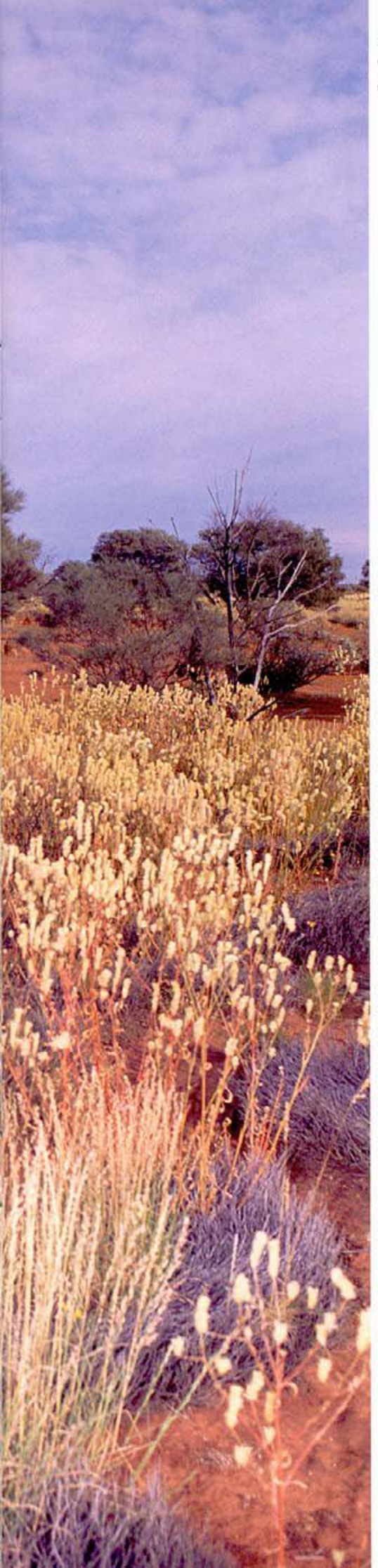
BETTONGS

burrowing on the mainland

Wayne Deeker



Ray Smith

Scientists, land managers, private companies and a local community are helping to build a brighter future for one of Australia's endangered species.

A small colony of burrowing bettongs, taken in 1992 from Western Australian islands to re-establish a mainland population (see *Ecos* 65), are in good condition and are breeding, providing hope that this and other endangered island species can be returned from near-extinction.

The burrowing bettong, *Bettongia lesueur*, is a rabbit-sized rat-kangaroo, and the only macropod to live in communal underground warrens. Before European settlement, it was common over most of arid and semi-arid Australia, but fox and cat predation (and probably competition from rabbits) caused its range to contract rapidly. Its decline had been noted as early as 1863; by 1942, the species was extinct on the mainland. It would have become extinct altogether had not remnant populations been stranded on Western Australian islands that exotic predators and competitors were unable to colonise.

Now one of Australia's rarest animals, the burrowing bettong has a total population of about 5000 individuals on just three islands: Bernier and Dorre islands in Shark Bay and Barrow Island off the north-west coast of Western Australia. Despite the apparent safety of their island homes, the animals do not have a secure future because the islands are vulnerable to human influence. Bettongs have already disappeared from two of the five islands they inhabited early this century; feral cats, and grazing by sheep and goats, might have wiped out the Dirk Hartog Island population around 1910, and in 1985 the bettongs on Boodie Island were accidental casualties of a rat-poisoning program. The release of unwanted pets or a severe accidental fire could result in the animal's extinction.

Aim
Establish a colony of burrowing bettongs on a mainland conservation reserve.

Progress
Bettong population in reserve doubled 10 months after release.

Future
Possible reintroduction of more rare species to the mainland of Western Australia.

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In May 1989, the people of Useless Loop, a small Western Australian mining town, established the Useless Loop Community Biosphere Project Group (ULCBPG), to convert a peninsula — Heirisson Prong (donated by Clough Engineering Group) — from unused pastoral land into a conservation reserve. Soon after, the Endangered Species Program of the Australian National Parks and Wildlife Service funded Mr Jeff Short and Mr

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Inspecting old bettong burrows in the Gibson Desert. Bettongs have been extinct on the Australian mainland for at least 50 years.

