SCIENCES & BIOENGINEERING SCIENCES

The Research Group
Ecology, Evolution & Genetics

has the honor to invite you to the public defence of the PhD thesis of

# Riccardo Pieraccini

to obtain the degree of Doctor of Sciences

Joint PhD with UGent

Title of the PhD thesis:

**Hormonal cues and climate stress shape seed dormancy release and early development in the seagrass *Zostera marina*: implications for seed-based restoration**

**Promotors:**
Prof. dr. Ann Vanreusel (UGent)
Prof. dr. Tom Van der Stocken (VUB)
**Co-supervisor:**
Em. prof. dr. Nico Koedam (UGent)

The defence will take place on

**Tuesday, December 2, 2025 at 4 p.m. in Ghent, Campus Sterre S9, Auditorium A0 in S9**

## Members of the jury

Prof. dr. Koen Sabbe (UGent, chair)
Em. prof. dr. Ludwig Triest (VUB)
Prof. dr. Olivier De Clerck (UGent)
Prof. dr. Gilles Lepoint (ULiège)
Prof. dr. Laura Govers (Rijksuniversiteit Groningen, NL)

## Curriculum vitae

Riccardo Pieraccini is a marine plant ecologist with a Master's degree in Marine and Lacustrine Science and Management (VUB-UAntwerpen-UGent).
As a PhD researcher, he studied seed-based restoration and seed priming in the seagrass *Zostera marina* under climate stress.
He aims to link experimental plant physiology with practical, large-scale coastal restoration.

## Abstract of the PhD research


Seagrass meadows are foundation habitats in coastal ecosystems, supporting biodiversity, storing carbon, and buffering shorelines, but they are declining worldwide under combined human and climatic pressures. Seed-based restoration is a promising, scalable alternative to shoot transplantation, yet its success is limited by seed dormancy, low germination, and the vulnerability of early life stages.

The PhD thesis investigates how light, plant hormones, and marine heatwaves regulate dormancy release, germination, and early seedling development in the seagrass *Zostera marina*. Experiments show that red light and the hormone gibberellic acid ($GA_3$) can strongly enhance germination and reduce time-to-germination without harming subsequent seedling growth, and that $GA_3$ priming improves germination success and synchrony across multiple populations while partially rescuing performance in older or sterilized seed lots. Additional work reveals that strigolactones stimulate, whereas smoke-derived compounds inhibit, germination and cotyledon growth, pointing to an evolutionary reconfiguration of ancestral hormonal signaling pathways in the marine environment. Simulated marine heatwaves further demonstrate that recruitment operates within narrow thermal windows: moderate warming suppresses germination, stronger warming can trigger germination but disrupts balanced seedling growth, and extreme warming damages photosynthetic function. Together, these findings show that targeted hormonal manipulations, particularly $GA_3$-based priming, offer a practical route to alleviate seed-based bottlenecks and increase the efficiency of seed-based restoration, while also highlighting the thermal and physiological limits that must be respected. By linking seed physiology with restoration practice, this work provides a mechanistic basis for designing climate-smart, seed-based strategies to support the long-term persistence of *Z. marina* meadows.