it's back...

THE RETURN OF

the woylie

Sitting around the barbecue at Dryandra, feeding salad snippets to wild woylies, it is hard to believe just twenty years ago these enchanting little animals teetered on the edge of extinction. Their recovery has been so swift that they have now been taken off the list of threatened fauna. What happened?

by
Tony Start,
Jackie Courtenay
and Keith Morris

The famous South Australian mammalogist, Wood Jones, wrote that early this century woylies were sold in Adelaide 'by the dozen at about ninepence a head for coursing on Sunday afternoons'. These days, thankfully, mechanical 'hares' lead greyhounds around the track. But if the punters still relied on live lures, they would have had to find an alternative, because woylies disappeared from South Australia soon afterwards.

In 1958, mammalogist H. H. Finlayson, famous for his work on central Australian mammals, plotted on a map of Australia all the locations where he could find reliable evidence that woylies had lived. He depended heavily on museum records, for it was no longer possible to check doubtful reports; woylies had already vanished from most places. His map revealed they had once occupied south-eastern Queensland, eastern and southern New South Wales, western Victoria, most of South Australia, much of the Northern Territory outside the wet-dry tropics, and the south-west of Western Australia. But there were huge voids on the map. Had woylies lived there, too?

During the 1980s, Andrew Burbidge and Phil Fuller from CALM, in collaboration with colleagues in the Northern Territory Parks and Wildlife Commission, visited people in Aboriginal communities across the western deserts. Their mission was to gather the knowledge these desert dwellers had of the mammals that once abounded in their lands (see 'The Disappearing Mammals', *LANDSCOPE*, Spring 1990). Many older people talked nostalgically about woylies and three important facts emerged: woylies had still been present until a few decades ago; they had now gone—disappeared completely—from the deserts; and their knowledge corroborated Finlayson's information for parts of South Australia and the Northern Territory. But it also showed that woylies had been common over many thousands of square kilometres of Western Australia that were blank on his map. Which other blank spaces actually had woylies? Perhaps we will never know.

However, we do know that by about 1980 only three tiny populations of woylies survived in their natural habitat. They were spots in the forests and adjacent woodlands of southern Western Australia. Those too were declining. There had been hopeful reports from Fitzgerald River National Park in WA and the Eyre Peninsula in South Australia, but they were never confirmed. Islands have often been the saving grace for Australia's vanishing mammals and Wood Jones wrote that woylies once swarmed on St. Francis Island off South Australia, but even there they have vanished. Four other small, South Australian islands had introduced populations, but their founders were captive-bred, Western Australian stock. The prognosis seemed grim.

WHY DID WOYLIES VANISH?

There are several hypotheses to explain why Australian mammals have declined so devastatingly. The decline has been more severe in the arid zone than in better watered areas, and most species that have fared badly weigh between about 35 grams and 5.5 kilograms, although some weigh as much as 8 kg. Woylies, at 1 to 1.5 kg, are typical examples of mammals in this 'Critical Weight Range'.

During the 1970s, CALM scientist Per Christensen studied woylies in jarrah forest at Perup, one of the three spots where they had managed to hang on. He

Previous page
Photo – Jiri Lochman

Above left: Poison bushes contain a poisonous compound, which is deadly to introduced animals.
Photo – Marie Lochman

Left: Woylies usually live alone, but this youngster still finds security from its mother.
Photo – Babs & Bert Wells/CALM

