A closer look at *Sphagnum*: Macrofossil analysis in a boreal peatland (Store Mosse, south-central Sweden)

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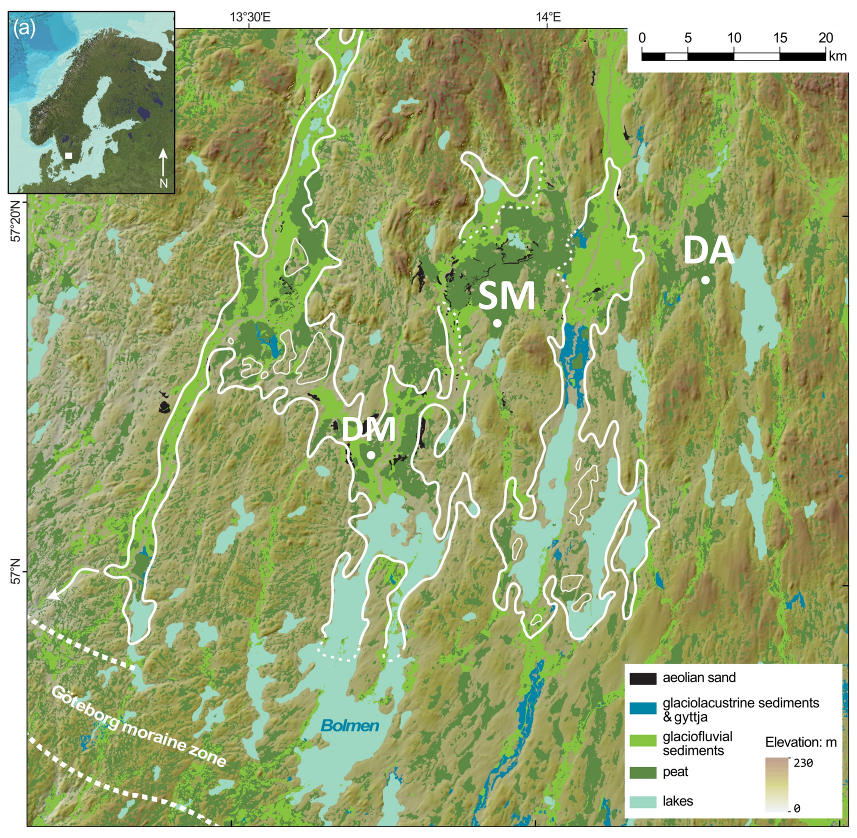


Fig 1: Location map; Store Mosse (SM) peat bog, along with Draftinge Mosse (DM) and Dala Mosse (DA) in south-central Sweden. The modelled main lake boundaries from glacial lake Fornbolmen, which previously covered the area, are shown in white (Kylander *et al.*, 2018).

Store Mosse is an ombrotrophic bog in south-central Sweden (Fig 1). It is the first focus site in a study of peat paleorecords from three bogs in the area, aiming to identify factors driving changes in species distribution of *Sphagnum* mosses - the dominant species in boreal peatlands.

By using macrofossil analysis, different vegetation stages are identified within the record. Of special interest are the different *Sphagnum* species which are examined using high power light microscopes, using their cell structures (from branch and stem leaves) to aid in species identification (Fig 2).

A ca. 7 m core was sub-sampled at 1 cm resolution for bulk density and peat accumulation (rates) (Fig 3). Early results from these analyses, along with an age model of 10 age dates, align well with previous paleoclimate studies in the area (Kylander *et al.*, 2013, 2016, 2018), however, the macrofossil analysis revealed some unusual transitions* (Fig 4).

Ten *Sphagnum* species have been identified from 72 samples within the core (Fig 4). Based on *Sphagnum* and fen vegetation coverage percentages, four transitions can be seen:

Lake-Fen-Bog-Fen-Bog (Fig 4).

Why study *Sphagnum* in boreal peatlands?

Sphagnum mosses are often well-preserved in the peat and can tell us about local climate and environmental conditions within the peatland. Using this information, the ecosystem's previous responses to climate change can be investigated. This is important in terms of potential future effects on carbon storage, since about 1/3 of the global soil carbon is stored in northern peatlands.

