Long-Term Monitoring of Brush-tailed Phascogale (Phascogale tapoatafa) *in Woodland and Dry Forest Ecosystems of Central Victoria*

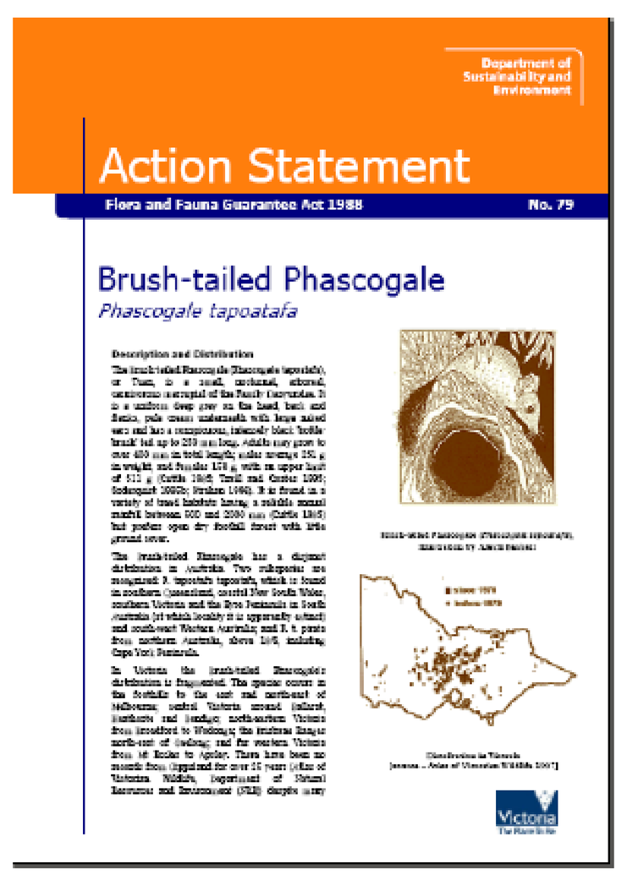
Brush-tailed Phascogale Co-Ordinating Group

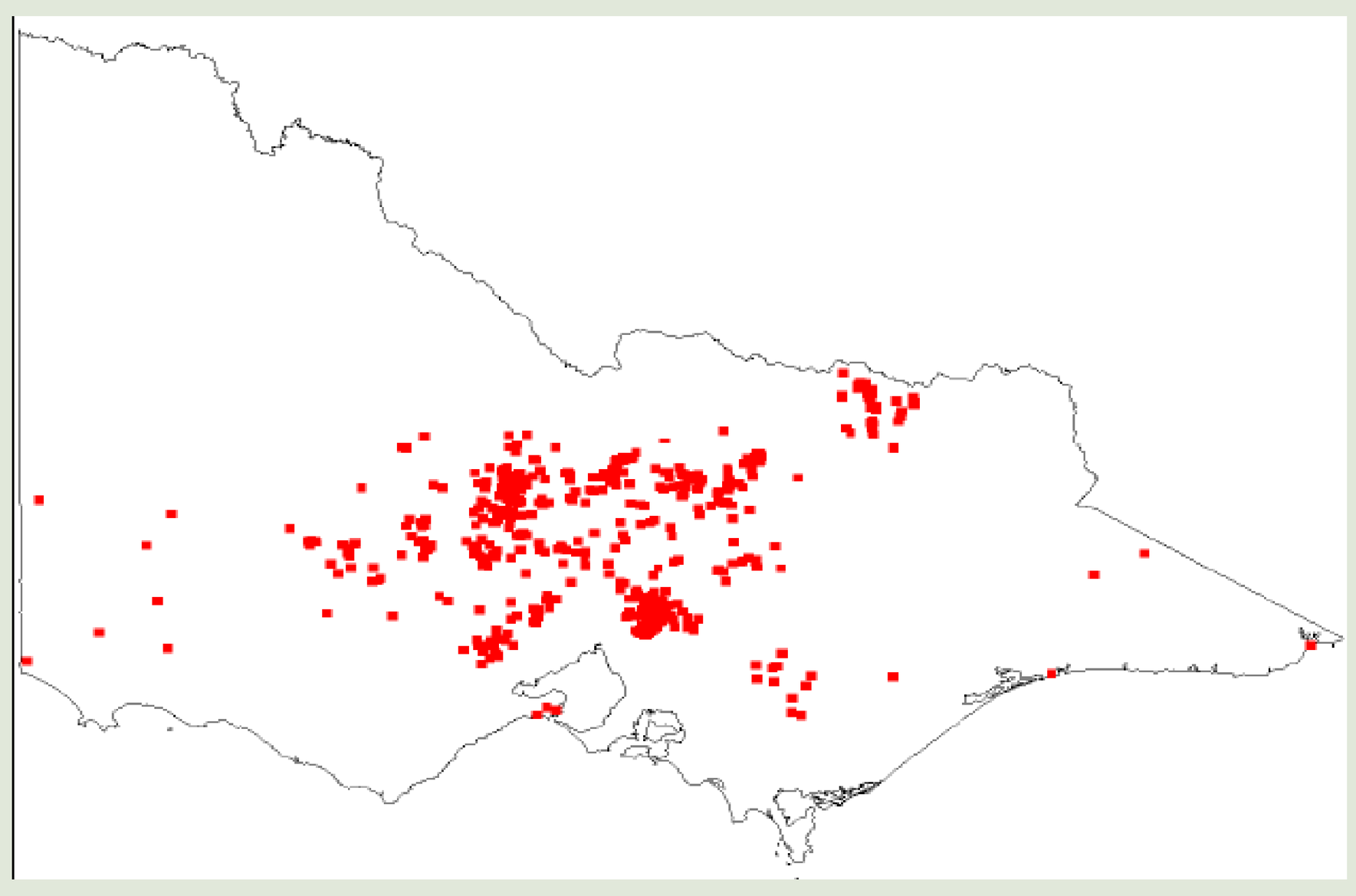
(Flora & Fauna Permit Number 10006680)

