FUNCTIONAL TRAITS AND ECOSYSTEM FUNCTIONING: LOOKING INTO EELGRASS MEADOWS

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Benthic Ecology Meating 2022
March 29th to April 2nd
Porthsmouth, NH

UQAR ISMER

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MEOPAR

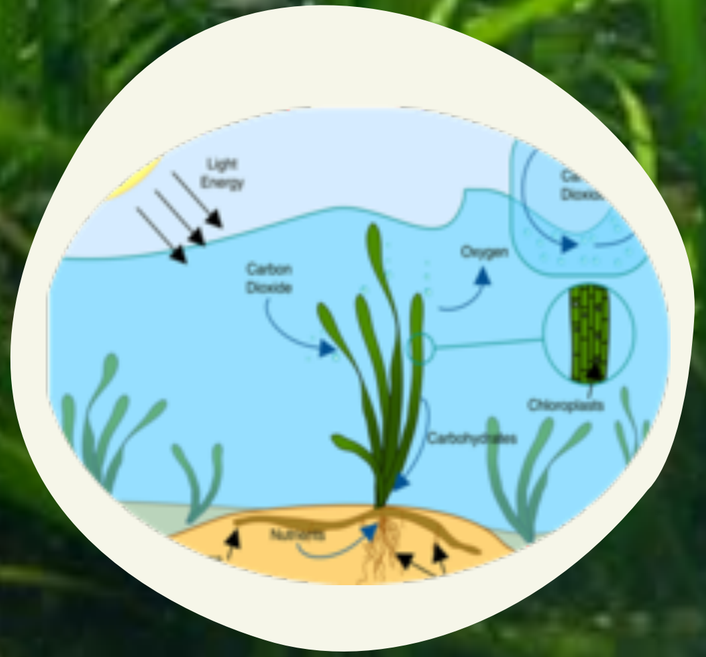
ZIP

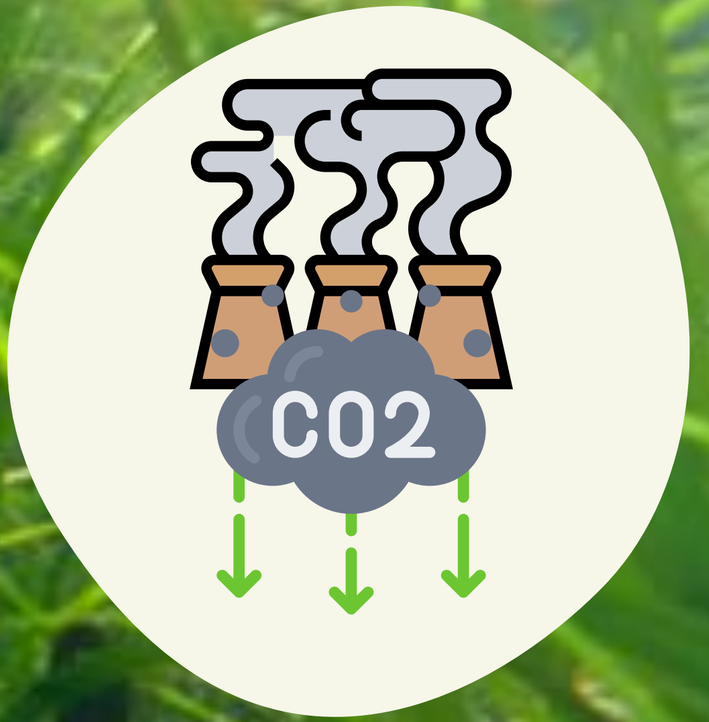
SEAGRASS MEADOWS

ensuring ecological functions and providing services

3D structure

biogeochemical cycles

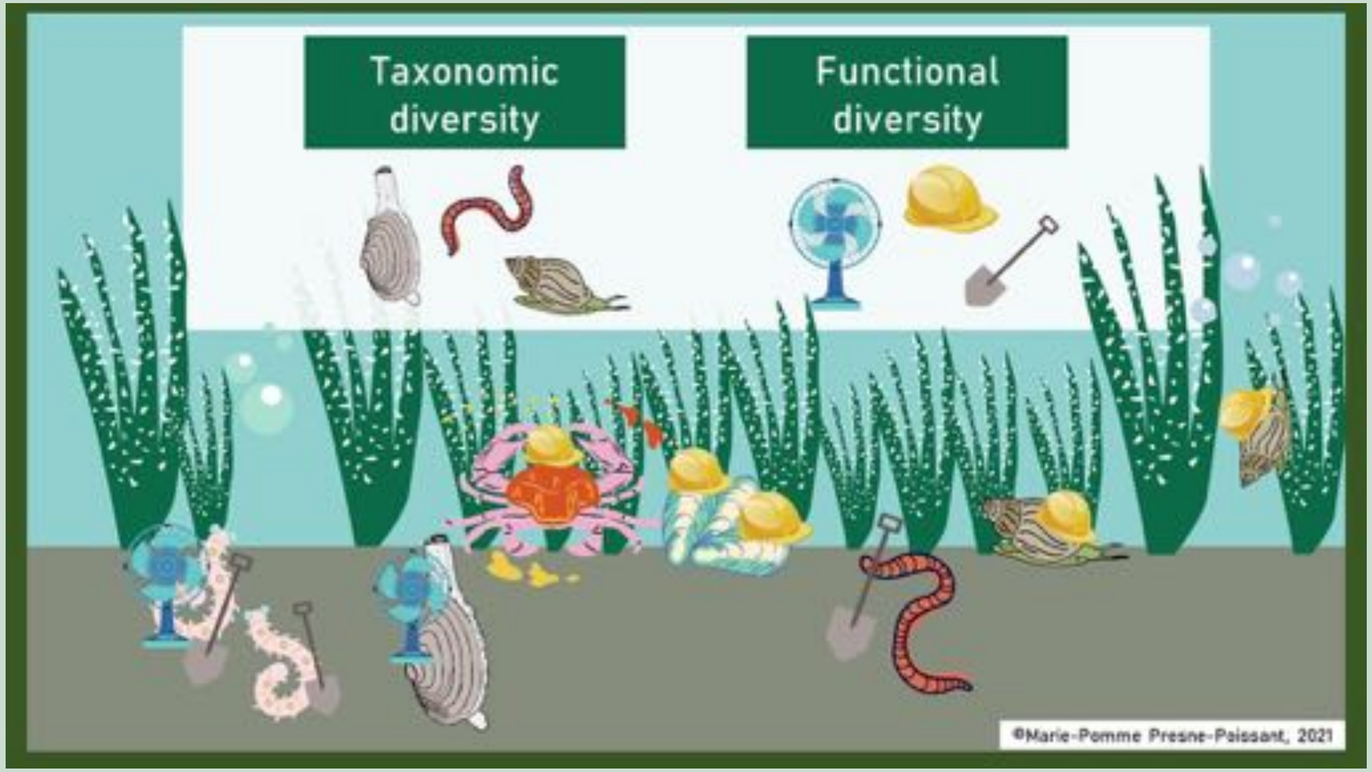


