SCIENCES & BIOENGINEERING SCIENCES

The Research Group

Ecology and Biodiversity

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

Rosa VAN DER VEN

to obtain the degree of Doctor of Sciences

Title of the PhD thesis:

All adrift?

A population genetic approach unravelling dispersal patterns of scleractinian corals

Promotor:

Prof. dr. Marc Kochzius

The defense will take place on

Tuesday February 5th, 2019 at 16:00h

in Auditorium D.2.01 at the campus Humanities, Sciences and Engineering of the Vrije Universiteit Brussel, Pleinlaan 2 - 1050 Elsene, and will be followed by a reception.

Members of the jury:

Prof. dr. Nico Koedam (chairman)
Prof. dr. Harry olde Venterink (secretary)
Prof. dr. Ludwig Triest (co-promotor)
Prof. dr. Eveline Peeters
Prof. dr. Isabel Schön (RBINS)
Prof. dr. Jean-Francois Flot (ULB)

Curriculum vitae

Rosa van der Ven (°1984) obtained a MSc degree in Biology (2010) from Wageningen University (Netherlands). In 2011 she started a position of teaching assistant combined with a PhD at the Department of Biology (VUB).
As a teaching assistant Rosa taught courses on e.g. animal biology, evolution and conservation genetics.
During her PhD, Rosa published two peer-reviewed papers, one as first author, presented her work at several international conferences and supervised nine local BSc and MSc theses.

Her research interests include the population genetics and physiology of corals to understand their ecology and resilience to climate change.

Abstract of the PhD research

Reef building corals are important ecosystem engineers that form the basis for one of the most productive and diverse marine ecosystems. However, coral reef ecosystems suffer from overexploitation, pollution as well as sedimentation, and face a global decline through increasing sea surface temperatures and ocean acidification. Marine Protected Areas (MPAs) could increase coral reef resilience, but in order to design and manage MPAs, knowledge on the genetic connectivity between such areas is essential. Connectivity between reefs determines gene flow, genetic diversity, and genetic structure of populations, as well as the ability of coral reefs to persist under and recover from current stressors, and to adapt to future climate change.
The population genetic structure and connectivity of stony corals was investigated in two understudied but ecologically important areas: The Western Indian Ocean (WIO) and the Red Sea, and two locations within Indonesia in the Coral Triangle. The main objectives were to 1) infer dispersal patterns across a range of spatial scales, 2) infer possible dispersal barriers and 3) compare genetic diversity with biogeographic patterns of species diversity. Three coral species with wide geographical distributions and different reproduction strategies were investigated: *Acropora tenuis, Acropora millepora and Seriatopora hystrix*. Genetic diversity and genetic structure were studied using highly variable microsatellite markers.
This study confirmed that *A. tenuis and A. millepora*, broadcast spawning corals with high dispersal capacity, showed high connectivity among sites as far as 2000 km and 1400 km apart, while the brooding coral *S. hystrix* shows substantially higher differentiation when comparing similar spatial scales.
A clear dispersal barrier was detected between the Red Sea and sites in the WIO for *A. tenuis* and *S. hystrix*. In the WIO, exchange within the Northern Mozambique Channel (NMC) region was found for *A. tenuis*, but a barrier in the Mozambique Channel was discovered for *S. hystrix* dividing northern Madagascar from the African mainland, with patterns of self-recruitment in northern Mozambique. No distinct region was found for the Southern Mozambique Channel (SMC) as sites in the Southwest of Madagascar show exchange with sites in northern Mozambique and Tanzania for both *A. tenuis* as *S. hystrix.* Within Indonesia, a strong signature of divergence associated with historical land bridges at the Sunda Shelf was found for *S. hystrix*. However, divergence was not pronounced in broadcast spawning coral *A. millepora* in which sample sites in Pulau Seribu and the Spermonde Archipelago were only weakly differentiated.

These patterns of contemporary dispersal barriers and genetic diversity within the WIO and Indonesia can be explained by the differences in life history of the two corals, as well as by oceanographic conditions facilitating larval dispersal. Studying these large-scale patterns is critical to understand how coral reefs were historically connected, which contemporary larval dispersal barriers they are experiencing now, and how to strategically manage conservation efforts for future preservation of these essential coral reef species.