Population fragmentation in the small-scaled skink (*Oligosoma microlepis*): the consequences of human landscape transformation on a habitat specialist's distribution, morphology, and genetics.

A thesis presented in partial fulfilment of the requirements for the degree of

Master of Science

In

Conservation Biology

At Massey University, Manawatu, New Zealand.

Moniqua Nelson-Tunley

2012

Abstract

The endemic small-scaled skink (*Oligosoma microlepis*) is restricted to the central North Island of New Zealand. Strong preference for exposed rock piles, a relatively rare habitat, has created a fragmented distribution and restricted subpopulation sizes. The Department of Conservation lists the species as in serious decline, with IUCN listing it as vulnerable. At the stronghold of this species in the southern part of its range, subpopulations exist on small rock piles separated by up to 11 km of pastureland. Scattered northern subpopulations are separated by more than 19 km. These distances may act as dispersal barriers, as might the lack of refugia between subpopulations on pastureland. Lack of migration between subpopulations could reduce genetic diversity and increase inbreeding. Reduced genetic diversity could decrease resistance to disease, parasitism and environmental change, whereas inbreeding may reduce fertility, lifespan and juvenile survival.

This thesis used a combination of survey data, morphological measurements and population genetics to investigate potential causes and consequences of population fragmentation on the small-scaled skink, with the aim of providing information to guide the long-term conservation of this species.

A survey of known small-scaled skink subpopulations was conducted to determine if the species is in decline. In addition, potential small-scaled skink habitat was searched, including previously surveyed sites. Evidence of decline was inconclusive, with three subpopulations appearing to be in decline and discovery of five new subpopulations.

Genetic (16S mitochondria and microsatellites) and morphological analysis was used to examine subpopulation differences in relation to species distribution, including investigating inbreeding within subpopulations. Relatedness between subpopulations was consistent with isolation by distance, indicating that small-scaled skink dispersal is limited by distance, but not significantly limited by pasture between subpopulations. Inbreeding was not detected within any subpopulation.

The main findings of this thesis were that evidence of species decline was inconclusive, with possible species expansion and undetected subpopulations. Dispersal was limited by dispersal distance but not by pasture and no subpopulation was subject to significant inbreeding. Current research indicates that pasture does not negatively affect the species, and may be beneficial in the formation and maintenance of habitat.

Acknowledgements

If it takes a village to raise a child, then it takes a scientific community to raise a thesis. I owe thanks to all my friends and lecturers in the Ecology Department at Massey University for their advice, camaraderie and the occasional welcome distraction. Thanks to my supervisors Doug Armstrong, Mary Morgan-Richards and Steve Trewick for their involvement in every step of the process. Thanks to Eddy Dowle and Marianna Bulgarella for helping me through the genetics work, and the other Phoenix members for their insights and advice.

I would like to acknowledge the organisations that have provided the funding that made this project possible: the Department of Conservation, Julie Alley bursary, Project Tongariro (Tongariro Natural History Society), SRARNZ, and Ecogecko consultants. Thank you to Jessica Scrimgeour from the Department of Conservation, who provided advice and liaison during the early stages of research. Thank you to the landowners that granted me access and generously provided accommodation during my fieldwork, as well as Dennis Keall for allowing sampling of the captive subpopulation.

Thank you to my family for encouraging my love of animals and the New Zealand wilderness, and for providing refuge during semester breaks.

Thank you to the small-scaled skinks that entertained us with their behaviours and interactions during sampling; sorry for the harassment.

Most of all, thank you to my partner Andrew Blayney. I cannot find the words to express my gratitude for his constant support, and hope that a lifetime supply of love and biscuits will suffice.

Contents

List of figures

List of tables