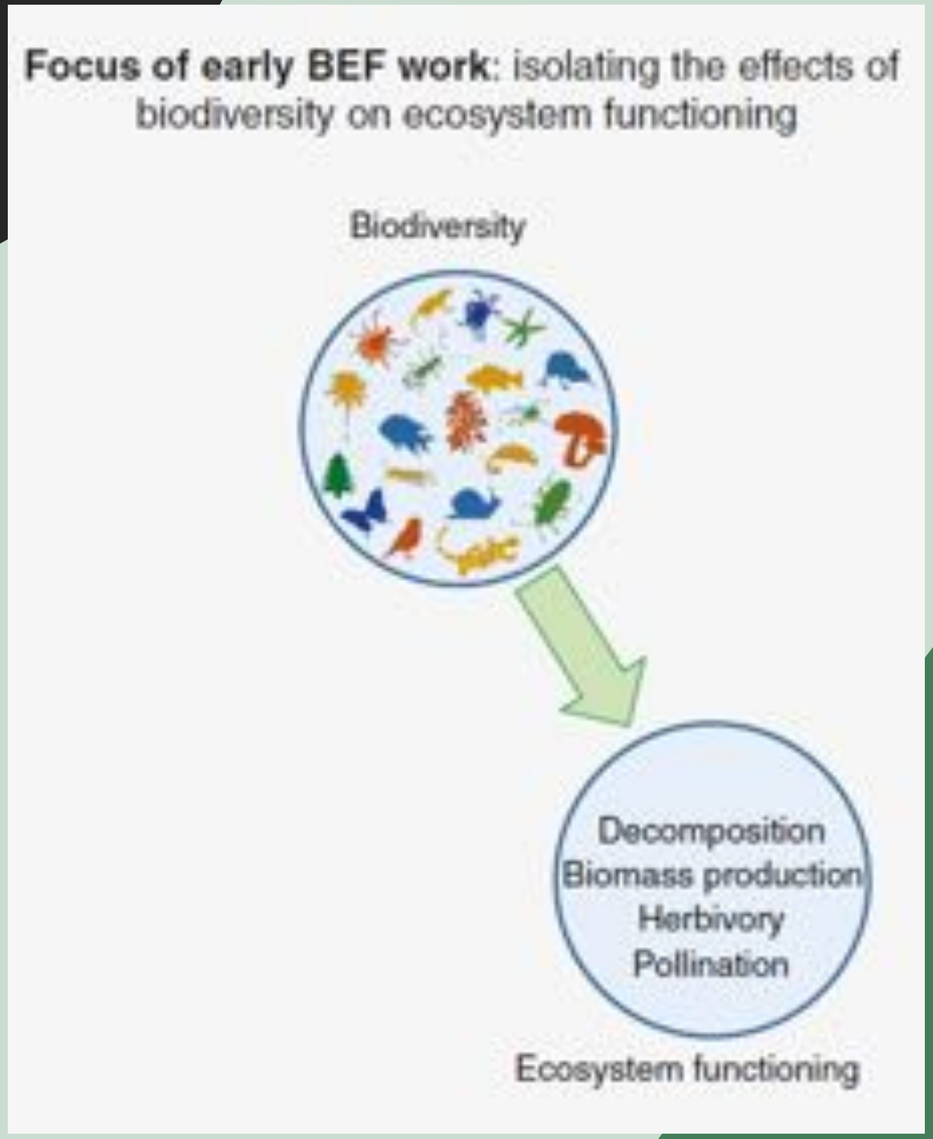


ecosystem services

BIODIVERSITY AND ECOSYSTEM FUNCTIONING

Does biodiversity enhance ecosystem functioning?





van der Plas, 2019

WORLDWIDE DECLINE OF SEAGRASS

How meadow fragmentation will affect biodiversity and ecosystem functioning?

SAMPLING

in Rimouski eelgrass meadow

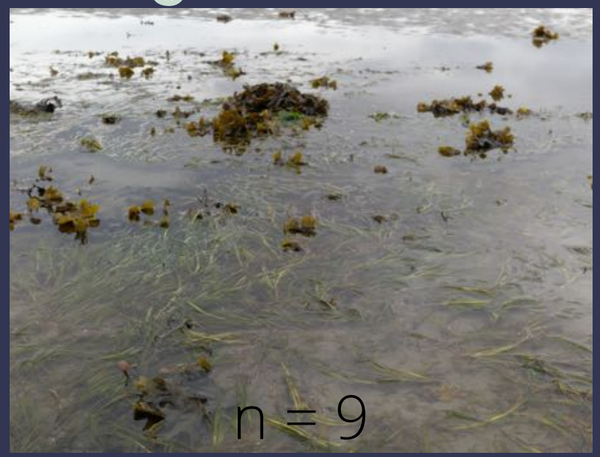
(*Zostera marina*)

- Boreal region: ice cover during winter
- Heterogeneous landscape
- Intertidal meadow: plants exposed to air at low tide

