Community structure of Megafauna and comparison between seagrass and sand bed in the Arcachon Bay, Southwest France

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Abstract

A field trip was conducted to investigate the epibenthic megafauna of *Zostera marina* seagrass beds and adjacent sand beds in Arcachon bay, France. A total number of five seagrass beds and adjacent sand bed were sampled.

High biodiversity was observed in the seagrass bed compared to sand beds as highlighted by the diversity index. Hierarchical clustering identified 3 main groups, subdivided into four groups for seagrass and two groups for sand bed (2022). Present results were compared to previous year's (2021) data.

Introduction

- The seagrass meadows provide food, shelter for commercial species, enhance nutrient cycling, water quality, and sediment dynamics (Airoldi and Beck, 2007).
- Seagrass beds have also been demonstrated to be vital sources of nutrients, which means can sustain a high level of secondary productivity in the coastal areas.

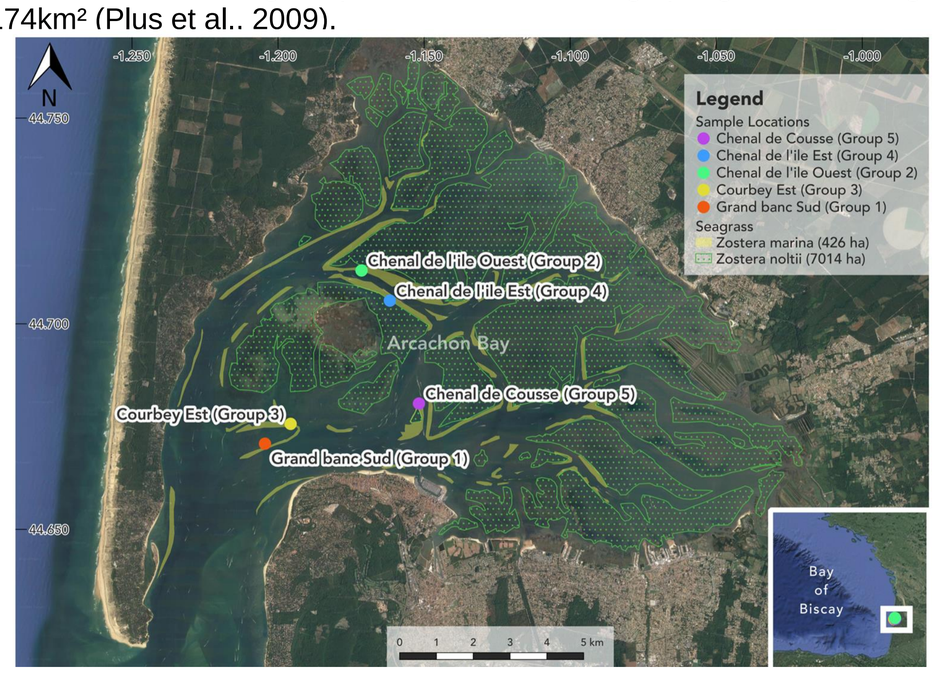
Objectives of the study

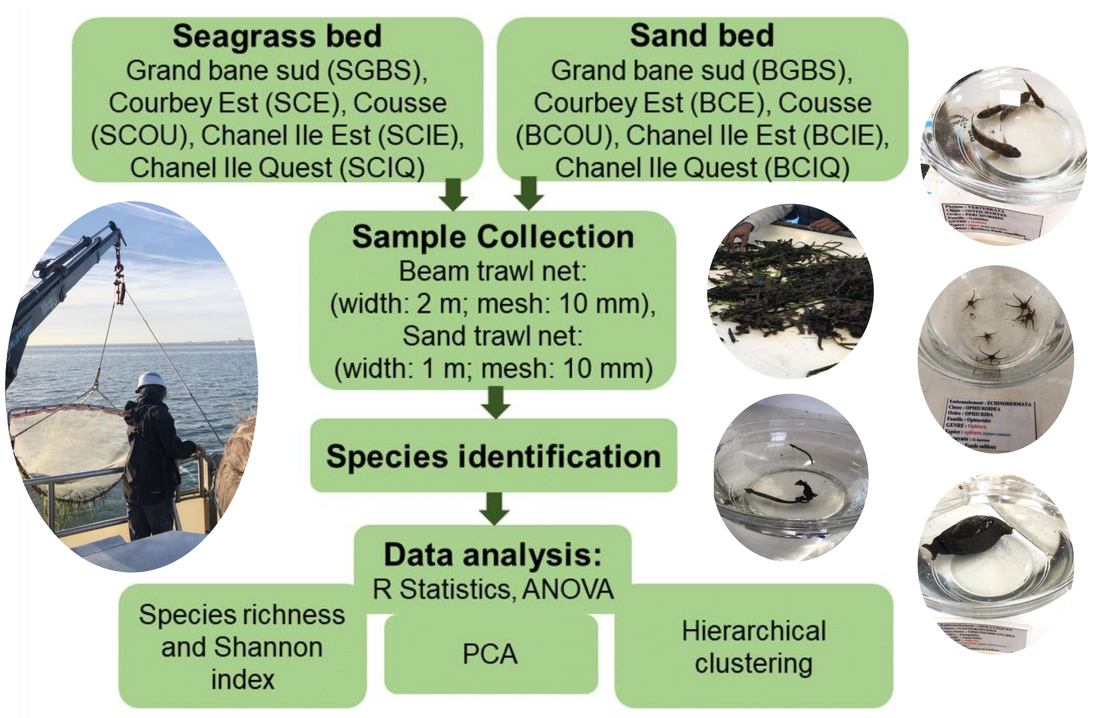
- To understand the structuring effect of *Z. marina* on benthic communities of the Arcachon Bay.
- To understand seagrass ecology and its importance.

Materials and Methods

- **Study Area:**

The Arcachon Bay is a triangular semi-enclosed lagoon situated at the southeastern end of the Bay of Biscay. It is characterized by a semi-diurnal tidal system with a tidal range between 0.8m during neap tide and 4.6m during spring tide, covering an area of up to 174km² (Plus et al.. 2009).

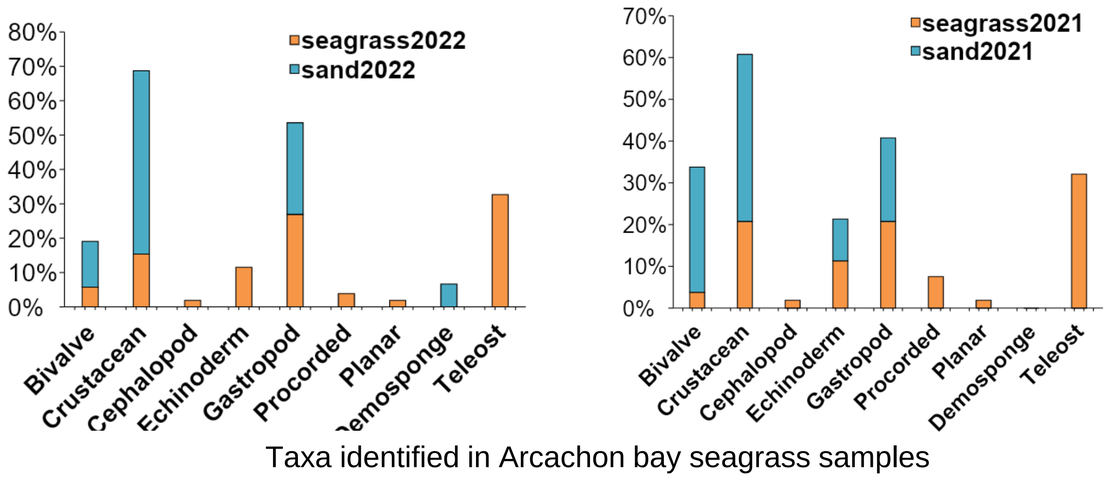




Results and Discussion

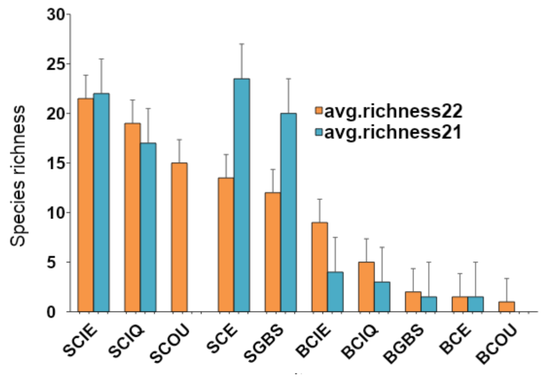
Species richness, Abundance and Diversity:

