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Salinity effects on mass loss and nutrient release in the litter decomposition of peatland macrophytes

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Global mean sea level had been rising and accelerating in the last decades affecting coastal wetlands that are important carbon stores since they are susceptible to fluctuating water levels. Climate-change-driven sea-level rise, which is predicted to reach about one to two meters by 2100, may lead to dramatic shifts in the vegetation composition of coastal wetlands consequently influencing ecosystem functions including photosynthetic activity, biomass production, litter decomposability, and ultimately the pattern and rates of nutrient cycling, carbon storage, and greenhouse gas exchange. In this regard, aside from water level, changes in salinity that may especially influence the decomposition of dead plant material are also of prime concern.

Here, we provide a comparative evaluation of the decomposition rates of the dominant macrophytes in different nearby freshwater and brackish peatlands. We assumed that the degradability of leaf litter differs among species due to the difference in chemical composition. Two peatland sites, Schutower Moor (freshwater) and Diedrichshagen Moor (brackish) were selected to compare the decomposition rate and nutrient release of *Phragmites australis*, *Carex* sp. and *Schoenoplectus tabernaemontanii* as influenced by salinity. We used the litterbag method using senescent leaves or stem parts (for *S. tabernaemontanii*) of the macrophytes that were collected in late autumn. We deposited 30 litterbags per species per site and retrieved 5 of these per site after 1, 2, 4, 6, 8 and 12 months, respectively.

Regardless of site and species, the highest mass loss occurred in the first 35 days of decomposition with a strong decrease thereafter with almost flat slopes. The initial decay rates of the same species did not differ significantly between sites. However, the initial mass loss of the *S. tabernaemontanii* litter was significantly higher than the other species. This species has the highest decay coefficient of 0.008 d^{-1} and 0.006 d^{-1} in freshwater and brackish sites, respectively. These decay rates are up to four times faster compared to the other species resulting in empty litterbags a year after deployment indicating the complete decomposition of *S. tabernaemontanii* while other species had between 40% to 60% dry mass remaining. Initially, the carbon and nitrogen contents of *S. tabernaemontanii* were significantly lower than those of the other species while its initial sulfur content was significantly higher than of the other species. *S. tabernaemontanii* retained a relatively high amount of nitrogen, phosphorus, sulfur and

magnesium throughout decomposition compared to the other species. This keeps the C:N, C:P, C:S, C:Mg and N:P ratios nearly constant from the start to the end of the study suggesting continuous microbial activities due to the availability of such nutrients in the detritus of *S. tabernaemontanii*. This confirms that *P. australis* and *Carex* sp. contribute to the formation of peat while *S. tabernaemontanii* does not.

Litter quality showed to be a more important factor affecting decomposition than the little difference in salinity between sites (e.g. annual average of 3psu) that did not significantly affect the decomposition rate of macrophyte litter. Therefore, future similar studies should consider comparing sites with higher salinity levels.