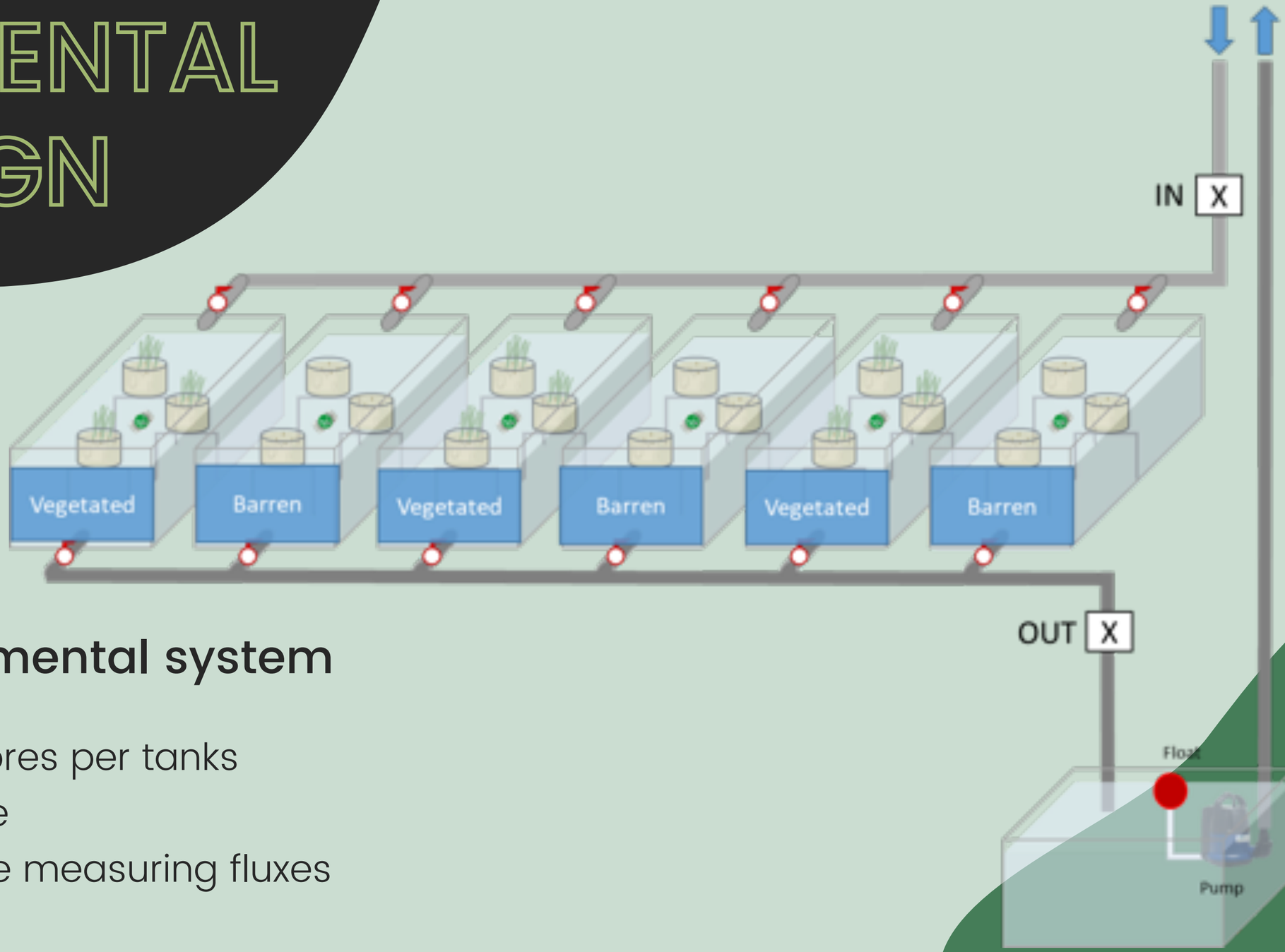
Two subhabitats

barren

vegetated



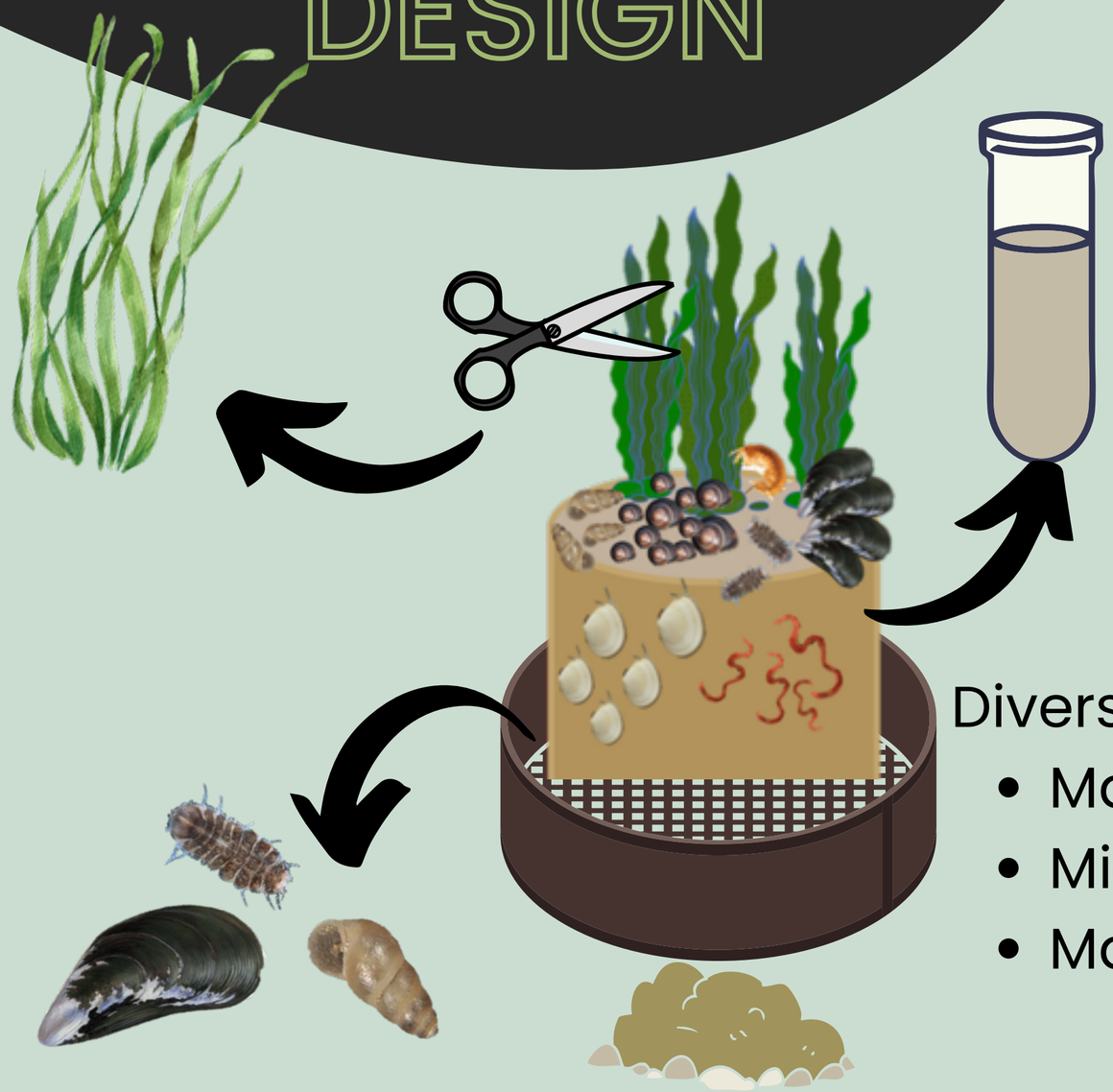
EXPERIMENTAL DESIGN



The outdoor experimental system

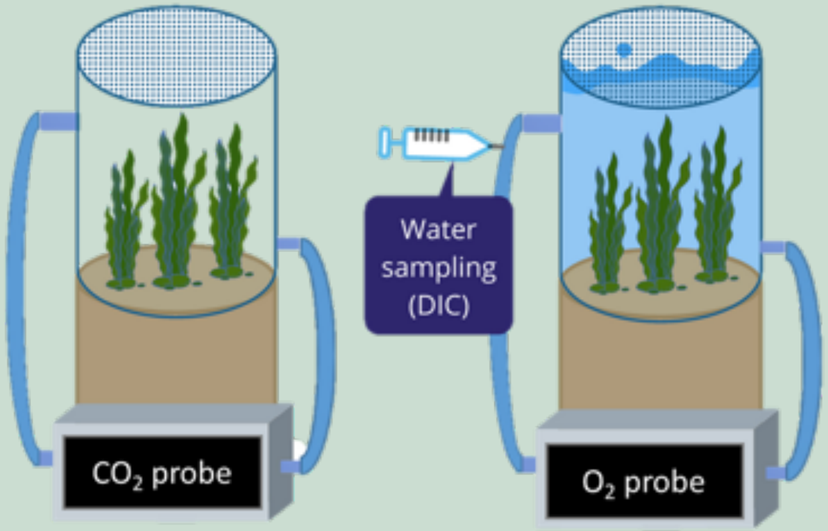
- 6 tanks (405 L); 3 cores per tanks
- Semidiurnal tide cycle
- 3 weeks period before measuring fluxes

EXPERIMENTAL DESIGN



Fluxes measured:

