Into the wild: restoring rangelands fauna

by Judy Dunlop and Keith Morris

Biodiversity conservation at a landscape scale, rather than individual species preservation, is becoming a key focus in today's conservation climate.
The Rangelands Restoration Project at Lorna Glen and Earaheedy conservation reserves in Western Australia's north-east Goldfields aims to restore natural ecosystem function and biodiversity to almost 600,000 hectares of rangelands by 2020.

Lorna Glen Conservation Reserve (known to local Aboriginal people as Matuwa) is a former pastoral lease about 160 kilometres north-east of Wiluna. The Western Australian Government acquired the station in 2000, and it is now managed jointly by the Department of Environment and Conservation (DEC) and the Wiluna Aboriginal community for conservation and cultural purposes. This property straddles the Murchison and Gascoyne Interim Biogeographic Regionalisation for Australia (IBRA) regions and contains at least 20 different land systems and broad vegetation types. Consequently, the area supports a high diversity of plants, invertebrates and small vertebrate fauna. Lorna Glen, for example, is known to support 70 species of reptile and 15 small mammals.

The Rangelands Restoration Project has several components which aim to restore the natural ecosystem, including control of introduced herbivores (cattle, camels and rabbits) and predators (feral cats and foxes). The introduction of ecologically appropriate fire regimes to promote vegetation diversity will also reduce the impact of large-scale wildfire events that homogenise habitats. Another important part of the project is the reintroduction of 11 species of mammals which previously occurred in the area. The project is unique in both its large scale and its attempt to control introduced predators without the use of predator-proof fences.

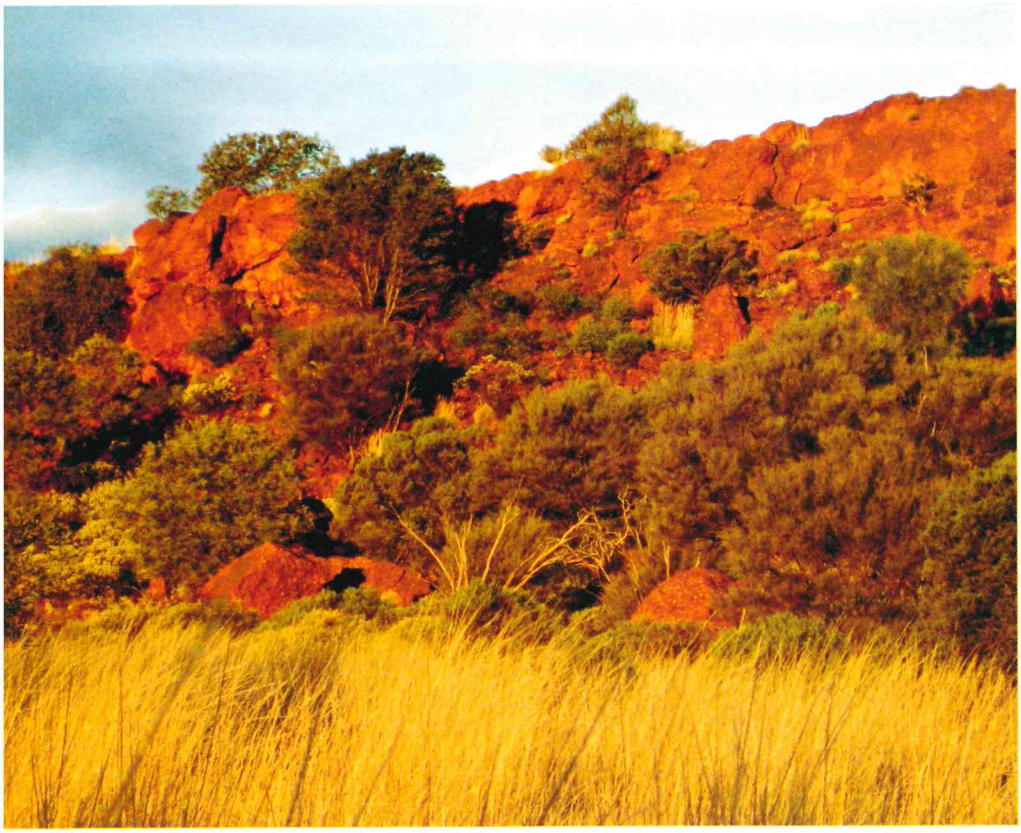
An altered landscape

Unfortunately, in the past 200 years, pressures from pastoralism, introduced predators, altered fire regimes and disease have combined to reduce or eliminate populations of many of Australia's unique medium-sized marsupials. Early Australian explorers commented on the visibility, abundance and even the annoying traits of Australia's medium-sized mammal fauna. However, most people today have never seen or even heard of many of these endearing creatures.

