SYLVIE GOBERT – UNIVERSITY OF LIEGE (BELGIUM) OCEANOLOGY

- education and research

Master in oceanography

Seagrass
Trace elements
Stable isotopes
Nitrogen dynamics
WFD

POSIDONIA MEADOW: AN ECOSYSTEM ENGINEER FROM LIVING PLANT TO DEAD LEAF ACCUMULATION

Sylvie Gobert

Hydralab IV, Large Event,Trondhein Friday 16 September

POSIDONIA MEADOW: AN ECOSYSTEM ENGINEER FROM LIVING PLANT TO DEAD LEAF ACCUMULATION

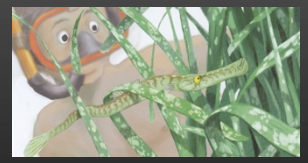
1. What is a Posidonia meadow?

2. What is an ecosystem engineer?

3. Example: From living plant to dead leaf accumulation.

WHAT IS A POSIDONIA MEADOW?

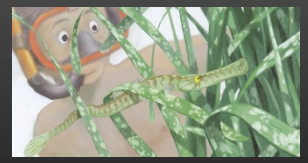
? *POSIDONIA MEADOW* ?



- Higher plants

Posidonia oceanica (L.) Delile

? *POSIDONIA MEADOW* ?



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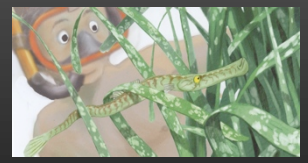

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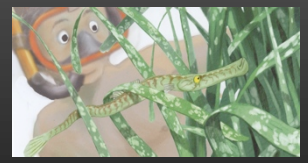

Posidonia oceanica (L.) Delile

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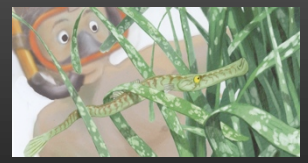
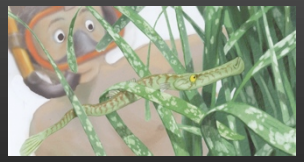


Posidonia oceanica (L.) Delile

- Higher plants

flower

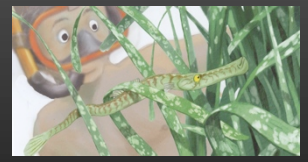
? *POSIDONIA MEADOW* ?



- Higher plants ~~(algae)~~
- Strickly confined to marine areas
- Fully adapted to marine environment

→ Seagrass

? *POSIDONIA MEADOW* ?



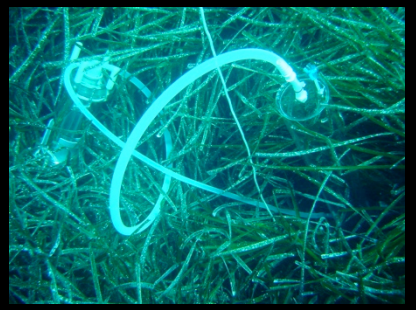
- Higher plants ~~(algae)~~
- Strickly confined to marine areas
- Fully adapted to marine environment
- Seagrass (*foundation species*)

Seagrass Meadow - Posidonia Meadow

ECOLOGICAL AND ECONOMIC IMPORTANCE

- Most productive ecosystems
- Food supplier and Habitat provider
- Nursery for economically important fish, shellfish, crustacean…
- Oxygen producer
- Stabilisation of coastlines and sediments

→ Biodiversity Hotspots



WHAT IS AN ECOSYSTEM ENGINEER?

DEFINTION

- « Ecosystem engineers are organims that directly or indirectly modulate the availibility of ressources to the other species, by causing physical state changes in biotic or abiotic materials. In so doing they modify, maintain and create habitats »

  Jones et al., 1994 OIKOS 69 373-386

!! The direct provision of ressources by an organism to other species in form of living or dead tissue is not engeneering !!