- at immersion
- at emersion
- with and without sunlight

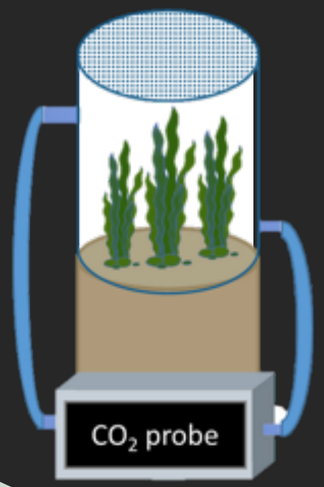


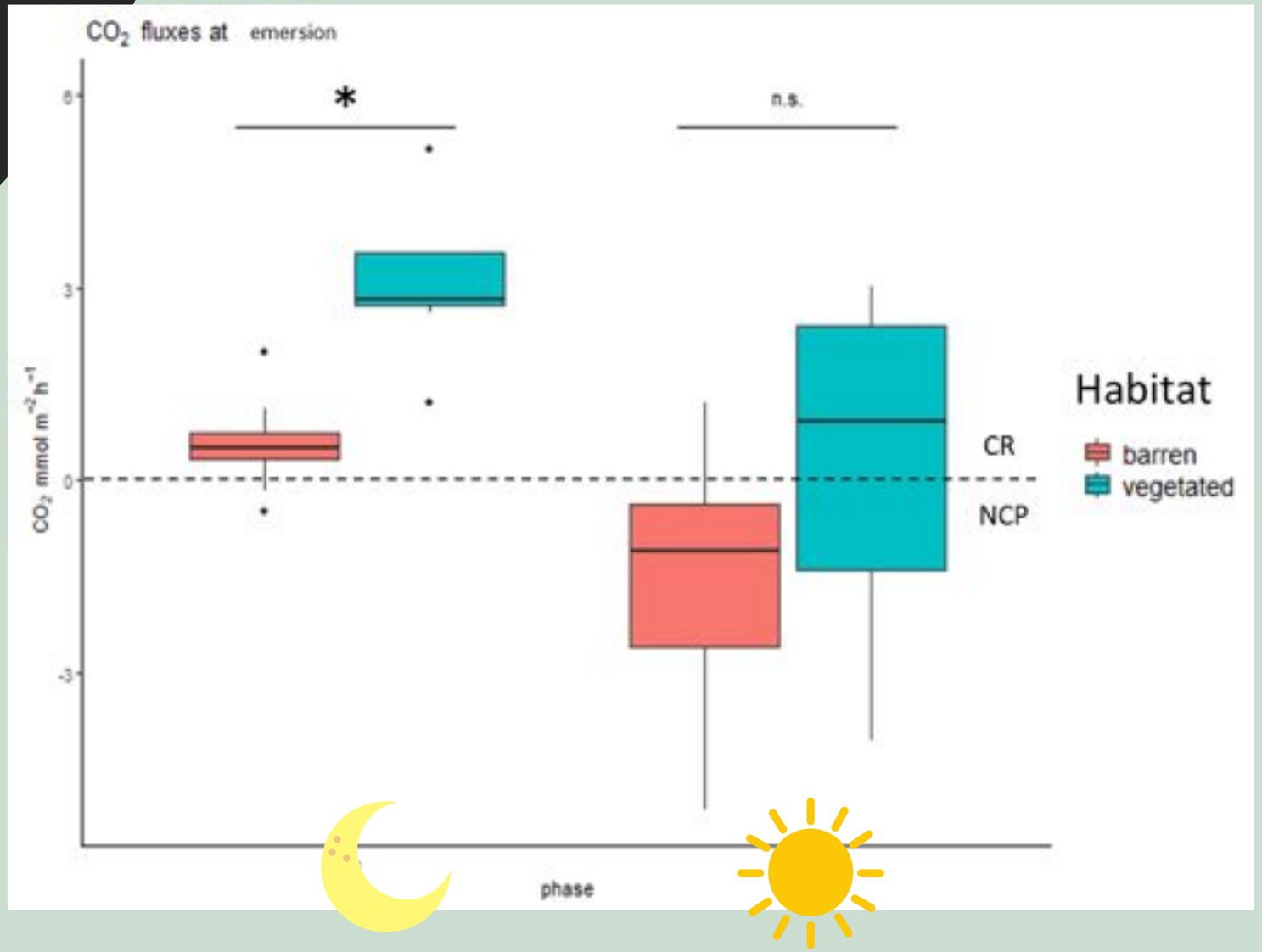
Diversity:

- Macrophytes
- Microphytobenthos
- Macrofauna (sieved on 500µm)

CARBON FLUXES

Comparing community respiration (CR) and community net production (NCP)



