

## Assessing cutover peatland regeneration by combined indicators: organic matter composition, bacteria, and testate amoebae (Protista).

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In order to refine management strategies for cutover peatlands, more information is needed on (1) processes controlling long-term carbon sequestration during peatland regeneration and (2) patterns of changes in the structure of different taxonomic groups of communities in relation with the biochemical characteristics of the peat OM. These were the main goals of the EU-funded project RECIPE<sup>1</sup>. In the present work, we focused on testate amoebae (Protista), bacteria, and biochemical characteristics of peat OM. These indicators, which are generally not considered together in peatland restoration studies, are likely to provide valuable information on biogeochemical processes occurring in the regenerating soil.

In typical plant communities re-colonising a cutover peatland in the Swiss Jura Mountains, we studied: 1) the depth-related changes of biochemical and micromorphological characteristics of peat OM, 2) the bacteria C biomass at different depths, and 3) the abundance, diversity, and community structure of testate amoebae living in the *Sphagnum* mosses at the surface. An unexploited area of the peatland was also studied as a reference.

Results showed contrasting biochemical signatures of peat OM which were observed along the regenerating profiles, allowing clear differentiation between the newly regenerated peat and the old catotelm peat. Over the succession, the OM composition of the new peat also differed: peat from the recent regenerated sites was dominated by *Sphagnum*-derived tissues and was characterised by lesser carbohydrate preservation and higher bacterial biomass, while the peat from older regenerating sites showed a heterogeneous botanical composition and lower bacterial biomass.

Hemicellulosic sugars of peat OM were used for reconstructing past vegetation, i.e. mannose - galactose for mosses and xylose - arabinose for sedges. OM alteration also included the differential biodegradation of cellulose and hemicellulose.

Surface testate amoeba communities changed from the recent to the advanced stages of regeneration suggesting a shift from wet and mesotrophic conditions to drier and more acidic conditions. Species richness and diversity increased but density declined from the recent to the advanced regeneration stage and the unexploited site. Biomass and the average size of species declined over the regeneration sequence but were higher in the unexploited site.

Overall, although the spontaneous secondary succession in the studied cutover bog leads to an ecosystem similar to that of the intact reference site in terms of surface vegetation, OM characteristics and testate amoebae continue to reflect disturbances associated with peat harvesting. Nevertheless, the

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<sup>1</sup>Reconciling commercial exploitation of peat with biodiversity in peatland ecosystems.

described dynamics of both microbial and biochemical variables over the succession showed some similarities between the advanced stage and the reference: higher testate amoeba diversity is associated with better carbohydrate preservation and heterogeneous botanical composition of the regenerated peat. This combination of indicators therefore provides a more complete assessment of the present and recent past ecological conditions that could be valuable for the management of cutover peatlands.