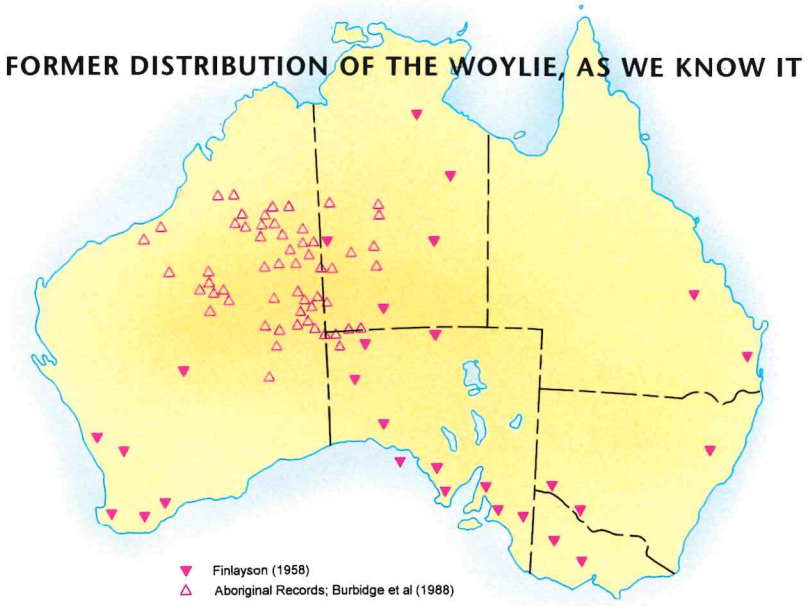
found that the presence of poison bush thickets was one key factor. The fox was the other. Another scientist, John Calaby, had also suggested that woylies survived only where their habitat contained extensive thickets of poison bush—a particular feature at Dryandra Woodland and Tutanning Nature Reserve, the other two sites where woylies had survived in the wild. It is probably no coincidence that other vanishing mammals, like numbats and tammar wallabies, have fared better in these three locations than elsewhere on the mainland.

Poison bush (one of several species in the genus *Gastrolobium*, a member of the pea family) contains sodium monofluoroacetate, better known as the poison '1080' (pronounced *ten-eighty*). This substance is very toxic to non-indigenous mammals including domestic stock and, particularly, to feral predators such as foxes (see '1080: The Toxic Paradox', *LANDSCOPE*, Winter 1991). It is so toxic that foxes eating rabbits that have been poisoned with 1080 have died. But indigenous mammals (and other animals) of the south-west have evolved a high level of tolerance. It is conjectural whether it was the thickets that aided escape, or the death of foxes which ate animals that fed on poison bush, but the end result is the same–woylie survival!

IN THE NICK OF TIME

While Per was studying woylies at Perup, other CALM scientists tried to trap them at Dryandra and Tutanning. In some parts of these reserves they could not catch any. In others, one or two, seldom more, were the rewards of extensive trapping surveys. Numbats and other species had parallel trends. This was alarming, because even in the 1960s they had been more abundant there, and the decline was still progressing even where there was poison bush.

One of the scientists, Jack Kinnear, had been using 1080 baits—similar to those deployed to control dingoes in pastoral areas—to protect dwindling populations of rock-wallabies from marauding foxes. And so it was that the first fox baits were trialed in the woylie refuges to see if they offered a solution. The result was dramatic. Within a few years, many woylies were being trapped easily at Dryandra and Tutanning, and for the first time in ages, they were commonly seen in the headlights when drivers were on the road at night. Dedicated scientists and operations staff had beaten the fox in the nick of time.



Right: Woylies used to live across the arid centre of Australia, but their last refuges were in the woodlands and forests of the south-west, like this one at Dryandra.
Photo – Jiri Lochman

RECOVERY PLANS

In 1990, the Australian Nature Conservation Agency (ANCA) invited CALM (and other State agencies) to write Recovery Plans for threatened species and submit them for funding consideration under the Commonwealth Endangered Species Program. The recovery plans would have action programs to be implemented over a period of up to ten years and, where a species occurred in more than one State, would require cooperation between them. By 1991, a recovery plan for woylies had been prepared jointly by CALM and its South Australian counterpart, and was up and running.

Implementation was supervised by a recovery team, which met twice a year. Members included CALM scientists and operational staff from CALM Regions, as well as an ANCA staff member and a scientist from South Australia. The ultimate measure of success would have to be that woylies no longer fell within the definitions of 'endangered' or 'vulnerable' used by the World Conservation Union or the relevant Australian Commonwealth and State Acts that protect our threatened fauna. However, the recovery plan defined specific criteria as targets for the actions it prescribed. Meeting those criteria would ensure success when the woylie's status was measured against the formal requirements of legislation and international standards.

Among other things, the specific criteria stipulated that there be six or more wild populations in substantial areas of suitable habitat in Western Australia and a wild population on the mainland of South Australia, in addition to the continued well-being of woylies on the two larger South Australian islands. The other two islands were so small that there was room for no more than 30 or 40 animals—too small for maintaining genetic viability indefinitely.

