SCIENCES & BIOENGINEERING SCIENCES

The Research Group

Ecology and Biodiversity

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

Elisha Mrabu Jenoh

to obtain the degree of Doctor of Sciences

Title of the PhD thesis:
Insect pest infestation on mangrove forests on Kenya: identification, threats and impacts

Promotors:
Prof. dr. Nico Koedam (VUB)
Prof. dr. Farid Dahdouh-Guebas (VUB)
Dr. Esther Kioko (National Museums of Kenya)
Prof. dr. Luc Leyns (VUB)

The defense will take place on
Wednesday, December 14, 2022 at 15h in auditorium E.0.05

Members of the jury

Prof. dr. Tom Van der Stocken (VUB, chair)
Prof. dr. Thomas Merckx (VUB, secretary)
Prof. dr. Joske Ruytinx (VUB)
Prof. dr. Charles De Cannière (ULB)
Dr. Judith Okello (Kenya Marine Fisheries Research Institute)

Curriculum vitae

Elisha Mrabu undertook his MSc course in Ecological Marine Management at VUB - UAntwerpen (2007-2009). In 2011, he proceeded for PhD research at the VUB. Both courses were funded by a VLIR-UOS ICP scholarship grant. He has 8 peer-reviewed publications (3 as first author) in international journals.

Elisha has given 6 oral contributions, 5 posters at international scientific meetings and he has 1 scientific dissemination on YouTube. Currently, Elisha works for the Kenya Marine Fisheries Research Institute (KMFRI) in Mombasa, as a research scientist. He has also worked as a part-time lecturer for Nairobi University (Muena campus), Kenya.

He has supervised 6 BSc degree students and 1 MSc degree student.

Abstract of the PhD research

Insect infestation in forest ecosystems can cause widespread disturbance altering the quality and quantity of habitat available to numerous other organisms. The dynamics of woodborer infestation of *Sonneratia alba* Sm. in Kenya, an important waterfringing mangrove species, very wide ranging in the Indian and West Pacific Oceans, was investigated. The insects responsible for the infestation, the extent of infestation along the Kenyan Coast, the infestation mechanism used by the insects and the trees' response to infestation in the mangrove formation were studied.

To know the woodborers infesting *S. alba* mangroves, emergent insects were trapped from infested branches, larvae were reared, and pupae obtained. Two woodboring insects were identified: the beetle *Bottegia rubra* (Cerambycidae, Psebiini) and an undescribed genus of a metarbelid moth (Lepidoptera, Cossoidea), hence new to science.

S. alba infestation is spread along the entire coastal strip in Kenya. The infesting woodborers had a partial distribution gradient with the metarbelid moth infesting mangroves in both northern and southern regions of the Kenyan coast (600 km). *B. rubra* appeared in low density in Gazi Bay and in high density in Mida Creek, Kilifi Creek, and Ngomeni, with densities gradually decreasing northwards. The infestation spread of this extent and intensity of *S. alba* infestation in Kenya merits mangrove conservation concern.

In this work, the time it takes each woodborer species to kill a branch, the infestation mechanism of the two insect woodborers were documented and the role of two ant species (*Oecophylla longipoda* and a *Pheidole sp.*) in defending *S. alba* from infestation was hypothesised. The presence of several fungal species was also ascertained.

After infestation by woodborers, the resultant death or recovery of the host branches is dependent on the strength and the timeliness of the primary and secondary plant defences. The findings highlighted polysaccharide compounds as the main compounds that undergo changes due to the infestation. Infested *S. alba* react by increasing the production of phytochemicals as a defence reinforcing their cell walls. Branches that were able to timely produce more had a chance to recover, those responding slower were overwhelmed by the infestation and died.

This study has offered information about insect infestation on *S. alba* mangroves in Kenya. While also setting a necessary further research agenda, the information contributes to the selection of a conservation strategy to be employed for the mangroves in the wider area of East Africa.