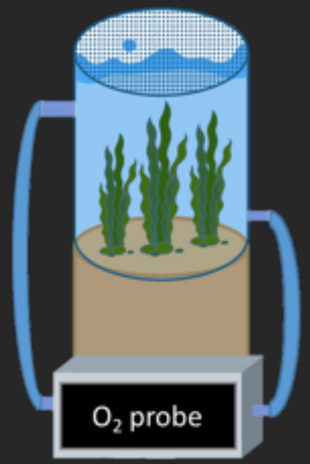


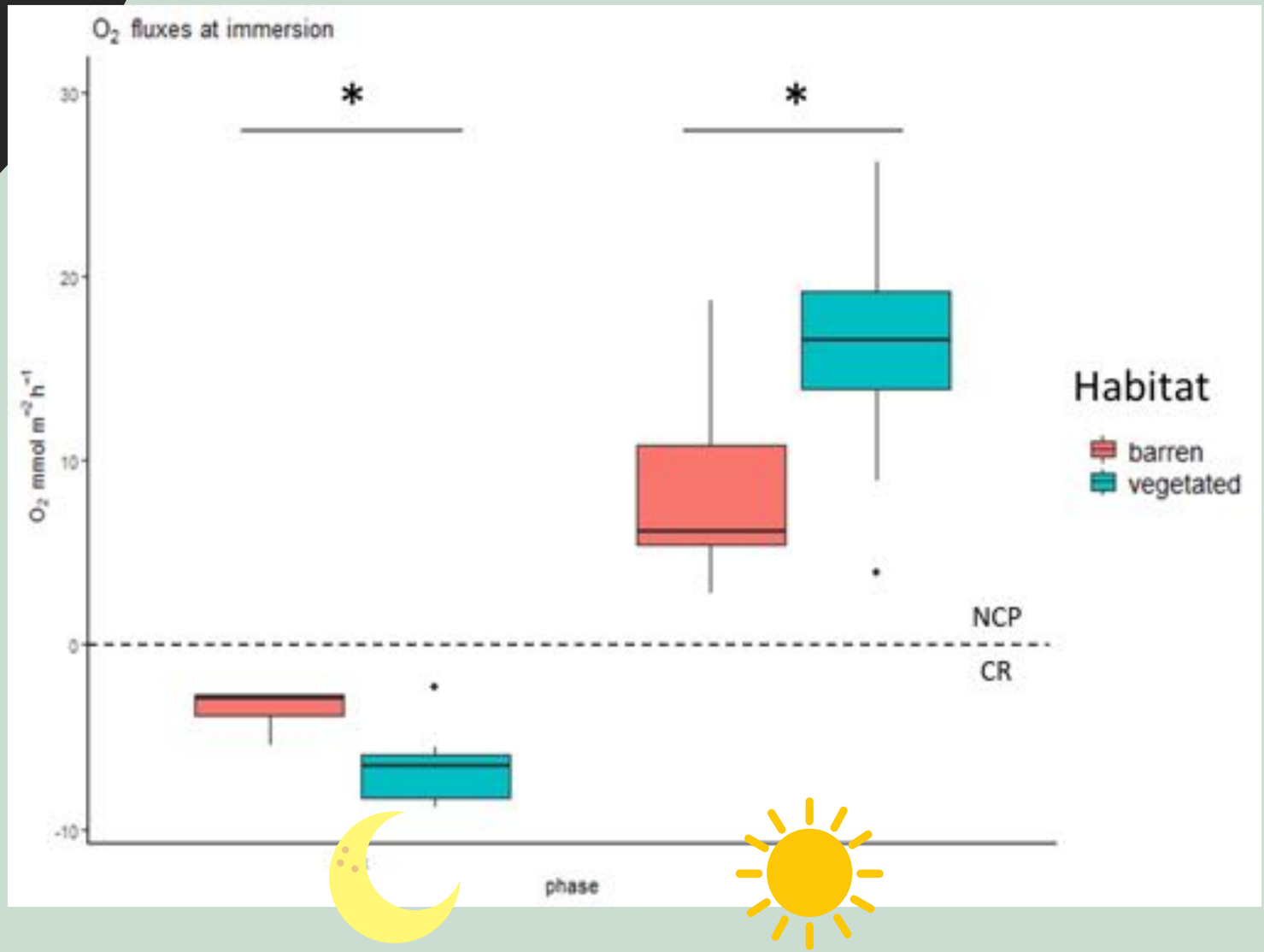
Functioning at low tide

- CR in vegetated habitat 5 x CR barren habitat
- NCP: no significative difference between habitats
- Dessication and thermal stress could explain NCP values large scope

OXYGEN FLUXES

Comparing community respiration (CR) and community net production (NCP)

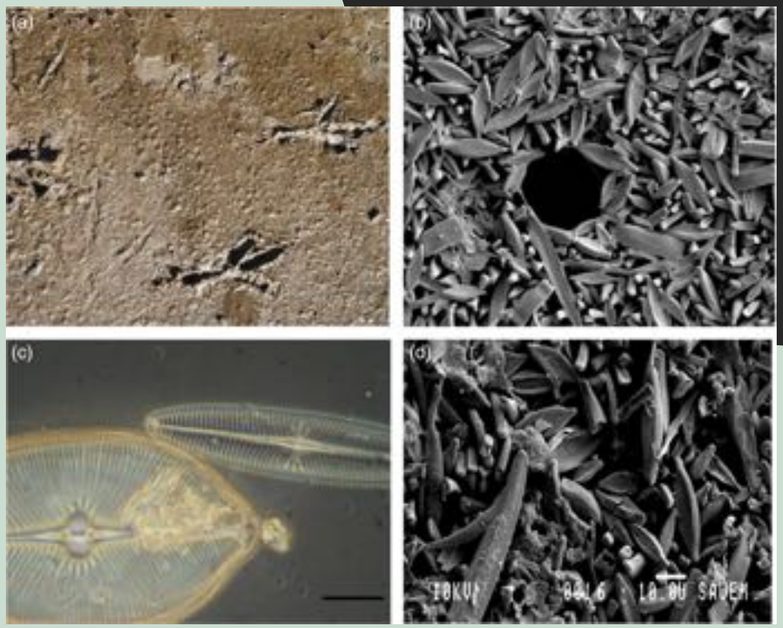




Functioning at high tide

- Oxygen fluxes : NCP and CR are 2 times higher in vegetated habitat
- Both communities are autotrophic
- Is the biomass responsible?

LINK FUNCTIONING AND PRIMARY PRODUCERS' TRAITS



Enteromorpha and eelgrass above ground biomass

[chla] in sediment

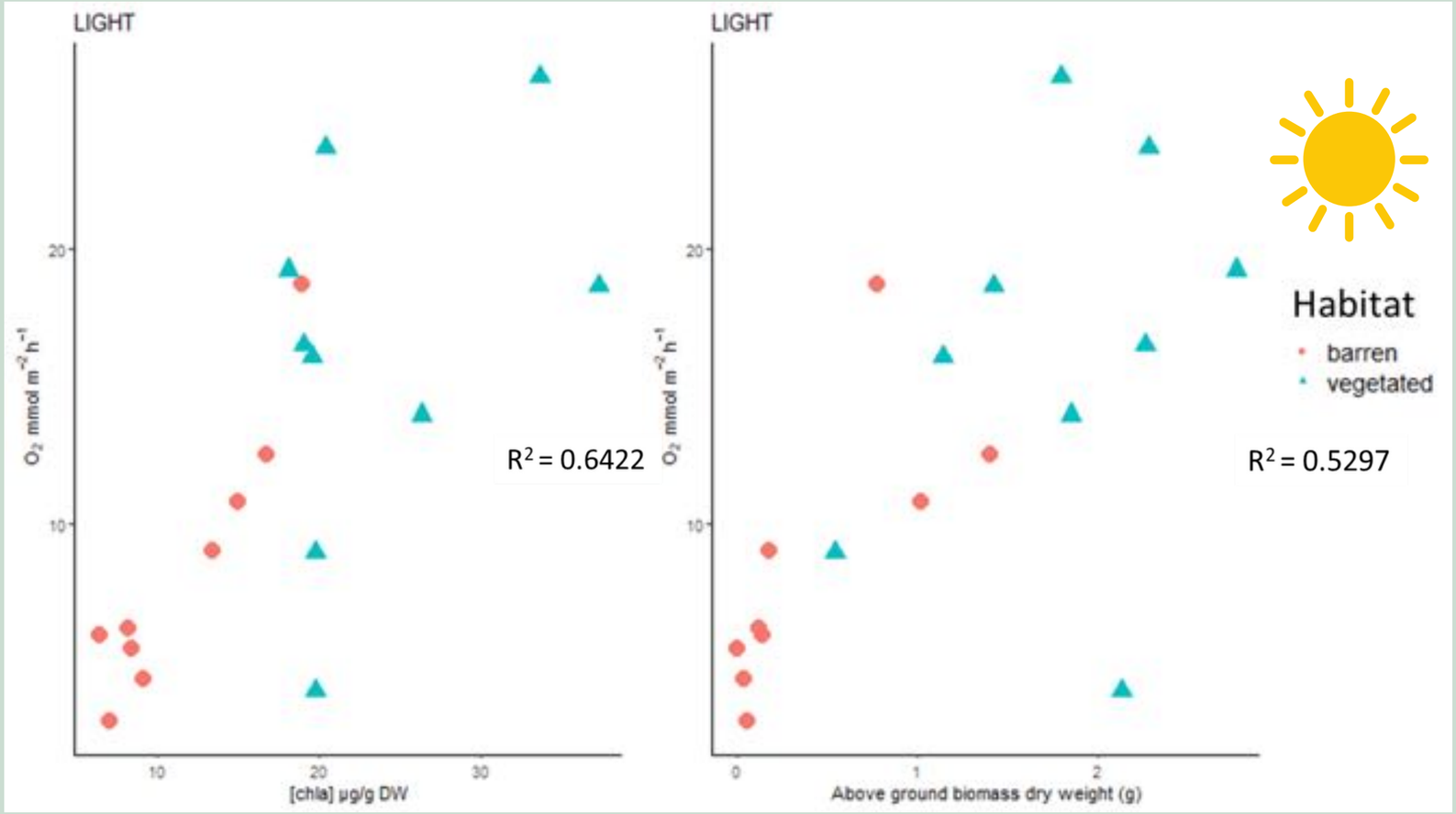
Linear model :

Flux ~ PAR+ AG biomass*Habitat + [chla]*Habitat

PRIMARY PRODUCERS CONTRIBUTION

On community net production (NCP)