RECOVERY

From the very beginning, things went well! Woylies breed fast; although only one baby is produced at a time, mothers can produce two or more joeys per year

and offspring can breed when less than one year old. Under the protection of fox control they demonstrated the benefit of high fecundity. Boyagin Nature Reserve had been regularly baited with 1080 since 1989 to reduce the number of foxes and then prevent them building up again as fox cubs dispersed from dens on neighbouring farm land. Woylies, six males and 14 females, were introduced for another research program in 1992. By mid-1995, almost every second trap would catch a woylie.

Per Christensen introduced woylies to Batalling Forest (where he had noted a lot of heart-leaf poison-bush) in 1983 and monitored their ability to fend for themselves for some years. CALM scientist Keith Morris, researching the safety of using 1080 where there were populations of threatened chuditch, discovered that there were still a few woylies at Batalling, but he was catching less than one per night for every hundred traps. CALM began fox baiting at Batalling in February 1991. By November that year the trap rate for woylies was about two animals per night per hundred traps (two per cent). Thereafter, it kept on rising: nine per cent in October 1992; 14 per cent in October 1993; and 24 per cent in July 1995. As numbers grew, the animals started to move into adjacent areas where there had been none. As the woylies spread out, so did the fox-baited area. It has increased from about 3 600 hectares in 1991 to more than 33 000 hectares now. The numbers of chuditch increased substantially too.

Although the woylie's powerful claws are adapted to digging for food, this one is using them to hold a beetle it is eating.
Photo – Jiri Lochman

Our biggest surprises came from the southern forests, where a woylie was found dead on a road near Lake Muir, some 15 km south east of Perup, and shortly afterwards, a substantial population was discovered at Kingston, 25 km west of Perup. They were found during a routine fauna survey in an area of State Forest that was programmed to be logged.

This woylie has gathered nesting material, which it will carry home wrapped in its tail.
Photo – Jiri Lochman

Furthermore they were common in an adjacent forest that been logged six years previously. Logging was immediately postponed to allow a research program to be set up, and fox-baiting began. CALM also surveyed the forests between Kingston and Lake Muir and found that woylies were present over most of the country, albeit in varying numbers.

In view of these developments, the recovery team revised the recovery plan after only three years. Progress had been so remarkable and the prognosis was so good that the action program was cut from ten to five years, the status of woylies to be reviewed at the end of 1995. Other changes provided for experiments at Kingston to find out whether logging affected woylies and, if necessary, devise prescriptions that would minimise any problems. Experiments would also be set up in a part of Batalling Forest to study how woylies coped with fire, which is an integral part of their environment. Again, the objective was to find out if it would be necessary to modify fire control practices. (So far, both experiments suggest that woylies cope well with these operations, but more data are still being gathered.)

Meanwhile in South Australia, David Armstrong prepared Venus Bay Conservation Park for woylies. His biggest tasks were controlling foxes, rabbits and feral cats. (For some reason cats are more of a problem for new populations of mammals in arid areas.) He succeeded, and a new colony of woylies is thriving,

WHAT IS A WOYLIE?

The pictures give a better impression of a woylie's looks than any words could, but they can't convey the heart-stopping shock of a long-tailed, rabbit-sized fur-ball exploding from a small bush right under your feet, shattering the tranquillity of your walk in the bush. With long bounds, it will zigzag out of sight before you get a good look. When you recover and examine the bush, you will, without doubt, find beneath it a domed nest of grass tucked into a scrape in the soil. The woylie would have harvested the grass nearby, gathered it into a sheaf and carried it home in its curled-up tail tip.

Woylies usually sleep in their nests all day. At dusk, they set off to find food. Their staple diet is 'truffles', the underground fruiting bodies of mycorrhizal fungi. These fungi live in a symbiotic association with trees and shrubs, helping transfer nutrients from the soil to the host plant's roots and tapping the carbohydrates the plant synthesised in its leaves. The truffles have a characteristic odour that percolates through the soil, guiding the woylies to the right spot. With powerful claws on their forepaws, they quickly excavate a conical hole and devour the reward, spores and all. In the fullness of time, the spores pass out in a new spot and so it is that woylies help to maintain the health of their own habitat.

