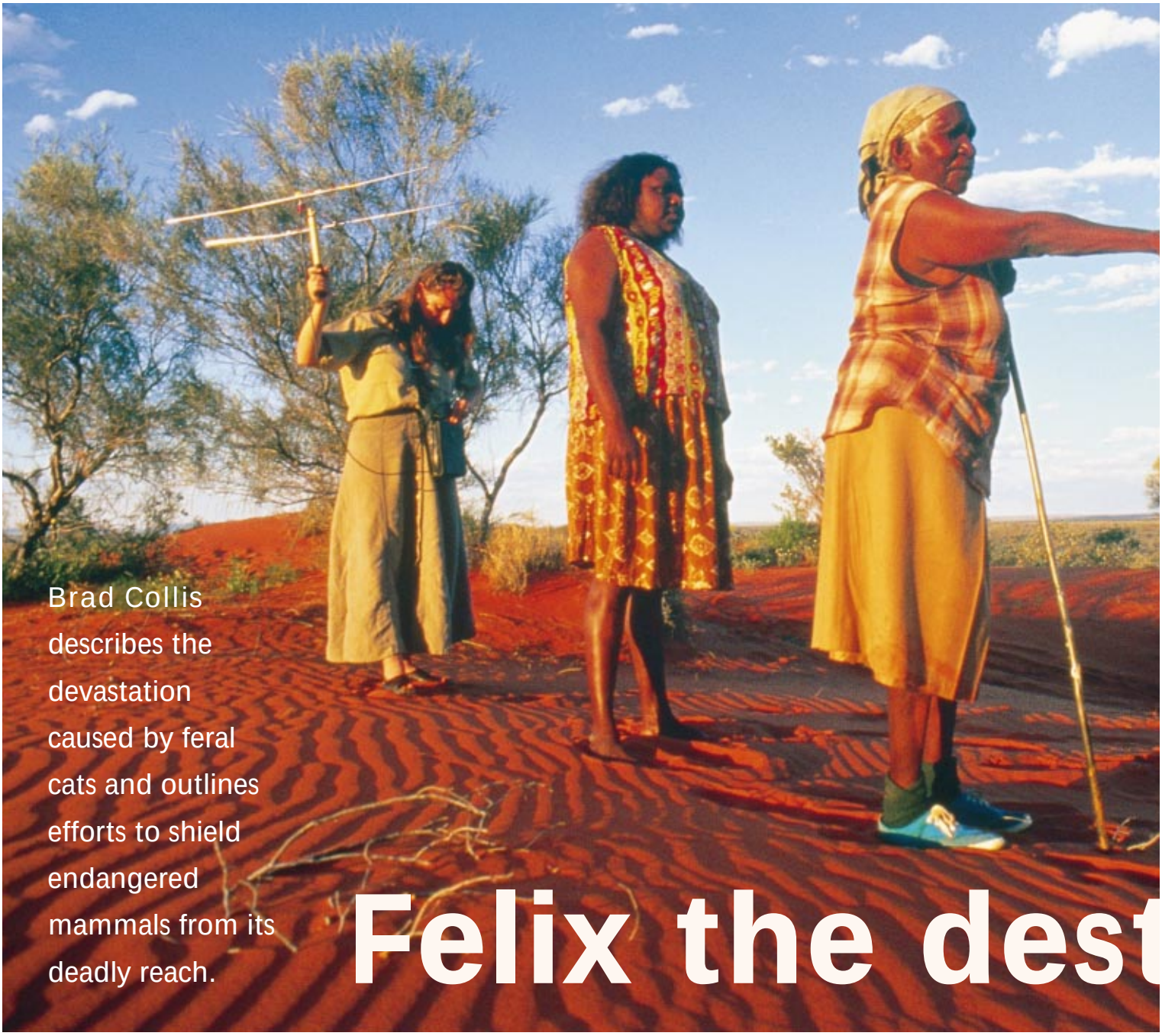

Brad Collis describes the devastation caused by feral cats and outlines efforts to shield endangered mammals from its deadly reach.

Felix the dest

Familiar tracks dot the red, wind-rippled desert near tufts of spinifex grass. Seventy-year-old Mitjili Napangangka touches the indentations with her digging stick, her whole presence suddenly alert. 'Ngaya . . . pussy cat.'

