RECONSTRUCTING THE MAMMAL FAUNA OF LORNA GLEN IN THE RANGELANDS OF WESTERN AUSTRALIA.

2006 - 2016

by

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Summary

The former pastoral lease of Lorna Glen was acquired by the Western Australian Government in 2000 for addition to the conservation estate. Based on sub-fossil surveys in the area, and ongoing fauna surveys, it is believed at least 36 species of non-volant native mammals once occurred on Lorna Glen, or in close proximity. Fifteen of these, mainly small dasyurids and rodents, still persist. Lorna Glen has been destocked and a control program is currently underway to reduce other introduced fauna, particularly feral camels and cats. Once this has been successful, there is an opportunity to reconstruct the mammal fauna of this rangeland site, and extend the activities of the Western Shield fauna recovery program in Western Australia. This is consistent with several recommendations of the Western Shield review in 2003. It is proposed that, following the successful control of domestic stock, feral camels, foxes and cats, 12 species of small and medium-sized mammals will be reintroduced to Lorna Glen. This reintroduction program will cost an estimated $2.1 million and is planned to run from July 2006 to June 2016. Details of the species to be translocated and the budget required are provided.

Introduction

Lorna Glen, 244 000 ha, is located 1100 kilometres north east of Perth, in the rangelands of Western Australia. It lies across the boundary of the Gascoyne and Murchison IBRA regions. It was established as a pastoral lease in the 1930s, and stocked at various times with sheep and cattle, until 2000 when it was purchased by the Western Australian Government for addition to the conservation estate. Earaheedy, the pastoral lease to the north east of Lorna Glen was also purchased by the Western Australian Government, in 1999. Both areas are currently Unallocated Crown Land and managed by the Department of Environment and Conservation (DEC) in partnership with the traditional owners.

The area now comprising Lorna Glen once supported a diverse mammal fauna that was representative of the rangelands and deserts to the north and east. These areas have suffered the greatest in terms of mammal declines in Western Australia (Burbidge and McKenzie 1989). The original vision for the *Western Shield* fauna recovery program was to expand introduced predator control and translocations beyond the south-west once an operational feral cat control program had been developed, and this was also recommended by the independent review of Western Shield in 2003 (Possingham *et al.* 2004).

Potentially Lorna Glen could support one of the most diverse mammal assemblages in arid Australia, and contribute significantly to the long-term conservation of several threatened species. Mammal reconstruction in this area will also contribute significantly to the restoration of rangeland ecosystems through activities such as digging the soil and grazing / browsing vegetation, and assist in the return of fire regimes that are more beneficial to the maintenance of biodiversity in the arid zone. Once populations have established, there will also be considerable potential for students and other researchers to study arid zone mammal biology and ecology and related issues.

Mammal fauna

A biological survey targeting small vertebrates has been underway on Lorna Glen since June 2003 (Cowan 2004). The aim of this was to determine the diversity and

relative abundance of small mammals and reptiles on Lorna Glen, and to relate this to the optimum feral cat baiting period. A list of historic mammal records for the area within 200 kilometres of Lorna Glen has also been compiled (Table 1). In August 2006, Dr Alex Baynes undertook a survey of Lorna Glen and parts of Earaheedy for sub-fossil mammal remains to provide an insight into the mammal fauna of the area just prior to European settlement (Baynes 2006).

At least 36 species of non-volant mammal species occur, or once occurred, on Lorna Glen (Table 2). Of these 19 (53%) species are still extant (mainly small dasyurids and rodents), 12 (33%) species are locally extinct, and 5 (14%) species are totally extinct (mainly medium-sized mammals).

Introduced fauna control

Domestic cattle were removed from Lorna Glen soon after it was acquired by the WA Government in 2000. All artificial watering points (bores, dams) were closed off soon after. Cattle from adjacent pastoral leases, particularly Millrose, still wander into Lorna Glen, however the completion of a cattle proof boundary fence around Lorna Glen in 2006 will prevent this in the future. This fence, and a culling program will also reduce the numbers of feral camels on Lorna Glen. Feral goats are occasionally recorded in the north of Lorna Glen. Regular aerial monitoring of camels, cattle and goats will be undertaken to assess the effectiveness of control programs.