Current Status
Brush-tailed Phascogale *Phascogale tapoatafa tapoatafa* L – Vulnerable

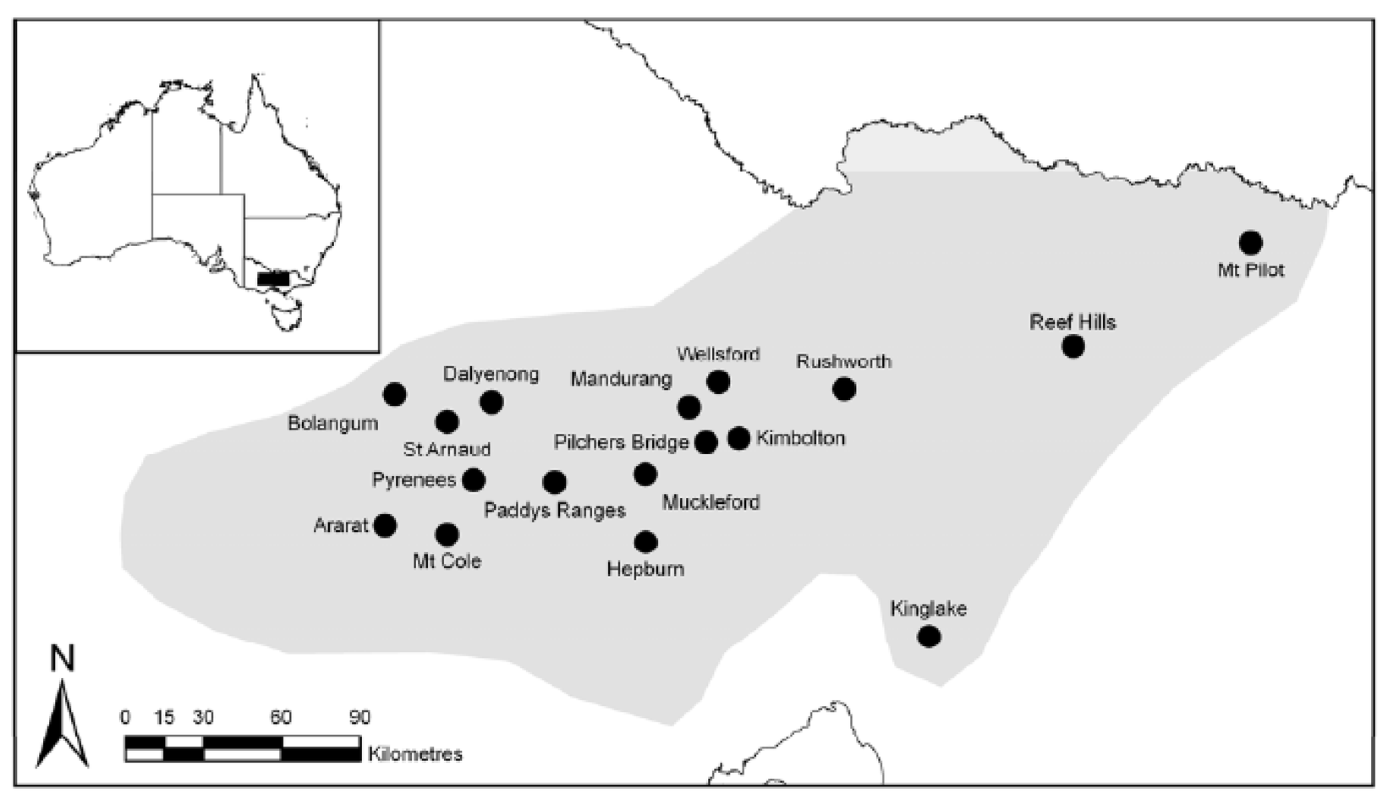
Vulnerable (VU)
A taxon is vulnerable when it is not critically endangered or endangered but is facing a high risk of extinction in the wild in the medium-term future

The Action Statement is currently being reviewed (2012)





Red dots indicate historical distribution.



