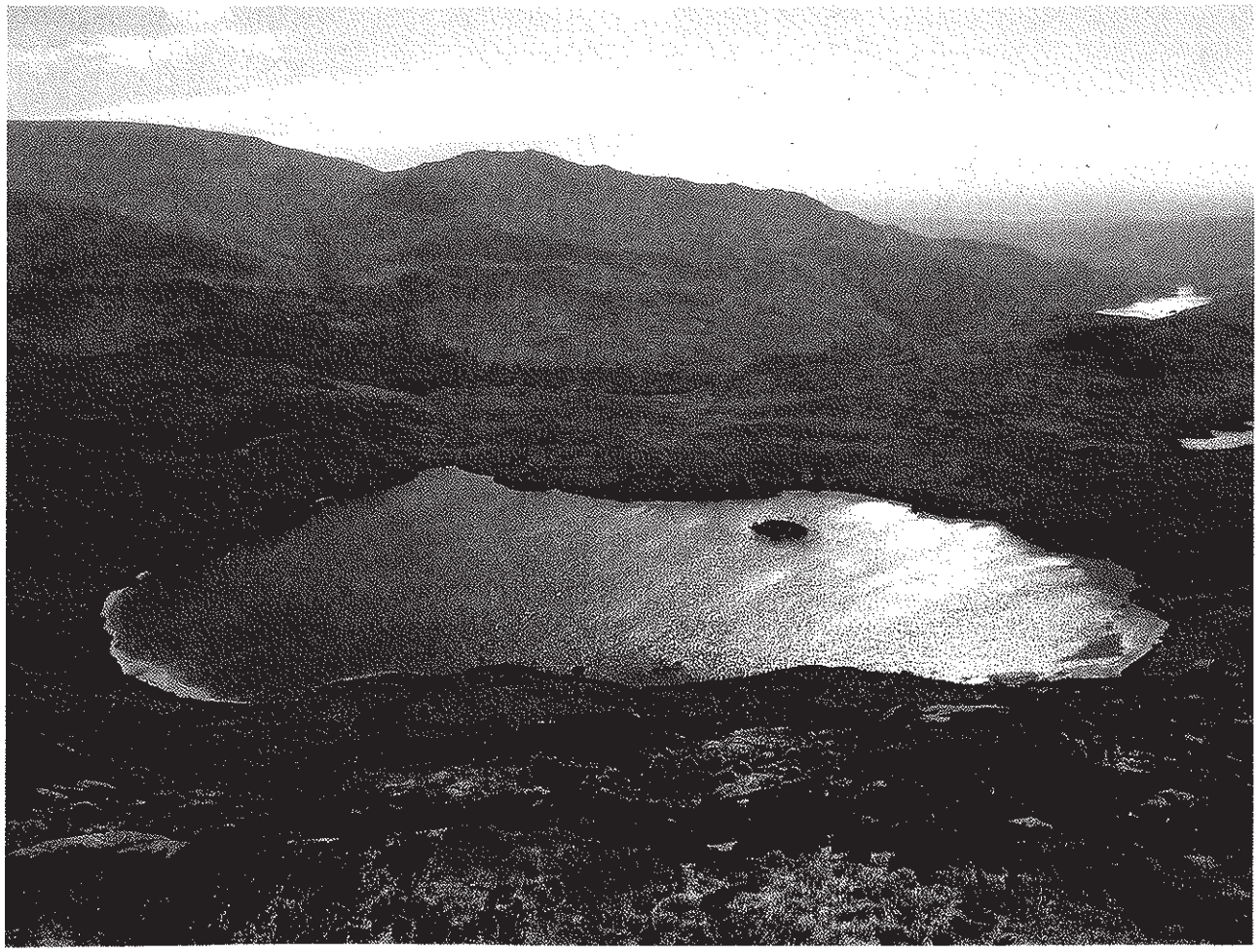
IPS2012

12th International Paleolimnology Symposium

Glasgow SECC 21-24 August, 2012

"advancing the science of palaeolimnology"



important questions in the management of environmental conditions. So, a new effort to collect and analyze sediment cores for the Great Lakes has been initiated. Diatom-based algal indicators, which are especially suited to paleolimnology, are anticipated to serve in addressing the issues that require long-term data in order to make critical remedial decisions in the Great Lakes.

S02-P-09 Paleolimnological assessments of reference conditions and biological integrity using benthic animals: a case study from Lake Tiiläänjärvi (Askola, Finland)

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In this study, we aim to demonstrate the value of fossil animal remains in assessments of limnoecological reference conditions. The case study site, clay-turbid Lake Tiiläänjärvi in Askola, southern Finland, suffers from hypereutrophic conditions and late-winter and end-of-summer anoxia. The retrieved sediment record revealed a succession from oligo-mesotrophic to eutrophic community that finally reached hypereutrophic climax community. The reference state was characterized by stable ecological conditions, but the biological integrity was completely lost in the upper part of the sediment profile. The number of taxa markedly decreased following the nutrient enrichment and only one taxon, tolerant of temporary anoxia, remained in the surface sample. Midge-based quantitative reconstruction of autumnal total phosphorus showed an identical trend compared to sediment characteristics, which correspond to increased land-use and other anthropogenic activities in the catchment. The inferred values for the reference state indicated mesotrophic conditions, which are typical for 'pristine' clay-turbid lakes in southern Finland, and a subsequent increase to eutrophic conditions, with hypereutrophic state reached at the top of the core. This development corresponds with the instrumentally monitored development since 1978, although the sediment chronology remains to be adequately established. The results support the theory that fossil remains of invertebrates provide a useful tool for assessments of lake reference conditions and biological integrity. Therefore, it can be recommended that the paleolimnological approach and the application of benthic invertebrate remains should be put to better use in local and regional lake management for determining baseline conditions.