- An ecosystem engineer is any organism that creates or modifies habitats

SEAGRASS MEADOW AS ECOSYSTEM ENGINNEER

Australia

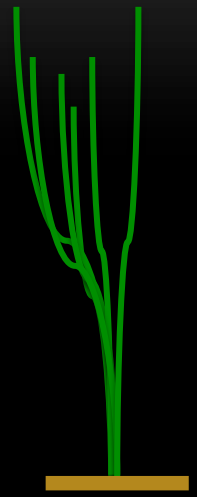
Mediterranean Sea

the case of *Posidonia oceanica*…

THE CASE OF *P. OCEANICA*: ...

LIVING PLANT

THE CASE OF *P. OCEANICA*: ...LIVING PLANT

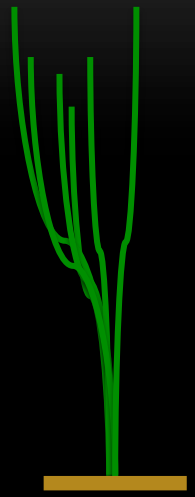


<u>One Shoot:</u>
5-6 leaves
1 cm width
20 -200 cm length

200-1000 shoots/^{m2}

Each m^2 of the bottom can offer more than 30m ^{2} of available substrate for colonization

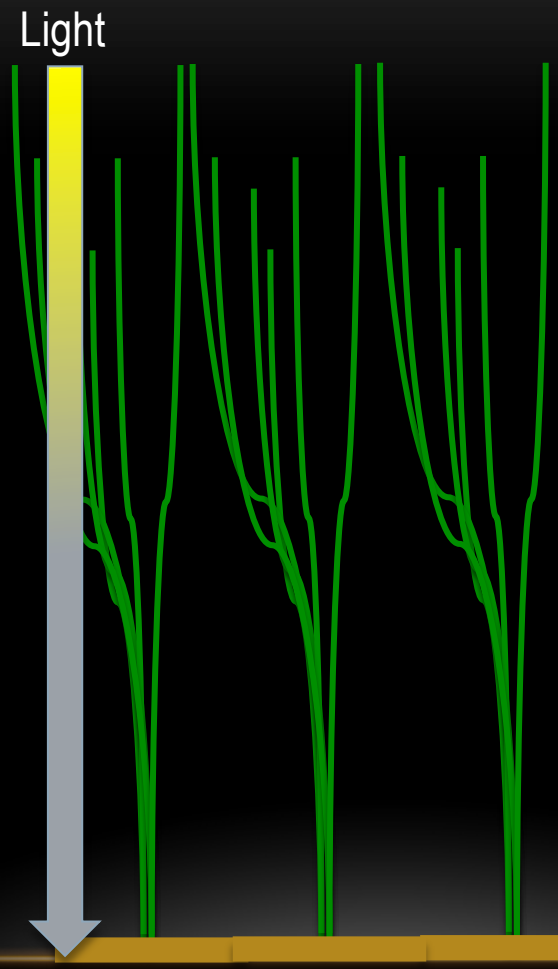
THE CASE OF *P. OCEANICA*: ...LIVING PLANT



One Shoot:
5-6 leaves
1 cm width
20 -200 cm length