The semi arid and arid zones have suffered greater mammal declines than most other regions of Western Australia due largely to the impacts of introduced predators and herbivores, and altered fire regimes. Of the 85 mammals (excluding bats) previously occupying the arid zone, 11 are now extinct, six are extinct on the mainland and now only occur on off-shore islands and 16 are severely restricted in their range. Mammals in the so-called critical weight range (35 grams to 5.5 kilograms) have largely disappeared from the arid zone and these are the focus of the reintroductions to Lorna Glen. Successful establishment at Lorna Glen will not only improve the conservation status of many of these mammal species, but also return many important ecological functions that burrowing animals provide to the environment, such as soil cultivation through digging and burrowing, nutrient and water cycling, and seed dispersal. The return of these animals is also important for the Wiluna traditional owners and other western desert groups, most of whom may have heard about these animals, but never seen them. Many of the mammals that once occurred in the arid zone were an integral part of their culture and an important food source.

Controlling cats and foxes

This project has built on the findings of the Desert Dreaming Project carried out in the 1990s, under which reintroductions of boodies (*Bettongia lesueur*) and golden bandicoots (*Isoodon auratus*) were attempted after effective fox control over large areas of the Gibson Desert. Unfortunately the



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Main Aerial view of the Lindsay Gordon Lagoon system at Lorna Glen.
Photo – Ninon Meyer
Inset Bilbies have been successfully reintroduced at Lorna Glen.
Photo – Jiri Lochman

Left Breakaway country at Lorna Glen.
Photo – Judy Dunlop/DEC

Above Brushtail possums were among the first native animals reintroduced to Lorna Glen.
Photo – Judy Dunlop/DEC

Right Lorna Glen Conservation Reserve is a former pastoral station.
Photo – Keith Morris/DEC

Far right A feral cat killed by the aerial baiting program.
Photo – Judy Dunlop/DEC

reintroductions were not successful due to an increase in feral cat abundance after fox numbers had been reduced—a phenomenon referred to as mesopredator release. This highlighted the need for effective feral cat control in the arid zone and strategies for this have since been developed by DEC scientists.

At Lorna Glen, cat abundance has been reduced through an annual aerial baiting and targeted trapping program to less than 20 per cent of what it was before cat control started in 2004. Foxes are almost non-existent at Lorna Glen. One of the aims of the project is to determine how much feral cat populations need to be reduced to enable the successful reintroduction of various mammal species.

Historical fauna record

Historical records and extrapolation from distribution maps indicate that the pre-European settlement mammal fauna of Lorna Glen could have comprised up to 37 terrestrial mammal species. Recent fauna surveys have confirmed that only 15 of these, mainly small rodents and small carnivorous (dasyurid) marsupials, presently occur at Lorna Glen.

In 2006, a sub-fossil survey was undertaken to improve knowledge of what mammal fauna previously existed at Lorna Glen. Skeletal remains found on the floors of caves and breakaways and in regurgitated pellets from owls provide the best available means of reconstructing the original mammal fauna of areas where some fauna has become locally extinct. The surveys uncovered remains of nine species of native rodents, six dasyurid species, several species of wallaby, and the pelvis and scats of brushtail possums. Non-skeletal evidence of other animals was also present, such as the many large, mounded warrens created by boodies on calcrete ridges throughout the area and remains of stick-nest rat nests in breakaways.

The historical fauna records and the results of the sub-fossil surveys were used to select a fauna community for

These species are earmarked for reintroduction to their former range at Lorna Glen ex-pastoral lease.