S02-P-10 Tracking the effectiveness of lanthanum-saturated bentonite clay as a management strategy for increased nutrients in aquatic systems: an applied paleolimnological approach

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Lake Simcoe, the largest (722 km^2) inland lake in southern Ontario, Canada, has been detrimentally affected by increased nutrient inputs resulting from anthropogenic activities. In addition to increases in aquatic plant biomass and algal blooms, decreases in deep-water oxygen have resulted in a loss of coldwater fish habitat, recruitment failures in key species (e.g. lake trout and lake whitefish), and the release of stored phosphorus (P) from sediment sources. In our efforts to reach remediation goals of decreased P loading, the use of lanthanum-saturated, modified bentonite clay (brand name PhoslockTM) to remove P from the water column was investigated at three storm water pond test sites in the Lake Simcoe watershed. While short-term (~14 days) environmental monitoring is required during the testing and application of PhoslockTM, there have been no studies which investigate the long-term (month to year) consequences and efficacy of this product in remediating P-enriched, Canadian temperate-region lakes. Using a paleolimnological approach, this study will enable the assessment of long-term environmental changes in these storm water ponds, account for long-term natural variation, and compare changes in P concentration and algal assemblages before and after PhoslockTM application. Preliminary results suggest PhoslockTM does reduce P loading in these systems; however, the effects can be short-lived in water bodies with low water residence times.

S02-P-11 Oxygen and carbon isotope record of the Eemian Interglacial (MIS 5e) in Poland based on lake carbonates

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The results of oxygen and carbon stable isotope investigations of eight Eemian (MIS 5e) lacustrine sediments from Poland are presented. The values of $\delta^{18}O$ changed from ca. –11 to –1‰, and $\delta^{13}C$ values oscillated between –3.5 and +7.0‰. The isotopic record correlated well with pollen, cladoceran, and diatom data that characterized the palaeolake environment, and the evolution of the palaeolakes in Poland was reconstructed. The palaeolakes originated during the final phase of the Wartanian (Late Saalian) Glaciation. The $\delta^{18}O$ and $\delta^{13}C$ values of that time reflect the input of detrital carbonates into the basins. The boundary between the glaciation and the interglacial period is expressed by a significant decrease in $\delta^{18}O$ and $\delta^{13}C$ values. During the early Eemian, a positive trend in $\delta^{18}O$ values confirms the gradual climatic changes. The Eemian optimum is characterized by constant $\delta^{18}O$ and $\delta^{13}C$ values. During the Early Vistulian (Weichselian) Glaciation, the palaeolake declined. The varying $\delta^{18}O$ values likely reflect frequent changes in water balance between precipitation and evaporation associated with an influence of marine circulation. The fluctuations of the isotopic curves in the upper parts of the successions (the post-optimum) were caused by a shallowing of the basin by infilling with sediments. The observed shifts in the isotopic curves are due to the proximity of the Baltic Sea and earlier strong oceanic influences.

S02-P-12 Reconstruction of the ecological conditions of Lake Garda (Italy) in relation with human impacts over the last two centuries

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Lake Garda is one of the four large Central European lakes included in the EuLakes Project (Reg. Nr. 2CE243P3). The main objectives are to evaluate the lake vulnerability against specific human stressors in a climate change scenario, and to promote sustainable lake management.

Lake Garda is the largest lake in Italy. The deep basin (350 m) is little impacted by human activities and is suitable for reconstruction of long-term environmental variability. In contrast, the shallow basin (81 m) is strongly affected by human activities and is for this reason more suitable for studying lake eutrophication. A consistent monitoring program was started in the early 1990s. Before that, only sporadic limnological measurements are available. Lake sediment records provide a complementary source of information to extend the time span of ecological records back into the past, through the reconstruction of secular lake evolution. Radiometric dating, geochemical (water and LOI content) and biological proxies (algal pigments and diatoms) are being analysed in one short core (56 cm) retrieved from the deepest part of the lake.

Initial analyses of the sub-fossil diatom assemblages during the 20th century show two major changes. The first one, recorded around 1960, is an increase in the relative abundance of planktonic Fragilariaceae, whereas centric taxa decrease suggesting a nutrient enrichment. The second change, in mid 1940s, consists of a decrease in benthic taxa, which may be related with the intensive hydroelectrical exploitation of the catchment area. A preliminary diatom-based, quantitative reconstruction of TP concentration over the last 200 years shows good agreement with monitoring data.