Rabbits occur on Lorna Glen at low densities and no control has been undertaken to date. It is likely that prior to releases off boodies at Lorna Glen, release warrens will be fumigated / baited to remove rabbits. Feral cat baiting has been undertaken since July 2003, and this has been successful at significantly reducing fox and feral cat abundance. Between 2003 – 2006 feral cats had been reduced from about 30 cats per 100 km to less than 5-10 cats per 100 km. However in July 2006 baiting was not as successful and this was attributed to heavy rains in January and February 2006 which resulted in an abundance of small vertebrates and earlier breeding of feral cats (Algar *pers comm*.). Feral cat baiting will again be undertaken in 2007 at a time to be determined depending on rainfall over the 2006/07 summer months. Mammal translocations will not proceed unless pre and post baiting monitoring indicates that fox abundance is close to 0 and feral cat abundance has been reduced to 5 – 10 cats per 100 km, or less.

Fire management

A fire management plan has been prepared for Lorna Glen / Earaheedy (Muller 2006). This identifies the need to protect physical and cultural assets, as well as the need to use fire to promote biodiversity. This will be achieved through a series of strategically placed small patch burns aimed at reducing the spread of wildfires and promoting a range of age class vegetation. Sites for mammal reintroductions will take into account the proposed burning regime to ensure that newly translocated animals will not be impacted by a fire, and that a range of age classes of vegetation might be available in the future.

Mammal translocation program

All species listed as locally extinct at Lorna Glen occur elsewhere in WA and could be reintroduced. It is proposed that 12 species listed in Table 2 be reintroduced to Lorna Glen over a seven year period (2007 – 2013), with two species being reintroduced in most years. The source of founders and the timing of reintroductions is shown in Table 3. Eight species (bilby, boodie, mala, western barred bandicoot,

Shark Bay mouse, pale field rat, numbat and chuditch) will need to be bred in captivity, either at DEC facilities (Peron or RTD), or at Perth Zoo. The first translocation (bilby) would occur in August 2007, preceeded by site selection for several species in June 2007. It should be noted that if the black-footed rock-wallaby was to be reintroduced, fox and cat control would have to be extended eastwards from Lorna Glen into the adjacent Wongawol pastoral lease, as the likely release sites would be in breakaways located in the north east corner of Lorna Glen.

A generic set of guidelines would be used where possible for the translocation of each species, however these may be modified depending on the species' ecology, life history and ability of the source population to support removal of animals over two consecutive years. They would include:

- Translocations for each species to occur over two years (assuming translocation in first year is successful) i.e. initial release in year 1 followed by restocking in year 2.
- Translocations to occur in May and August.
- At least 40 founders per year (20 males, 20 females) will be translocated, at the same time.
- At least 20 of these to be intensively monitored via radiotracking.
- Monitoring would include an initial intensive eight week period immediately after release, followed by two week monitoring periods of radio-tagged animals every 6-8 weeks for at least the next 2-3 years after each release.
- Additional monitoring of non-radio-tagged animals through trapping would occur at least every 6 months after this time and be restricted to cooler months between March/April and September/October each year.
- All releases with be "hard" releases. i.e no temporary holding pens.
- Source populations will also be monitored.

More detailed translocation monitoring protocols will be developed and all participants will be required to strictly follow these without variation, unless these variations have been agreed to. A detailed Translocation Proposal (TP) will also be prepared for each species to be reintroduced.

STAFFING

It is envisaged that this project would be undertaken jointly by staff from within the Fauna Conservation Program (Science Division), Species and Communities Branch (Nature Conservation Division) and Regional Services staff from the Goldfields Region. A list of potential participants is shown below. At least three staff will be on site at Lorna Glen continuously for at least 3 months after each release. Staff will be rotated every 12 – 14 days, preferably by fly-in, fly-out sponsorship arrangements with local gold mining companies. Perth Zoo would require an average of 2 FTEs for the period they would be involved in captive breeding (2011 - 2013) and will contribute another 2 FTEs and some existing infrastructure (breeding pens etc) to the captive breeding program.