Next steps for this site:

- Increasing resolution of macrofossil analyses
- Species distribution modelling

Fig 2: *Sphagnum* cell structures

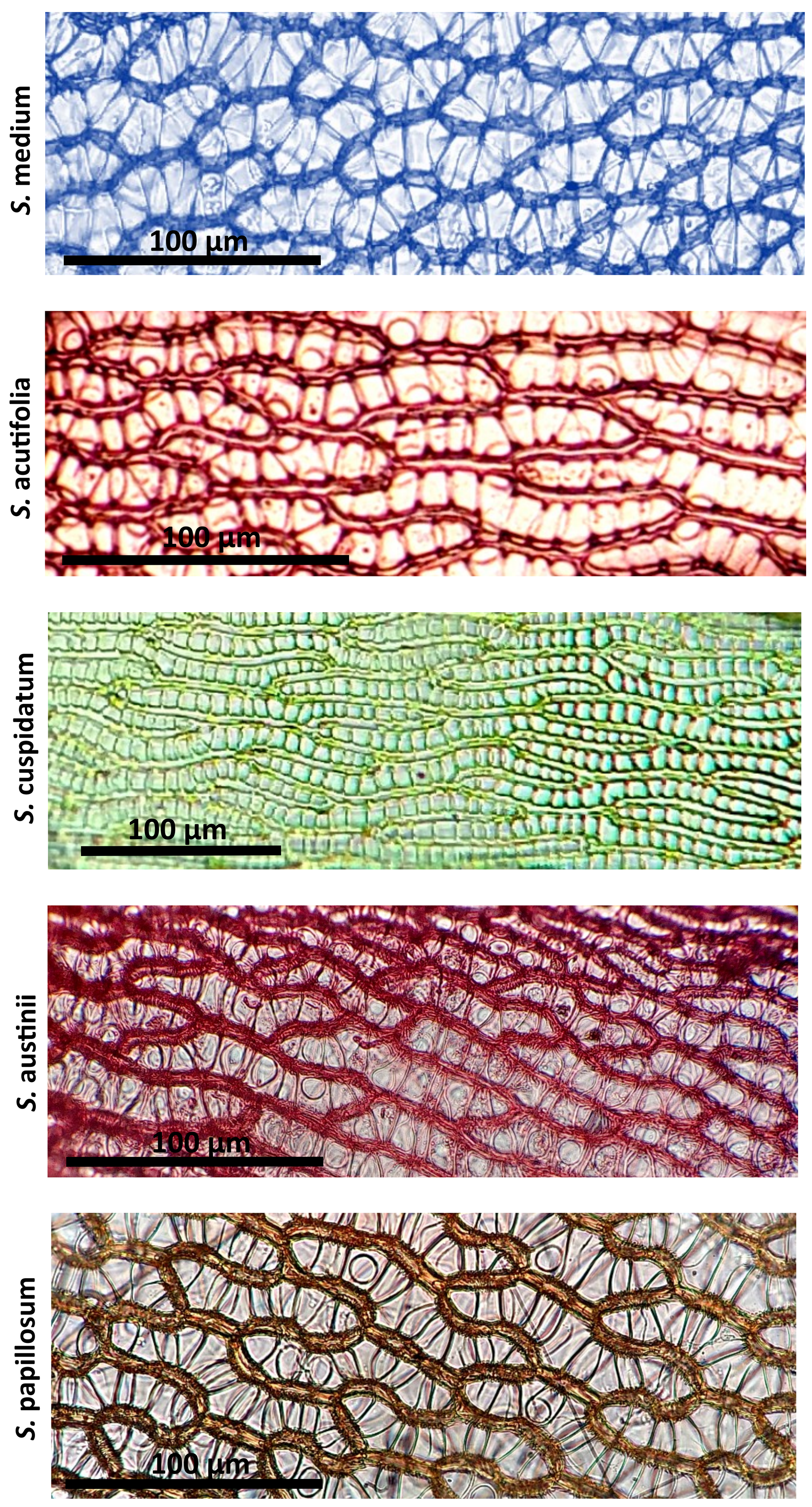


Fig 3: (a) Bulk density (g cm^{-3}) and (b) Peat accumulation rate (g m^{-2} yr^{-1})