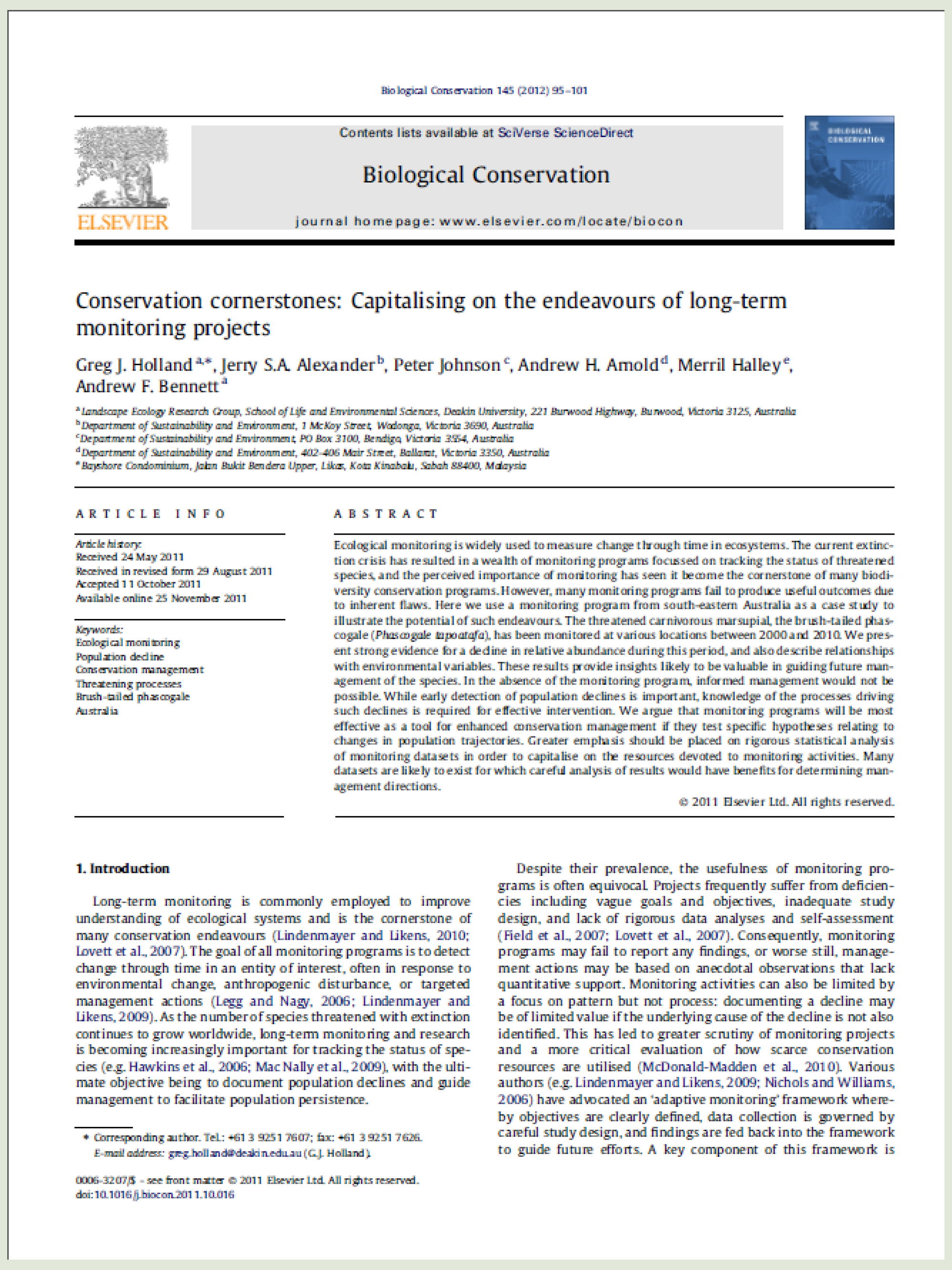
Grey shading indicates approx. current (2012) distribution
From Holland et al (2012)
Andy Arnold 2012

The Brush-tailed Phascogale Coordinating Group (BTPCG) has been meeting and coordinating the implementation of the Brush-tailed Phascogale FFG Act Action Statement since 1997. The BTPCG is <u>not</u> a recovery team per se, but more of a working group that coordinates management actions that occur within a variety of woodland systems across the State.