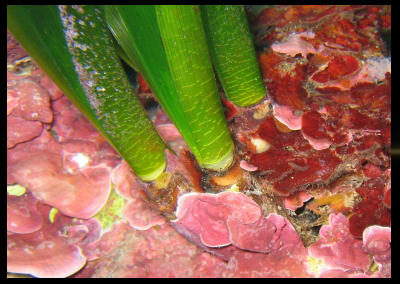
Seems homogeneous

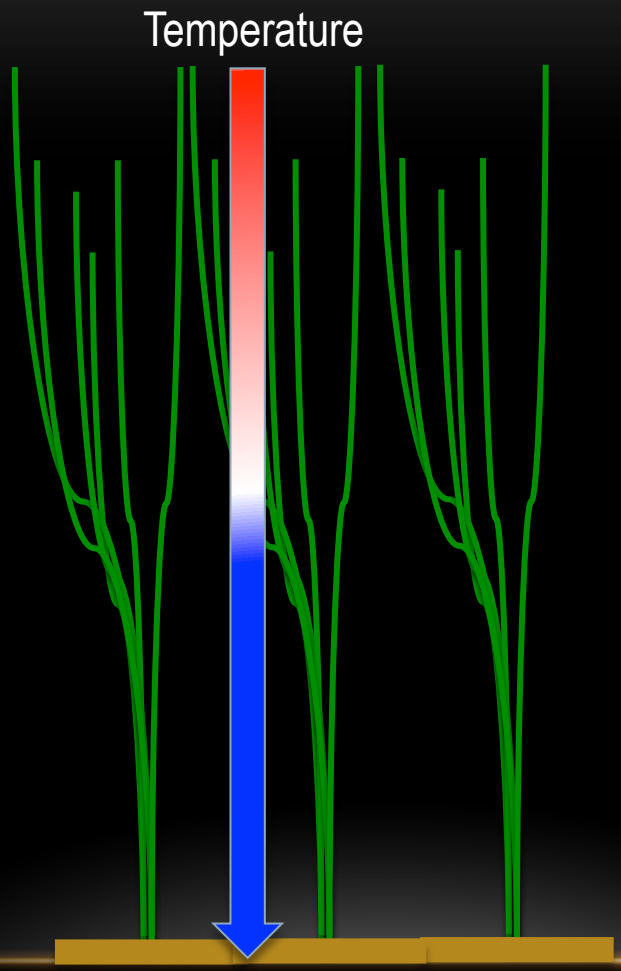
THE CASE OF *P. OCEANICA*: ...LIVING PLANT



Colonisation of algae grazers

THE CASE OF *P. OCEANICA*: ...LIVING PLANT

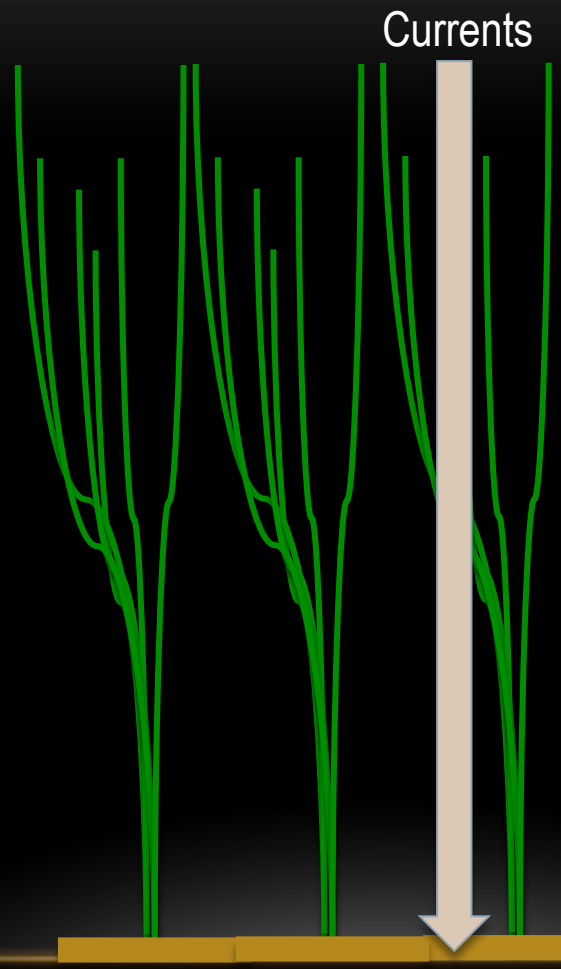




Chemical reactions
Bacteria activities

Nutrients, oxygen gradients

THE CASE OF *P. OCEANICA*: ...LIVING PLANT



Reduction of hydrodynamism
Enhancing particle sedimentation
Reduction of waves and storms

Horizontal and vertical successions of deeply different microhabitats

Provide adequate life conditions for an important number of organisms characterised by widely different ecological niches

