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Biomass quality of rich fen bryophytes along the temperate to subarctic gradient sheds light on possible effects of climate change on peat formation in fens

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Introduction:
Fens, unlike bogs, are mires fed by ground or surface water, usually enriched by minerals and nutrients, which allows them to support high and specific biodiversity. Fens are dominant mires of the more continental temperate areas and the Arctic but they are also common in some of the boreal regions. Even though much less recognized than bogs, they remain globally important carbon stores and sinks. Their major peat builders are sedges and so-called brown mosses (non-Sphagnum bryophytes) which have been much less studied in the context of biomass quality than Sphagnum species. In the presented study we aimed to quantify the biomass quality (decomposability) of the common fen bryophytes along more than 15 degrees south-to-north transect.
Material and methods
We studied the biomass quality of fen bryophytes in three regions: temperate fens of NE Poland, mid-boreal Trøndelag, and sub-arctic Finnmarksvidda (both latter in Norway). Studied species were Campyllium stellatum, Scorpidium cossonii, Sphagnum warnstorfii and Tomentypum nitens. In each region, mosses were collected from several sites during the summer of 2022. Each collected moss sample was divided into two. One was quickly dried and the latter was kept alive and later grown in a common garden in standardized conditions, for more than a month, to produce new biomass. Both the biomass collected in the field and the new biomass produced in the common garden experiment were analysed with NIR spectroscopy to assess their biomass quality. We compared the impact of origin on biomass quality of both original biomass and the one produced in common conditions using mixed effect models with location and species as the random factors.
Conclusions
The obtained results shed light on the possible impacts of climate warming on peat formation in fens. Assuming that fens will maintain their integrity in the course of climate change, this change may impact the peat-forming potential of fens via changes in bryophyte community composition as well as by impacting the performance and biomass quality of the locally occurring species. Thus studying bryophyte biomass quality along the climatic gradient might help us to better predict the future of carbon accumulation in fens.