Using Brush-tailed Phascogale as the focus species has the effect of engaging with many different agencies, community groups and non-government organisations. Land managers, involved in the annual monitoring, are able to apply the principles and understandings learnt from their time involved with the program to their own particular circumstances.

The issues encountered during the program contribute to a better understanding of the dynamics of a woodland ecosystem and an improved, more holistic approach to management decisions across both the private and public land estate. The long-term monitoring data have been analysed and published in an international journal[1].

Holland G. J., Alexander J. S. A., Johnson P., Arnold A. H., Halley M. and Bennett A. F. (2012). Conservation Cornerstones: Capitalising on the endeavours of long-term monitoring projects. Biological Conservation 145: 95 – 101.



Biological Conservation 145 (2012) 95–101

Contents lists available at SciVerse ScienceDirect

Biological Conservation

journal homepage: www.elsevier.com/locate/biocon

Conservation cornerstones: Capitalising on the endeavours of long-term monitoring projects

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ARTICLE INFO

Article history:
Received 24 May 2011
Received in revised form 29 August 2011
Accepted 11 October 2011
Available online 25 November 2011

Keywords:
Ecological monitoring
Population decline
Conservation management
Threatening processes
Brush-tailed phascogale
Australia

ABSTRACT

Ecological monitoring is widely used to measure change through time in ecosystems. The current extinction crisis has resulted in a wealth of monitoring programs focussed on tracking the status of threatened species, and the perceived importance of monitoring has seen it become the cornerstone of many biodiversity conservation programs. However, many monitoring programs fail to produce useful outcomes due to inherent flaws. Here we use a monitoring program from south-eastern Australia as a case study to illustrate the potential of such endeavours. The threatened carnivorous marsupial, the brush-tailed phascogale (*Phascogale tapoatafa*), has been monitored at various locations between 2000 and 2010. We present strong evidence for a decline in relative abundance during this period, and also describe relationships with environmental variables. These results provide insights likely to be valuable in guiding future management of the species. In the absence of the monitoring program, informed management would not be possible. While early detection of population declines is important, knowledge of the processes driving such declines is required for effective intervention. We argue that monitoring programs will be most effective as a tool for enhanced conservation management if they test specific hypotheses relating to changes in population trajectories. Greater emphasis should be placed on rigorous statistical analysis of monitoring datasets in order to capitalise on the resources devoted to monitoring activities. Many datasets are likely to exist for which careful analysis of results would have benefits for determining management directions.

1. Introduction

Long-term monitoring is commonly employed to improve understanding of ecological systems and is the cornerstone of many conservation endeavours (Lindenmayer and Likens, 2010; Lovett et al., 2007). The goal of all monitoring programs is to detect change through time in an entity of interest, often in response to environmental change, anthropogenic disturbance, or targeted management actions (Legg and Nagy, 2006; Lindenmayer and Likens, 2009). As the number of species threatened with extinction continues to grow worldwide, long-term monitoring and research is becoming increasingly important for tracking the status of species (e.g. Hawkins et al., 2006; Mac Nally et al., 2009), with the ultimate objective being to document population declines and guide management to facilitate population persistence.

Despite their prevalence, the usefulness of monitoring programs is often equivocal. Projects frequently suffer from deficiencies including vague goals and objectives, inadequate study design, and lack of rigorous data analyses and self-assessment (Field et al., 2007; Lovett et al., 2007). Consequently, monitoring programs may fail to report any findings, or worse still, management actions may be based on anecdotal observations that lack quantitative support. Monitoring activities can also be limited by a focus on pattern but not process: documenting a decline may be of limited value if the underlying cause of the decline is not also identified. This has led to greater scrutiny of monitoring projects and a more critical evaluation of how scarce conservation resources are utilised (McDonald-Madden et al., 2010). Various authors (e.g. Lindenmayer and Likens, 2009; Nichols and Williams, 2006) have advocated an 'adaptive monitoring' framework whereby objectives are clearly defined, data collection is governed by careful study design, and findings are fed back into the framework to guide future efforts. A key component of this framework is

