

## **Project Summary “The vulnerability of an assemblage of subtropical rainforest vertebrate species to climate change in south-east Queensland”**

Valerie Hagger<sup>1,2</sup>

1 School of Biological Sciences, University of Queensland, St Lucia, Queensland

2 Sinclair Knight Merz, PO Box 3848, South Brisbane, Queensland

Global climate change is a key threat to natural ecosystems with high biodiversity and endemism such as the subtropical rainforests of eastern Australia. The subtropical rainforests of eastern Australia occur from Gladstone in south-east Queensland (SEQ) to Hunter River in north-east New South Wales (NSW). They are the largest and most diverse in Australia, acknowledged for their world heritage values as the Gondwana Rainforests of Australia World Heritage Area. They support relict species and ecosystems of Gondwanan origin, regional endemics and over 280 threatened taxa.

Predicted impacts on terrestrial biodiversity from climate change consist largely of shifts in latitudinal and altitudinal distributions, with possible extinctions of vulnerable species. Relative vulnerability is dependent on a species exposure and sensitivity to climate change, mediated by the species resilience and capacity to adapt to that change. Factors that reduce extinction risk of a species are (1) resistance or the ability of a species to withstand an environmental perturbation such as climate change, and (2) resilience or the ability of a species to recover from an environmental perturbation.

The aim of the study was to identify which species and taxonomic groups are most vulnerable to climate change in an assemblage of subtropical rainforest vertebrates in SEQ and to recommend adaptation strategies for species most at risk of extinction. It was also to determine if vulnerability is correlated with a species ability to recolonise disturbed habitats.

I synthesised published data for an assemblage of 38 subtropical rainforest vertebrate species in four taxonomic groups (amphibians, reptiles, birds and mammals), in order to assess relative vulnerability to climate change using rarity and resilience models. I targeted endemic and/or threatened species recorded in SEQ rainforest to focus on likely ‘vulnerable’ species. I considered two dimensions of vulnerability, (1) resistance to change, defined by indicators of rarity (geographic range, habitat specificity and local abundance), and (2) resilience to change defined by indicators of a species’ potential to recover (reproductive output, dispersal potential and climatic niche).

I also undertook a monitoring program of target species in paired regrowth and remnant sites in Lamington National Park to determine species ability to recolonise habitats after disturbance. In the absence of long-term monitoring, these results were analysed to predict species recovery under climate change.

I found that reptiles were the most vulnerable, followed by frogs and birds. Mammals were the least vulnerable. The most vulnerable species in each taxonomic group include:

<b>Amphibians</b>	<b>Reptiles</b>	<b>Birds</b>	<b>Mammals</b>
<i>Phyloria kundagungan</i>	<i>Harrisoniascincus zia</i>	<i>Atrichornis rufescens</i>	<i>Kerivoula papuensis</i>
<i>Phyloria loveridgei</i>	<i>Saproscincus spectabilis</i>	<i>rufescens</i>	<i>Pseudomys oralis</i>
<i>Assa darlingtoni</i>	<i>Phyllurus caudiannulatus</i>	<i>Menura alberti</i>	<i>Antechinus</i>
<i>Mixophyes fleayi</i>	<i>Erotoscincus graciloides</i>	<i>Orthonyx temminckii</i>	<i>subtropicus</i>
	<i>Eulamprus tryoni</i>		
	<i>Saproscincus rosei</i>		
	<i>Saltuarius swaini</i>		
	<i>Saproscincus challengerii</i>		

The three traits in the rarity model were found to be independent of one another, whilst reproductive output and dispersal potential interacted in the resilience model. Across all taxa species with low reproductive output also had a low capacity to disperse. Monitoring of species in regrowth rainforest showed that species with low resilience have a reduced capacity to recolonise disturbed habitats. This study supports the conclusions of other vulnerability assessments on terrestrial vertebrates, in that many of the species with narrow geographic range tended to have high habitat specialisation. It provides valuable information for prioritising adaptive management actions for species most at risk.

Measures recommended for climate change adaptation of SEQ rainforest focus on building resilience of species and ecosystems. As a priority, identification and protection of climatically stable habitat (cool refugia) is required for vulnerable amphibian, reptile and bird species to ensure their protection against climate change. Cool refugia occur where thermally buffered environments overlap with core habitat or distribution of vulnerable species. As a supplementary measure better management of weeds and feral animals, and contingency for natural disasters require incorporation into existing reserve management plans.