➡ Sereval thousand of species live together among shoots

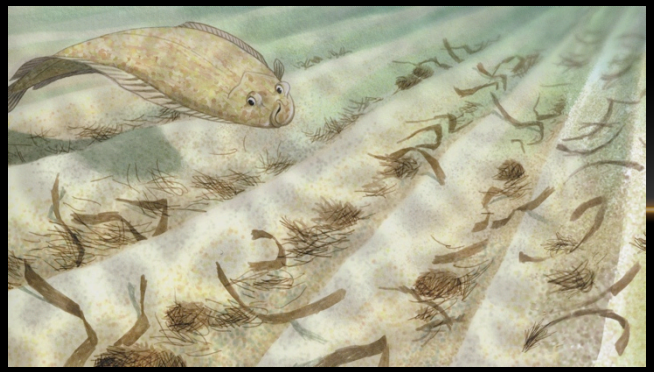
THE CASE OF *P. OCEANICA*: …

DEAD LEAF …

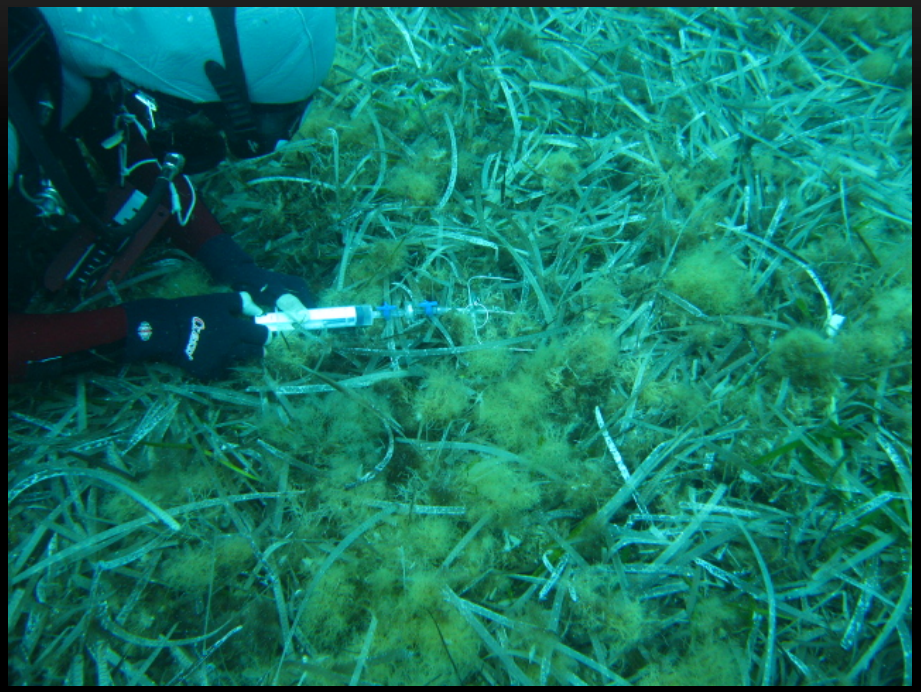
DEAD LEAF … AT THE END OF THE SUMMER

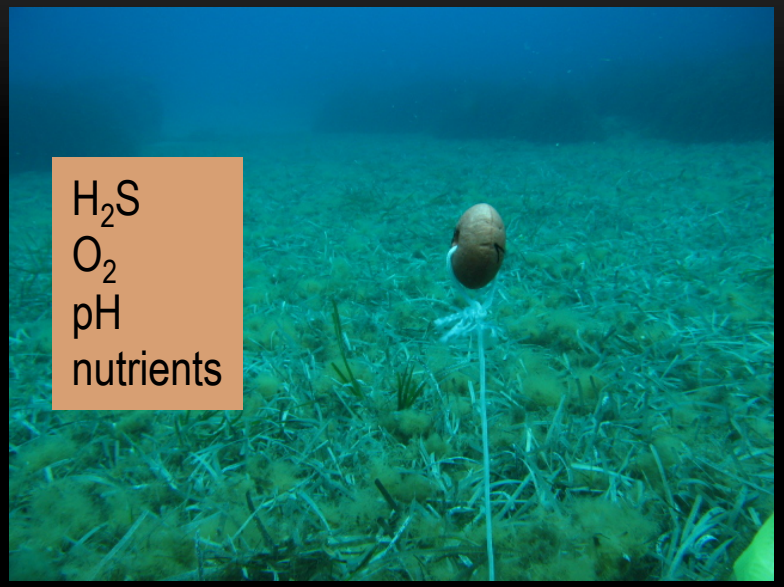
DEAD LEAF … NECROSIS

