Linking functional traits and ecosystem functioning in a Canadian coastal eelgrass meadow

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Context

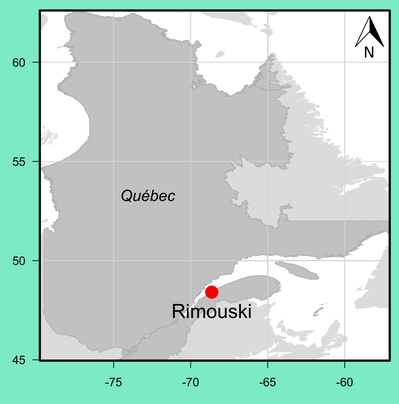
Eelgrass (*Zostera marina*) are important features of coastal ecosystems, being engineering species, primary producers and contributors of many ecosystem services such as carbon sequestration ('blue carbon'). Many factors, from human activities to environmental change, threaten the stability and functions of these ecosystems.

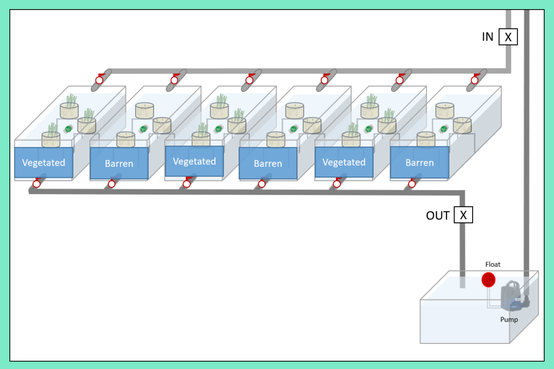
To allow a better conservation and management of coastal meadows, there is a need to understand how functional diversity of communities (i.e. number of ecological functions) and biogeochemical functioning are linked.

Goals and Methods

- ▶ *Describe functioning of eelgrass meadows*
- ▶ *Compare vegetated and barren areas within meadows*

We studied eelgrass meadows in the region of Rimouski (Québec, Canada). Sediments cores were collected in Summer 2021 with and without plants, and incubated under natural light within mesocosms to study biogeochemical fluxes at emersion (CO_2) and immersion (O_2, DIC). We also studied the concentration of microphytobenthos, the composition of the benthic community and related functional traits.

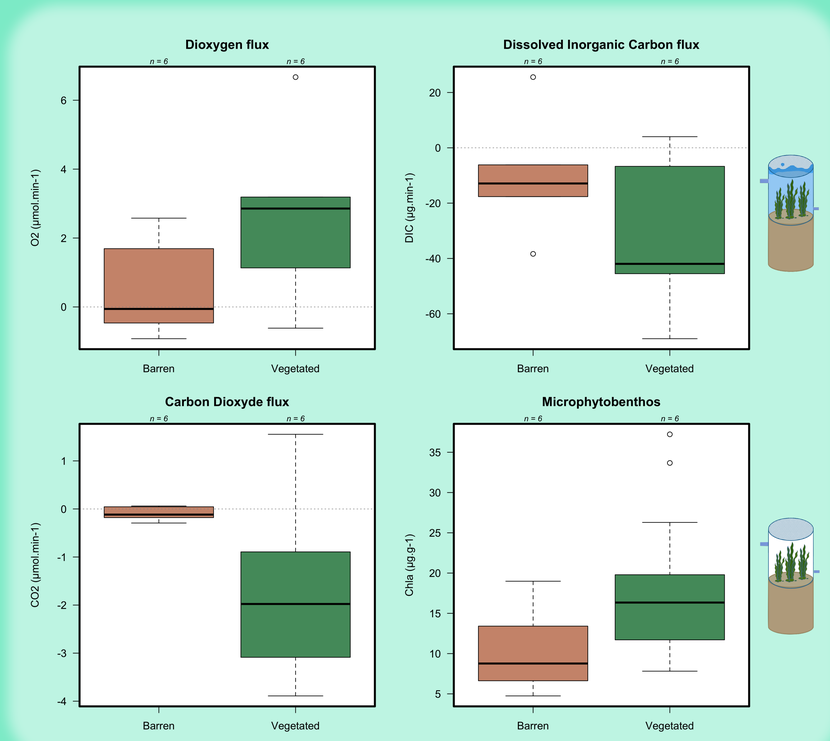


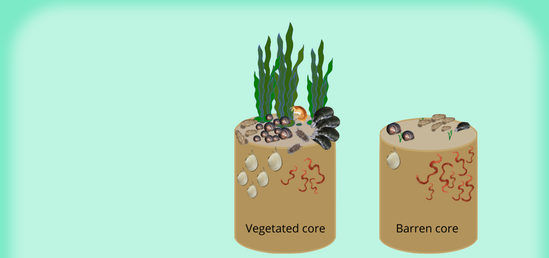


Results

At immersion, dioxygen fluxes are higher in vegetated than in barren cores. Looking at DIC fluxes, both fluxes are **negative** with lower values in vegetated cores. At emersion, most of the fluxes in vegetated cores are **negative** and lower than in barren cores. Low and high tide carbon fluxes show similar patterns, presumably driven by the primary producers in the core. Benthic community composition show remarkable differences between barren and vegetated cores. **Arthropods** (*Gammarus* sp and *Jarea albifrons*) have been observed in vegetated cores only and **bivalves** (*Mytilus* sp and *Macoma balthica*) are bigger and more abundant there. **Annelids** (mostly Oligochaeta) are more abundant in barren cores. Vegetated cores also show slightly higher biodiversity indices, along with a higher Pielou's evenness.

Vegetated cores shelter an abundant and rich community with a high net productivity, meaning that the **presence of eelgrass** overcompensate community respiration. Dioxygen and carbon dioxide fluxes averages in barren cores are near 0, which could be explained by the presence of **microphytobentic productivity** compensating for the community respiration.





	Vegetated core	Barren core
Richness =	12	10
Shannon =	2.02	1.43
Pielou =	0.82	0.62

Mean plant density	71.6
Mean leaf biomass (g)	5.529
Mean shoot length (mm)	271.89
Mean leaf area (mm^2)	691.6
Standard Leaf Area ($mm^2.g^{-1}$)	8827.66

Conclusions

- In barren cores, microphytobenthos compensates for lack of eelgrass
- Eelgrass enhances abundance and diversity of benthic species

Next steps:

- Compile data further to validate primary results
- Compute functional traits and functional diversity to understand the role of different species in biochemical fluxes