Bruce Turner, of the CSIRO Division of Wildlife and Ecology in Perth, to determine the potential for reintroducing bettongs to the peninsula.

The reintroduction of native species into areas from which they have disappeared — as a result of habitat loss or predation, especially by cats and foxes — is fearfully difficult and has generally been unsuccessful. However, Mr Short and Mr Turner considered it feasible in this case. Bettongs are hardy, have a high reproductive potential, and are not fussy eaters. Heirisson Prong is a suitable site because its climate, geology and soil conditions resemble those of the islands; consequently, it shares with them the coastal dune vegetation the bettongs prefer, with 50-70% of plant species in common. Its long, narrow shape also made predator control cost-effective.

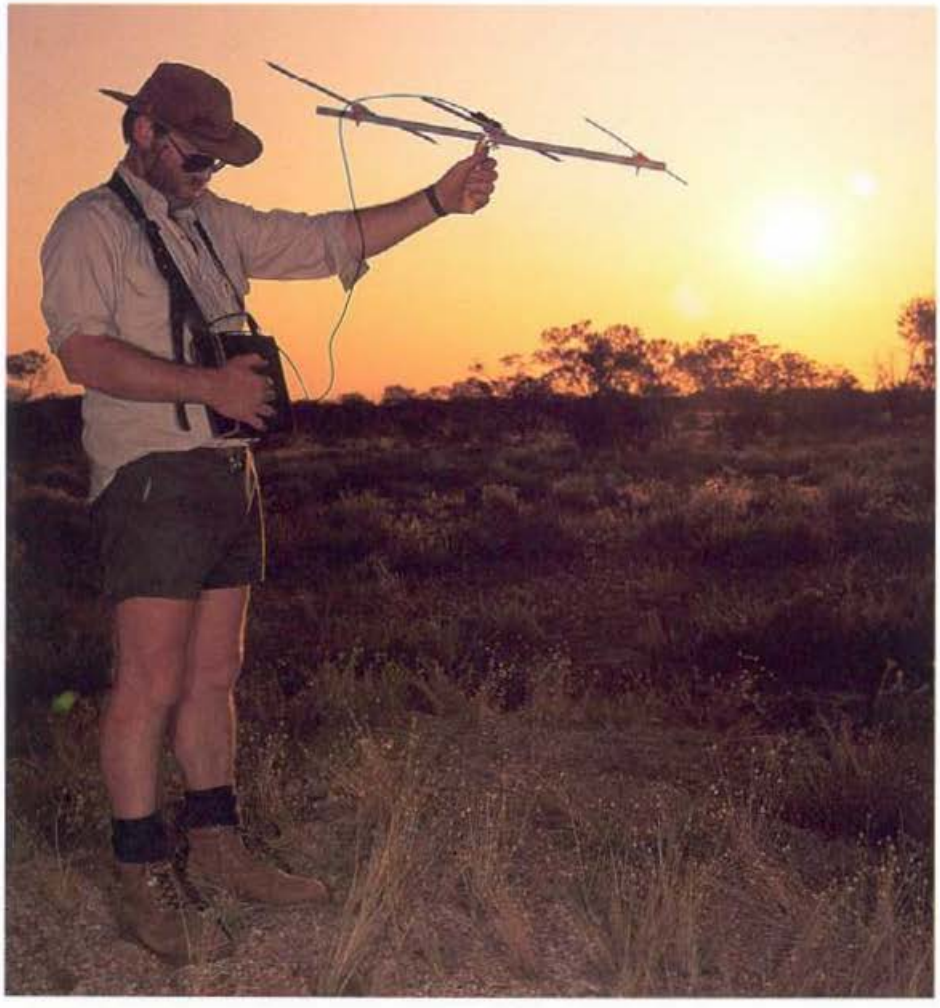
The bettongs were reintroduced to the Prong in three stages (see *Ecos* 65). Stage One began in 1989 with the construction of a 2.7 km vermin-proof fence across the peninsula's narrow neck, cheaply and effectively excluding predators from 1200 ha. The people of Useless Loop built the fence, and Shark Bay Salt Joint Venture Pty Ltd met the $35 000 cost.