Boodies (burrowing bettongs) look very like woylies, but have a very different lifestyle. They live a communal life in large warrens.
Photo – Jiri Lochman

despite the long journey from Dryandra for their founders. Jackie Courtenay, a Research Fellow at Edith Cowan University, established another population at Julimar Conservation Park, north of Perth. Blood samples have been collected from each of the 40 founders, and by determining the genetic 'finger-print' of each woylie and its genetic contribution to successive generations, we will have a much better understanding of the genetic consequences of starting new populations from small founder numbers.

CALM scientist Paul de Tores is measuring the effectiveness of Operation Foxglove, a program to control foxes on about 550 000 hectares of the northern jarrah forest, partly funded by Alcoa of Australia. As woylies translocate so easily and reproduce so rapidly, he has introduced them to nineteen sites in that area. They too have settled in well, and Paul has recently reported the first second-generation woylie born into one of his new colonies. These are above and beyond the six key Western Australian populations required by the recovery plan. But they demonstrate the leaps and bounds by which we can now return woylies to many parts of their range.

In November 1995, the recovery team duly reviewed the status of woylies against the various sets of criteria with which it had to contend. The conclusion was clear. Woylies are increasing rapidly in numbers and areas they occupy. The IUCN classification has a category 'Conservation Dependent', which is one of a group of categories for species at lower risk than any of those that are threatened. So long as fox baiting is maintained, woylies will thrive. This then is an ideal classification for them.

The recovery team recommended to the various agencies that woylies be deleted from the lists of endangered or vulnerable fauna, with the proviso that they will need careful monitoring and on-going protection from foxes, and in Western Australia the recommendation has now received ministerial approval. As far as we know, this is the first time an Australian mammal has been deleted from lists of threatened species as a result of recovery through management actions. It is a historic moment and another indication that the tragic decline of Australian fauna is being reversed.

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Jackie Courtenay is a post-doctoral fellow at Edith Cowan University researching woylie genetics.

Keith Morris is a principal research scientists and Manager of the Species Conservation Section of CALM's Science and Information Division (Woodvale).

THE WOYLIE'S RELATIVES

Relationships
'Macropod' (large foot) is a colloquial term often used to cover all those marsupials in the Superfamily to which kangaroos and wallabies belong. It embraces two distinct Families. The kangaroos and wallabies, together with tree-kangaroos, hare-wallabies and quokkas belong to the larger and more familiar one. The other, technically the Potoroidae, includes just ten species of potoroos, bettongs and a rat-kangaroo. They are relatively small (0.5 to 3 kilograms) and more primitive (in an evolutionary sense) than the kangaroos and their kin; indeed, the musky rat-kangaroo of tropical Queensland shares many anatomical features with possums!

How have they fared?
In 1840, John Gilbert was collecting wildlife specimens in Western Australia for the artist John Gould. He secured four potoroid species in south-western WA:

- **Broad-faced potoroos**, it seems, lived in the country that has become our Wheatbelt. They have not been recorded in the last 120 years or so, and are now presumed to be extinct.
- **Gilbert's potoroos** were presumed extinct until their rediscovery a year ago (see 'Lost & Found', *LANDSCOPE*, Autumn 1995). Sub-fossil bones found in caves and sand-dunes suggest they were restricted to a high-rainfall fringe along the south coast. They are still critically endangered.
- **Boodies or burrowing bettongs** live underground in warrens, which are sometimes so extensive that those deserted decades ago are still evident today—even the ones that are not maintained by invading rabbits. The bettongs were as familiar to the first farmers along the Avon River, inland from Perth, as they were to Aboriginal inhabitants of Australia's vast deserts and farmers of western New South Wales. Within the lifetime of many living people, they have vanished from the mainland, and, were it not for still-flourishing populations on four arid islands off the north-west coast, we would have to presume them extinct too. Even on their islands they are vulnerable to invasion by predators like foxes and catastrophic fires.
- **Woylies** (called brush-tailed bettongs in the eastern States) all but joined the lamentable list of extinct marsupials, but they are now well on the road to recovery. However, they will depend on conservation actions, particularly fox control.

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