

EGU2020-12257

<https://doi.org/10.5194/egusphere-egu2020-12257>

EGU General Assembly 2020

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Temporal pattern of terrestrial plant diversity in northern Fennoscandia

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Understanding the dynamics of biodiversity in the past will contribute to a better informed inference of future biodiversity. Palaeoecological patterns in biodiversity are mainly preserved in natural archives such as lake sediments. Using ancient DNA from the sediment of 10 lakes from northern Fennoscandia, we analysed terrestrial plant diversity pattern for the entire Holocene, and how these patterns correspond to drivers of change such as temperature and biota. We modeled temporal trends in taxonomic richness and turnover using generalized additive models (GAM). We included delta oxygen isotope values from North Greenland Ice Core Project as a proxy for regional temperature, and the presence of dominant woody species as biotic drivers of terrestrial plant diversity.

Results show a general tendency of an increase in species richness from the early Holocene onwards, but this pattern is asynchronous across the lakes, with some lakes having a peak in diversity in the mid-Holocene (8,000-6,000 cal. BP), late Holocene (~2,500 cal. BP), or in recent times. The turnover decreases in most of the lakes throughout the Holocene. Meanwhile, it consistently increases in a few lakes. With some exceptions, temperature and biotic variable differentially affects the richness and turnover across the lakes. Our study from multiple lakes and heterogeneous habitats may be able to identify the main drivers of past biodiversity changes in these systems. As a result, it may help us to understand the mechanisms of change so that the impacts of current climate change and biotic factors on biodiversity may be assessed.

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