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Carbon sequestration capacity of naturally reintroduced temperate eelgrass meadows.

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Seagrass meadows are highly productive habitats that can act as 'blue carbon sinks' in coastal ecosystems. They have strong capacities for ecosystem engineering, i.e., changing abiotic conditions by facilitating sedimentation, reducing resuspension, and trapping seagrass-derived and other particles. Most estimates of seagrass sediment carbon sink capacity are based on studies performed in systems formed by *Posidonia oceanica* - a Mediterranean seagrass species that is completely different from the *Zostera marina* – the dominant seagrass element in temperate subtidal meadows (Nellemann et al., [1]; Duarte et al., [2]).The present study is the first estimation of seagrass sediment carbon sink storage in the low density temperate *Zostera marina* beds in the Baltic Sea. The seagrass beds' presence and aerial coverage in these waters dramatically decreased within the last century. Recently, the natural reintroduction of *Zostera* meadows took place in the area. It is intriguing whether current natural reintroduction affects the sedimentary system in the area. As indicated by ^{210}PB sediment dating, the upper 10 cm sediment layer is mixed and represents the last 60 years – so the period after seagrass decline. Therefore, several descriptors of organic matter quantity and quality and grain size characteristics, along with possible organic matter sources in the sediment at vegetated and unvegetated bottoms, are compared in the upper 10 cm sediment layer. The POC and photopigments concentrations in sediments were higher in vegetated bottoms, while no difference in the grain size descriptors was detected. The POC enhancement in vegetated sediments was not accompanied by changes in the mean δ^{13}C signature, but the SIAR mixing model (Parnell et al. [3]) outputs based on both nitrogen and carbon stable isotope ratios indicate higher percentages of organic matter that originated from seagrass production in vegetated sediments (40-45%) compared to unvegetated ones (4.5–21%). The carbon stock in the vegetated sediments in the southern Baltic Sea amounts 42.0 ±, 0.2 g m^{-2} whereas the annual C accumulation amounts are 10.5 ± 0.1 g m^{-2} (with a mass sediment accumulation rate of 0.24 ± 0.02 g cm^{-2}). Thus, even the recent and relatively weakly developed vegetation of the small temperate seagrass species *Zostera marina* in the Baltic Sea may play a considerable role in carbon sequestrations. The values for the Baltic Sea *Zostera* beds are much lower than those reported for *Posidonia* from warmer systems as well as lower than those reported for some other *Z.marina* meadows. Therefore, our results indicate that global calculations (Fourqurean et al., [4]) should be reconsidered by taking into account species-related and geographical variability.

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