Reintroduction of the Mala to Aboriginal Land in the Tanami Desert, Northern Territory : A case study of the reintroduction process as a research and management tool

by

Geoff Lundie-Jenkins

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Statement of Sources

The studies presented in this thesis were completed by the author while a part-time student in the Department of Ecosystem Management, University of New England, Armidale, N.S.W., Australia. Assistance given by other persons is indicated in the text or in the list of acknowledgments. All references cited are included in the bibliography. The work is otherwise original.

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I declare that the substance of this thesis is, to the best of my knowledge and belief, original and my own work, except as acknowledged in the text, and that the material has not been submitted, either in whole or in part, for a degree at this or any other university.

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Geoff Lundie-Jenkins

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Abstract

Reintroduction of the Mala to Aboriginal Land in the Tanami Desert, Northern Territory: A case study of the reintroduction process as a research and management tool

The Rufous Hare-wallaby or mala *Lagorchestes hirsutus* is one of a suite of Australia's arid zone species which have suffered badly in the 200 years since European settlement. Within the Northern Territory alone at least 15 species of arid zone vascular plants and vertebrate animals have become extinct since settlement, and a further 75 species are classified as either endangered or vulnerable. From being one of the most abundant and widespread macropods of central Australia, the mala has declined to the point where it is now one of the rarest and most limited in its distribution. Wild populations of mala are currently known only from Bernier and Dorre Islands off the Western Australian coast. Reintroduction is therefore seen as one of the key elements of the recovery plan which has been prepared for the species.

Reintroduction has become an area of keen interest in conservation. It is seen by many as a means of restoring ecosystems or communities to near natural states. The history of attempts to reintroduce mammals in Australia is short and in general attempts have been poorly researched and documented. The reported failures of many such reintroductions have been apportioned to single factors, and little attention has been paid to ecology or population dynamics. As a means of addressing this lack of rigour a conceptual model of the reintroduction process is introduced. The model illustrates the processes involved in a reintroduction, the benchmarks against which the success of such a program can be assessed, and the biological and management information that can potentially be generated by it. The applicability of this model is evaluated using a reintroduction project initiated for the mala as a case study.

As the mala is already extinct in the wild, a program of captive rearing and release is the only option for their re-establishment. A prerequisite for the success of such a program is the establishment of a viable, self-sustaining captive population that is able to endure the loss of many animals over a long period, while reintroduction

techniques are developed and perfected. An examination of demographic and genetic characteristics for the existing captive population of mala was undertaken to evaluate the suitability of this population as a source population for reintroductions. The population was found to be self-sustaining, and there was no evidence of detrimental effects on demographic or genetic characteristics resulting from current management. Aspects of behaviour modification and disease susceptibility for the captive stock may require further examination.

The critically endangered status of the mala provided the impetus for the reintroduction that acts as the case study for this thesis. The planning phase of the reintroduction drew largely on a body of information derived both from previous reintroduction attempts for the mala, and past research on the species. A release site was selected on Aboriginal land in a region of the Tanami Desert. The site was well within the species' former distribution, and mala were known to have existed at the site as recently as 1987. Past ecological research conducted on mala which existed at this site provided important background data for the reintroduction, and guided decisions in relation to management of the site. The initial release of captive-bred mala at this site took place in October 1989 and the subsequent survival, dispersal and acclimatisation of the released animals was rigorously monitored.

Over a period of 48 months a total of 49 captive-bred mala were successfully transferred and released at the site in the Tanami Desert. Whilst there was considerable variation in the survival of individual animals a maximum survival period of 37 months was recorded. Predation was the major cause of known mortalities within the reintroduced population and was particularly episodic in its occurrence, with deaths clumped within relatively short spaces of time. Even under the most favourable conditions experienced during the study, both with respect to rainfall and predators, juvenile survival rates were low and hence natural recruitment to the population was slow. This slow recruitment rate overlain by periodic catastrophic declines associated with predation resulted in an extremely fragile population dynamic with an extremely high risk of extinction.

There were several significant differences in the patterns of dispersal and site fidelity observed for male and female captive-bred mala released during the study. There was no significant difference in three elements of initial post-release movement measured for males and females suggesting that initial post-release behaviour is influenced by habitat and environmental factors that act equally on males and females. Beyond the initial 6 months following release, males occupied larger range areas and showed a significant tendency for greater exploratory movement. The patterns of habitat use recorded for the released population were extremely similar to those recorded from past studies of wild mala conducted at the site. Most activity occurred within the dense *Triodia pungens*-dominated habitat with small concentrations of activity, in the form of feeding areas, occurring in the adjacent open caliche vegetation. Dispersion of individual animals within the release area appeared to be influenced by both interactions with other animals and the location of supplementary feed stations.