Potential participants:

Keith Morris	Science Division, Woodvale
Brent Johnson	Science Division, Woodvale
Neil Thomas	Science Division, Woodvale
Neil Burrows	Science Division, Kensington
Graeme Liddelow	Science Division, Manjimup
Bruce Ward	Science Division, Manjimup

Adrian Wayne	Science Division, Manjimup
Colin Ward	Science Division, Manjimup
Marika Maxwell	Science Division, Manjimup
Peter Orell	Nature Conservation Division, Kensington
Christine Freegard	Nature Conservation Division, Kensington
Mark Cowan	Nature Conservation Division, Woodvale
Gina Broun	Regional Services Division, Kalgoorlie
TBA	Regional Services Division, Kalgoorlie

BUDGET

A summary of the budget required for new staff salaries, infrastructure establishment, site selection, equipment, captive breeding, translocation and monitoring, and the monitoring of source populations is shown in Table 4, with more details shown at Appendix 1. Costings are based on 2006 dollars. A total of $2.1 million (2006 dollars) will be required from July 2006 to June 2016 to undertake this program. After the translocations have been completed in 2016, an ongoing budget of approximately $85,000 per year will be required to allow routine, less frequent monitoring of the Lorna Glen reintroduced fauna.

REFERENCES

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McKenzie, N.L., Hall, N. and Muir, W.P. (2000). Non-volant mammals of the southern Carnarvon Basin, Western Australia. *Records of the Western Australian Museum* Supplement No. 61: 479-510.

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Possingham, H., Jarman, P. and Kearns, A (2004). Independent review of *Western Shield* – February 2003. *Conservation Science Western Australia* **5** (2): 2-18.

Species	Date	Location	Latitude / Longitude	Reference
Tachyglossus aculeatus	1975	Carnarvon Range	25° 15' S / 120° 41' E	McKenzie, N.L. and Burbidge, A.A. (1979). The wildlife of some existing and proposed nature reserves in the Gibson, Little Sandy and Great Victoria Deserts. Western Australian Wildlife Research Bulletin No. 8.
Onychogalea lunata	1874	Mount Bates		Forrest, John.(1875). Explorations in Australia.
Bettongia lesueur	1902	Macintosh Hill	24° 40' S / 121° 32' E	Elliot, Mike and Ian (1998). Do not yield to despair. Frank Hanns Exploration Diaries in the arid interior of Australia.
Trichosurus vulpecula	1874	Windich Springs	25° 22' S / 120° 42' E	Forrest, John.(1875). Explorations in Australia
Leporillus apicalis	1975	Carnarvon Range	25° 15' S / 120° 41' E	McKenzie, N.L. and Burbidge, A.A. (1979). The wildlife of some existing and proposed nature reserves in the Gibson, Little Sandy and Great Victoria Deserts. Western Australian Wildlife Research Bulletin No. 8.
Canis lupus dingo	1975	Carnarvon Range	25° 15' S / 120° 41' E	McKenzie, N.L. and Burbidge, A.A. (1979). The wildlife of some existing and proposed nature reserves in the Gibson, Little Sandy and Great Victoria Deserts. Western Australian Wildlife Research Bulletin No. 8.
Canis lupus dingo	1896	Kingston Pass	26° 13' S / 122° 06' E	Wells, L.A. (1993). Journal of te Calvert Scientific Exploring Expedition, 1896-7.
Felis catus	1896	Kingston Pass	26° 13' S / 122° 06' E	Wells, L.A. (1993). Journal of te Calvert Scientific Exploring Expedition, 1896-7.
Felis catus	1894	Lake Darlot	27° 47' S / 121° 34' E	Carnegie, David W (1898). Spinifex and sand.
Camelus dromedarius	1975	Carnarvon Range	25° 15' S / 120° 41' E	McKenzie, N.L. and Burbidge, A.A. (1979). The wildlife of some existing and proposed nature reserves in the Gibson, Little Sandy and Great Victoria Deserts. Western Australian Wildlife Research Bulletin No. 8.

Table 1. Historic records of mammals within 200 kilometres of Lorna Glen.