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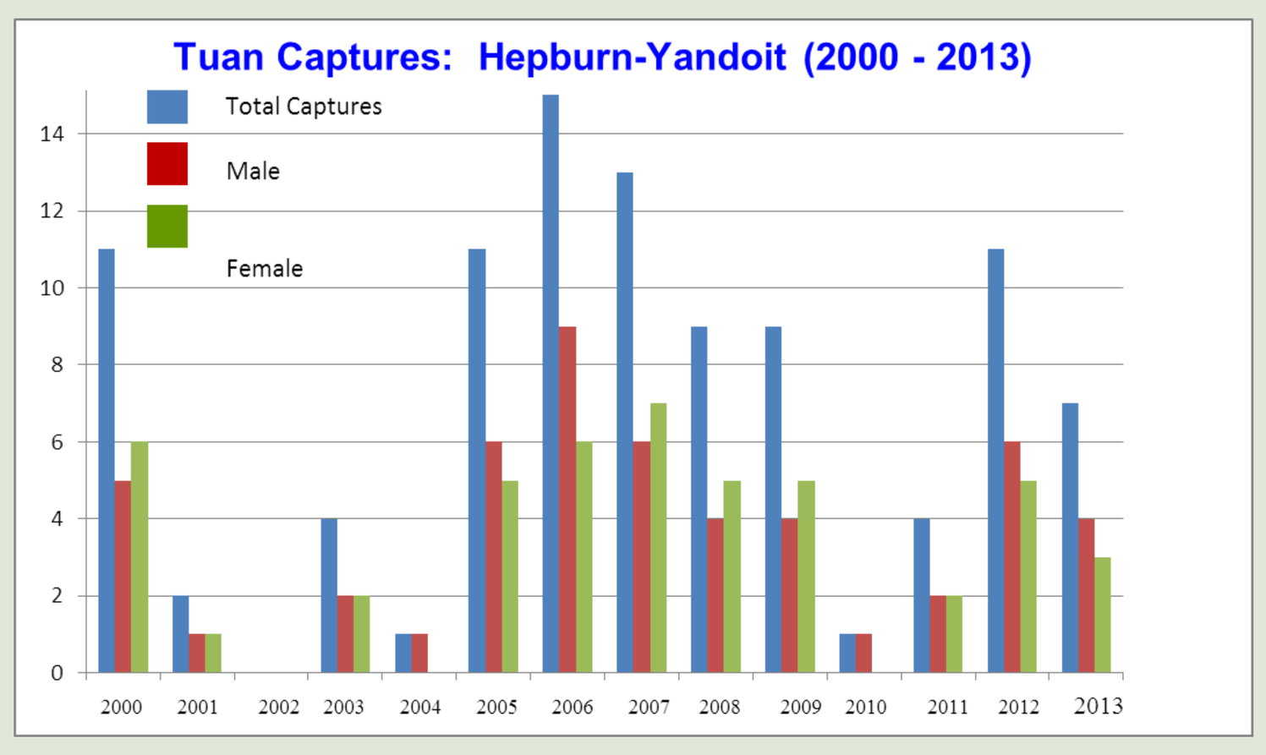