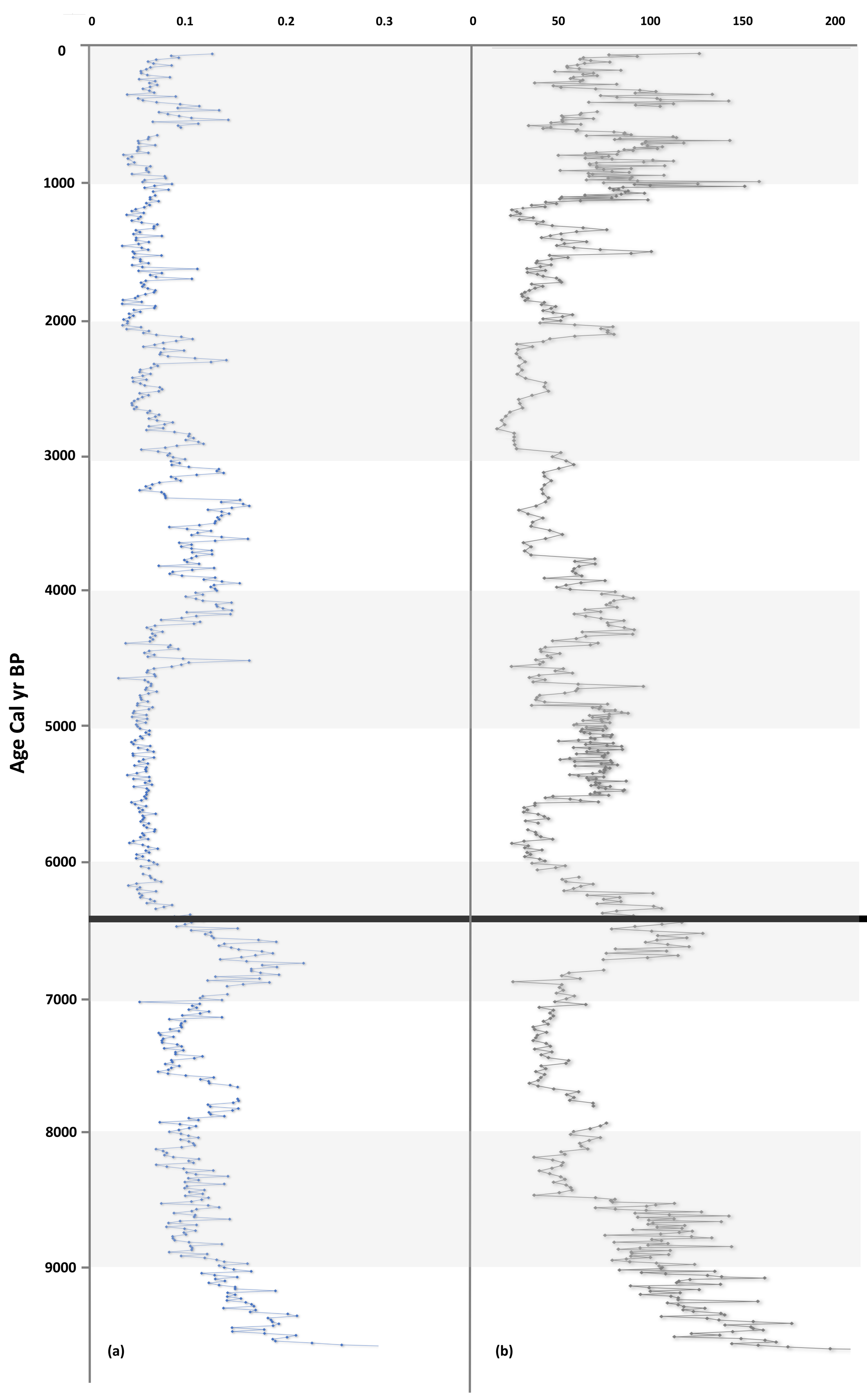
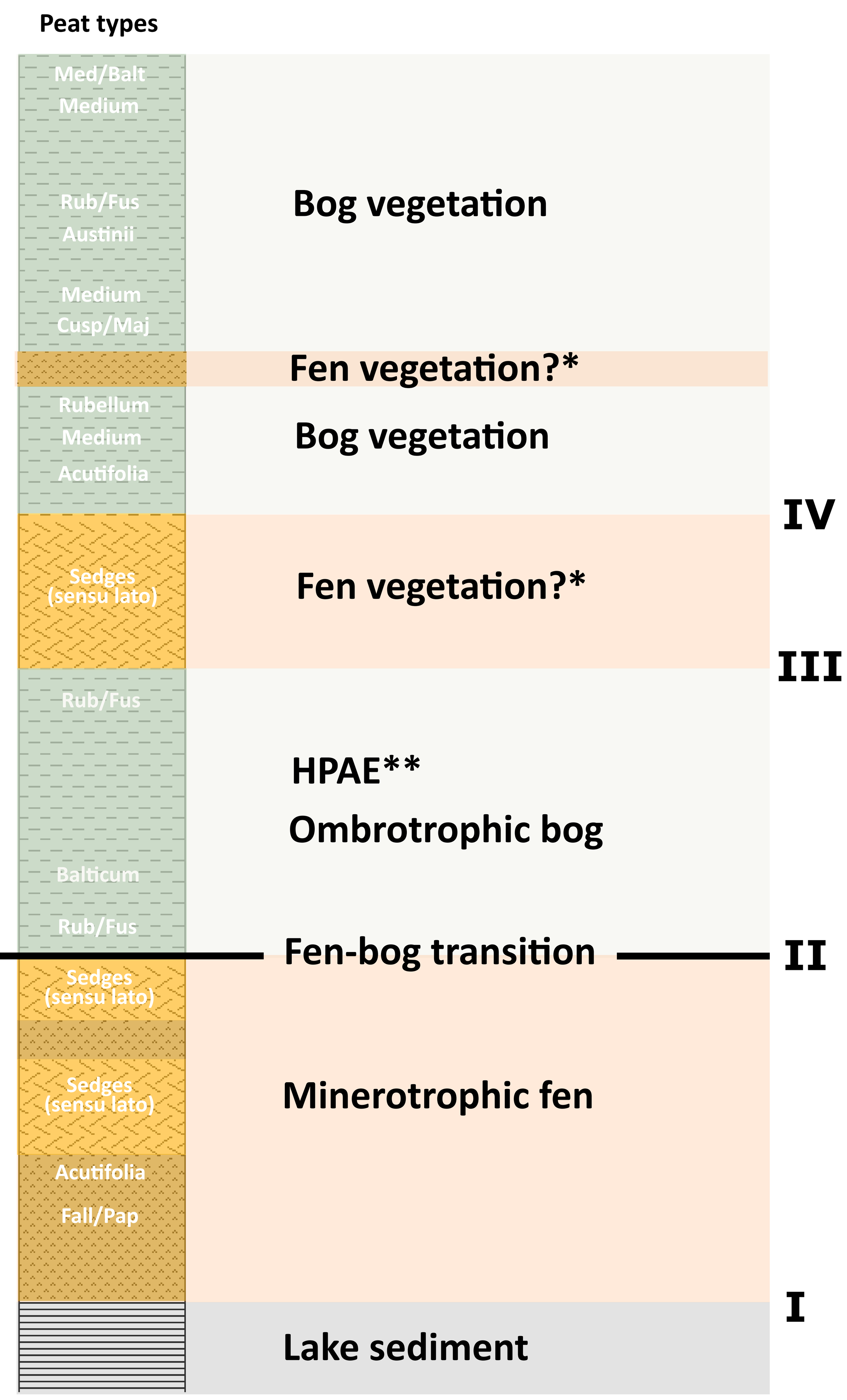


Fig 4: Vegetation transitions



*Unusual transitions in the vegetation. **High Peat Accumulation Event.

Fig 2: A series of pictures of *Sphagnum* branch leave cell structures from the macrofossil analysis conducted on Store Mosse peat: *S*. medium, *S*. acutifolia, *S*. cuspidatum, *S*. austinii, and *S*. papillosum. These pictures show structures used in identification of the different species, such as size and shape or pores and hyaline cells, and presence or absence of papillae/lamellae and fibrils. **Fig 3:** Bulk density analysis (a) and peat accumulation rates (PAR) (b) plotted against age (Cal yr BP) from Store Mosse, with the main fen-bog transition clearly marked around 6300 Cal yr BP. **Fig 4:** The peat stratigraphy and dominant *Sphagnum* species throughout the core (in white text), outlining vegetation changes and transitions (I: Lake-Fen; II: the main Fen-Bog transition; III: Bog-Fen vegetation; and IV: Fen vegetation-Bog), the main fen-bog transition, the HPAE* as correlated with previous research by Kylander *et al.,* (2016;2018) and Sjöström (2018) in the area.

Minerogenic | **Fen (>15% Sphagnum)** | **Fen (<15% Sphagnum)** | **Bog**

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