Species	Current status on Lorna Glen	Comments	Reintroduce?
Echidna *Tachyglossus aculeatus*	Extant	Remains found in breakaways	No
Kultarr *Antechinomys laniger*	Extant	Owl pellet remains	No
Mulgara or Ampurta *Dasycercus sp.*	Extant	Owl pellet remains – *D. cristicauda or D. hillieri?*	No
Chuditch *Dasyurus geoffroii*	**Locally extinct**	**No remains found but likely to have occurred at LG**	**Yes**
Wongai Ningaui *Ningaui ridei*	Extant	Owl pellet remains	No
Red-tailed Phascogale *Phascogale calura*	**Locally extinct**	**Owl pellet remains on Millrose Station**	**Yes**
Woolley's Pseudantechinus *Pseudantechinus woolleyae*	Extant	Owl pellet remains	No
Fat-tailed Dunnart *Sminthopsis crassicaudata*	Extant	Not identified in owl pellets	No
Little Long-tailed Dunnart *Sminthopsis dolichura*	Extant ?	Probable record from Millrose, confused with *S. ooldea?*	No
Hairy-footed Dunnart *Sminthopsis hirtipes*	Extant	Not identified in owl pellets	No
Long-tailed Dunnart *Sminthopsis longicaudata*	Extant	Not identified in owl pellets	No
Stripe-faced Dunnart *Sminthopsis macroura*	Extant	Not identified in owl pellets	No
Ooldea Dunnart *Sminthopsis ooldea*	Extant	Owl pellet remains, confused with *S. dolichura?*	No
Lesser Hairy-footed Dunnart *Sminthopsis youngsoni*	Extant ?	Not identified on owl pellets	No
Numbat *Myrmecobius fasciatus*	**Locally extinct**	**Not identified in owl pellets but unlikely to be – diurnal.**	**Yes**
Pig-footed Bandicoot *Chaeropus ecaudatus*	Totally extinct	Owl pellet remains	No
Golden Bandicoot *Isoodon auratus*	**Locally extinct**	**Owl pellet remains, taxonomic issues with *I. obesulus*.**	**Yes**
Western Barred Bandicoot *Perameles bougainville*	**Locally extinct**	**Not identified in owl pellet remains, but likely sand dune fauna**	**Yes**
Bilby *Macrotis lagotis*	**Locally extinct**	**Not identified in owl pellets but likely to have occurred at LG.**	**Yes**
Boodie *Bettongia lesueur*	**Locally extinct**	**Not identified in owl pellets but many old warrens on LG**	**Yes**

Mala *Lagorchestes hirsutus*	**Locally extinct**	**Not identified in owl pellets but likely sand dune fauna**	**Yes**
Euro *Macropus robustus*	Extant	Many remains in caves, live animals seen around breakaways.	No
Red Kangaroo *Macropus rufus*	Extant	Seen around LG	No
Crescent Nailtail Wallaby *Onychogalea lunata*	Totally extinct	May have been recorded in owl pellets.	No
Black-footed Rock-wallaby *Petrogale lateralis*	**Locally extinct**	**Owl pellet remains and old scats found in caves**	**Yes**
Common Brushtail Possum *Trichosurus vulpecula*	**Locally extinct**	**Owl pellet remains on LG and Millrose, old scats found in caves.**	**Yes**
Lesser Stick-nest Rat *Leporillus apicalis*	Totally extinct	Owl pellet remains and old nests found in breakaways.	No
Spinifex Hopping-mouse *Notomys alexis*	Extant	Owl pellet remains	No
Short-tailed Hopping-mouse *Notomys amplus*	Totally extinct	Owl pellet remains	No
Long-tailed Hopping-mouse *Notomys longicaudatus*	Totally extinct	Owl pellet remains	No
Bolam's Mouse *Pseudomys bolami*	Extant?	Owl pellet remains? Confused with *P. hermannsburgensis* ?	No
Desert Mouse *Pseudomys desertor*	Extant	Owl pellet remains	No
Shark Bay Mouse *Pseudomys fieldi*	**Locally extinct**	**Owl pellet remains from LG and Millrose**	**Yes**
Sandy Inland Mouse *Pseudomys hermannsburgensis*	Extant	Owl pellet remains, mummified body found in cave.	No
Pale Field-rat *Rattus tunneyi*	**Locally extinct**	**Owl pellet remains**	**Yes**
Dingo *Canis lupus dingo*	Extant	Remains found in cave	No

Table 2. Non-volant mammals recorded at Lorna Glen. Those species in bold could be reintroduced.
(based on Cowan (2004) and Baynes (2006))

