Phytoplankton response to the environmental and climatic variability in a temperate lake over the last 14,500 years in eastern Latvia

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Phytoplankton species are the primary producers in lakes and play important roles in food-web structures. Any shift in their diversity and productivity has an impact on other aquatic life forms. Fossil phytoplankton identified alongside pollen analysis holds great potential to improve our knowledge on environmental requirements of specific algae, their responses to stress factors and species co-occurrences. Using pollen, non-pollen palynomorphs, temperature reconstructions and lithological information as proxies of environmental factors, we statistically test their associations with the fossil phytoplankton community composition. Results reveal that the climate warming and following decrease in landscape openness, and increase in organic matter were significant environmental variables affecting dynamics of phytoplankton communities in both Lateglacial and Holocene. Ontogeny of lake varied through terrestrial development that affected lake indirectly but increased mean summer temperature affected lake directly leading to increased aquatic productivity. Water tolerance indicating moist soils in the surroundings of the lake positively correlated with *Pediastrum*, *Scenedesmus* and *Tetraedron* during the Early Holocene (11,650–8000 cal yr BP). Redundancy Analysis results display a positive association between cyanobacteria and mean air summer temperature and suggest that warming led to higher cyanobacterial abundances and favoured cyanobacteria over other phytoplankton taxa. Therefore, bearing in mind future possible climate warming, dominance of cyanobacteria in temperate lakes is likely.