An intensive baiting, trapping and shooting campaign followed to eliminate exotic predators from the fenced region and to suppress their numbers in a large buffer zone south of the fence. The baits contained '1080' (sodium monofluroacetate) — a tasteless, colourless and odourless rat-poison that occurs naturally in many Western Australian food plants. Bettongs and other native animals are highly tolerant of 1080; some species can withstand doses hundreds of times stronger than those sufficient to kill introduced species such as rabbits, foxes or cats.

Baiting eliminated foxes from the Prong in 1991. However, cats persisted, and their numbers increased steadily in the absence of foxes until they reached double the population prior to baiting. An intensive campaign of trapping, shooting and poisoning is now reducing the numbers of feral cats. Mr Short believes the combination of fence, buffer zone and the Prong's shape means limited numbers of predators will be able to 're-invade' the conservation area, not only increasing the bettongs' chances of re-establishing themselves but also providing an ideal site for studying the species' ability to cope with low levels of predation.

If control of feral cats proves possible on the Prong, bettongs could possibly be reintroduced to about 2500 km^2 of land around Shark Bay (on the Peron Peninsula, Edel Land and Dirk Hartog Island). This would be a major breakthrough, since to date our efforts to reconstruct Australia's pre-European mammal fauna have been on a very small scale, with little more than moral victories.

Stage Two began in May 1992, when 12 bettongs (the first seen on the mainland for 50 years) were taken by a Channel Ten helicopter from Dorre Island to a maximum-security 8 ha breeding enclosure surrounded by a solar-powered, electrified fox- and cat-proof fence on Heirisson Prong. The helicopter avoided the animals suffering the stress of an eight-hour boat and road journey. All the bettongs survived the trip and settled immediately into



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Radio tracking bettongs.

the artificial burrows provided for them. Three days later, they moved of their own accord into nearby empty rabbit warrens.

After three weeks the bettongs were doing well, with a weight increase of 10-15%. Two individuals had given birth, and the remaining six of the eight females had young in the pouch. All of the young survived to reach independence by December 1992 (indeed, several of these had young of their own by February 1993). The colony was off to an encouraging start with a doubling of the original population within 10 months of the initial release.

In mid 1993, 30 more bettongs are due to be brought in from Dorre Island, bringing the number in the breeding enclosures to 36, with 30 more roaming free on the Prong.

Stage Three of the project, an ecological experiment, will determine whether bettongs can sustain low-level predation, and how they interact with rabbits. Some evidence suggests that rabbits and bettongs can co-exist to a certain extent, so one portion of the peninsula will have rabbits present in unregulated numbers as an experimental control. This will yield information important to future management decisions.

Pending the outcome of the bettong project, the Western Australian Department of Conservation and Land Management (CALM) may attempt to reintroduce the Shark Bay mouse (*Pseudomys praeconis*) to the Prong late in 1993. Four other species — the western barred bandicoot (*Perameles bougainville*), the greater stick nest rat (*Leporillus conditor*), the banded hare wallaby (*Lagostrophus fasciatus*) and the rufous hare wallaby (*Lagorchestes hirsutus*) — are also being considered for reintroduction in the near future. If these projects are successful, Heirisson Prong will have one of the largest concentrations of endangered species in mainland Australia.

There is even talk of more ambitious reintroduction projects. Shark Bay Salt Joint Venture and Clough Engineering have suggested constructing a fence across the 6 km land boundary of their Carrarang Station to create an 800 km^2 wildlife sanctuary for the establishment of other rare species.

This early apparent success sets a precedent for similar, perhaps more adventurous, projects in future. Heirisson Prong has already demonstrated what can be achieved when the private sector, scientists, land management agencies and the public work together. The bettong's future is already brighter, as may be the future of other endangered species at Shark Bay.

More about the topic

Beckmann R (1990). Demise of the desert mammals. *Ecos* **63**: 32.

Beckmann R (1990). Bringing back the bettongs. *Ecos* **65**: 32.

