Impacts of invasive exotic plants on reptile and amphibian assemblages

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Certificate of Authorship/Originality

I certify that the work in this thesis has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree except as fully acknowledged within the text.

I also certify that the thesis has been written by me. Any help that I have received in my research and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

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Abstract

The invasive spread of exotic plants into native vegetation can pose serious threats to native faunal assemblages. This is of particular concern for reptiles and amphibians because they form a significant component of the world's vertebrate fauna, play a pivotal role in ecosystem functioning and are often neglected in biodiversity research. A framework to predict how exotic plant invasion will affect reptile and amphibian assemblages is imperative for conservation, management and the identification of research priorities.

In this thesis I present and test the first predictive framework to describe the impacts of exotic plant invasions on reptiles and amphibians. Central to the framework is the identification of exotic plant and native reptile and amphibian life-history traits that influence the response of reptiles and amphibians to exotic plant invasion. These traits are integrated into three mechanistic models based on exotic plant invasion altering: (1) habitat structure; (2) herbivory and predator-prey interactions; (3) the reproductive success of reptile and amphibian species and assemblages. With this framework, I identified novel growth forms and structural features of exotic plants and small body size of reptiles and amphibians as life-history traits most likely to be linked to strong and readily detectible impacts of invasion.

A test of framework predictions against available empirical evidence in the literature provided support for predictions from each of the three mechanisms of the framework. I performed field-work to test predictions relating to differential effects of exotic plant growth forms and the susceptibility of small-bodied native reptile and amphibian species to invasion. I compared the impacts of Lantana (*Lantana camara*), which differs strongly in growth form to the dominant native vegetation in the dry sclerophyll forest it invades, and Bitou Bush (*Chrysanthemoides monilifera* ssp. *rotundata*) which provides a similar growth form replacement in the coastal heathland it invades. Lantana significantly altered habitat structure by increasing understorey cover, creating cooler and shadier conditions. Lantana invasion was associated with lower reptile abundance, particularly of the scincid lizard *Lampropholis delicata,* the

smallest reptile species present. In contrast, Bitou Bush did not significantly alter habitat structure, insolation or habitat temperature and was not associated with significant changes in reptile abundance.

The findings of this thesis confirm the importance of plant and animal life-history traits in determining responses of reptiles and amphibians to exotic plant invasions. The trait-based approach employed in this thesis offers considerable benefits to assessing the impacts of exotic plant invasion on native biodiversity. In particular, my framework provides a basis for predicting impacts and determining future research and management priorities.

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Acronyms & Abbreviations

ANOSIM	Analysis of Similarity
ANOVA	Analysis of Variance
C	Carbon
CI	Confidence Interval
DBH	Diameter at Breast Height
ESD	Environmental Sex Determination
EST	Eastern Standard Time
GLM	General Linear Model
GenLMM	Generalised Linear Model
GLMM	Generalised Linear Mixed Model
GSD	Genotypic Sex Determination
HSD	Honestly Significant Difference
LSD	Least Significant Difference
M-BARCI	Multiple Before-After Reference Control-Impact
PAR	Photosynthetically Active Radiation
N	Nitrogen
nMDS	Non-metric Multidimensional Scaling
NSW	New South Wales
P	Phosphorus
SE	Standard Error
SL	Shell Length
SVL	Snout-Vent Length
TL	Total Length
TSD	Temperature-dependent Sex determination
UV	Ultraviolet