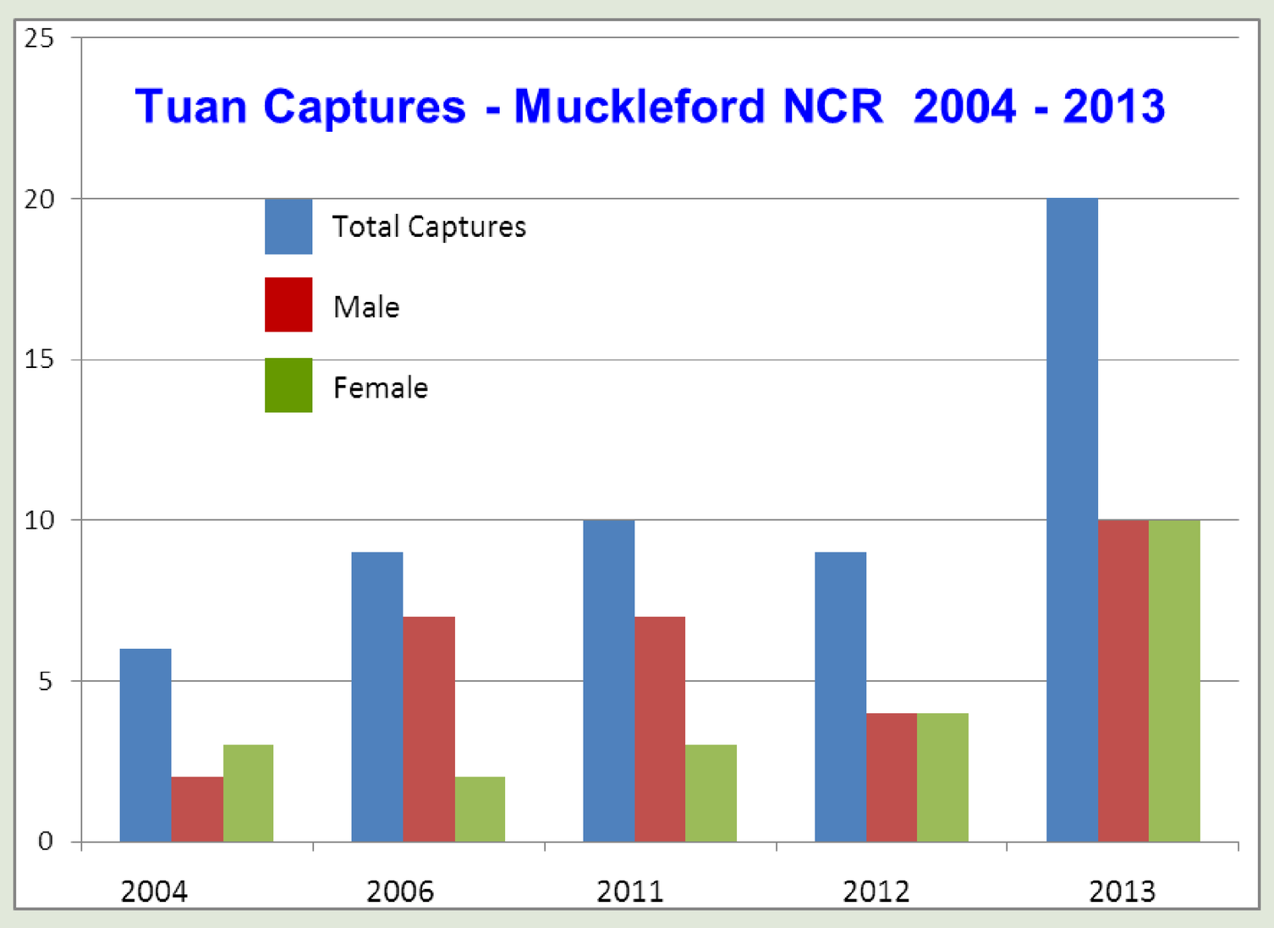
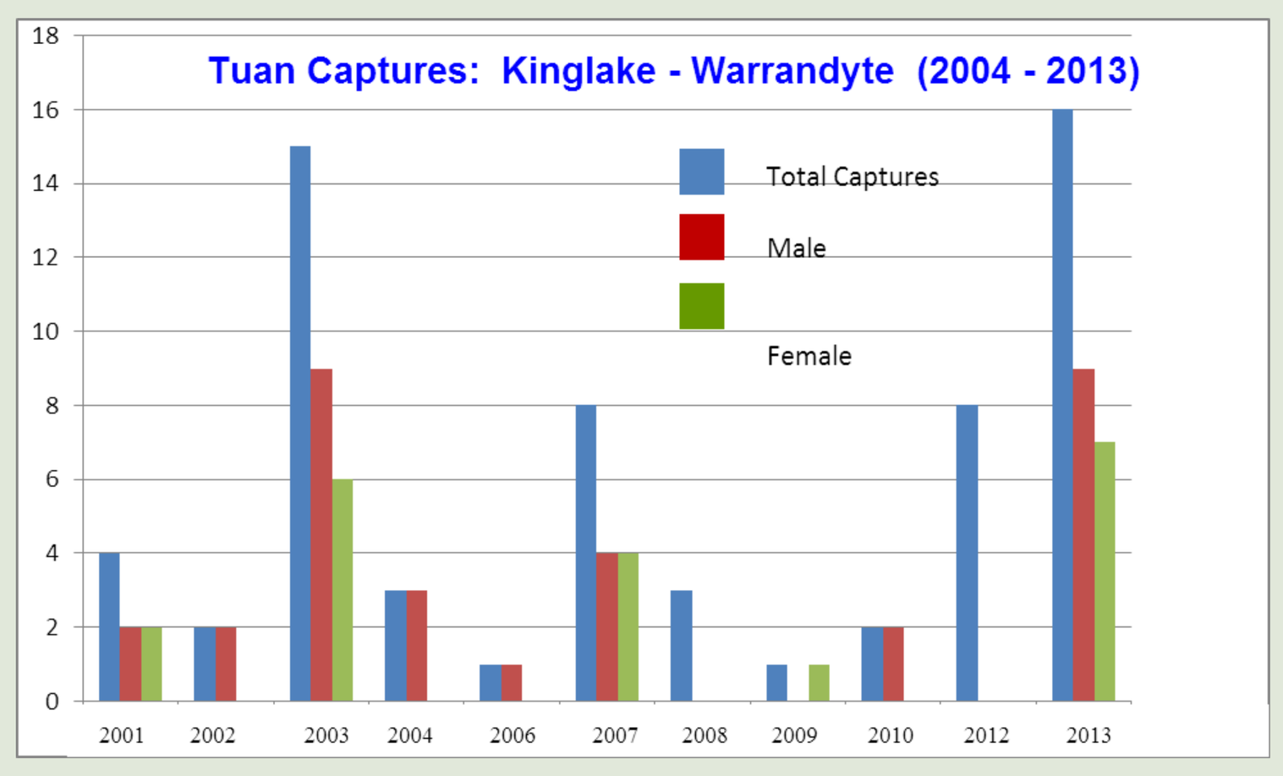
