SCIENCES & BIOENGINEERING SCIENCES

The Research Group

Ecology and Biodiversity

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

Gordian Rocky Mataba

to obtain the degree of Doctor of Sciences

Title of the PhD thesis:

Exploring integrated strategies to control oviposition and larval development in mosquitoes in Northern Tanzania

Promotors:
Prof. dr. Bram Vanschoenwinkel (VUB)
Prof. dr. Luc Brendonck (KU Leuven)
Prof. dr. Linus Munishi (The Nelson Mandela African Institution of Science and Technology)

The defense will take place on
Monday, March 6, 2023 at 16h in auditorium D.2.01

Join live event

Members of the jury

Prof. dr. Iris Stiers (VUB, chair)
Dr. Tom Van der Stocken (VUB, secretary)
Prof. dr. Thomas Merckx (VUB)
Prof. dr. Marc Elskens (VUB)
Dr. Tatenda Dalu (University of Mpumalanga)
Dr. Wouter Deconinck (Royal Institute of Natural Sciences)
Dr. Grite Nelson (The Nelson Mandela Institution of Science and Technology)

Curriculum vitae

Gordian Mataba is a Tanzanian with M.Sc. Marine and Lacustrine Science and Management from VUB in Belgium. Currently he is the academic staff at the Nelson Mandela African Institution of Science and Technology (NM-AIST) in Tanzania working in the capacity of assistant lecturer. Gordian is interested in research which focus on the field of applied aquatic ecology and ecotoxicology. This includes management, and conservation of aquatic resources, pollution monitoring and remediation, and control of disease vectors which reproduce in water.

Abstract of the PhD research

Besides services, ecosystems can also provide disservices. A significant disservice is the emergence of mosquitoes from freshwater habitats. These mosquitoes transmit diseases which claim millions of lives every year worldwide. The problem is exacerbated by the absence of vaccines or effective cures for many mosquito borne diseases, making effective control of mosquito populations the only reliable method to control these diseases. The widespread development of mosquito resistance against widely used insecticides hinders successful control of mosquito borne diseases using chemicals. This resistance in combination with the environmental hazards of pesticides point out the need for alternative, more effective and ecologically friendly means of mosquito control. Biological control of mosquitoes could therefore become an appropriate complementary method.

In this thesis, we investigated different strategies of biological control of mosquito populations by means of reducing oviposition and larvae development. Using field surveys, we investigated which factors limit population of mosquito larvae in aquatic habitats including temporary ponds, artificial habitats (e.g., discarded tires, flowerpots) and small ground pools (e.g., hoofprints, puddles, and small pools). In a next step, we used field mesocosms to investigate whether aquatic predators could control mosquito populations by deterring oviposition. Lastly, we investigated whether pesticides (e.g., Bacillus thuringiensis var israelensis - Bti) could control mosquito populations by mechanisms other than lethal effects, such as deterring or attracting oviposition.

We found that in our study region (Lake Manyara Basin, Tanzania), populations of larval mosquitoes in aquatic habitats are controlled by different factors. In temporary ponds, populations of mosquito larvae are controlled by aquatic predators, while in small ground habitats their abundance is determined by the level of turbidity and proximity of habitat to houses. In artificial habitats, populations of mosquitoes (i.e., larvae) are mainly determined by covering, emptying, and refilling of water storage vessels by residents. In addition, we found evidence that presence of predators in a breeding habitat deters mosquito oviposition. Lastly, we found that the pesticide Bti was effective in controlling larvae abundance by killing them but not by altering mosquito oviposition and there was no change in the pond invertebrate community structure.

We conclude that in our study region, it is important to have an integrated mosquito control approach which prioritizes controlling mosquito larvae of small ground habitats with environmentally friendly larvicides and conservation of mosquito predators in temporary ponds. Also, proper management of water storage containers and discarded artefacts is emphasized in this region.