University of Antwerp
Faculty of Science

ECOSPHERE

The ECOSPHERE research group aims to study aquatic and valley ecosystems that are continuously challenged by natural and anthropogenic stressors. The research focuses on acquiring fundamental and applied knowledge at different levels of structural and functional organisation in order to underpin environmental management decisions.

MASTER THESIS SUBJECT 2023

Coastal marshes under pressure: Species-specific growth response of tidal marsh plants to hydrodynamics such as waves or currents

Research group: ECOSPHERE

Hosting laboratory: CDE

Promotor(s): Stijn Temmerman, stijn.temmerman@uantwerpen.be

Daily supervision: Ken Schoutens, ken.schoutens@uantwerpen.be

Flume facility!

Salt marsh species distribution!

- **This topic mostly contains ☐ literature study, ☒ lab work, ☒ field work, ☒ experimental work, ☐ GIS, ☐ numerical modelling, ☐ other: ……**
- **Possession of driver's license B is ☐ needed, ☐ recommended, ☒ not needed**
- **Possession of certificates needed: ☐ FELASA C, ☐ other: ……**

Summary: Salt marshes, which are ecosystems naturally occurring along the shores of coasts and estuaries (i.e. tidal rivers), are highly valued ecosystems that play a key role in delivering services such as biodiversity conservation, climate mitigation by carbon sequestration, and climate adaptation by nature-based shore protection against sea level rise and storms. Salt marsh restoration and creation is more and more implemented as a sustainable complement to existing shore protection infrastructure. However, many questions remain on their effectiveness, especially under future climate scenarios.
Wave attenuation forms a crucial element in the shore protection function of salt marshes: as waves propagate during high tides that inundate the salt marshes, the wave motion feels friction from the salt marsh vegetation structure and sediment bed, resulting in a reduction of the wave energy, called 'wave attenuation'. The effectiveness of this wave attenuation increases in function of species-specific plant traits such as high aboveground biomass and high shoot stiffness. However, salt marsh plant growth is also challenged by environmental conditions such as exposure to hydrodynamics from waves and currents. From field observations, we know that plant species, which are typically more flexible, tend to grow closer to the wave exposed marsh edge while stiffer species grow more sheltered, landwards in the marsh. Therefore, it is hypothesized that the capacity of marsh plants to grow under hydrodynamic exposure depends on species-specific plant traits too. Hence, the research question here is: do plant species from shoreward, low marsh zones to landward, higher marsh zones, show a decreasing capacity to survive and grow under hydrodynamic exposure?

In this thesis you will participate in field and/or flume experiments to investigate the species-specific growth response to hydrodynamic exposure (from currents and/or waves), for three brackish marsh plant species with contrasting plant traits, which can be found along a cross-shore zonation from the low, hydrodynamic exposed marsh edge to the higher, more sheltered marsh. You will assess how this response to hydrodynamics interacts with the growth response to tidal inundation duration, which typically also co-varies along the shore-to-landward zones in tidal marshes. The thesis involves a lot of practical work in the context of growing seeds and building the experimental setup (starting 2nd semester of MA1). The flume facility is situated in the novel Mesodrome facility at Campus Drie Eiken (Antwerp).

The only requirement is a great sense of enthusiasm to do a lot of practical work! :D

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