- Bilby (*Macrotis lagotis*) – Vulnerable; locally extinct.
- Brushtail possum (*Trichosurus vulpecula*) – Not threatened, but locally extinct.
- Mala (*Lagorchestes hirstus*) – Vulnerable; extinct on the mainland, three island populations.
- Boodie (*Bettongia lesueur*) – Vulnerable; healthy island populations but extinct on the mainland (except for fenced populations on Heirisson Prong and Dryandra Woodland).
- Golden bandicoot (*Isoodon auratus*) – Vulnerable; extinct in the arid zone, healthy island populations, mainland populations persist in the Kimberley.
- Western barred bandicoot (*Perameles bougainville*) – Endangered; extinct on the mainland (except for fenced population on Heirisson Prong), occurs on three islands.
- Numbat (*Myrmecobius fasciatus*) – Vulnerable; extinct in the arid zone, but persisting in the south-west of WA.
- Red-tailed phascogale (*Phascogale calura*) – Endangered; extinct in the arid zone, but persisting in the south-west of WA.
- Chuditch (*Dasyurus geoffroii*) – Vulnerable; extinct in the arid zone, but persisting in the south-west of WA.
- Shark Bay mouse (*Pseudomys fieldi*) – Vulnerable; extinct in the arid zone, restricted to three islands.
- Pale field-rat (*Rattus tunneyi*) – Not listed as threatened but has suffered a large range contraction and is locally extinct.

Top Bilbies have returned to their former habitat at Lorna Glen.
Photo – Dave Watts/Lochman Transparencies

Centre Reintroduced brushtail possums have established well at Lorna Glen.

Above Boodies released in the Gibson Desert succumbed to cat predation.
Photos – Jiri Lochman

reintroduction at Lorna Glen. Releases have been staged in order of perceived vulnerability to predation by feral cats, with the most resilient established first. Brushtail possums (*Trichosurus vulpecula*) and bilbies (*Macrotis lagotis*), which are respectively known as wayurta and ninu by the local Aboriginal people, were introduced first. The two species are both known to persist in the presence of cats and have been successful in previous translocations. They are also important ecosystem engineers—by digging and burrowing they disturb the soil which helps recycle water and nutrients through the earth. (See the box above for the full list of species intended for release).

Some of the species to be reintroduced, such as the bilby, numbat (*Myrmecobius fasciatus*) and mala (*Lagorchestes hirstus*), are so reduced in the wild that they can only be sourced from captive breeding colonies, while others that still persist in adequate numbers, such as brushtail possums and Shark Bay mice (*Pseudomys fieldi*), will be translocated directly from the wild.

Return of the mammals

Having virtually eliminated foxes and reduced cat density by more than 80 per cent, initial releases of brushtail possums and bilbies occurred in spring and autumn of 2007. These species were chosen because they once occurred in the area and because they are known to be less vulnerable to predation by foxes and feral cats than some other species. Mala, a species that is extinct in the wild on the mainland and is known to be more susceptible to predation, were released in 2008.

Approximately half the animals released were fitted with mortality-sensing radio-transmitters and were intensively monitored for up to five months following release. Following the animals to their daytime refuges provided data on movements and microhabitat selection by free-ranging animals in an arid environment. It also enabled scientists to target mortality events as soon as possible after they occurred to best determine cause of death.

The brushtail possums were either wild-caught animals from Wheatbelt reserves or from the Australian Wildlife Conservancy's Karakamia Wildlife Sanctuary, near Perth. Despite having come from moister climates, the possums have established well and are living in the large river red gum (*Eucalyptus camaldulensis*) hollows which

Above The radio-tracking tower used for locating radio-collared animals.

Above right Mala reintroductions were unsuccessful.

Right Preparing artificial burrows for bilbies to be released into.
Photos – Judy Dunlop/DEC

line the creeks and extend across the floodplains at Lorna Glen. Recent trapping surveys recorded new adults which probably arrived as small pouch young, as well as females with new pouch young conceived on site.

Sourcing animals for reintroductions

The bilbies originated from two of DEC's captive breeding programs—Peron Captive Breeding Centre in Shark Bay, and the Return to Dryandra (Barna Mia) facility in the Dryandra Woodland reserve near Narrogin. Both of these are fenced enclosures where animals are protected from foxes and feral cats and supplementary fed. Bilbies were also taken from a large wild population which was introduced to Thistle Island, off Port Lincoln, South Australia in the 1990s. Of the three source sites, the Peron Captive Breeding Centre is the closest in habitat and climate to Lorna Glen and Thistle Island differs the most. The Thistle Island animals, however, were from a wild, free-ranging population, rather than a captive colony, which was thought to be an advantage for survivorship.

