

Rescuing Gilbert's potoroo, the world's most endangered marsupial, with community help.

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ABSTRACT:

Few species have survived a decline in numbers to less than 50 individuals. As far as we know, Gilbert's potoroo has existed in such low numbers for many years. The greatest threat to its continued existence is wildfire in its last stronghold at Two Peoples Bay. A captive colony was established soon after the rediscovery of the species in 1994, but although several offspring resulted, breeding ceased after seven years. The challenge of bringing this species back from the brink of extinction involves research into the ecology and biology in the wild, captive and assisted breeding methods and reintroduction.


In the wild, however, most females have pouch young throughout the year and most young are born while the preceding sibling is still suckling. Hand-rearing of large pouch young has been tried and while this method works, it is very labour-intensive. Cross-fostering has the potential to increase greatly the reproductive output of the wild population. A captive colony of long-nosed potoroos was recently established near Albany and one wild young has been successfully cross-fostered. A 14-hectare fenced enclosure has been established on private property in order to be used as a half-way house for captive animals. One of these techniques or a combination of several may provide the means to pull this species back from the brink of extinction.

Introduction

In late November 1994, a zoology Ph.D. student, Liz Sinclair, and one of her volunteer assistants, Adrian Wayne, a second year zoology student, were checking traps in dense heathland on the slopes of Mount Gardner at Two Peoples Bay Nature Reserve. They hoped to catch quokkas, as Liz needed blood and tissue samples to carry out her investigation into the genetics of the quokka. On two consecutive mornings, they found strange medium-sized mammals in the cage traps. They took these animals back to their base, where they were soon identified as Gilbert's potoroos, a type of rat-kangaroo thought to be extinct, by a group of experts who hurried to the scene.

The first specimens of Gilbert's potoroo known to science were obtained by John Gilbert near Albany in 1840. Gilbert was employed to make collections of Australian mammals and birds by taxonomist and natural history writer John Gould. Gilbert was first to recognise that this potoroo was different from other similar rat-kangaroos, and Gould concurred, describing it as a new species in 1841. The only other live specimens were collected by George Masters in 1869 for the Australian Museum, and William Webb, between 1875 and 1879. All of these specimens apparently came from the Albany area (King Georges Sound). A skull was found on the ground by zoologist Guy Shortridge near Margaret River in 1906, indicating that the species had been present in the area less than 100 years previously.

In the first two months after the rediscovery, five potoroos were taken into captivity to establish a captive colony. The two primary reasons behind this were to insure against the loss of the species through a large wildfire at Two Peoples Bay Nature Reserve, and to start breeding animals for a future translocation to another site. At that stage Gilbert's potoroo was regarded by the scientific community as a western form of the long-nosed potoroo (*Potorous tridactylus*), found widely in south-eastern Australia. Long-nosed potoroos breed readily in captivity and perhaps it was assumed that, all things being equal, this breeding colony would grow and prosper.



While Liz Sinclair continued her Ph.D. work on quokkas, she included a study of the genetics of Gilbert's potoroo, focussing particularly on its relationships with long-nosed potoroos and long-footed potoroos (*P. longipes*). She found that Gilbert's potoroos were as different from long-nosed potoroos as were long-footed potoroos, and so deserved to be recognised as a species in their own right, restoring the western population to full species status, *P. gilbertii* (Sinclair & Westerman 1996).

Recovery Plans

Given that Two Peoples Bay was the only place known to support a population of Gilbert's potoroos, it was clear that the newly-discovered species was in extreme danger of extinction. Within two months, funding had been raised from State and Commonwealth sources to begin the recovery process. The first interim recovery plan, written within three months, laid out the immediate actions needed to pave the way for the major recovery work (Start & Burbidge 1995).

