

Leaf size doesn't matter: environment shapes eelgrass biodiversity more than a foundation species' traits.

Alexandre MULLER¹, Stanislas Dubois², Aurelien Boye³, Gabin Droual⁴, Mathieu Chevalier¹, Marine Pasquier¹, Loïg Roudaut¹, Jerome Fournier⁵, Isabelle Auby³, and Flavia Nunes¹

¹Ifremer Département Océanographie et Dynamique des Écosystèmes

²IFREMER DYNECO

³Ifremer

⁴Ifremer Departement Oceanographie et Dynamique des Ecosystemes

⁵Museum National d'Histoire Naturelle

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Abstract

Aim: Understand the ecological processes that shape community composition in eelgrass meadows along the coast of France at local and regional scales. **Location:** Northeastern Atlantic. **Methods:** Combining taxonomic and trait-based approaches with structural equation modeling, we explored the mechanisms governing community assembly in five meadows located over a distance of 800 km along the French coast in the Northeast Atlantic. We assessed the spatial variability of eelgrass-associated invertebrate communities as affected by environmental parameters or morphological traits of the eelgrass and linked these mechanisms to their impacts at local and regional scales through analyses of the taxonomic and functional α and β diversities. We then quantified the direct and indirect effects of environmental factors on macrofaunal structure and composition. **Results:** Eelgrass meadows locally favored higher species abundance, diversity, and functional traits present in the community relative to nearby bare sediments. At the regional scale, eelgrass diversity was comparable between sites, with high species turnover observed among them, and each site being characterized by different species and different sets of traits. These differences were due in part to morphological traits of the meadows, but the explanatory variables that best explained the differences among the meadows were environmental conditions, including temperature, current velocity, and Δ water level. **Main conclusions:** Meadows appear to harbor subsets of species from the regional species pool, rather than harboring eelgrass-specific assemblages. The processes that maintain seagrass diversity appear to reflect a seascape-scale meta-community composed of many habitats connected by source-sink dynamics. Given that eelgrass enhances the diversity and abundance of species found in neighboring habitats, conservation programs should consider ecosystem-level protection spanning multiple habitats, including eelgrass, in order to maximize the protection of biodiversity.

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