The survival rate and reasons for mortality for these three groups differed substantially. Fewer bilbies from the wild Thistle Island population were predated by feral cats or native predators, which is not surprising given that they were probably more predator-aware than captive-bred animals. However, the captive-bred animals were more successful at finding adequate food and adapting to the arid environment. This was partly due to the very good condition of the animals when they were translocated from the captive breeding facilities, having sufficient body reserves to cope with the stress of translocation and establishing new refuges. The Thistle Island animals had difficulty in finding food in a foreign environment. These findings reinforce the belief that translocations have a greater chance of success if founder animals are taken from the wild and taken to similar environments. Unfortunately, this is not always possible for threatened species.

Reintroduction results

Recent trapping surveys have identified a number of new sub-adult bilbies and brushtail possums with no identifying tags (so called 'cleanskins'). These animals were either pouch young when the mothers were translocated, or were conceived and born at Lorna Glen. All of the adult female bilbies recaptured had new pouch young. They are a species which can continually

Left A brushtail possum in a rivergum tree hollow.
Photo – Judy Dunlop/DEC

Below left A bilby from the Barna Mia facility before its release.
Photo – Keith Morris/DEC

reproduce and can produce up to six young a year in good seasons. The brushtail possums, which breed seasonally, have successfully raised a generation of young which are now independent and will be producing their own young in 2009.

A proportion of the animals were screened for general health and parasites by doctors Andrew Thompson and Andrew Smith from Murdoch University as part of an Australian Research Council linkage project on wildlife disease and health (see 'Meet the parasites' on page 24). This involved collection of ectoparasites, scats and small amounts of blood for health screening. These checks are ongoing and animals are re-sampled whenever they are captured. Preliminary results have shown that the animals reintroduced to Lorna Glen are generally in good health and a new species of *Trypanosoma* (blood parasite) has been found in a brushtail possum. Work is ongoing into the strains of *Giardia* associated with possums and bilbies and the team will soon begin looking for other intestinal parasites including *Cryptosporidium* and *Blastocystis*.

Unfortunately, the mala translocations in 2008 have not been as successful as the bilbies and brushtail possums. Despite cat activity being reduced considerably due to extensive cat control measures, nearly half of the radio-collared mala succumbed to predation by the few remaining cats. When this was combined with deaths from other causes such as native predators (wedge-tailed eagles and large goannas) and inability to find sufficient food, the mala were not able to establish. Mala are a small hare-wallaby, similar in size to a quokka but with a long coat, giving them a somewhat 'shaggy' appearance. They shelter in squats under spinifex which do not offer as much protection from predators as tree hollows or burrows. These captive-bred animals also did not exhibit strong 'fight or flight' behaviours, making them quite vulnerable to predation by cats. As few as one or two cats were most likely responsible for predation, returning each night to the area where the animals were living. These mortalities provide an example of the destruction that feral cats are capable of, and lend insights into the fauna declines that occurred as cats spread throughout the mainland.

Learning for the future

It is important that we learn from experiences gained through the translocations of bilbies, brushtail possums and mala to Lorna Glen. A strategy to improve survivorship of predator-vulnerable species such as mala has been prepared and will be implemented in 2009. This requires some changes to what has been done in the past, including ensuring that founder stock come from the best available site, that releases are undertaken when food resources are high (for example, after prolonged rainfall events), that released animals are protected from predators temporarily in a large fenced enclosure while they acclimatise to the Lorna Glen environment, and improving feral cat control and monitoring techniques so that predation pressure is reduced even further. When these changes are implemented it is expected that the end result will be the release of more 'street wise' animals that will contribute to the vision of once again having some of our unique fauna roaming free in the rangelands, rather than being confined behind fences, or restricted to islands.

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The Rangelands Restoration Project is being jointly run by DEC's Goldfields Region and Science Division with collaborative input from Murdoch University and The University of Western Australia. It is supported by a Commonwealth Caring for Our Country grant. A special thank you to the many staff and volunteers whose time and dedication has made this project possible, particularly Kalgoorlie DEC staff and Bruce and Kay Withnell, the resident caretakers at Lorna Glen.

2009271-09-2000

Department of Environment and Conservation
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