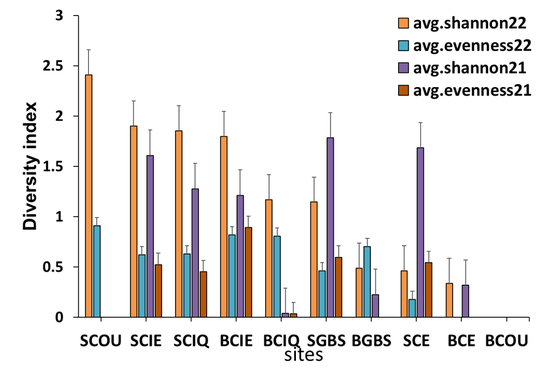
- Seagrass beds showed higher and greater diversity and abundance than sand bottoms
- Variation of diversity amongst stations different years since the hydrodynamical and nutrient cycling vary according to spatial-temporal variables (McCartney et al., 2011).



Taxa identified in Arcachon bay seagrass samples

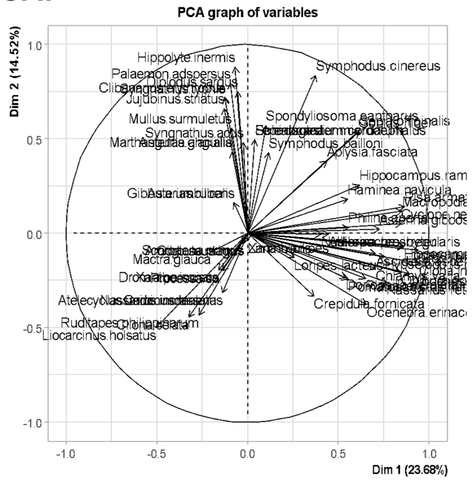
- Megafauna communities in both years are relatively the same where teleost is dominant in seagrass while crustacean in sand.

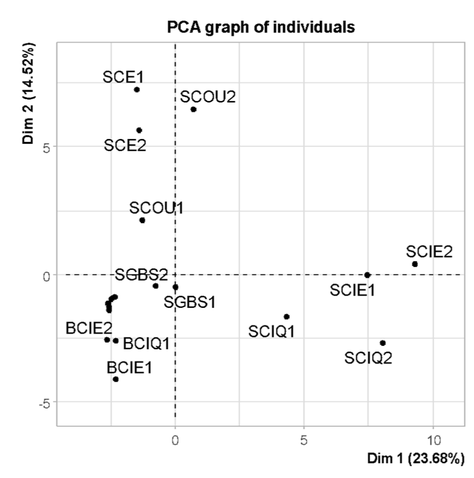




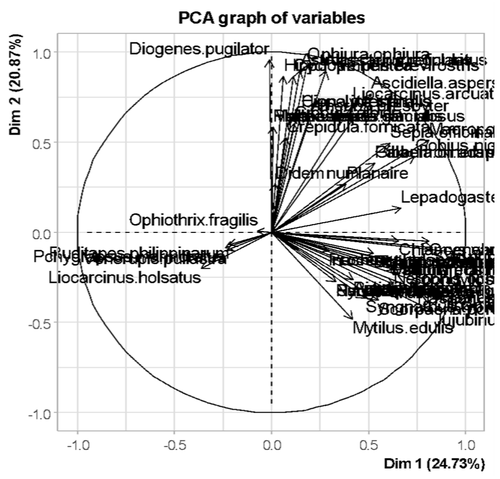
- Based on the graph above, the highest average species richness is in stations SCE and SGBS during 2021 (left). It can also be seen that SCOU has the highest biodiversity among all stations in both years. This is due to the high shannon index and high evenness (close to 1) (right).

