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Carbon and Nitrogen storage in Baltic coastal wetlands

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Coastal wetland systems are a priority habitat, according to the EU Habitats Directive (1992). They consist of a range of plant communities and in Europe can include salt marshes, coastal wet grasslands, swamp vegetation on the seaward edge, and scrub vegetation on the landward side. Coastal wetlands provide numerous essential ecosystem services, including supporting high biodiversity, high productivity, flood defense and wave attenuation as well as carbon and nitrogen sequestration and storage. Despite their ecological importance coastal wetlands have been subjected to habitat degradation and loss throughout their distribution as well as decreases in ecosystem service provision, and this is likely to be exacerbated by climate change. There has been increasing interest in the ability of coastal wetlands to store and sequester carbon and nitrogen as a highly important ecosystem service that may help mitigate climate change.

We collected topsoil cores from three Baltic coastal meadows following stratified random sampling for each plant community: Lower Shore (LS), Upper Shore (US), Tall Grass (TG) and Open Pioneer (OP). A total of 10 cores per plant community per site were collected. Sampling cylinders (88.2 ml capacity; 40 mm height; 53 mm internal diameter) were used to collect undisturbed soil material. Organic carbon content (SOC) was determined by the Tjurin (wet combustion) method and total nitrogen (Ntot) content with the Kjeldahl method.

Our results show that organic carbon content and total nitrogen are site and plant community specific. The specificity is likely driven by sedimentary and geomorphic constraints such as rates and duration of inundation and allochthonous organic inputs, which highlights how increasing rates of sea level rise and frequency of extreme flooding events will likely impact carbon and nitrogen storage in coastal wetlands. This also shows that not all sites provide the same level of these ecosystem services and should carbon metrics be applied for conservation purposes in the future, site specific studies and monitoring of carbon sequestration will be required.