



The Research Group
Ecology, Evolution & Genetics

has the honour to invite you to the public defence of the PhD thesis of

Edward Mayila

to obtain the degree of Doctor of Sciences

Title of the PhD thesis:

Environmental trace metal status and their effects on sharptooth catfish (*Clarias gariepinus*) immune cell population and functioning in Tanzania

Curriculum vitae



Full Name Edward Samwel Mayila
Date of Birth 20/10/1975, Chato - Tanzania.
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2021 Registered to pursue a Doctor of Sciences, VUB
2013 MSc. One Health Molecular Biology, SUA
2008 BSc. Biotechnology and Laboratory Sciences, SUA
2003 Diploma in Medical Laboratory Sciences. MUHAS

2015 ISO-15189 Mentor on the Laboratory Quality Management System and Personnel Competence.

From 2016 Employed by the Sokoine University of Agriculture, College of Veterinary Medicine, Biomedical Sciences, Dept of Microbiology, Parasitology and Biotechnology.

Until 2016: Worked with the Ministry of Ministry of Health at the National Health Laboratory.

Publications

1. <https://doi.org/10.1371/journal.pone.0306335>.
2. <https://doi.org/10.1016/j.cirep.2024.200191>.
3. <https://bmccresnotes.biomedcentral.com/articles/10.1186/s13104-016-2283-0>

Abstract of the PhD research

Trace metals, naturally occurring elements, can negatively affect biota at low concentrations due to their persistence and bioaccumulation in the food chain. This study assessed the environmental pollution status of eleven trace metals (Al, Cd, Co, Cu, Cr, Fe, Mn, Ni, Pb, V, Zn) and arsenic using ICP-MS. This study also assessed the immune status of catfish by analyzing blood cells (WBC, RBC, Hb) and microflora. Samples were collected from the upper and lower Ruvu, Rufiji, and Matandu Rivers and a pond near Java-Saadani, in Tanzania. An experimental exposure study with Cd stress on the blood cell population and functioning was also conducted.

The results showed low to moderate pollution levels, with nickel posing the least ecological risk. Trace metal concentrations in catfish tissues were within WHO/FAO/EU limits. The Target Hazard Quotient (THQ) and Hazard Index (HI) were <1, indicating low risk. Trace metal concentrations in catfish tissues were within WHO, FAO, and EU limits. The Target Hazard Quotient (THQ), Hazard Index (HI), and carcinogenic risk were low, indicating minimal risk to the biota.

In-vivo blood parameters varied by site, with lower Ruvu showing the highest values: WBC (37.32×10^3 cells/ μ l), RBC (1.4×10^6 cells/ μ l), Hb (6.04 g/dl). Microflora load was highest at lower Ruvu (405×10^8 CFU/ml).

Experimental cadmium exposure reduced WBC and RBC counts, increased cell fragility, and impaired phagocytosis. WBC counts in control tanks remained stable (28.8 to 32.0×10^3 cells/ μ l), but in the treatment group, they progressively decreased (18.7 to 32.0×10^3 cells/ μ l in week 1, 13.5 to 29.8×10^3 cells/ μ l in week 2, 9.6 to 28.8×10^3 cells/ μ l in week 3). RBC counts declined from 1.9×10^6 cells/ μ l in week 1 to 1.2×10^6 cells/ μ l in week 3, while Hb dropped from 9.3 g/dl to 5.0 g/dl.

Continued monitoring of trace metals is recommended to detect early pollution signs.

Promotors:

Prof. dr. Marc Kochzius (VUB)
Dr. Cyrus Rumisha (Sokoine University of Agriculture, TZ).
Dr. Alexander Mzula (Sokoine University of Agriculture, TZ).

The defence will take place on
Tuesday, February 4, 2025, at 3 p.m. in auditorium I.0.02

Members of the jury

Prof. dr. Luc Leyns (VUB, chair)
Prof. dr. Wen-Juan Ma (VUB, secretary)
Prof. dr. Martine Leermakers (VUB)
Prof. dr. Gudrun De Boeck (UAntwerpen)
Prof. dr. Lieven Bervoets (UAntwerpen)