

EARTHWATCH INSTITUTE FIELD REPORT

Project Title: Bringing Back the Bilbies

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Research Site: The Arid Recovery Reserve is an 86km² rabbit, cat and fox proof fence protected area of land. It is located 20km north of Roxby Downs in central South Australia.

Local Management Status of the Research Site:

The reserve contains land from the BHPBilliton special mine lease and four pastoral leases. The reserve is protected by a memorandum of understanding, between the four managing partners, BHPBilliton, Department of Environment and Heritage SA, the University of Adelaide and the Friends of Arid Recovery. It is locally managed by Arid Recovery project staff and directed by a steering committee with representation from all of the partner organisations.

Scientific names of primary species being studied:

Macrotis lagotis, *Bettongia leuseur*, *Leporillus conditor*, *Perameles bougainville*, *Tiliqua rugosa*, *Oryctolagus cuniculus*, *Felis catus*, *Vulpes vulpes*

Key Research Objectives:

The main objective of Arid Recovery, an ongoing programme, is to research the restoration of ecological processes on a landscape scale in the arid zone after the removal of rabbits, cats and foxes and reintroduction of locally extinct species. Specific research objectives of the Earthwatch component in 2004 were to:

- Determine the most effective methods for population monitoring of reintroduced species.
- Determine if the distribution and abundance of soil invertebrates and seeds is influenced by the presence of feral or re-introduced species
- Determine the home range of sleepy lizards inside and outside the Reserve and relate patterns to vegetation, habitat use and presence of feral species
- Determine the nest fidelity and social structure of stick-nest rats at 20 nest sites

Date this report was completed: 30 October 2005

Data Collection and Results

a) Give a concise account of the data you have collected during the past field season.

Monitoring of reintroduced species

During September 2004, cage traps were set for one night at 84 trap sites within the main enclosure and 29 trap sites in the first expansion. Captures were weighed, sexed, marked and checked for reproductive condition before being released at point of capture. The number of captures of each species was compared with previous years to determine population trends.

Soil invertebrates and seed bank

A survey of the soil seed bank within in the reserve, outside the reserve and in a control area, in order to determine whether the reintroductions have had an affect on the soil seed bank was completed. Ten soil samples were analysed at 45 sites.

A survey of ruby saltbush (*Enchylaena tomentosa*) density and berry numbers within in the reserve, outside the reserve and in a control area, in order to determine whether predation by the reintroduced bilbies and bettongs has had an affect on the berry numbers was completed. Fifty bushes at were measured at 15 sites.

Sleepy lizards

Ten lizards were radio-tracked during each Earthwatch expedition, 5 inside and 5 outside the Reserve. Lizards were captured by hand during opportunistic searching. Radio transmitters were attached to the base of the tail and measurements and weights recorded. Daily fixes were obtained on each lizard and information recorded on movement, habitat, activity and feeding. The position of the lizards was recorded at least once per day during the Earthwatch trip and a minimum of three times per week for up to three months after each Earthwatch trip. In addition to marking the position of the lizard with a GPS the behaviour and habitat (nearest plant and landform) was recorded. Several methods were used to determine the diet of sleepy lizards. In April a number of volunteers spent time following lizards are drawing tracking maps to show the food plants visited. Faecal samples were also collected to look at the role of sleepy lizards as seed dispersers.

Stick-nest rats

Twenty stick-nest rat nests were trapped in April and September 2003 using Elliott and Cage traps set for 3 nights. Each nest was measured and tagged and given an activity score. Captured rats were ear tagged, sexed, weighed and released.

b) What progress have you made towards achieving your original objectives?

A considerable volume of data has been collected for all of the projects. Soil seedbank and ruby saltbush surveys are completed. Whilst some preliminary investigations of analysis have revealed patterns (as presented below), thorough analysis of data is yet to be undertaken.

c) Please provide a summary of your results.

Monitoring of reintroduced species

Bettongs were the most common species captured during annual cage trap monitoring. The low captures of bilbies and rats is unlikely to be indicative of low population size as bettongs are extremely trap happy and enter traps before other species. Bettong numbers have increased inside the reserve since their release in 2000.

Table 1.