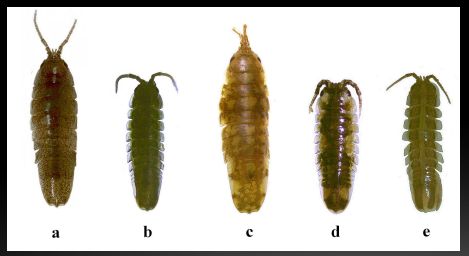
DEAD LEAF… ACCUMULATION = LITTER



DEAD LEAF… ACCUMULATION = LITTER







DEAD LEAF… ACCUMULATION = « BANQUETTE »

Exported

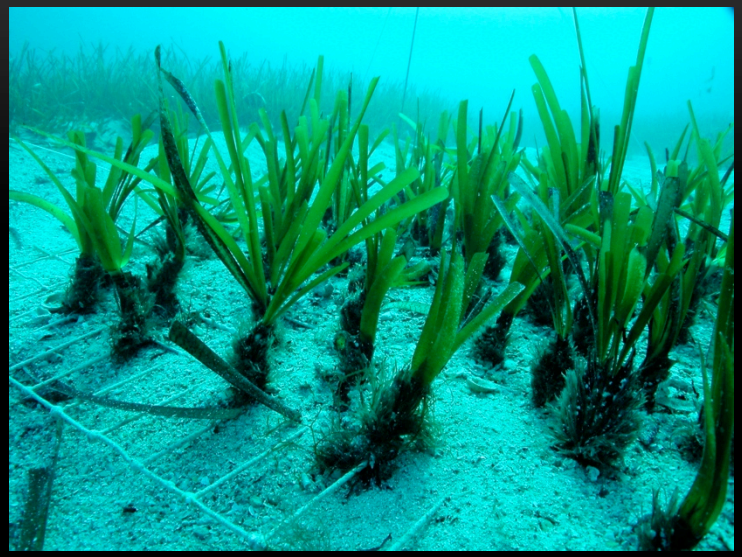
Reduction of hydrodynamism
Reduction of waves and storms
Stabilisation of the beach
Reduction of the erosion