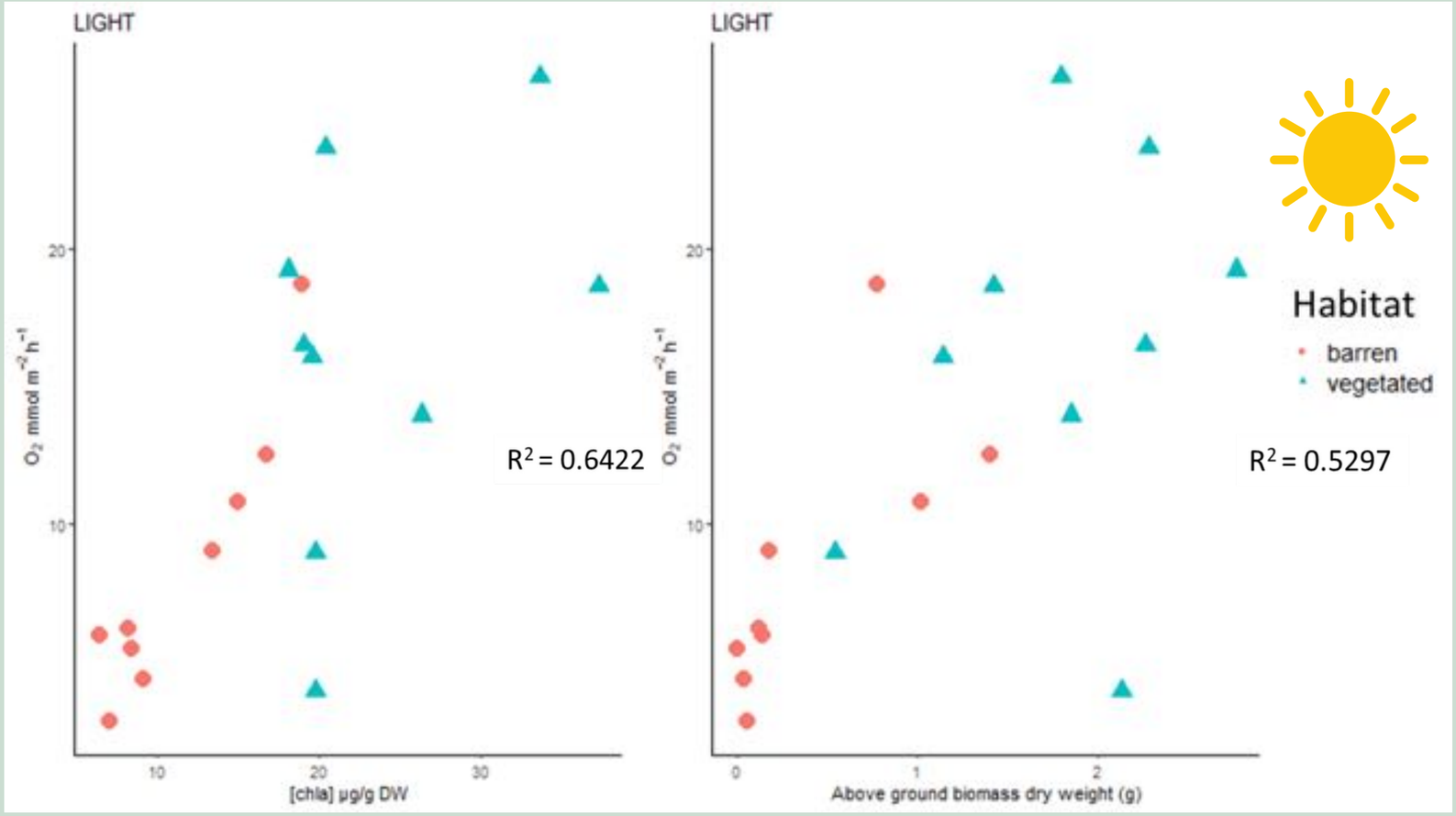
- **Microphytobenthos** and **AG biomass** explain NCP variation
- Habitats have differences in primary producers biomass
- AG biomass explains the differences between habitats

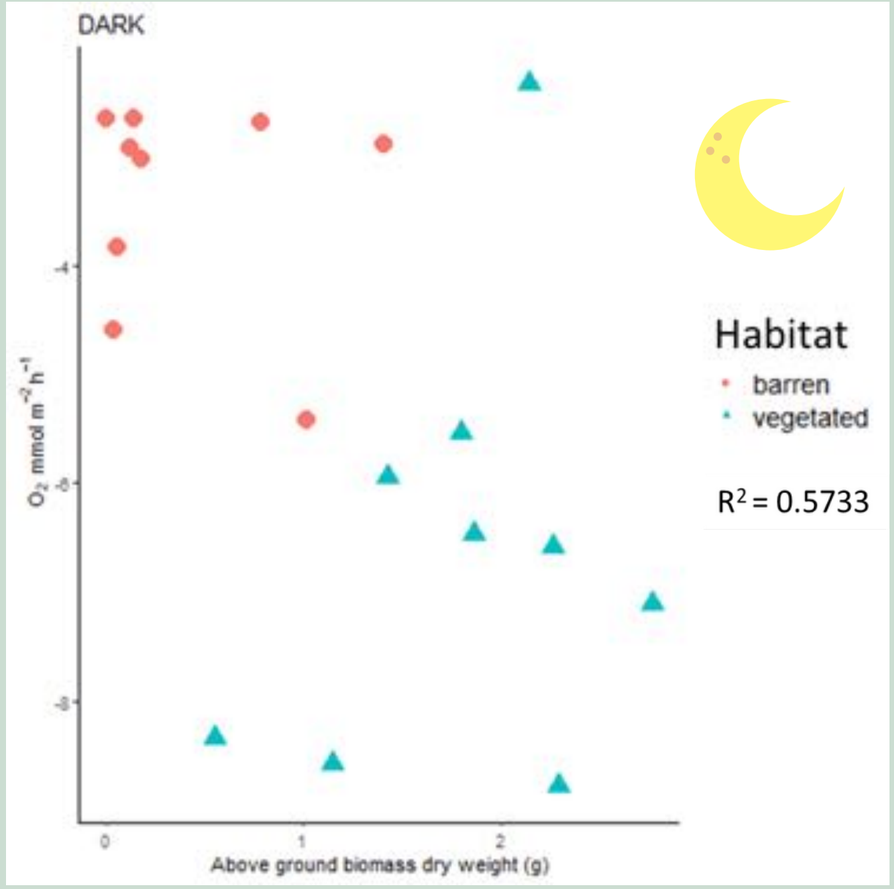


PRIMARY PRODUCERS CONTRIBUTION

On community respiration (CR)

- Only AG biomass is linked to CR
- Differences of CR between habitats are explained by AG biomass
- Microphytobenthos plays no significant role in CR





WHAT ABOUT THE MACROFAUNA?

