Habitat use and occupancy patterns of the endangered green and golden bell frog (*Litoria aurea*) – implications for conservation management

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The University of Newcastle

Australia
Statement of Originality

The thesis contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution 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 the text. I give consent to the final version of my thesis being made available worldwide when deposited in the University’s Digital Repository, subject to the provisions of the Copyright Act 1968.

I hereby certify that the work embodied in this thesis contains published papers/scholarly work of which I am a joint author. I have included as part of the thesis a written statement, endorsed by my supervisor, attesting to my contribution to the joint publications/scholarly work.

Signed: .................................................. Date: .............................................
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Abstract

Successful management of threatened species requires an understanding of how they use their habitat and respond to management intervention. For this thesis, I investigated the habitat features driving the distribution of the threatened green and golden bell frog (*Litoria aurea*) toward industrial landscapes, and constructed an experimental trial habitat to compare habitat use patterns and determine whether the constructed habitat would support its growth, survival, and persistence. A detectability study was also conducted to determine detection probabilities among various habitat types. The results revealed the most important landscape feature was the number of permanent waterbodies within a kilometre distance which determined *L. aurea* occupancy, colonization, and breeding. The most utilized habitat for all demographic groups was aquatic vegetation while the least utilized was open water. Moreover, accounting for detection probabilities altered the outcomes of nearly all habitat variables, and incorporating them is essential to avoid wrong conclusions. Lastly, the constructed habitat provided *L. aurea* with sufficient resources to grow, survive, and persist for three years. Implications for future conservation management is that a landscape level approach is required to successfully manage this species. Although a relatively small animal, *L. aurea* disperse large distances to waterbodies. While it has been recognized as a colonizing species, this aspect of its life history has been underestimated and largely ignored. The creation of permanent waterbodies is necessary in areas with little interconnectivity, many ephemeral ponds, or where droughts are common. A greater proportion of aquatic vegetation should also be the focus of future *L. aurea* management. Furthermore, large release numbers are necessary to combat its high mortality rates and as buffer against predation and disease. The findings of this thesis also demonstrate that experimental trials prior to implementation of large scale initiatives are highly valuable for informing future habitat management decisions.
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Preface

This thesis is presented as a collection of published and submitted journal articles, each of which addresses a specific aim of this thesis. The papers are linked and integrated into the existing scientific literature by a general introduction chapter and the results summarised in a conclusion chapter.

During my candidature, the research project required replicated field surveys over a relatively large area with wetlands of various sizes and depths. To meet occupational health and safety regulations and for other logistical purposes I worked in a small team with other doctoral students. This meant that we shared the duties of data collection and discussed the implications and findings as a team. The outcome is that we each contributed to the conduct of the research and have co-authored several papers. While I am not the principle author on these publications I was directly involved in the conduct of the field work, discussion of results, analysis and contributed to the writing of the papers. The layout is summarised below:

Chapter 1. Introduction


Chapter 6. Conclusions

List of additional publications and conference presentations relevant to the thesis but not included:

**Publications:**


**Conference Presentations:**


All work presented in this thesis was conducted according to the Australian Government National Health and Medical Research Council’s Code of Practice for the Care and Use of Animals for Scientific Purposes and under approval from the University of Newcastle’s Animal Care and Ethics Committee (project no. A-2010-145 and no. A-2011-137). This thesis was funded by BHP Billiton (G1000939). All field work was conducted according to the National Parks and Wildlife Act under the scientific license no. SL10042