Three women, alone in the vast Tanami Desert in Central Australia, study the paw prints. Napangangka and her daughter, Cindy Nakamarra, are keen to begin the hunt, but wait for scientist Rachel Paltridge, who is carrying what looks like television antennae. She slowly rotates the aerial and nods.

The signal tells her it's a cat they had caught and radio-collared the previous day. Paltridge activates a hand-held GPS (global positioning system) unit. From this point on, every movement made by the cat in the previous 24 hours will be tracked using the most ancient of human skills, and plotted with the most sophisticated space-age technology.

This extraordinary marriage of the ancient and modern is being used to understand the behaviour of feral cats in Australia's outback, where the feline predator is rapidly bringing small native animals to the brink of extinction.

'The radio and satellite equipment can tell me how far and where the cats have travelled,' Paltridge says. 'But the Pintubi Aboriginal women's traditional hunting skills provide much more: where the cats have found prey, what they've eaten, how many times they've urinated or defecated, even where they've sat, waiting to pounce.'

Paltridge has noted the resilience of cat populations even during the harshest seasons. 'A lot will die during a drought, but after good rains when birds and eventually small mammals return, there are kittens everywhere and the cat population builds quickly,' she says.

It may take half a day of chasing a cat up and down sandhills before the women can get close enough to throw a net, capture the animal and fit it with a radio collar.

Collared cats are then monitored every three months for a 12-month period to see how their activities change through the seasons. On the final trip the cats are killed. After Paltridge has downloaded the final GPS data into a laptop computer at their desert campsite, Napangangka and Nakamarra deftly turn the cats into a bush delicacy. 'A rather sweet, tender and juicy white meat,' Paltridge says.

The cat-tracking program by the Parks and Wildlife Commission of the Northern Territory is part of a broader program with the Western Australian Department of

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Danielle Risbey

Above; This large male cat was caught and radio-collared during baiting trails at Heirisson Prong Peninsula on the west coast of Western Australia. Control of feral cats at the Prong is part of a program to reconstruct a community of native mammal species extinct on mainland Australia.

Left: A blend of ancient and modern techniques are being used to track cats in the Tanami Desert, where the feline predator is rapidly bringing small native animals to the brink of extinction. Rachel Paltridge, Cindy Nakamarra and Mitjili Napangangka may follow a cat for half a day before getting near enough to fit a radio collar.

Conservation and Land Management, to save endangered marsupials.

Feral cats, believed to have arrived during landings on the west coast by European sailors in the 17th century, are now prolific throughout the Australian hinterland. Together with changed fire patterns and introduced herbivores, cats and foxes are believed to have contributed to the demise of small native animals. A 1993 survey estimated there were about 60 000 feral cats in the Northern Territory alone.

Cats are ideally suited to the arid zone because they don't need to drink if they are able to catch live animals. Apart from their hunting prowess they also carry toxoplasmosis, a parasite-born disease that can be fatal for native species.

Senior wildlife officer with the commission, Dr Glen Edwards, says cat control can only really begin with the sort of knowledge being built up by Paltridge's work. He says obvious controls such as baits, trapping, and natural predators are not practical, which makes the cat problem particularly worrying.

'We can knock over foxes and dingoes with baits, but feral cats don't scavenge,' he says 'They seek out live prey, so there would need to be an extreme shortage of prey before baits could be expected to work. Trapping and shooting is not practical for such large areas.'

As for natural predators, Edwards says the wedge-tail eagle would be ideal, except cats are nocturnal. And while dingoes and foxes eat kittens, there's no evidence to indicate they threaten adult cats.

Endangered species which scientists are now trying to save from cats and foxes include the mala (*Lagorchestes hirsutus*), the antina (*Zyzomys pedunculatus*, or central rock rat), the burrowing and brushtail bettong, *Bettongia lagotis*, the bilby, *Macrotis lagotis*, the Alice Springs mouse, *Pseudomys fieldi*, and the mallee fowl, *Leipoa ocellata*.

The central goals of such conservation biology are to slow and halt the worldwide erosion of biological diversity and to ensure the survival of ecological systems.

