

Thesis master

**RESOURCE PARTITIONING BETWEEN
TWO SYMPATRIC AUSTRALIAN SKINKS,
EGERNIA MULTISCUTATA AND
*EGERNIA WHITII***

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Declaration

This is to 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.

Stephen Bellamy

August, 2006

Abstract

When species compete for resources, in a stable homogeneous environment, there are two possible outcomes. The first is that one species will out-compete the other and exclude it from the environment. This is known as the competitive exclusion principle. The second is that both species will manage to coexist. Coexistence can only occur if the species' niches are differentiated such that interspecific competition is minimised, or eliminated. This outcome is known as resource partitioning.

Two closely related Australian skink species of the *Egernia* genus, *Egernia multiscutata* and *Egernia whitii*, are abundant and sympatric on Wedge Island in South Australia's Spencer Gulf. The species are morphologically very similar and appear to have very similar life histories and habitat requirements. Ostensibly, they would compete for limiting resources in this environment.

This thesis is the first investigation into resource partitioning in this previously unstudied model organism. I report the results of multi-faceted investigations into the coexistence of the skinks, *E. multiscutata* and *E. whitii* on Wedge Island and the evidence for, and mechanisms of, any facultative resource partitioning between them.

Study methods involved a transect survey of most of Wedge Island to determine the species' distributions and any evidence for resource partitioning; a morphological comparison to investigate any potential competitive advantages of either species; a habitat choice experiment to establish retreat-site preferences in the absence of interspecific interference; and, a series of staged dyadic encounter experiments to investigate interspecific competitive interactions.

Resource partitioning was evidenced by differential distributions of the species among substrates containing the elements required for permanent refuge shelters. This partitioning was not mediated by avoidance of particular substrates but by the presence of the opponent species, combined with attraction to suitable substrates. Asymmetries in some morphological characters were found to confer a potential competitive advantage to *E. multiscutata* in agonistic encounters with *E. whitii*. Both species were found to have the same refuge site preferences when interference competition was experimentally removed. This result was not concordant with observed resource partitioning in the field and suggests that the habitat choices of both species are modified by the presence of the opponent species. Analyses of staged dyadic encounter experiments showed that *E. multiscutata* was more likely to gain greater access to a contested habitat resource and more likely to exclude *E. whitii* from the resource than *vice-versa*. Nevertheless, the outcome of competitive interactions was not completely deterministic and there was some tolerance of co-habitation. *E. multiscutata*'s competitive advantage was attributable largely to its greater mass and head dimensions relative to snout to vent length. However,

differential behavioural responses to the threat of larger opponent size also played an important part in resource partitioning between the species.

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Proverbs 3 (New International Version)

⁵“Trust in the Lord with all your heart
and lean not on your own understanding;

⁶In all your ways acknowledge him,
and he will make your paths straight.”

Amen.

Foreword

The data chapters of this thesis are written as independent manuscripts suitable for publication in refereed journals with only minor modification. Therefore it was not possible to avoid some degree of redundancy, particularly in the chapter introductions.

Originally this study was conceived as an investigation into dispersal patterns and behaviour in *Egernia multiscutata* and *Egernia whitii* on Wedge Island using molecular techniques. Much of the fieldwork was carried out on this basis.

Unfortunately a change in supervision and resources meant that it was no longer possible to complete the original research plan during the course of my candidature. Therefore, in collaboration with a new supervisory panel, I altered the project focus from dispersal to resource partitioning and adapted work already done accordingly.

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