

The occurrence, relative abundance and environmental associations of small terrestrial mammals in the Northern Kimberley, Western Australia

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A thesis submitted in total fulfilment of the requirements for the degree of
Doctor of Philosophy

School of Biological Sciences
Faculty of Science



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This thesis is dedicated to my parents

Lynette Olds & Graham Olds

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Declaration

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution in my name and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made. In addition, I certify that no part of this work will, in the future, be used in a submission in my name, for any other degree or diploma in any university or other tertiary institution without the prior approval of the University of Adelaide.

This thesis presents an original and independent piece of research. All significant aspects of analysis and interpretation of results were done by myself. The thesis is presented as a series of papers. Collaborations have been indicated by the co-authorship of these papers as follows: 1) Bill Breed and David Taggart were included in recognition of the contribution they have made as my supervisors; 2) Jim Reside, George Madani, Alexander Dudley, Henry Cook, Brendan Schembri, Christopher Jackson, Tamara Waina, Ernie Boona, Sally Potter, Raz Martin, Nicholas Evans and Brian Charles were include in recognition of their field support across multiple years and 3) Cecilia Myers was included in recognition of her expert advice and land management responsibly of the study sites. These contributions in no way effect the originality or my overall contribution to the thesis.

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Thesis Abstract

This study examines the distribution and abundance of the small terrestrial mammal fauna (non-volant, <2kg) in the Northern Kimberley bioregion, Western Australia. This region is considered 'pristine' as there have been no known recent mammal extinctions, and cane toads have not yet extensively invaded the region. This study was undertaken on two pastoral stations, Doongan and Theda Stations, which cover a combined area of over 6,650 km². These stations have never previously been surveyed for the occurrence of small mammals. The investigation describes the presence, abundance and environmental relationships of the small mammal species on these stations. The records obtained in this study fill a significant gap in knowledge of the distribution and relative abundance of the small mammal species in the Northern Kimberley region. The results are compared to the small mammal fauna on three adjacent national parks, as well as to those of the broader region of northern Australia.

Extensive trapping surveys of small mammals were undertaken on the two properties. However, only 15 of the 27 small mammal species known to occur in the Northern Kimberley were detected. Four species were commonly found (*Pseudomys nanus*, *Rattus tunneyi*, *Zyromys argurus* and *Sminthopsis virginiae*). Six other species were detected, but less frequently (*Leggadina lakedownensis*, *Pseudomys delicatulus*, *Pseudantechinus ningbing*, *Dasyurus hallucatus*, *Isoodon macrourus* and *Petroseudes dahli*). The other five species were only detected occasionally (*Melomys burtoni*, *Pseudomys johnsoni*, *Hydromys chrysogaster*, *Planigale maculata* and *Petaurus breviceps*). The trapping success rate was found to be generally low, suggesting that populations were at low density. This indicates that the abundance and distribution of the small mammal fauna may be reduced from what would have occurred in the recent past.

Environmental assessments identified 14 broad habitat types that were surveyed for small mammals across the two stations. The abundance and occurrence of small mammals in these habitats was determined. Temporal changes in trap success were evident across the nine year study period. The influence of broad-scale environmental variables on the composition of the small mammal community was examined using a relatively new modelling tool, the *mvabund* package. The environmental variables partially explained the variation seen across the annual survey efforts. The influence of fire and rainfall variation may have created changes in landscape productivity which, in turn, influenced the small

mammal community's composition. Land systems, which describe patterns of vegetation, topography and soils, were also associated with community composition. These systems may indicate the likelihood of species being present within the small mammal community, whilst environmental variables, such as fire and rainfall, influence the species' ability to persist, or vary, in relative abundance.