The extremely small population size of Gilbert's potoroo alone qualifies it for the category Critically Endangered (less than 50 mature individuals), according to the IUCN Red Book criteria (IUCN 2001). The recovery of Gilbert's potoroo is led by the Department of Environment and Conservation (DEC) and overseen by a Recovery Team, first established soon after the rediscovery. The Recovery Team, which includes members from DEC, the WWF Threatened Species Network, Perth Zoo and Zoos South Australia, universities, the Gilbert's Potoroo Action Group (GPAG) and other South Coast community members, is responsible for the preparation of a recovery plan. As recovery plans need to be up-to-date, revisions have been carried out every few years. The current recovery plan is the *Gilbert's Potoroo Recovery Plan 2003-2008* (Courtenay and Friend 2004). It lays out a series of actions (and costs) necessary for recovery of the species over the time period specified.

Gilbert's Potoroo Action Group (GPAG)

In November 2001, a public meeting was held in Albany to see if there was support for the idea of a community group dedicated to the recovery of Gilbert's potoroo. The meeting was organised by Peter and Ruth Speldewinde, with assistance and advice from Susanne Dennings, who had extensive experience in organising the Malleefowl Preservation Group, based in Ongerup, southern WA. A group was formed and within five months it was incorporated and well on the way to becoming a force in the recovery effort. Since then GPAG has been extremely active in promoting public awareness and education about the potoroo, in fundraising to support the recovery effort and in hands-on assistance with many aspects of recovery work in the field and with the captive facilities. Amongst the many achievements of the group are the production and distribution of a colour brochure, designed by students at an Albany high school, the construction of a very informative website www.potoroo.org and running of a successful annual fundraising scheme with a local winery. The support of this community group has been extremely important in the continued support that the recovery program has received.

Population studies

One of the most important pieces of information needed for good recovery planning is an estimate of population size, and information about the growth or decline of the population. An understanding of the population dynamics of the species, in particular the rates of reproduction and mortality, as well as longevity, is an important basis on which to plan recovery actions. Regular monitoring of the population by trapping was put in place in 2000. The monitoring program involves trapping over about 75% of the Mount Gardner area three times each year. Each session takes three weeks and is carried out by DEC staff and community members. This involves trapping for four nights at each of nine trapping areas. Between 13 and 24 potoroos

(not counting pouch young) are handled at each trapping session. Based on this data, an estimate of the maximum population size at Two Peoples Bay is approximately 35 animals.

Despite fluctuations in numbers captured, the population is apparently quite stable and most of the habitat on the Mount Gardner headland is occupied. Other important findings were that female potoroos could be found with pouch young in all months of the year, and that more than half of the of the pouch young recorded did not survive to maturity. This means that the population should be able to withstand the removal of some of the young animals, given that many would not survive anyway.

Surveys for other populations

When Gilbert's potoroo was rediscovered the immediate question was, had any other populations that had survived? If so, the status of the species would be much better. Searches have been carried out every year since 1994, mainly in sites close to the coast, between Bremer Bay and Margaret River. Rather than using labour-intensive trapping methods, hair-traps were used. The design used in this survey is the hair-arch, a flat piece of plastic bent into an arch and held in that shape by a bent piece of fencing wire. Double-sided adhesive tape under the arch picks up hairs of mammals brushing up against the underside. Microscopic examination can reveal the identity of the mammal that left the hair. Bait can be placed under the arch, or it may simply be placed in an obvious animal runway. This survey method avoids the need to check traps early every day and the arches can be carried in easily to remote sites.

The surveys have involved many people and thousands of traps have been deployed. A large survey to the west of Albany was funded by the WWF Threatened Species Network and carried out by the Denmark Environment Centre, assisted by many local community members. Despite all this work, no other populations of Gilbert's potoroos have been discovered. Recovery work is entirely dependent on the survival of the Two Peoples Bay population.


Contributions by university students

A number of student projects that investigate specific aspects of potoroo biology have been extremely valuable in understanding the functioning of the population. These studies have included potoroo diet in the wild, identified feeding sites and use of other habitat, prevalence of pathogens in the wild population and behaviour in captivity. In addition, students have provided much of the voluntary workforce that has enabled studies into the spatial organisation of potoroos through continuous radio-tracking for two-week periods to be carried out.

