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**LIFE HISTORY AND CHEMOSENSORY  
COMMUNICATION IN THE SOCIAL  
AUSTRALIAN LIZARD, *EGERNIA WHITII***

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**“Ecology is not a science with a simple linear structure: everything affects everything else.” “The beauty of ecology is that it challenges us to develop an understanding of very basic and apparent problems, in a way that recognises the uniqueness and complexity of all aspects of nature but seeks patterns and predictions within this complexity rather than being swamped by it (Begon *et al.* 1996)”.**



**“Ask and it will be given to you: seek and you will find: knock and the door will be opened to you”  
(Matthew 7:7, New International Version)**

## **DECLARATION**

I certify that this thesis does not incorporate, without acknowledgement, any material previously submitted for a degree or diploma in any university; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.

Robyn L. Bellamy  
August 2006

## ABSTRACT

Social relationships, habitat utilisation and life history characteristics provide a framework which enables the survival of populations in fluctuating ecological conditions. An understanding of behavioural ecology is critical to the implementation of Natural Resource Management strategies if they are to succeed in their conservation efforts during the emergence of climate change. *Egernia whitii* from Wedge Island in the Spencer Gulf of South Australia were used as a model system to investigate the interaction of life history traits, scat piling behaviour and chemosensory communication in social lizards.

Juveniles typically took  $\geq 3$  years to reach sexual maturity and the results of skeletochronological studies suggested longevity of  $\geq 13$  years. Combined with a mean litter size of 2.2, a pregnancy rate estimated at 75% of eligible females during short-term studies, and highly stable groups, this information suggests several life history features.

Prolonged juvenile development and adult longevity may be prerequisite to the development of parental care. Parental care may, in turn, be the determining factor that facilitates the formation of small family groups. In *E. whitii* parental care takes the form of foetal and neonatal provisioning and tolerance of juveniles by small family or social groups within established resource areas. Presumably, resident juveniles also benefit from adult territorialism. Research on birds suggests that low adult mortality predisposes cooperative breeding or social grouping in birds, and life history traits and ecological factors appear to act together to facilitate cooperative systems.

*E. whitii* practice scat piling both individually and in small groups. Social benefits arising from signalling could confer both cooperative and competitive benefits. Permanent territorial markers have the potential to benefit conspecifics, congeners and other species. The high incidence of a skink species (*E. whitii*) refuging with a gecko species (*N. milii*) on Wedge Island provides an example of interspecific cooperation. The diurnal refuge of the nocturnal gecko is a useful transient shelter for the diurnal skink. Scat piling may release a species 'signature' for each group that allows mutual recognition.

Scat piling also facilitates intraspecific scent marking by individual members, which has the potential to indicate relatedness, or social or sexual status within the group. The discovery of cloacal scent marking activity is new to the *Egernia* genus. *E. Whitii* differentiate between

their own scats, and conspecific and congeneric scats. They scent mark at the site of conspecific scats, and males and females differ in their response to scent cues over time. Scat piling has the potential to make information concerning the social environment available to dispersing transient and potential immigrant conspecifics, enabling settlement choices to be made.

This thesis explores some of the behavioural strategies employed by *E. whitii* to reduce risks to individuals within groups and between groups. Scents eliciting a range of behavioural responses relevant to the formation of adaptive social groupings, reproductive activity, and juvenile protection until maturity and dispersal are likely to be present in this species. Tests confirming chemosensory cues that differentiate sex, kin and age would be an interesting addition to current knowledge. The interaction of delayed maturity, parental care, sociality, chemosensory communication and scat piling highlights the sophistication of this species' behaviour.

An alternative method for permanently marking lizards was developed. Persistence, reliability and individual discrimination were demonstrated using photographic identification and the method was shown to be reliable for broad-scale application by researchers. Naturally occurring toe loss in the field provided a context against which to examine this alternative identification method and revealed the need to further investigate the consequences of routine toe clipping, as this practice appears to diminish survivorship.

## ACKNOWLEDGMENTS

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## FOREWORD

The data chapters of this thesis (Chapters 2, 3, 4, 5 and 6) are written as independent manuscripts intended to be suitable for presentation as publications in refereed journals with minor modification. Therefore it was not possible to avoid some degree of replication in the information presented.

My original research centred on dispersal in the social organisation of *Egernia whitii*. North-south transects of Wedge Island at 100 metre intervals were completed in a collaborative exercise with a colleague. Habitat descriptions, details of substrate and vegetation, weather information, skink captures, location and social proximity were recorded.

Polymorphic microsatellite DNA loci were to be identified and developed to reveal the degree of relatedness both within groups and between groups. For this purpose 335 *E. whitii* throughout the island were blood or tissue sampled. In addition 251 lizards had blood slides taken for parasite detection and to pinpoint the period of vitellogenesis. Fresh scat specimens (110) were collected to examine diet and determine habitat optimisation, and a further 29 scat specimens were preserved for microscopy.

The combined data were to provide information on relatedness, life history, sociality, growth patterns, and parasitism in the various different habitats utilised on the island. I expected to discover whether or not dispersal was sex biased, the common age at dispersal, and the relatedness structure within groups.

Unfortunately a change in supervision and resources meant that it was no longer possible to complete the planned research during the course of my candidature. Therefore in collaboration with a new supervisory panel I altered the project focus from dispersal and social organisation to life history and chemosensory communication, using data previously generated for the original project.

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