Small mammal community dynamics and associated trophic niche widths in a mining-impacted catchment.

By

Christopher Hugh Davies

0713561K

A dissertation submitted to the Faculty of Science, University of the Witwatersrand, in fulfilment of the requirements for the degree of
Master of Science.

in the
School of Animal, Plants, and Environmental Sciences
University of the Witwatersrand
Johannesburg
South Africa

November 2013

Small mammal community dynamics and associated trophic niche widths in a mining-impacted catchment.

By

Christopher Hugh Davies

0713561K

Supervisors:

Dr Mark Keith

Centre for Wildlife Management

University of Pretoria

Pretoria, South Africa

Dr Deanne Drake

School of Animal, Plant and Environmental Sciences

University of the Witwatersrand

Johannesburg, South Africa

Abstract

The aim of this research was to contextualise, in terms of community structure, food web metrics and mercury contamination, small mammal communities living in the areas surrounding tailings storage facilities (TSFs) on a gold-mining property near Carletonville, South Africa. Tailings are liquid slurry containing waste material produced during the processing of ore. Pollution released into the environment by TSFs exposes wildlife to potential health hazards, such as elevated mercury concentrations. Therefore, this study focussed on describing the 1) small mammal population dynamics, 2) isotopic niche widths, and 3) mercury bioaccumulation in small mammal hair, to provide insight into the interactions between mining pollutants (indicated by mercury) and small mammal ecology and food webs.

During the study, six rodent species (order Rodentia, families Muridae and Nesomyidae) and two shrew species (order Soricomorpha, family Soricidae) were captured. Three Muridae (sub-family Murinae) species were: the striped mouse, *Rhabdomys dilectus* (n = 147); the multimammate mouse, *Mastomys sp.* (n = 77); and the rock rat (or veld rat), *Aethomys sp.* (n = 1). Two Muridae (sub-family Otomyinae) species were: the vlei rat, *Otomys auratus* (n = 14); and the Angoni vlei rat, *O. angoniensis* (n = 4). The Nesomyidae (sub-family Dendromurinae) species was Brant's climbing mouse, *Dendromus mesomelas* (n = 4). The two insectivorous shrew (family Soricidae) species captured were: the swamp musk shrew, *Crocidura mariquensis* (n = 46); and the forest shrew, *Myosorex varius* (n = 8).

This study confirmed that small mammal species diversity and abundance are influenced by the amount and quality of vegetation present and the cover it provides in the lower height classes (leaf litter and 0 – 30cm above ground). Disturbances to vegetation, such as through the occurrence of fire at the West Wits Mining Complex (WWMC), influenced

small mammals both directly (likely through injury or death) and indirectly by removing resources such as cover and food. Although small mammal hair mercury concentrations did not exceed international regulatory standards, small mammal hair did reflect the general mercury abundance in their habitats.

Hair mercury concentrations also reflected trophic strategy, as insectivores had significantly higher hair mercury concentrations than omnivores and herbivores. Whilst not significant, there was a trend in omnivores toward higher hair mercury concentrations than herbivores as expected. Hence, bioaccumulation of mercury is evident in the terrestrial food web at WWMC, but not to the point where mercury would be considered a health hazard to wildlife or humans by international regulatory organisations as no clear measurable impact by chronic exposure to mercury pollution was found. The structure of the small mammal community at the WWMC, containing primary and secondary consumers, can therefore be used to gain more detailed insight into the interactions of food webs and environmental pollution in the mining environment.

Key words: small mammals, mercury, isotopes, trophic niche, mine pollution, bioaccumulation.