In Australia at least 23 species of vertebrates and 97 species of vascular plants have become extinct since European settlement 200 years ago. A further 119 species of terrestrial vertebrates and 880 species of plants, unique to the Australian continent, are listed as endangered.

The mala was actually considered extinct until biologist, Dr Alan Newsome, now with CSIRO Wildlife and Ecology at Canberra, found a small population in the Tanami Desert in 1959. The discovery is a treasured memory.

'I was on a field trip in the Tanami in 1959 with my Masters supervisor, looking for *Desycercus*, a small fat-tailed marsupial,' he says.

'It was bloody hot and we were trying to find some shade against a termite hill to have lunch when I noticed sand dunes in the distance that were covered with small mammal tracks. We didn't know what had

A reprieve for the central rock rat

FOR the Parks and Wildlife Commission of the Northern Territory, the surprise rediscovery of the central rock rat (*Zyzomys pedunculatus*) has created a considerable scientific and management challenge.

The central rock rat was found two years ago by amateur naturalists in the Macdonnell Ranges west of Alice Springs, 36 years after its last reported sighting. Scientists now must undertake the delicate task of studying its physiology and habitat. They have to do this with minimal disturbance and stress. There simply aren't enough animals in existence to risk losing one.

Scientist in charge of the antina project is Jeff Cole, a wildlife biologist with the commission at Alice Springs. He says bone fragments found at Cape Range in Western Australia show the native rodent was once widespread. 'We can't say for sure what caused its demise, but the remote area in which it has been found is in the central ranges where there is no grazing and no rabbits, which certainly gives us a clue,' he says.

Cole says there's a moral and scientific obligation to try and ensure the animal's survival, but it won't be easy.

'What we hope to do is build up a knowledge base, gradually expand its population away from the risk of extinction, and then make it secure in the wild,' he says. 'We are now determining the range of the surviving populations to get an idea of its preferred habitat and to understand the cause of its decline.'

'At the moment we know what it looks like, but little more. We know almost nothing about its physiology. We don't really even know what it eats. It has a fat tail, which is generally a storage organ, except this one loses its tail if it is touched. Why? We don't know. Presumably it's an escape mechanism similar to that used by geckoes.'

Cole says the central rock rat is the second significant find in the Macdonnell Ranges in an area so remote that it is only accessible by helicopter. The long-tailed dunnart, a marsupial, was also rediscovered a few years ago after being missing for 100 years and officially listed as extinct in central Australia. 'Both instances give us some hope that other extinct animals might also be surviving in isolated pockets,' Cole says.

Another animal he hopes will reappear is the western quoll (*Dasyurus geoffroyi*) a 'native cat' extinct in central Australia, although there are some in the south-west of WA, again indicating just how widespread many of the small native mammals were.

The commission has established a small antina breeding colony at its Desert Park facility, where it is hoped enough can be bred for reintroduction if necessary.

Parks and Wildlife Commission of the Northern Territory

The central rock-rat, rediscovered 36 years after its last reported sighting, now presents a major management challenge.

made them so that night dug a hole to try and catch one, but without success.

'We back-tracked about 100 miles to Mt Doreen Station to speak with an Aboriginal fellow who told us they were mala. He returned with us and after following the tracks for about 100 metres one jumped right out in front of us.

'We ascertained that this was probably the last colony left and after consulting with some very wise men we made a decision to keep quiet, otherwise every museum in the world would have been after them.'

From then until the present it's been an unremitting struggle to keep the species alive. Latest efforts centre on small populations that have been transplanted from central Australia to an island off the Western Australian coast and also to a small protected area in that state's south-west forest.

The mala is a small wallaby, smaller than a cat, and was named the rufous hare by early settlers who were reminded of the European hare. It was once widespread across Australia, so biologists hope the relocation of small numbers to different parts of the country will give the tiny marsupial its best chance of surviving agricultural clearing and introduced pests such as cats, foxes and rabbits.

Head of the mala recovery plan, Don Langford from the Northern Territory Parks and Wildlife Commission, says once predators reduce the population of a native animal to a critical level, it becomes susceptible to environmental factors such as drought, which might deliver the final blow. Meanwhile, the cats and foxes are able to sustain themselves on another introduced pest: rabbits.