Catling PC (1991). Ecological effects of prescribed burning practices on the mammals of southeastern Australia. *Conservation of Australia's Forest Fauna* (ed D Lunney). Royal Zoological Society of NSW, Sydney.

Gill AM (1981). Adaptive responses of Australian vascular plants to fires. *Fire and the Australian Biota* (eds AM Gill RH Groves & IR Noble). Australian Academy of Science, Canberra.

King DR Oliver AJ & Mead RJ (1981). *Bettongia* and fluoroacetate: a role for 1080 in fauna management. *Australian Wildlife Research* **8**: 529-536.

Pech RP Sinclair AR Newsome AE & Catling PC (1992). Limits to predator regulation of rabbits in Australia: evidence from predator-removal experiments. *Oecologia* **89**: 102-112.

Short J Bradshaw SD Giles J Prince RI & Wilson G (1992). Reintroduction of macropods (Marsupialia: Macropoidea) in Australia: a review. *Biological Conservation* **62**: 189-204.

Soul ME & Simberloff D (1986). What do genetics and ecology tell us about the design of nature reserves? *Biological Conservation* **35**: 19-40.

A rocky road to reintroduction

The history of small macropod reintroductions should remind us of the risky nature of the bettong project: all but a few previous attempts have failed. Bettongs were not the only small mammal species whose numbers declined as a result of Europeans' changes to the Australian environment. Eighteen Australian mammal species have become extinct since 1788, half of all mammal extinctions worldwide in recent time. In 1991 a further 113 Australian animal species were classified by the IUCN (International Union for the Conservation of Nature and Natural Resources) as being endangered or threatened. These species survive only in small numbers, in a few highly vulnerable locations.

Endangered macropods have been reintroduced to parts of their former ranges at least 25 times in the past few decades. Most attempts failed within two years, but a few of the populations introduced to islands have survived. Overall, 11% of reintroductions to mainland sites have succeeded, and 60% of reintroductions to islands.

The reason for the difference becomes clear when sites are compared in terms of the presence of predators. Only 8% of reintroductions to mainland and island sites with predators succeeded, compared with an 80% success rate for islands without predators.

The effects of predators on their prey change depending on the prey species' density. Dr Roger Pech and colleagues in the CSIRO Division of Wildlife and Ecology recently demonstrated that the predator-prey relationship can fall into two possible steady states: predators may have no regulatory effect on a prey population, killing animals that might have died anyway; or they can have a profound effect, maintaining prey abundance at low levels, at times causing the populations of prey species to 'crash'.

Each state is fairly stable, but dramatic natural or human-induced changes to environmental conditions may cause prey species to switch from one to the other. The birth rate of a predator-regulated population might increase drastically following a year of particularly good rainfalls and food abundance, or if predator numbers fall suddenly. This may lead to what Dr Pech calls an outbreak: a change to the unregulated state, where prey species escape the control of predators. In an outbreak, predators do not limit the prey population size in that state. Rather, the abundance of prey rises and falls according to the carrying capacity of the ecosystem. In contrast, when an unregulated population is exposed to a drought or disease (for example, myxomatosis among rabbits) the birth rate can decline, leading to a change to a predator-regulated state.

Food availability

The populations of unregulated prey species oscillate depending on climatic factors, with predator numbers following changes in prey numbers after a slight lag. Predators in these systems do not exert a controlling effect on prey; the usual reason for a decline in prey abundance is food availability.

This up-down pattern can continue for centuries, but if any extreme environmental changes occur that allow prey numbers to fall below the threshold where they can be regulated by predators, prey numbers can then be maintained at low levels, with a risk of falling to zero.

Bettongs, like most of Australia's small endangered mammals, are always vulnerable to predators because of their small populations. It's hard for us to influence the predator-prey relationship to change to an unregulated state, because foxes and cats are so difficult to control in large areas for any length of time.

Despite Heirisson Prong's geography, which helps exclude predators, and the extensive baiting and other precautions that have been taken there, we can't assume the bettongs are safe. A break in the fence, combined with a decline in the baiting program's effectiveness, could see predators infiltrate the Prong once more. We will never really be able to label the bettong project a 'success' while the peril of predators continues.