Trapping Session	Bettong	Bilby	Stick-nest Rat	Bandicoot
Annual monitoring 2001	23	0	0	0
Annual monitoring 2002	21	2	2	1
Annual monitoring 2003	37	0	4	0
Annual monitoring 2004	45	1	0	0

Effect of reintroduced species on ecosystem processes

The survey of the soil seed bank found little difference between inside the reserve and outside, except that the seed abundance and diversity in the top 2cm of the dunes was slightly lower inside compared to outside the reserve.

The survey of the Ruby saltbush found that the plants were larger (though not taller), and had more ripe berries inside the reserve than in the control and outside areas. This suggests that the predation of the berries by bilbies, bettongs and stick-nest rats does not have an impact on berry numbers, and on the contrary, suggests that the presence of these reintroduced animals may enhance the productivity of the *Enchylaena* plants in Arid Recovery.

Sleepy lizards

The extremely dry summer preceding the April trip allowed us to determine response of the sleepy lizards to high environmental stress and whether these differed inside compared to and outside the reserve. Lizards in April appeared in poor condition with very little fat stored in their tails both inside and outside the reserve. Weight relative to length showed lizards to weigh less in April 2004 compared to September. However, they were not considerably lower than lizards caught in April or September in 2003 figure (1a and 1b). Good rain throughout winter in 2004 increased food availability for sleepy lizards; in September all lizards caught were in good condition and had higher weight per unit length than in April, both inside and outside the reserve.

Sleepy lizard home ranges in April were smaller than in September (table 2), except for outside females. In April many lizards were relatively inactive, often remaining in a single burrow for long periods of time, to conserve energy whilst conditions were dry and food availability was low. Differences between home range sizes inside and outside the were not recorded, data will be further investigated for potential differences in range area use after the final field season. Track measuring in September showed native stock, poached egg daisy and parakeelya to be favoured food plants both inside and outside the reserve.

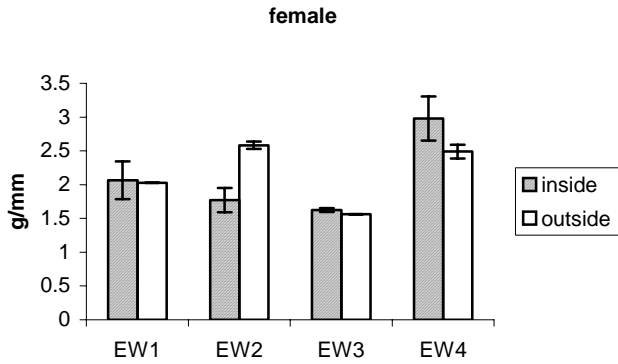


Figure 1a. Mean weights of female sleepy lizards

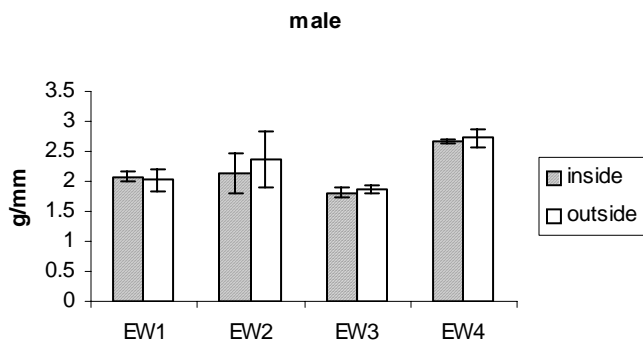


Figure 1b. Mean weights of male sleepy lizards

Table 2. Mean home range sizes of sleepy lizards inside and outside the Arid Recovery Reserve in April and September 2004 (standard error figure in brackets data from one lizard only where no standard error present)

		inside	outside
Male	April 2004	0.89 (± 0.35) ha	1.01 (± 0.17) ha
	Sept 2004	5.03 (± 2.17) ha	3.24 ha
Female	April 2004	0.38 (± 0.29) ha	0.53 (± 0.8) ha
	Sept 2004	1.81ha	0.34 (± 0.02) ha