Because there is no sheep industry in the Northern Territory, foxes are tolerated more than in other states and have been allowed to multiply. Dingoes, the only natural predator, are on the other hand controlled, because they can be a threat to new-born calves.

Glen Edwards says dingo control has to be finely balanced because dingoes are the top predator in Australia and any fall in numbers would affect the whole food chain.

'For example, in NSW where they've reduced dingo numbers, kangaroo and feral goat populations are out of control,' he says. In central Australia, which is prime goat country, there are no goats because we've been able to ensure there are enough dingoes to eliminate them naturally.

The mala was thought extinct until a small population was found in the Tanami Desert in 1959. A colony has since been established, away from feral cats, on at Trimouille Island off the remote northern coast of WA.

Alan Newsome is an authority on predator-prey relationships. His research runs parallel to an immuno-contraception program seeking ways to biologically sterilise foxes and feral cats using a virus or bacteria (see Cunning contraceptions, *Ecos* 95).

Newsome says that once a prey population, such as rabbits, falls below a certain threshold, predators such as dingoes can hold them there. But if rabbit numbers fall too far, alternate prey such as kangaroos and other native animals 'cop a beating'.

Another Vertebrate Biocontrol CRC researcher, also based at CSIRO Wildlife and Ecology, Robin Molsher, has radio-collared cats and foxes near Mudgee in NSW, and mapped their movements. She says cats and foxes occupy separate terrain.

Cats prefer woodlands and foxes prefer open grass country. But when foxes are removed through 1080 baiting, cats expand into the vacated territory. Also, when the foxes are removed, kangaroos venture into the open grassland, and animals such as possums spend more time on the ground, using more of their overall habitat.

When researchers splashed fox urine on the ground, the native animals immediately retreated to the dense scrub. So stark was the change in observed behaviour that scientists believe this could disrupt the native animals' breeding patterns.

Newsome says the behaviour of native animals, rather than just head-counts, could therefore be the most accurate way of determining whether or not a native community is under threat, and the level to which predator numbers need to be reduced to restore a balance.

Another source of stress for small native animals is the lost groundcover caused by cattle grazing and a changed fire regime. 'Plants here co-evolved with Aboriginal people and their fire regimes, which were used to regenerate vegetation,' Langford says. 'After the Europeans moved in, the land wasn't burned until a lightning strike or campfire spark triggered a bushfire that destroyed everything.'

Seeking sanctuary

Efforts to breed-up mala numbers began in 1986 near the Willowra Aboriginal Community in the Tanami, about 400 kilometres north-west of Alice Springs. A small number were enclosed in a square-kilometre of land ringed with electric fencing to keep out cats and foxes.

When their numbers had built up, groups of mala were caught and held in a smaller enclosure before the electricity was turned off and the fence raised to allow the animals to leave at leisure.

'We did four to five releases of mala fitted with radio collars, but it wasn't long before we noticed the numbers falling again and we identified feral cats as the cause,' Langford says. 'We tried to control the cats, but it was impossible and the mala population collapsed.'

The scientists restored the electric fence for the surviving 150-200 animals, and started searching for an offshore site away from predators.

The Western Australian Department of Conservation and Land Management offered the mala recovery team one of the Montebello islands, Trimouille. The island, off the remote northern coast, had been degraded by two nuclear weapon tests in the 1950s, but was still considered the mala's best chance. Radiation levels are now well below the danger threshold.

After consulting with the central Australian Warlpiri people who own the mala 'dreaming', Langford and his team were given approval to establish a colony on the island. Early in 1997, 30 mala were taken there in an airlift from the Tanami Desert. It was one of the most complicated animal translocations ever undertaken in Australia.

Twenty female and 10 male mala were caught, fitted with radio collars and taken in four-wheel-drive vehicles during the night to the Willowra Aboriginal community air strip. The animals were farewelled by Aboriginal elders and loaded aboard an aircraft for a 1000 km trip to Karratha. There the mala were transferred to a long-range helicopter provided by an oil

company and flown to Trimouille Island. They were monitored for 10 days as they gradually moved away from the release site.

