SCIENCES & BIOENGINEERING SCIENCES

The Research Group

Marine Biology / Ecology and Biodiversity

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

Filip HUYGHE

to obtain the degree of Doctor of Sciences

Title of the PhD thesis:

Evolutionary and Ecological connectivity of the skunk clown fish in the Indian Ocean and its importance for the design of Marine Protected Areas

Promotor:

Prof. Dr. Marc Kochzius

The defense will take place on

Thursday May 31 2018 at 15:00 h

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. Kim Roelants (chairman)
Prof. Dr. Bram Vanschoenwinkel (secretary)
Prof. Dr. Robinson Mdegela (co-promotor, Sokoine Univ. of Agriculture)
Prof. Dr. Geert Angenon
Prof. Dr. Filip Volckaert (KUL)
Prof. Dr. Isabelle Schön (KBIN)

Curriculum vitae

Filip Huyghe graduated as Master of Science in Biology in 2012. He started his PhD on connectivity of the skunk clownfish in 2013. The research was funded by a VLADOC scholarship. For fieldwork, Filip stayed for two periods of six months at State University of Zanzibar (SUZA), Tanzania. His research resulted in 4 publications in peer-reviewed journals, of which 2 as first author.
In addition, Filip supervised two MSc and four BSc students and assisted in several practical courses and excursions. He also delivered oral presentations in six international conferences.

Abstract of the PhD research

To assure that Marine Protected Areas (MPAs) fulfil their conservation roles, spacing of protected areas is very important, and information on connectivity at different levels is necessary for correct spacing. In this thesis, genetic markers are used to infer connectivity on both evolutionary and ecological timescales, using the skunk clownfish, *Amphiprion akallopisos* as a model species. Three aspects of connectivity are investigated. First, genetic differentiation is assessed using two types of markers. Secondly, self-recruitment (SR) and larval dispersal on several reefs in the vicinity of the island of Unguja, Tanzania, are analysed, and more precisely the influence of reef quality or health and local oceanography on these processes. And third, connectivity-based resilience of the total population on the reef system of Unguja is assessed by measuring average larval dispersal distances and the probability of dispersal of larvae among all reefs in the system.

On an evolutionary timescale, gene flow among populations from the Western Indian Ocean (WIO) and the Eastern Indian Ocean (EIO) was assessed as well as among several populations within these two regions using the Control Region as mitochondrial marker (mtDNA) and 13 microsatellite loci as nuclear markers. Nuclear and mitochondrial markers both detected strong genetic differentiation between WIO and EIO populations, as well as a shallower population structure among Malagasy populations and East African mainland populations.

On ecological timescales, self-recruitment (SR) was much higher in a nearly pristine coral reef than in other reefs, but reefs in an intermediate health state did not display intermediate levels of SR but levels rather similar to those of degraded reefs. Parental size did not seem to influence SR. Dispersal was not higher in the direction of the dominant sea surface current than in other directions. Seasonal variation or influence of changing oceanographic conditions on SR or larval dispersal were also not detected.

All reefs around Unguja seem to be well-connected through larval dispersal. On each individual reef, however, SR only accounted for 21% of all recruits on average. All studied reefs were largely dependent on larval input from other reefs in the area. Mean dispersal distance per larva was 16.4 km. Replacement time of adults by new recruit, for the population as a whole was 1.4 years per adult, but was much longer for each individual reef when only SR was taken into account. Two reefs contribute most of the recruits within the total population through larval dispersal. Protection of an additional reef would greatly improve total population resilience while still permitting exploitation of the other reefs by artisanal fishers.