

The Research Group
Ecology and Biodiversity

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

Alex NEHEMIA

to obtain the degree of Doctor of Sciences

Title of the PhD thesis:

***Influence of salt farming on the habitat, trophic ecology
and genetic population structure of
macroinvertebrates in mangroves.***

Promotor:

Prof. Dr. Marc Kochzius

The defence will take place on

Wednesday 21st June 2017 at 15:00 h

in Auditorium E.0.12 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. Harry Olde Venterink (chairman)

Prof. Dr. Margaret Chen (secretary)

Dr. Natacha Brion (co-promotor)

Prof. Dr. em. Frank Dehairs

Prof. Dr. Isabelle Schön (KBIN)

Prof. Dr. Philippe Dubois (ULB)

Curriculum vitae

Alex Nehemia was born in Tanzania in 1980. He attained his Bachelor degree of Science with Education at University of Dar es Salaam in 2008. He graduated with a master degree in marine sciences from the Institute of Marine Sciences of the University of Dar es Salaam in 2011. In September 2014 he joined the laboratory of Marine Biology for his Ph.D. study under the supervision of Prof. Dr. Marc Kochzius and Dr. Natacha Brion. He has been performing experimental work that involved mtDNA and microsatellites analysis. In addition, he conducted analysis of sediment particles size distribution and stable isotopes. Alex is the main author of one published international paper and one more is in review.

Abstract of the PhD research

Human activities, such as solar salt farming, are a threat to mangroves and important marine fauna. The loss and degradation of mangroves contribute to the loss of habitats and the alteration of hydrological conditions and may have an influence on the larval recruitment, settlement and dispersal trajectories of various marine species. Salt farming activities may also result in a change in the nutrition and feeding ecology of marine fauna, such as macroinvertebrates. Marine macroinvertebrates, including crabs and gastropods, form a major component of mangroves and are responsible for maintaining the health of the mangrove ecosystem. The ecosystem function of some macroinvertebrates is associated with their feeding strategies, which involve transformation, degradation and recycling of organic matter. Other macroinvertebrates construct burrows which they use as a refuge against predators and during high tides. By this bioturbation they improve soil aeration, recycling of nutrients and stimulate microbial decomposition, which promotes the growth of mangrove trees. Despite the important link between mangroves and macroinvertebrates, little has been done to maintain and conserve this important component of the ecosystem. In this study the impacts of salt farming on habitat and feeding ecology of the mangrove crab *Austruca occidentalis* and the snail *Littoraria subvittata* was determined by analysing particle size distribution, Organic C and total N content as well as C/N ratio, $\delta^{15}\text{N}$ and $\delta^{13}\text{C}$ in sediments. Nevertheless, C/N ratio, $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ were assessed in mangrove leaves and tissues of *A. occidentalis* and *L. subvittata*. The impact of salt production in mangroves was also assessed by analysing genetic diversity, gene flow and effective population size in *A. occidentalis* and *L. subvittata* at salt ponds. The values obtained were then compared to values obtained from natural sites where no salt farming production was taking place. Finally, the population genetic structure of *L. subvittata* and *L. pallescens* in the Western Indian Ocean was assessed. Based on the results obtained, salt farming activities may be responsible for increased sand contents, sediments enriched with ^{13}C and ^{15}N and mangrove leaves enriched with ^{13}C . The tissues of *A. occidentalis* and *L. subvittata* from mangroves at salt ponds were also enriched with ^{13}C compared to those from natural mangroves. The higher enrichment of ^{13}C in tissues of *A. occidentalis* and *L. subvittata* from mangroves at salt ponds might suggest the existence of environmental stress caused by unsuitable habitats due to clearing and selective logging of mangrove trees and hypersalinity. Apart from that, the results suggest that salt farming activities may be responsible for the loss of genetic diversity and the alteration of gene flow in mangroves at salt ponds and might be linked to a decrease in the effective population size. It was also revealed that the population of *L. subvittata* can be genetically isolated by patterns of ocean currents. In order to maintain a productive ecosystem, it might be important for marine resource managers and researchers to promote conservation and restoration of the habitats of important macroinvertebrates at salt ponds.