Whilst only a small number of dispersal events by *in situ* born animals were monitored during the study, it was apparent that there is a tendency for male offspring to disperse further from the natal home-range than females. This data, collected from two mothers (each of whom reared a young of each sex whose dispersal was monitored by telemetry) found in both cases that male young ranged over a greater area following independence and occupied less of the natal home-range compared with female young. The proximate causes of this dispersal are not known, but observed aggression between mothers and male offspring in captivity suggests that aggression may be involved.

Both captive-bred and *in situ* bred mala showed similar patterns with respect to the types of natural food used and the seasonal patterns of usage over the range of conditions encountered during the study. This suggests that captivity does not appear to impair an animal's ability to select as diverse and seasonally appropriate diet as that used by an *in situ* bred animal. Whilst animals from both cohorts showed an ongoing tendency to utilise food supplements which were provided at the release site, both showed distinct preferences for particular natural food plants during periods when they were available. There were strong similarities between the diet selection recorded for the

reintroduced mala during the present study and past studies of wild mala conducted at the site.

The absolute values for and seasonal trends in water flux and field metabolic rate recorded for reintroduced mala were consistent with values recorded for similar sized macropods. Rates of water flux recorded for released mala were significantly higher than values recorded for captive-maintained animals during a summer (hot & wet) sample period due to the high levels of moisture in natural food plants. Changes in the levels of Total Body Water of released animals between sample periods suggest either changes in the quantity of water in the alimentary canal or in the level of muscle mass. The increased energetic demands for mala of free-release were greatest in winter under the conditions which prevailed during the study. Movements of captive-bred stock to areas with a significantly different climatic regime to the site of their captive holdings could impose significant energetic demands on animals.

Although the present study did not result in the establishment of a new self-sustaining population of mala it has significantly improved our knowledge of the mala and the reintroduction process. Many of the outcomes of the study have direct implications with respect to future reintroduction and recovery of the mala. In particular the study has : confirmed the suitability of captive-bred mala as stock for future reintroductions, developed and tested techniques associated with reintroduction, provided important data on the dynamics of an establishing population and identified the intrinsic and extrinsic factors influencing the establishment, persistence and growth of a population. This information has already had a significant effect on the future direction of the mala recovery program and decisions in relation to future reintroductions.

The structured approach to planning, monitoring and evaluating a reintroduction introduced by this study has had a major influence on the quantity and quality of information derived from this reintroduction. Application of such an approach potentially increases the transference of the results to other programs and species. The high costs of reintroductions and the trend towards the development of so-called "Fauna Reconstruction Sites" favour adoption of this adaptive management approach to reintroductions.

List of Abbreviations and Acronyms

Abbreviation/ Acronym	Definition
A.M.L.	Automated Motor Language
A.N.C.A.	Australian Nature Conservation Agency formerly the A.N.P.W.S. and so referred to in the *Endangered Species Protection Act* 1992.
A.N.P.W.S.	Australian National Parks and Wildlife Service
A.N.Z.E.C.C.	Australian and New Zealand Environment and Conservation Council
C.S.I.R.O.	Commonwealth Scientific and Industrial Research Organisation
C.A.L.M.	Western Australian Department of Conservation and Land Management
C.C.N.T.	Conservation Commission of the Northern Territory
D.L.W.	Double Labelled Water
D.N.A.	Deoxyribonucleic Acid
E.S.A.C.	Endangered Species Advisory Council
E.S.P.	Endangered Species Program of the Australian Nature Conservation Agency
E.P.A.	Environmental Protection Authority
E.S.R.I.	Environmental Systems Research Institute
F.M.R.	Field Metabolic Rate
F.A.A.	Formal-acetic-alcohol
G.I.S.	Geographic Information System
G.P.S.	Global Positioning System
H.M.M.	Harmonic Mean Model
I.A.A.	Incremental Area Analysis
I.S.I.S.	International Species Information Systems
I.U.C.N.	International Union of Conservation Nations
M.C.P.	Minimum Convex Polygon
N.S.W.	New South Wales, Australia
N.T.	Northern Territory, Australia
P.A.W.C.	Parks and Wildlife Commission of the Northern Territory

List of Abbreviations and Acronyms (continued)

Abbreviation/ acronym	Definition
P.V.A.	Population Viability Analysis
S.S.C.	Species Survival Commission of the I.U.C.N.
S.M.R.	Standard Metabolic Rate
S.P.A.R.K.S.	Single Population Analysis and Record Keeping System
T.B.W.	Total Body Water

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