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## Biodiversity and food web structure influence short-term accumulation of sediment organic matter in an experimental seagrass system

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**ABSTRACT:** We tested the effects of grazer diversity and food chain length on the quantity and quality of accumulated sediment organic matter (SOM) in experimental eelgrass (*Zostera marina*) mesocosms. By use of a factorial manipulation of crustacean grazer species richness and predator presence, we examined the effects of epibenthic consumers on SOM composition by using stable carbon isotopes ( $\delta^{13}\text{C}$ ) and lipid biomarker compounds. Grazer species composition strongly influenced nearly all measures of SOM quantity and quality. In particular, increased densities of the grazing amphipod, *Gammarus mucronatus*, decreased accumulation of benthic microalgae (chlorophyll *a*) and the relative abundance of polyunsaturated fatty acids (FA, a proxy for labile algal organic matter) and branched FA (a proxy for bacterial biomass). On average, increasing grazer species richness decreased SOM quantity (percentage of total organic carbon). Increasing food chain length by addition of predatory blue crabs (*Callinectes sapidus*) resulted in a trophic cascade, increasing algal biomass and accumulation of algal organic matter in sediments, and enhancing the quality of SOM. Concomitantly, the relative proportion of bacterial branched FA increased. The identity and number of epibenthic consumers strongly influence accumulation and composition of SOM and the pathways by which it is processed, and these responses are not easily predictable from bulk measurements ( $\delta^{13}\text{C}$ , percentage of total organic carbon) alone.

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