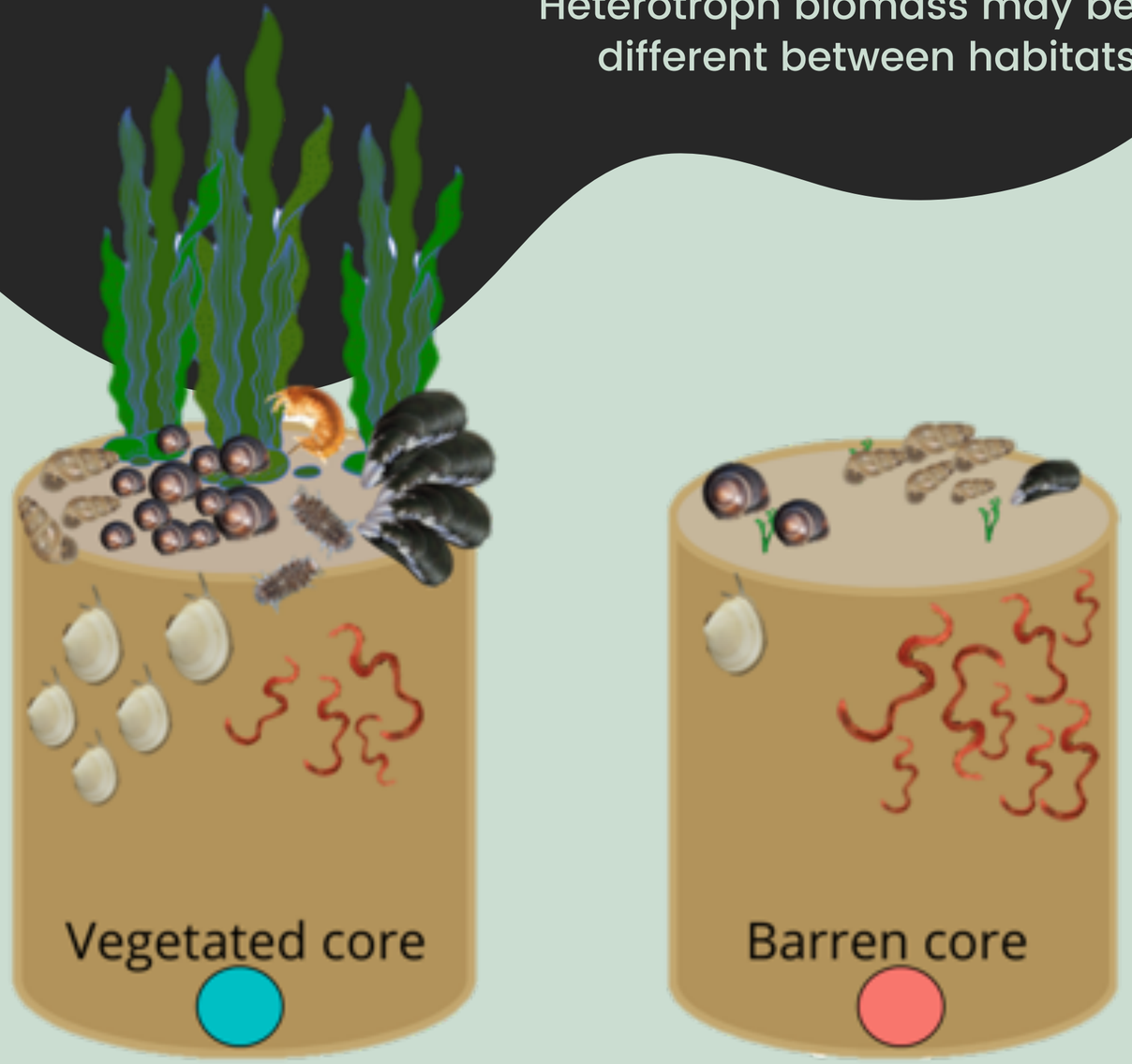
Heterotroph biomass may be different between habitats

The meadow : a heterogeneous landscape

Habitats shelter different communities due to their **3D structure** (or lack of structure)

Vegetated areas most likely have higher **diversity and abundances** in macrofauna

CR in bare sediment is more likely to be explained by **macrofauna**



TAKE-HOME MESSAGES

Functioning is not homogeneous across the meadow

Difference in functioning between habitats is explained by primary producers biomass

Looking forward to understand how macrofauna traits are linked to functioning

THANK YOU !

ISMER Coastal Ecogeochemistry Lab team
Élodie Palais, Isadora D. Lacourse and Laurianne Belles-Îles
and Jonathan Pothier (Sud-de l'Estuaire ZIP comitee) for their help during the summer
Fanny Noisette and Elliot Dreujou for their help and support