Dietary studies have shown us that Gilbert's potoroos are extremely dependent on fungi, mostly underground-fruiting or "truffle-like" fungi. Amongst the mammals of the world, only the long-footed potoroo is as highly fungivorous, as the diets of both species consists of over 90% fungi (Nguyen *et al.* 2005). Gilbert's potoroos also eat some fleshy fruits that occur in their habitat and by passing fungal spores and seeds in their faeces, act as important dispersal agents for fungi and plants (Cochrane *et al.* 2006).

Captive breeding

The captive colony was founded in 1994-1996 with the capture of six adults including females with a total of three pouch young. Although the animals were originally held in aviaries constructed for noisy scrub birds, a purpose-built facility was completed in July 1995 and the animals were moved into it. Breeding occurred quite frequently in the first two years, but after 1997, only two more potoroos were born. Investigations of nutrients in fungi eaten by Gilbert's potoroos in the wild were used to revise the diet, different housing arrangements and other husbandry changes were tried, but all to no avail. The breeding colony has declined and



although males and females are regularly paired up, the facility now has another function, providing housing for animals being moved under the translocation program. Other means to increase the numbers of Gilbert's potoroos are clearly needed. A 14-hectare area of remnant bush on private land near Two Peoples Bay has been fenced to exclude cats and foxes and a pair of captive Gilbert's potoroos will be released into this area in August 2007. We hope that the provision of natural foods and more space will stimulate breeding.

Cross-fostering

The idea of cross-fostering Gilbert's potoroo was first suggested to the Gilbert's potoroo recovery team in the late 1990s by Dr David Taggart, a marsupial reproductive biologist now working with Zoos South Australia who has been using this technique to increase numbers of the very rare Victorian brush-tailed rock-wallaby and other species. Although it had been known since the 1960s that early stage macropod pouch young could be fostered by another female under the right conditions (Merchant & Sharman 1966), the technique had not been used to increase the numbers of a threatened species for another 20 years. Smith (1990) successfully fostered rare northern bettong *Bettongia tropica* pouch young to female woylies *Bettongia penicillata*. David Taggart has successfully continued the use of this technique in a number of species (Taggart 2002).

Cross-fostering can increase the rate of production of young by a female of a threatened species, if once her pouch young has been removed, she produces another pouch young quickly. The first pouch young is substituted for the young of the surrogate mother, belonging to a common species that breeds easily in captivity. The surrogate mother takes over the suckling of the threatened species joey until weaning, when it is moved into the company of its own species. If the pouch-pouch transfer occurs at an early stage, the rate of production of young by a female of the threatened species can be increased 4 to 8-fold, depending on the duration of gestation and lactation.

A captive colony of long-nosed potoroos was established in a purpose-built facility at a site between Albany and Two Peoples Bay in mid-2006. We are working closely with Dr Taggart to investigate the usefulness of cross-fostering in the overall recovery of Gilbert's potoroo.

Cross-fostering is seen as a means by which to remove Gilbert's potoroos from the wild for eventual translocation with very little impact on the wild population. Compared with removing an established adult, or even an independent subadult, the removal of a two-week-old joey has a very small effect on population numbers.

Hand-rearing

Another way to remove Gilbert's potoroos from the wild with little impact on the population (although more than cross-fostering) is to take large furred joeys for hand-rearing. As this is close to the time at which the subsequent joey is born, there is little increase in the rate of production of pouch young, but the hand-reared joey is protected during the very vulnerable young-at-heel and early independence periods.

During the captive breeding program, it had been found that the Gilbert's potoroos were easily upset by disturbance and went off their food, often losing weight after handling or other disturbance. Our hope was that hand-reared animals might be less easily upset and able to be handled without such consequences.