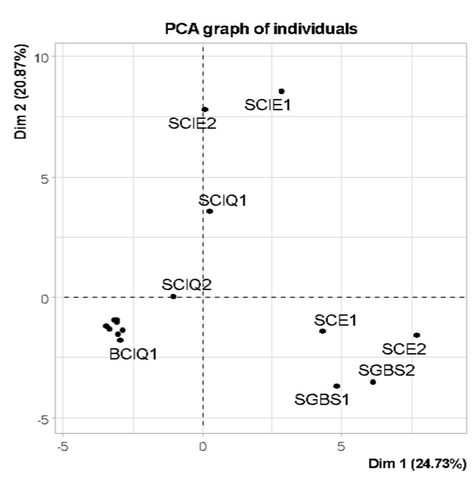
PCA:





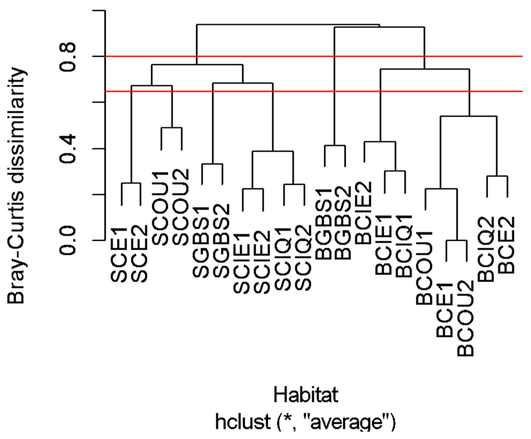
The Dim 1(23.68%) shows habitat gradient, large numbers of the megafauna correlate with the seagrass habitat. Dim 2 (14.52%) shows geographical variation with some seagrass showing strong negative correlation with each other e.g SCE and SCIQ.





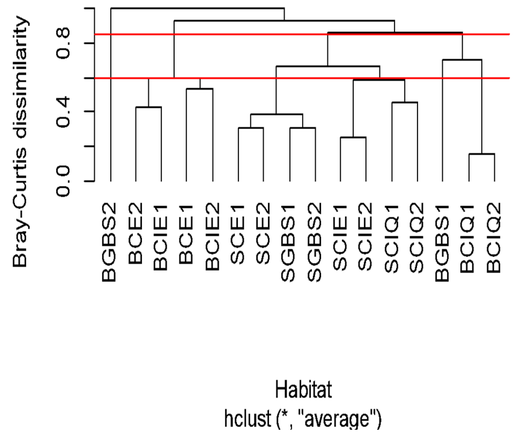
2021 (24.79%) shows more habitat influence on species compared to 2022. Sand habitats showed negative correlation with seagrass habitats. Dim 2 showed geographical gradient (ocean mouth to inner bay) we observed that SCIE and SCIQ (inner bay) have negative correlation with SCE and SGBS (ocean mouth)

Community Structure:



Specific megafauna for the three main clusters in 2022:

- Group 1: *Macropodia rostrata, Sepia officinalis* (all seagrass habitats)
- Group 2: *Mactra glauca* (BGBS1, BGBS2)
- Group 3: *Liocarcinus holsatus* (sand beds except those in group 2)



Specific megafauna for the three main clusters in 2021:

- Group 1: *Gobius niger Macropodia rostrata* (all seagrass)
- Group 4: *Venerupis pullastra* (BGBS2)
- Group 2: no specific fauna identified (BCE1 BCE2 BCIE1 BCIE2)
- Group 3: no specific fauna identified (BCIQ1 BCIQ2 BGBS1)

Conclusion

- The study indicates that seagrass abundance appears to have a significant influence on benthic macrofauna in the Arcachon Bay.
- Seagrass beds have a positive effect on the diversity and productivity of benthic epifauna populations as study sites with seagrass beds showed more diversity and productivity relative to sandy sites without the *Zostera marina.*
- There is also a change in macrofauna communities from the open ocean to their inner bay, which may be related to the physicochemical gradient.

References

- Airoldi, L., Beck, M. W. (2007). Loss, status and trends for coastal marine habitats of Europe. *Oceanography and Marine Biology: An Annual Review.* 45, 345 – 405.
- McCartney, M., Morardet, S., Rebelo, L. M., Finlayson, C. M., & Masiyandima, M. (2011). A study of wetland hydrology and ecosystem service provision: GaMampa wetland, South Africa. *Hydrological sciences journal*, 56(8), 1452-1466
- Plus, M., Dumas, F., Stanisière, J. Y., & Maurer, D. (2009). Hydrodynamic characterization of the Arcachon Bay, using model-derived descriptors. *Continental Shelf Research*, *29*(8), 1008-1013.