SCIENCES & BIOENGINEERING SCIENCES

The Research Group

General Botany and Nature Management

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

Lise Beirinckx

to obtain the degree of Doctor of Sciences

Title of the PhD thesis:
Disentangling ongoing hybridization and cryptic species of the submerged macrophyte genus Ruppia using ecological and molecular insights

Promotor:
Prof. dr. Ludwig Triest (VUB)
Prof. dr. Bram Vanschoenwinkel (VUB)

The defense will take place on
Monday, March 28, 2022 at 16h00 in the U-Residence (green room)

Members of the jury

Prof. dr. Iris Stiers (VUB, chair)
Prof. dr. Farid Dahdouh-Guebas (VUB, secretary)
Prof. dr. Dominique Maes (VUB)
Prof. dr. Carla Lambertini (University of Milan)
Prof. dr. Brigitta van Tussenbroek (National Autonomous University of Mexico)

Curriculum vitae

Lise Beirinckx obtained her Master of Science, Biology at Ghent University in 2013. Afterwards, she started as an assistant at the Biology department of the Vrije Universiteit Brussel. She combined teaching various practicals in the bachelor of biology with a doctoral research with Prof. Dr. Ludwig Triest and Prof. Dr. Bram Vanschoenwinkel. She has presented her work at the International Seagrass Biodiversity Symposia and has published two scientific articles in peer-reviewed international journals. She supervised several bachelor's and master's thesis students.

Abstract of the PhD research

Ruppia is a genus of aquatic submerged plants that are typically found in waterbodies with fluctuating water levels and salinity. Taxonomy within this genus has always been difficult because it combines high morphological variability with a lack of unambiguous identification criteria. Two European species are generally recognized, *R. spiralis* and *R. maritima*, although they are sometimes difficult to distinguish morphologically. As a result of incorrect species identification, our ecological understanding of these species remained limited.

In this thesis, we used a combination of molecular markers and germination experiments to better understand how *Ruppia* lineages coexist locally. First, microsatellite markers combined with chloroplast and nuclear sequence data were used to detect and delineate different *Ruppia* lineages that co-exist within a Mediterranean and a North-sea wetland area. Second, seed germination experiments were carried out to understand how these lineages can locally co-exist. We found that *R. maritima* and *R. spiralis* are two well-diverged species that can be easily distinguished genetically and ecologically. *R. spiralis* is a perennial, outcrossing species. Seeds can germinate under a broad range of conditions, which coincides with the wide environmental distribution in different types of (semi-)permanent waterbodies. *R. maritima* is a diploid, selfing species. Seeds only germinated under low salinities, which partly explains its very restricted habitat of temporary ditches in the studied areas. However, genetic markers also revealed that *Ruppia* taxonomy is complicated by several hybrid lineages that could not be distinguished morphologically. First, a Mediterranean hybrid lineage of an ancient origin may present an emerging species and occupies a distinct pond type. Second, more recent lineages of a hybrid origin were detected, involving *R. spiralis* and this ancient Mediterranean hybrid lineage, where the latter acted as the pollen donor. Finally, recent *R. spiralis* x *R. maritima* hybrids were encountered in wetlands along the North-sea. The detection of several morphologically similar but genetically and ecologically diverged *Ruppia* lineages, suggests that we must reconsider *Ruppia* species diversity and distributions.

Our findings support the hypothesis that aquatic plant genera are more diverse and complex than previously thought. Considering the high threats aquatic ecosystems currently face, this complexity should be more thoroughly investigated, both taxonomically and ecologically.