Mean home range sizes of sleepy lizards inside and outside the Arid Recovery Reserve (standard error figure in brackets)

	inside	outside
Male	1.6 ± 0.27 ha	2.5 ± 0.65 ha
Female	0.9 ± 0.29 ha	1.4 ± 0.8 ha

Stick-nest rats

Twelve individual stick-nest rats were captured during trapping at 20 permanent nest trapping sites in the main enclosure of the Reserve during 2004. This number is much lower than that of previous years, and is not believed to be a true indication of the number of stick-nest rats within the main enclosure due to trap interference by bettongs. During the April session there was extensive interference with traps by bettongs and only one stick-nest rat was trapped, despite evidence (both vocal and faecal) to support stick-nest rat activity in 95% of the nests monitored (see graph). The dry summer preceding the April trapping meant there was little food available for bettongs resulting in their attempts to remove bait from traps set for stick-nest rats. The September trapping session incorporated a number of devices to exclude bettongs and resulted in a slightly better trap success rate. However, the number of stick-nest rats trapped was again not consistent with the number of active nest and is likely to be an under-representation of population size

One hundred and thirty-eight stick-nest rats have been captured at the 20 nest sites since March 2000. More stick-nest rats were captured during the September trapping than the April trapping which is consistent with an annual trend of more rats captured in Spring than Autumn (in spite of bettong interference). This is likely to be due to breeding over the mid-year winter period as well as an annual summer die-off due to high temperatures. The seven adult female rats trapped in September all showed signs of breeding activity. Retraps were most common within 12 months of capture and there were very few recaptures at a nest after 1 year.

Table 3. The number of individual rats captured at the 20 nest sites

Date	No.individual rats captured at 20 nests
Mar 2000	10
Nov 2000	23
Mar 2001	11
Oct 2001	33
Sept 2002	18
Apr 2003	14
Sept 2003	32
Apr 2004	1
Sept 2004	11

The number of recaptured rats caught at nest sites and the time since first capture.

6 months	12 months	18 months	2 years
8	7	4	1

Only 9% of captured rats have been retrapped at the same nest site suggesting a high annual mortality rate or low nest fidelity. An average of 0.85 rats are captured at each nest per trapping session. The maximum number of rats captured at a single nest was 14 over nine trapping sessions. Only 5 rats have been captured at more than one nest, 3 females and 2 males. Four of these five rats were captured in nests less than 500m apart but one male was captured at 2 nests more than 2 km apart.

Significance/Benefits of Research

a) What is/are the significance/benefits of your research at the following levels?

- local (in the area of the research site)
- national
- international

Locally the research conducted by this programme can provide information about how ecosystem recovery can improve land condition. Results of the research are provided to the regional strategy for integrated natural resource management and the soil conservation board.

At a national level the research conducted at arid recovery provides highly significant information about the impact of national pest species (rabbits, cats and foxes) on ecological processes and in addition to actively establishing locally extinct populations of nationally threatened species, research conducted on these populations provides information to assist the national recovery of these species.

On an international level research conducted is significant for both providing information on arid zone ecosystems and ecological restoration techniques. Some technologies developed by arid recovery have already been used in restoration programs in other countries.

b) How do your findings contribute to issues of sustainability?

Our findings provide transferable knowledge, information and technology for broadscale environmental management of Australia's arid lands. The results also demonstrate how mining, pastoralism and conservation organisations can work together to achieve tangible benefits from sustainable conservation.

Dissemination of Results

a) Have you provided details of results from your research to or within:

- Scientific papers (indicate status; e.g., peer reviewed or in progress/press)
- Management plans and reports (in progress or completed)
- Presentations (given or planned)
- Popular articles or films (in progress or completed)
- Books, chapters, illustrations

Posters were presented at two conferences in 2004:

Newell, J. 2004, 'Investigating the effects of ecosystem engineering by reintroduced Greater Bilbies (*Macrotis lagotis*) and Burrowing Bettongs (*Bettongia lesueur*)', Australasian Wildlife Management Society conference, Kangaroo Island.

Newell, J. 2004, 'Are soil seed banks affected by the reintroductions of Bilbies and Bettongs', Ecological Society of Australia conference, Adelaide.

A comprehensive annual report is produced by the project and disseminated to programme stakeholders. Earthwatch should have already received a copy of this report.