Phylogeny, phylogeography and conservation genetics of the *brachyotis* group of rock-wallabies.

Petrogale brachyotis (short-eared rock-wallaby)

Submitted by

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TABLE OF CONTENTS

NOTE:
All files on the CD are in FAS file format.
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CD accompanies the print copy of the thesis held in the
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LIST OF FIGURES

LIST OF TABLES

(migration rate at which genes come into the two populations); and *t* indicates the divergence time between the two populations.

Table 3.7

Population migration rates (m_1, m_2) for the *brachyotis* group populations, which represent the migration rate at which genes come into the populations.

Table 4.1

Location of sampled *P. brachyotis* populations and the number of identified mtDNA haplotypes.

Table 4.2

Summary of genetic diversity indices for sampled populations of *P. brachyotis*, including: haplotype diversity (h), nucleotide diversity (π), allelic diversity (AD), allelic richness (AR), mean expected heterozygosity (H_E), unique alleles (A_U) and inbreeding levels (F_{IS}).

Table 4.3

Genetic differentiation (pairwise Φ_{ST} of mtDNA and F_{ST} for microsatellites) between sampled *P. brachyotis* populations (Couchman – C; Cyprus Valley – CV; Monsmont Island – M Is; Bullanyin Island – B Is; King Edward River – KER; and Pump Hill – PH).

Table 4.4

Reported allelic diversity (AD) and average heterozygosity (H_E) at polymorphic microsatellite loci in 25 populations of *Petrogale* which were assessed using an assortment of the markers used in this study.

Table 5.1

Pairwise genetic sequence divergence between mtDNA lineages of the *brachyotis* group using a Tamura-Nei distance model.

Table 5.2

Results of analyses of molecular variance for mtDNA, *BRCA1*, *ω-globin*, A1 and A2 for the *brachyotis* group of rock-wallabies.

Table 5.3

Population migration rates (m_1, m_2) estimated from the isolation with migration program.

Table 5.4

Pelage characteristics of *P. brachyotis* populations from four geographic regions.

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THESIS SUMMARY

This thesis explores phylogenetic relationships amongst rock-wallabies, genus *Petrogale*, throughout Australia and in particular the phylogeographic relationships of three species (*brachyotis* taxonomic group) from north-west Australia. A combination of nuclear and mitochondrial DNA markers have been utilised to assess evolutionary history at several spatial scales. The first data chapter assesses broad scale relationships amongst rock-wallaby species with subsequent chapters examining the impacts of biogeographic processes on genetic diversification within the *brachyotis* group and conservation implications. These studies have increased our understanding of rock-wallaby evolution and provide valuable data to support the recognition of multiple species within *Petrogale brachyotis* (short-eared rock-wallaby). It has also established new hypotheses about the relationships of *P. burbidgei* (monjon) and *P. concinna* (nabarlek) to *P. brachyotis* within the *brachyotis* group. Although *P. brachyotis* is widespread, we have found this species is highly divergent across its range, with future management needing to ensure the survival of multiple highly diverse genetic lineages.

The phylogenetic analysis (chapter two) identified four distinct clades within *Petrogale*, with three comprising taxa with the ancestral karyotype (2n=22). The *brachyotis* group was the first to diverge and phylogenetic relationships within this lineage suggest the need for a focused phylogeographic study of this group and the likelihood of taxonomic revisions. There was support for *P. purpureicollis* being reinstated as a full species and *P. concinna* being classified within *Petrogale* rather than the monotypic genus *Peradorcas*. Ancestral habitat reconstructions suggested ancestral *Petrogale* were originally widespread across Australia and have undergone vicariance as a result of isolation caused by environmental/climatic changes during the Plio-Pleistocene.

The third chapter concentrated on north-west Australia, the main focus of this thesis, and its numerous proposed biogeographic barriers which have remained largely untested by phylogeographic studies. This thesis provides the first evidence of how these barriers have profoundly influenced the genetic differentiation of mammals within north-west Australia. Rock-wallabies, with their habitat specificity and naturally low gene flow are a good indicator

species for biogeographic barriers and provide good evidence of how past climatic cycles during the Plio-Pleistocene have influenced genetic differentiation across northern Australia.

The fourth chapter was more localised and focused on the genetic diversity of *P. brachyotis* within the Kimberley. This study provided evidence of greater connectivity of populations than previously recorded for any other rock-wallaby, highlighting how suitably connected habitat can allow dispersal of rock-wallabies across large distances. Large genetic differentiation was detected between the East and West Kimberley *P. brachyotis*, supporting the need for a reassessment of taxonomic classifications and conservation units within *P. brachyotis*.

The final data chapter examined the conservation status of the *brachyotis* group of rock-wallabies and outlined taxonomic reclassifications of *P. brachyotis*. This analysis provided evidence for division of *P. brachyotis* into two species. It is likely that additional taxonomic changes will be necessary in the future as further sampling and analyses are undertaken. Although this thesis has significantly advanced our understanding of the relationships within the *brachyotis* group, it also highlights the need for future work on this group of rock-wallabies.

STATEMENT OF AUTHORSHIP

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution to Sally Potter and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

This thesis represents an original and independent piece of research. All significant aspects of analysis and interpretation of results were done by myself. The thesis is presented as a series of papers. The nature of the collaborations indicated by the co-authorship of these papers takes two forms: 1) Authors D.A. Taggart, M.D.B. Eldridge and S.J.B. Cooper were included in recognition of the contribution they have made to my training as my supervisors. 2) Author C.J. Metcalfe was included as co-author in recognition of her providing *Cytb* sequence data. 3) Author J.Z. Paplinska was included as co-author in recognition of her training in genotyping microsatellites from rock-wallaby faecal samples and expert advice. I carried out all further analyses of this material. These contributions in no way diminish the originality or my overall contribution to the thesis.

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