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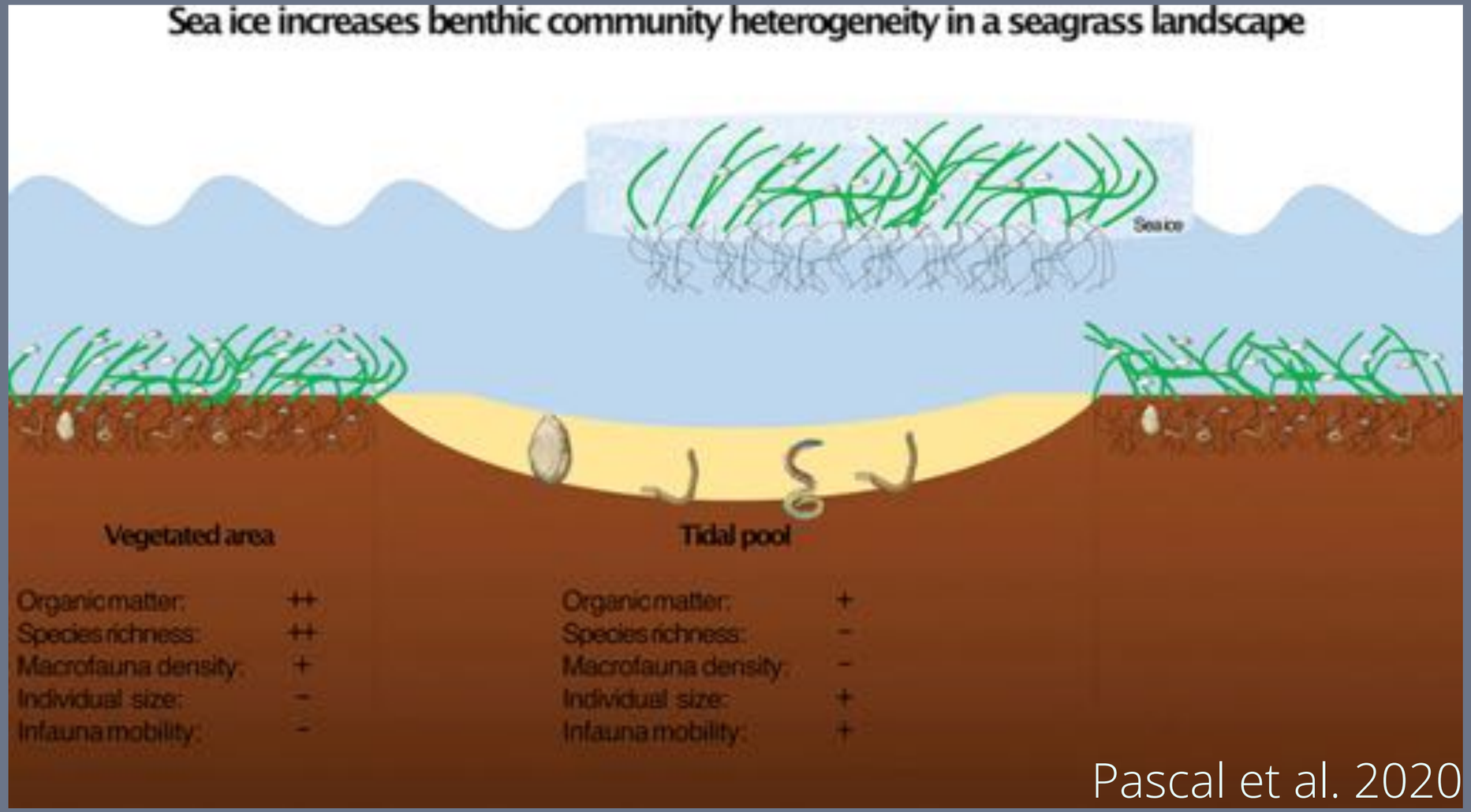
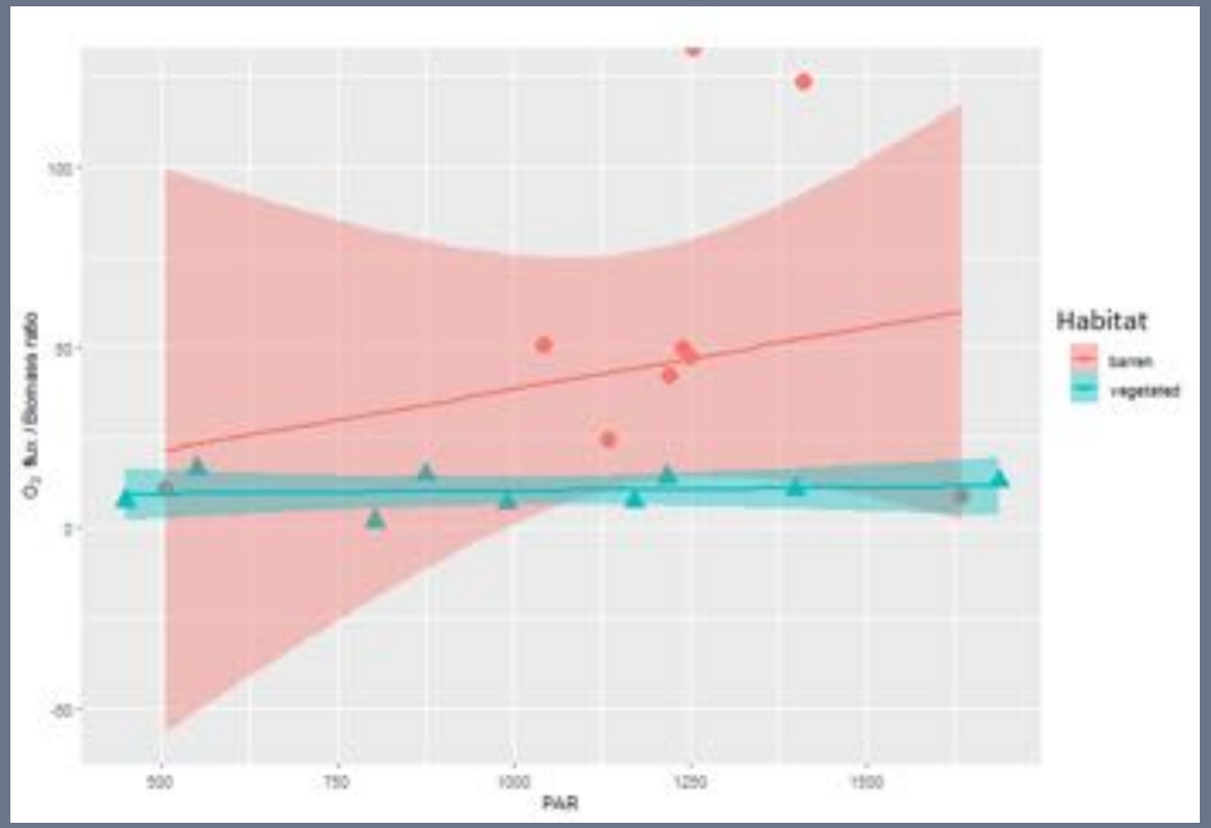
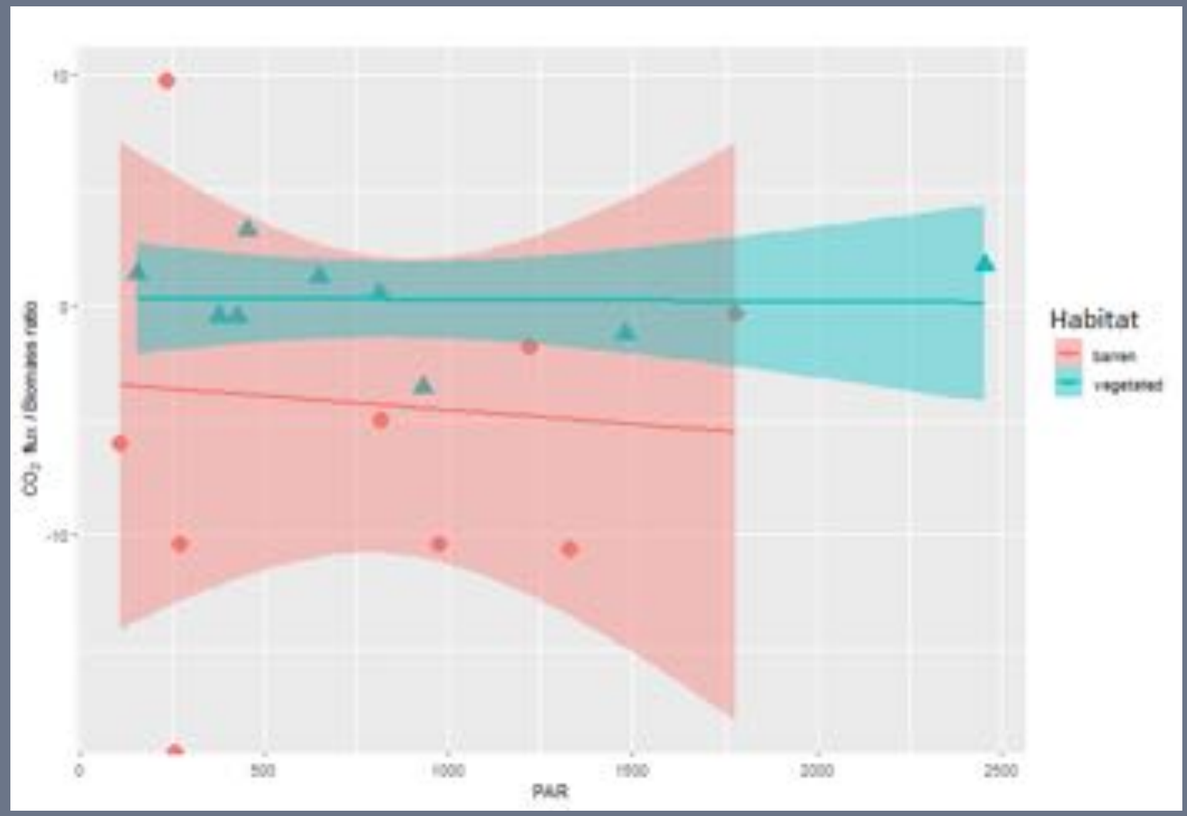
APPENDIX I



Pascal et al. 2020

APPENDIX II


100
50
0
-50
500
750
1000
1250
1500
PAR
Habitat
barren
vegetated


10
0
-10
0
500
1000
1500
2000
2500
PAR
Habitat
barren
vegetated

APPENDIX III