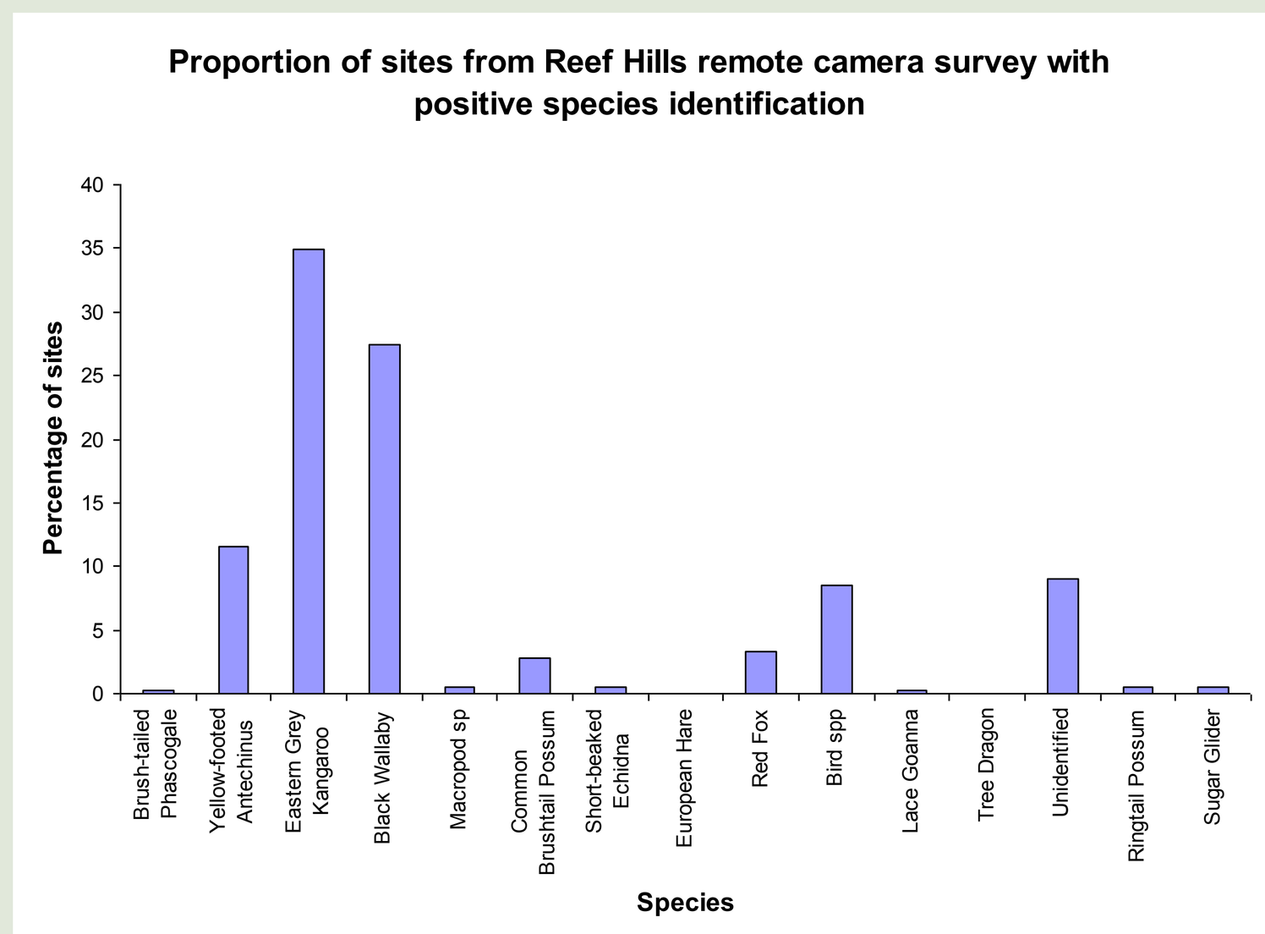
doi:10.1016/j.biocon.2011.10.016









