

Abstract

Climate change has an adverse effect on aquatic ecosystems resulting in alterations in water temperature, lake mixing patterns, resource availability, and, in turn, lake biota. The complexity of processes occurring in the environment still pose a challenge in understanding how climate change and in particular meteorological conditions influence biotic signal formation in lake sediments. Therefore, this thesis aims to identify and explain the relationships between seasonal changes in meteorological conditions and composition of chrysophyte cyst and diatom communities in temperate freshwater lakes. Three lakes located in northeastern Poland (Łazduny, Rzęśniki, and Żabińskie) were studied for three and half years using high-resolution monitoring of limnological and hydrochemical properties of the water column as well as modern sedimentation. Statistical analyses of the collected data combined with the meteorological variables facilitated exploration of linkages between chrysophyte cyst and diatom assemblages and weather conditions.

A conducted study showed that the seasonality and species succession of chrysophyte cysts and diatoms were indirectly influenced by meteorological conditions acting through changes in the mixing regime and nutrient cycling of investigated lakes, and highlighted importance of timing and duration of mixing and stratification phases in shaping chrysophyte cyst and diatom dynamics. This study pointed out some differences in biota responses caused by site-specific conditions. Depending on the trophic status of the lake, the statistically significant responses to specific meteorological conditions could be detected in low-trophy lakes while in an eutrophic lake the relationships were much more complex. Detailed analyses showed that it was not possible to identify specific cyst morphotypes or diatom species whose variability was solely modeled by meteorological conditions. However, recognized links between studied biological proxies, especially chrysophyte cysts, and changes in meteorological conditions showed the potential and limitations of using them in paleoclimatic reconstructions.