When Don Langford returned to the island last month, 28 mala were alive and well. One was missing and one was found drowned.

'We noticed them investigating the water's edge when they were set free,' he says. 'They'd never seen the sea before.'

The hope is to build up mala numbers, and also the populations of other endangered species, while efforts continue to wipe out cats and foxes on the mainland. 'I doubt we'll ever eradicate foxes and cats, but we should be able to suppress them enough to give native animals a chance to hold their own,' Langford says.

More about mammal recoveries

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An interactive cartoon CD-ROM 'mission' relating to the mala recovery is located at http://www.abc.net.au/science/ingenious/ingeni.htm.

A B S T R A C T

Cats are prolific throughout the Australian hinterland. They thrive in the arid zone because they don't need to drink if able to catch live prey, and they are untroubled by predators. Together with foxes, changed fire patterns and introduced herbivores, cats have contributed the demise of small native animals. Efforts to recover endangered mammals such as the mala and central rock rat depend on feral cat control. Aboriginal women are helping to track feral cats in the Tanami Desert to help scientists better understand the behaviour of cats in the wild. Other work centres on predator-prey relationships, and cat control techniques.

Keywords: **Cats; feral animals; wildlife surveys; wildlife tracking; mala.**

Will cats take the bait?

ON the Heirisson Prong Peninsula, scientists and wildlife managers are fighting an ongoing battle to protect from predators reintroduced populations of the burrowing bettong *Bettongia lesueur*, and western barred bandicoot *Perameles bougainville*.

Heirisson Prong juts into Shark Bay on the west coast of Western Australia. The 1200-hectare area at its tip is managed by the mining community at nearby Useless Loop and CSIRO Wildlife and Ecology as part of a program to reconstruct a mammal community of species extinct on mainland Australia, but surviving on offshore islands.

Feral cats are thought responsible for the limited success of programs to reintroduce endangered mammals to arid Australia. At Heirisson Prong, they are being controlled both in the 1200 ha core area where endangered species have been reintroduced, and an adjoining buffer zone of 100 km^2. In the past, control of feral cats in an area of this size has required persistent and costly trapping programs. Scientists have been seeking new methods which are more cost-effective and less labour intensive.

In 1995, a study by Jeff Short, Bruce Turner and Reg Carnamah from CSIRO, and Danielle Risbey from Murdoch University, tested the effectiveness of baiting feral cats with poisoned mice. They turned to mice after the earlier failure of four alternative baiting methods.

The mouse carcases were poisoned using a single oat grain coated sodium monofluoracetate (1080) that was inserted into their throat. The radio-tracking of collared cats and spotlight surveys before and after baiting were used to gauge the bait's effects. Reductions of more than 74% in the cat population were achieved.

Short and his colleagues attribute the success not only to the choice of bait, but also to strategic timing. 'The other vital element to success was picking the timing of baiting by knowing how the major prey items in the cat's diet were changing in abundance,' Short says. 'We bait as populations of alternative prey are crashing.

'We found that bait acceptance, even with mice, varies from almost total ignoring (when plenty of food about) through to high acceptance during troughs in food availability. Therefore our baiting strategies for cats and foxes are entirely different.

'Foxes we bait monthly with large dried meat baits. Because they are scavengers, there are no problems with bait acceptance, regardless of prey availability. Cats we may bait as infrequently as once every two to three years, waiting patiently for their key prey species to drop out before hitting them hard.'

Jeff Short

Jeff Short

Above: Baiting trials are assessing techniques for protecting reintroduced burrowing bettongs from predation by feral cats.

Right: The remains of a burrowing bettong killed by a feral cat at Heirisson Prong.

The cat baiting is part of a control strategy that includes three to four different methods and a range of attractants. Regular trapping is also carried out, at a rubbish tip (cage traps) and in the bush (leg-hold traps). The leg-hold traps use a diversity of lures that include food at one time of the year and social scents at another.

Short says the problem with baiting is the risk to non-target species, particularly bandicoots. This needs careful management. 'We avoided this potential problem by partitioning our study area into a core area for endangered mammals (where predators have been eliminated) and a peripheral buffer area of ongoing predator control,' he says. 'A range of creative solutions may be needed for other sites.'

Bryony Bennett