Genetic Analysis of Brush-tailed Phascogale (*Phascogale tapoatafa*) in Victoria

Dr Andrea Taylor, Monash University, June 2010

Genetic samples were collected by the Brush-tailed Phascogale Coordinating Group, and analysed by Dr. Andrea Taylor from Monash University.

"Management units" or MUs, based on analysis of 6 microsatellite loci, were identified from potential locations of barriers in the landscape that might be preventing gene flow and contributing to differentiation among these MUs.

Objectives

1. Define regional populations among all sampled individuals.
2. Determine changes in genetic structure between sampling periods.
3. Determine temporal changes in genetic diversity for locations where sample sizes permit.

Figure 1: (Below) Victorian *Phascogale tapoatafa* sample locations, pooled across 2000-2009. Locations indicated with smaller lettering had only one or two samples, while sample sizes from other locations

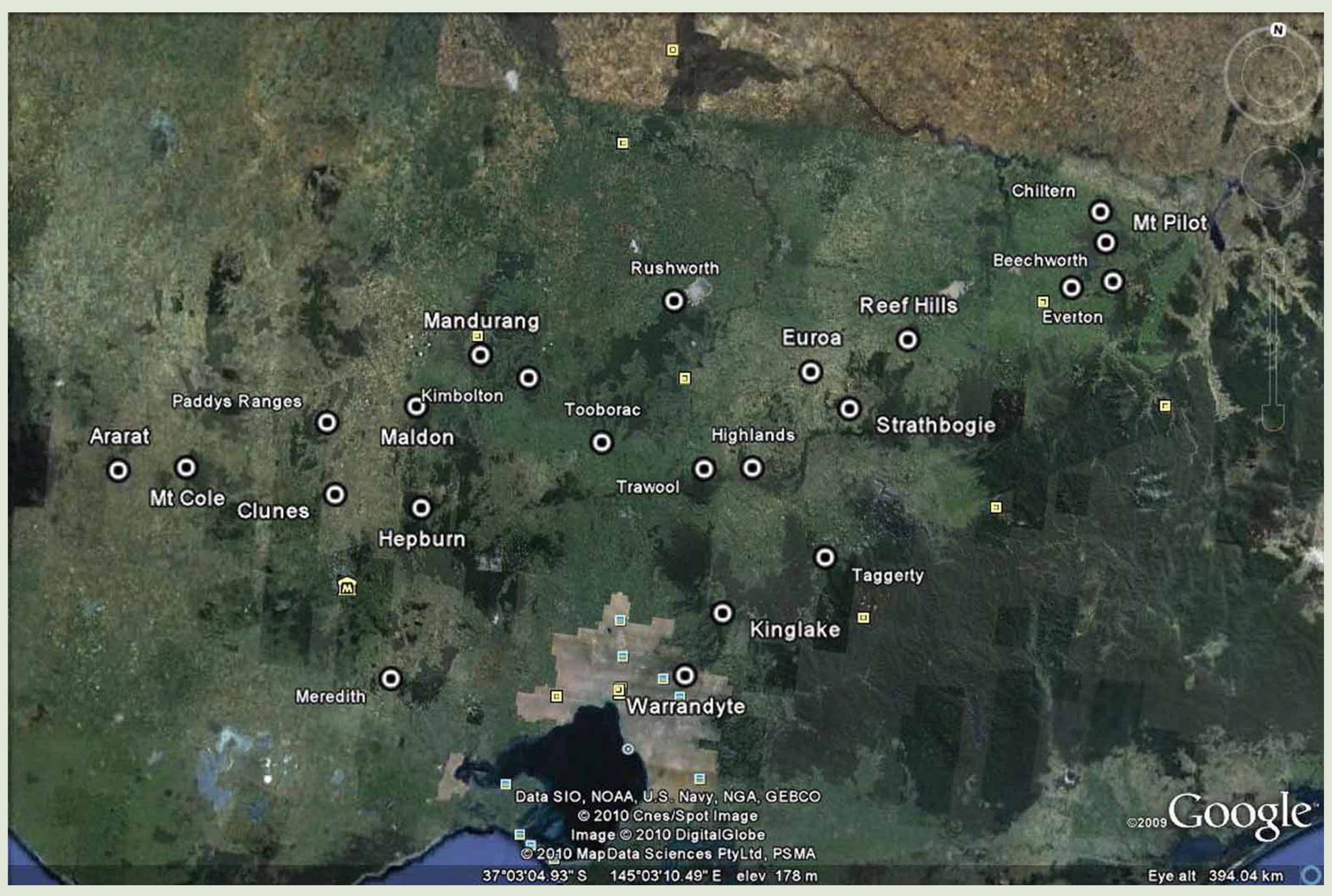


Figure 2: (Right) 'STRUCTURE plots' based on microsatellite analysis of 301 Victorian *Phascogale tapoatafa*.

Colours represent each of the 6 genetic clusters identified among the samples on the basis of minimising genetic disequilibria. Each vertical bar represents a single individual and the colours indicate the proportional ancestry of that individual's genotype to each cluster. Genetic similarity between individuals is indicated by colour-sharing, and implies connectivity and gene flow between the relevant geographic locations. Population identifiers are as follows: 1 Ararat; 2 Mt Cole; 3 Clunes; 4 Meredith; 5 Hepburn; 6 Tooborac; 7 Maldon; 8 Kimbolton; 9 Mandurang; 10 Kinglake; 11 Warrandyte; 12 Trawool; 13 Taggerty; 14 Highlands; 15 Strathbogie; 16 Euroa; 17 Reef Hills; 18 Everton; 19 Beechworth; 20 Mt Pilot.