

**Evolution and Ecology of the Prehensile-  
Tailed Skink – *Corucia zebrata***

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## Abstract

A complete understanding of species' ecology spans a number of biological disciplines and includes the distribution and genetical lineages and how these lineages correspond with geological features in space and time, the properties of single populations (group composition, neighbourhood size and population size), habitat preferences and the behaviour and movement pattern of single individuals. This study focused on the large and ecologically atypical prehensile-tailed skink (*Corucia zebrata*), a reptile endemic to the Solomon Archipelago. Due to its large size and unusual ecology, *C. zebrata* is regarded as one of the most unique reptiles world wide, however very little information about the species exists beyond that of anecdotal nature. This thesis explores the ecology of *C. zebrata* with specific focus on phylogeography, population genetics and population size, habitat preferences and behaviour. Specifically, the aims of the thesis were to 1) Define biogeographic regions for *C. zebrata*, determine levels of divergence between island populations and assess these patterns in light of information on Pleistocene land bridges, island isolation and island age. 2) Explore the group composition and overall population structure of one *C. zebrata* population with inferences on social behaviour. 3) Explore the habitat preferences and home range size of *C. zebrata* with comparisons to other terrestrial and arboreal taxa of similar size. 4) Assess the effective and census population sizes of one *C. zebrata* population with inferences on the conservation status of the population.

For phylogeographic analysis, 61 *C. zebrata* were sampled from 14 locations across the Solomon Archipelago and sequenced at two mitochondrial loci and four nuclear loci for assessment of population differentiation and Bayesian phylogenetic inference. These data were regarded in light of geological information on Pleistocene land bridges and island age. The fine scale genetic structure of one population was assessed from a sample of 51 lizards captured in a 900 ha study plot within a larger area of continuous rainforest on Ugi Island, Makira Province. Bayesian assignment analysis and pair-wise relatedness between individual lizards based on eight polymorphic DNA microsatellite loci were used to investigate population structure and group composition. Additionally, these loci were used to estimate the effective population size on Ugi Island, and were, together with estimations on population census, used for conservation assessment. For assessment of movement patterns, a six-week study of *C. zebrata* on Ugi Island was conducted to determine home-range sizes and overlap among conspecifics. During this time, 25 lizards were fitted with radio transmitters and were followed for periods of 5–38 days.

Populations of *C. zebrata* on separate islands were found to be genetically distinct from each other, with reciprocal monophyly on mitochondrial DNA. Populations on islands connected by Pleistocene land bridges were marginally less divergent than from other nearby but isolated

islands. There are indications that *C. zebrata* has radiated across the eastern islands of the archipelago within the last 1 - 4 million years. Genetic analysis of the population on Ugi Island indicated that the connectivity within the population was high as all animals constituted a single genetic group and there were indications of a high dispersal rate across the sample area. There was ambiguous evidence for social associations of family groups. Telemetry results indicated that the average home range over the period studied was equivalent to the canopy of one tree. Assessment into population size indicated no immediate concern for the population on Ugi; however this cannot be extrapolated to populations on the remainder of the archipelago.

Data in this thesis suggest that dispersal between islands is very limited and that barriers to gene flow exist within the major islands. Phylogeography of *C. zebrata* is not explained by Pleistocene land bridges. The population genetic results indicated that there may be some short-term family association in this species, but potential social adaptations do not affect the overall genetic structure of the population. It was noted that the conventional survey methods that involve searching tree trunk habitats have low detection probability and that the detection probability is heterogeneous with respect to the habitat (tree species) and region of the country. These are important considerations for further ecological studies of the species, in particular for the purpose of assessing its conservation status.

## Publications and Presentations

The thesis is based on the following articles and conference publications:

### Accepted journal publication:

**Hagen, I.J.** & Bull, C.M. (2011) Home Ranges in the Trees: Radio Telemetry of the Prehensile Tailed Skink, *Corucia zebrata*. *Journal of Herpetology*, **45**, 22-25. This publication appears in Chapter 4.

### Submitted journal publication:

**Hagen, I.J.**, Donnellan, S., Herfindal, I. & Bull, C.M. Hanging about in Trees: Population Genetic Structure of the Prehensile Tailed Lizard, *Corucia zebrata*. Submitted to *Wildlife Research*. This manuscript appears in Chapter 3.

### Journal publication awaiting submission:

**Hagen, I.J.**, Donnellan, S. & Bull., C.M. Phylogeography and colonisation history of the prehensile tailed skink *Corucia zebrata* on the Solomon Archipelago. To be submitted to *Journal of Biogeography*. This manuscript appears in Chapter 2.

### Conference publications:

‘Conservation genetics of *Corucia zebrata* and implications for conservation planning and management’. ESF Conservation Genetics Conference, Trondheim, Norway, May 2009. Oral presentation. Data from this presentation appears in Chapter 2.

‘Phylogeography of Endemic Taxa Across the Solomon Archipelago’. 6<sup>th</sup> World Congress of Herpetology, Manaus, Brazil, August 2008. Oral presentation. Data from this presentation appears in Chapter 2.

‘Genetic  $N_e$  and conservation assessment of elusive species; a case study of the Solomon Islands prehensile tailed skink (*Corucia zebrata*)’. Sustainable Conservation – Bridging the Gap, Trondheim, March 2010. Poster presentation. Data from this presentation appears in Chapter 5.

‘Evolution of Social Behaviour in *Egernia* Group of Australasian Skinks’. European Society for Evolutionary Biology (ESEB), Turin, August 2009. Poster presentation. Data from this presentation appears in Chapter 3.

## **Declaration**

I certify that this thesis does not incorporate without acknowledgement any material previously submitted for the 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.

INGERID JULIE HAGEN

A handwritten signature in blue ink that reads "Ingerid Julie Hagen". The signature is written in a cursive style with a long, sweeping tail on the final letter.

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This research was carried out under Flinders University  
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from the Solomon Island's Department of Education

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This thesis is dedicated to the Rainforest Foundation;  
a non-governmental organisation that works towards the  
world wide protection of rainforests.