Over a period of two years, two large pouch young approximately 100 days old and due to emerge from the pouch within 1-2 weeks were taken from wild females and transferred to the

care of Eunice Daubert, a very competent wildlife carer in Albany. Eunice had already cared for a captive-born Gilbert's potoroo that was orphaned soon afterpouch exit. The first of these, a female, gave us some concern in the early stages as she hardly put on any weight for the first two weeks, although, she took the milk formulawell. After that period, however, her growth curve caught up with those of captive-bred Gilbert's potoroos reared by their mothers. Eunice had her eating a range of foods including a few truffles when they were available. She was transferred to the captive colony after two months, at which stage she was eating well, although still given milk formula in a bowl twice a day. This potoroo adapted well to the captive breeding facility, but has not bred although she has been paired with available males regularly over the past three years.

The second hand-reared potoroo, a male, gave us much more trouble. Like the female, he put on very little weight in the first two weeks, but had a continually loose bowel. It was a constant balancing act for Eunice to get enough milk into him without his diarrhoea getting worse. His growth curve was way below the average and his food intake and weight gain continues to fluctuate although he is now two years. He spent five months with Eunice, before his weight and food intake had settled enough that we could be confident that he could be left in the pen alone. This was a very fraught time for Eunice and all the potoroo team and it made us question the practicality of hand-rearing as a method to bring potoroos into captivity. This is a very labour intensive process and although there are many people who would quite willingly go through it, less demanding alternative methods need to be examined first.

Translocation

One of the major actions proposed in all the recovery plans for Gilbert's potoroo is the establishment of additional populations, in order to reduce the dependence of the species on the survival of the Two Peoples Bay population. Selection of a site for a translocation of Gilbert's potoroo was difficult as it could not be assumed that the Mount Gardner headland is the best habitat for the species just because it provides the last refuge. Given there are so few animals, the loss of high numbers would not be acceptable, so it was thought that the animals would need to be confined to the site, as well as protected from foxes and cats. The first translocation site would need to be an island or a fenced area on the mainland. Bald Island, 25 kilometres east of Two Peoples Bay, was chosen for a trial in early 2005. Two animals were placed on the island, monitored by trapping and radio-tracking and then taken off after five weeks. During this time, the animals found food and nest sites and maintained their weight. Based on the success of this trial, a translocation proposal was approved and in August 2005, three potoroos were released on the island. Nearly two years later, seven potoroos have been released and this project has proven a success, with no deaths and females producing pouch young regularly. Two new animals have been captured on the island. Regular monitoring trips are carried out, often with volunteers to assist in the work.

Funding

The continuation of the Gilbert's potoroo recovery program relies on funding from several sources, notably the Western Australian and Federal governments. Natural Heritage Trust funding to support threatened species recovery on WA's South Coast Region is provided through South Coast NRM, while the Department of Environment and Conservation provides funding through salaries and through the two-year \$15 million *Saving our Species* program. The Foundation for Australia's Most Endangered Species (Inc.) has provided funds for materials used in the construction of the 14-hectare fenced area into which captive potoroos will be released. The generosity of the two landowners who allowed the construction of the cross-fostering facility and the fenced area on their properties must beacknowledged, although neither has asked for any recognition. Of course, the donation of hundreds of days and

thousands of hours by many volunteers cannot be valued in dollar terms. Their physical and moral support sustains the project.

Conclusion

We have the means to save Gilbert's potoroo, the world's rarest marsupial, from extinction. The relative importance of cross-fostering, wild-wild translocation and captive breeding in small or large enclosures, cannot yet be predicted, but the results of trials so far indicate that a combination of these methods can produce increases in numbers of animals and populations. The funding vital to achieve this goal relies on continued support of the local and wider community, and very little can be achieved without this support.

BIOGRAPHY: Tony Friend has been involved in research on threatened marsupials in Western Australia since 1980, when he joined the Department of Fisheries and Wildlife to carry out research on the numbat and find a way to reverse its rapid decline. This work, with other studies, led on to the Department of Environment and Conservation's *Western Shield* program of fox control and reintroduction of threatened mammals. He has worked on a number of other species, including the red-tailed phascogale, western barred bandicoot, quenda, and bilby. Most recently his focus has been on the recovery of Gilbert's potoroo.

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