Abstract

An examination of primary production in lakes shows regular trends during the Late Glacial and the Holocene periods: an increase ('eutrophication') and a decrease ('oligotrophication') usually connected with the input of terrestrial organic matter ('dystrophication'). Although nutrient availability usually influences production, other abiotic and biotic factors enter lakes' complex ontogeny, such as light availability, mixing regime, pH level, mechanical disturbance, predation or competition. Consequently, the past relationship between nutrient availability and primary production contains important information about the drivers of ecosystem functioning in the past.

The reconstruction of past processes relies on the sensitive response of aquatic organisms to environmental changes. Their subfossil remains record the dynamic processes in the sediments and reveal both the local lacustrine history and more global events. Among other organisms, diatoms fulfil their function as a valuable proxy of past physical and chemical properties of water bodies. Whereas the record of planktonic diatom species dynamics represents the general ecosystem condition, variations in species-rich littoral periphytic diatoms add necessary insight into finer environmental fluctuations.

The presented research combines qualitative and quantitative diatom analysis with other proxies (e. g., chironomids, pollen, plant macrofossils, sediment geochemistry) to investigate a complex process of in-lake succession. We specifically tracked the past trophic development of two Central-European lakes predetermined towards opposite trophic trajectories by their morphology and landscape position. While the large lowland shallow lake experienced early eutrophication primarily driven by autochthonic factors, the small mountain forest lake underwent dystrophication by allochthonous input of dissolved organic matter. Both lakes confirmed their assumed tendencies in the scope of general post-glacial lake trophic trajectories. However, our record from the lowland lake provides a unique insight into the response of a highly self-controlled ecosystem to the sharp climatic change at the Late-Glacial/Holocene transition. The mountain forest lake demonstrates that long-lasting dystrophication can show a very similar pattern on poorly-buffered bedrocks in Central Europe as in the well-studied boreal regions.