Species proposed for reintroduction	Potential source(s) for founders	Proposed reintroduction date
Bilby *Macrotis lagotis*	Captive breeding (RTD and PCBC)	Aug 2007
Common Brushtail Possum *Trichosurus vulpecula*	Boyagin animals, wild to wild.	May 2008
Boodie *Bettongia lesueur*	Bernier and Dorre Is stock, Captive breeding (RTD), also Faure Island	Aug 2008
Mala *Lagorchestes hirsutus*	Central Australian stock, captive breeding (PCBC and RTD).	May 2009
Golden Bandicoot *Isoodon auratus*	Wild to wild translocation from Barrow Island.	Aug 2009
Western Barred Bandicoot *Perameles bougainville*	Captive breeding (RTD), disease issues to be resolved.	May 2010
Black-footed Rock-wallaby *Petrogale lateralis*	Wheatbelt animals, wild to wild.	Aug 2010
Shark Bay Mouse *Pseudomys fieldi*	Captive breeding (Perth Zoo)	May 2011
Pale Field Rat *Rattus tunneyi*	Captive breeding (Perth Zoo)	Aug 2011
Red-tailed Phascogale *Phascogale calura*	Wild to wild translocation from south-west sites, some captive breeding may be required (Perth Zoo)	May 2012
Numbat *Myrmecobius fasciatus*	Captive breeding (Perth Zoo)	Aug 2012
Chuditch *Dasyurus geoffroii*	Captive breeding (Perth Zoo)	May 2013

Table 3. Potential sources of founder animals for Lorna Glen and timings of reintroductions.

Activity / Species	Founder source	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Staffing, infrastructure establishment		X	X								
Preparation, release site selections		X	X	X	X						
Bilby	captive	b	T / M b	t / m	m	m	m	m	m	m	m
Common Brushtail Possum	wild	s	T / M	t / m	m / s	m	m	m / s	m	m	m
Boodie	captive	b	b	T / M b	t / m	m	m	m	m	m	m
Mala	captive	b	b	T / M b	t/ m	m	m	m	m	m	m
Golden Bandicoot	wild	s	s	s	T / M s	t / m s	m / s	m / s	m / s	m / s	m
Western Barred Bandicoot	captive		c / b	b	T / M b	t / m	m	m	m	m	m
Black-footed Rock-wallaby	wild	s	s	s	s	T / M s	m / s	m / s	m / s	m / s	s/m
Shark Bay Mouse	captive			c / b	b	T / M b	t / m	m	m	m	m
Pale Field Rat	captive				c / b	b	T / M b	t / m	m	m	m
Red-tailed Phascogale	captive / wild			s	s/c/b	b	T / M b	t / m	m	m	m
Numbat	captive	s	s	s	s	s / b	s / b	T / M b	t / m	m	m
Chuditch	captive / wild	s		s		c / b	b	T / M	t / m	m / s	m

Table 3. Timing of activities for mammal translocations to Lorna Glen.

(X = activity commences / underway, T / M = translocation and intensive monitoring, t / m = restocking and less intensive monitoring, m = ongoing less intensive monitoring, b = captive breeding activities underway, c = capture of new/additional founder stock for captive breeding, s = monitoring of wild source populations)

ACTIVITY	2006/ 07	2007/ 08	2008/ 09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	TOTAL
New salaries and operating		55,000	55,000	57,000	57,000	60,000	60,000	62,000	62,000	65,000	**533,000**
Infrastructure establishment, vehicle and equipment	59,000	40,000	40,000	40,000	40,000	40,000	44,000	40,000	40,000	20,000	**403,000**
Release site selection	7,000										**7,000**
Translocations including capture, captive breeding, release and monitoring.		69,000	138,000	168,000	178,000	177,000	157,000	125,000	89,000	56,000	**1,157,000**
TOTAL	**66,000**	**164,000**	**233,000**	**265,000**	**275,000**	**277,000**	**261,000**	**227,000**	**191,000**	**141,000**	**2,100,000**

Table 4. Summary of budget required for mammal reconstruction at Lorna Glen.
(2006 $$)

(Note: approximately $85,000 p.a. is required after 2016 for ongoing fauna monitoring)