water quality assessment. In 2000, the European Parliament set out the European Water Framework Directive (WFD), a framework for managing and protecting water