Llobet et al 2005

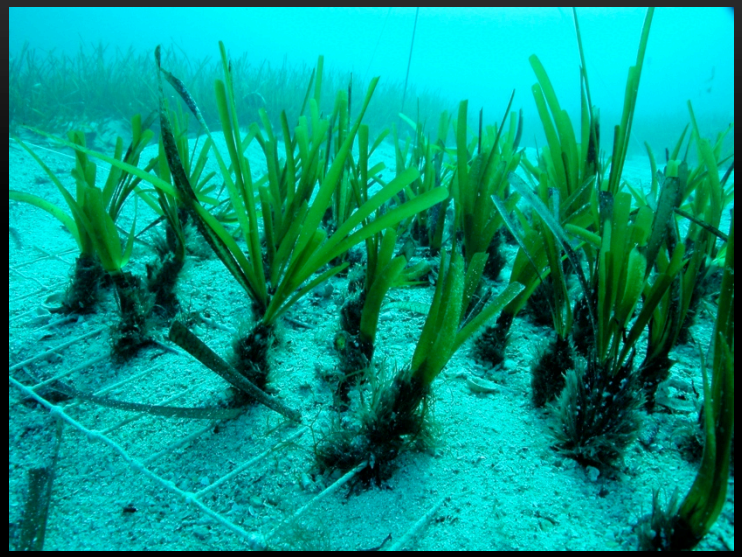
WORK WTH POSIDONIA IS NOT EASY

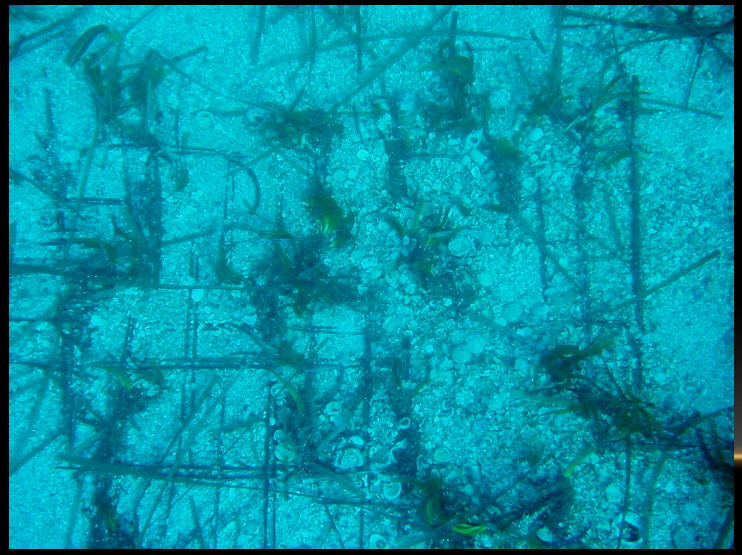
- In situ
- Aquarium = difficult

- Roots (more than one meter depth)
- Slow growth species
- No flower (rare)



The transplantation: Once upon a time….





Four years after..

NO!

They lived happily ever after

http://www2.ulg.ac.be/oceanbio/Membres/Gobert/Gobert.html

Lepoint, G., Cox, A.-S., Dauby, P., Poulicek, M., & Gobert, S. (2006). Food sources of two detritivore amphipods associated with the seagrass Posidonia oceanica leaf litter. *Marine Biology Research, 2*(5), 355-365.

http://hdl.handle.net/2268/956

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IF 2006: **0.806**; last: **1.484**; IF5: **1.452** — EigenF 2006: **0.0002**; last: **0.0004** — Article Infl. 2006: **0.3271**; last: **0.2730**

Gobert, S., Lepoint, G., Biondo, R., & Bouquegneau, J.-M. (2006). In situ sampling of pore waters from seagrass meadows. *Biologia Marina Mediterranea, 13*, 230-234.

http://hdl.handle.net/2268/9309

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Gosselin, M., Bouquegneau, J.-M., Lefèbvre, F., Lepoint, G., Pergent, G., Pergent-Martini, C., & Gobert, S. (2006). Trace Metal Concentrations in Posidonia Oceanica of North Corsica (Northwestern Mediterranean Sea): Use as a Biological Monitor? *BMC Ecology, 6*, 12.

http://hdl.handle.net/2268/1210

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Gobert, S., Lejeune, P., Lepoint, G., & Bouquegneau, J.-M. (2005). C, N, P concentrations and requirements of flowering Posidonia oceanica shoots. *Hydrobiologia, 533*, 253-259.

http://hdl.handle.net/2268/11516

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IF 2005: **0.978**; last: **1.964**; IF5: **1.997** — EigenF 2005: **0.0298**; last: **0.0281** — Article Infl. 2005: **0.4930**; last: **0.4834**

Lepoint, G., Dauby, P., & Gobert, S. (2004). Applications of C and N stable isotopes to ecological and environmental studies in seagrass ecosystems. *Marine Pollution Bulletin, 49*(11-12), 887-891.

http://hdl.handle.net/2268/1183

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IF 2004: **1.619**; last: **2.359**; IF5: **2.899** — EigenF 2004: **0.0188**; last: **0.0220** — Article Infl. 2004: **0.7532**; last: **0.7627**

Vangeluwe, D., Lepoint, G., Bouquegneau, J.-M., & Gobert, S. (2004). Effect of transplantation on Posidonia oceanica shoots. *Vie et Milieu-Life and Environment, 54*(4), 223-230.

Thank You!