Controversial cats

by Jeff Short

Cats—are they cuddly friends or murderous moggies? The answer varies, according to whom you ask.

Cats are revered as a companion animal and are kept by many of us as domestic pets, yet some scientists believe they are one of the scourges of the Australian bush, responsible for many of the early extinctions of Australian mammals. Feral cats and their role in the Australian bush were largely ignored by scientists until about 15 years ago, in part because they believed their impact was minimal. Indeed, some scientists believe cats are being unjustly demonised. Perhaps the strongest defender of cats in recent times has been Tim Flannery, well-known author, palaeontologist, Director of the South Australian Museum and 2007 Australian of the Year. In a published essay in 2003, he poured scorn on the belief that cats may have played a role in mammalian extinctions in the early years of European settlement. This belief, according to Flannery, takes pride of place as one of Australia's "environmental lies". Strong words from a highly respected scientist.

Flannery argued that cats had been introduced to Australia at the time of European settlement and would have reached the zenith of their distribution on the continent by the 1840s—well before major extinctions of native mammals. Moreover, cats and native mammals have co-existed on two of Australia's largest islands, Kangaroo Island and Tasmania, and by extension should also have done so on the mainland. Flannery conceded that cats may have played a role in eliminating small and isolated populations such as on Faure Island at Shark Bay. Cats may also be effective, according to Flannery, in eliminating newly reintroduced mammals as they are captive-bred and naïve, have no experience of complex natural environments, and are "sitting ducks for any half-competent predator". Just how true are these assertions?

Colonisation by cats

There has been doubt about the origin of cats in Australia, with some researchers suggesting that they may have arrived before European settlement as a result of Dutch shipwrecks or visits by Macassan fishermen. However, recent research by Department of Environment and Conservation (DEC) Scientist Ian Abbott has done much to resolve the debate. His detailed and comprehensive search for historical records of the occurrence of cats across Australia enabled him to date the arrival and spread of cats. He concluded that cats established from a British origin and from multiple nodes around the coast as settlers established pastoral and other enterprises. Close to two-thirds of Australia was still unoccupied by cats in 1860, and it was not until after 1890 that cats had largely colonised the continent. This is some 20 to 50 years after that hypothesised by Flannery, coinciding with a first wave of extinctions of native mammals from arid Australia.

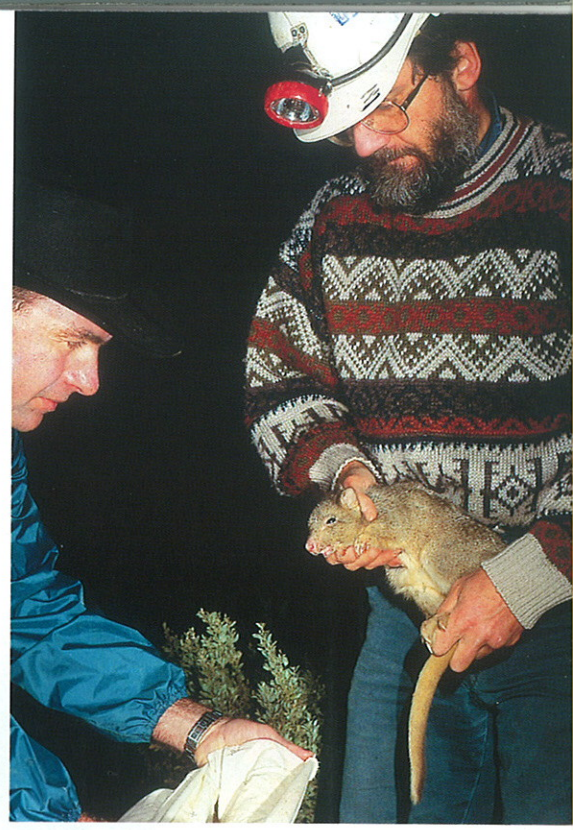
Cats and climate

DEC Research Fellow Andrew Burbidge examined the loss of mammals on Australian islands and found that climate appeared to play a role—the effectiveness of cats in eliminating mammals was highly dependent on rainfall. The apparent lack of impact of feral cats on mammals on islands in high rainfall areas may be explained by a combination of dense vegetation providing refuges from predation, lower incidence of severe drought that limits reproduction in prey species, and (in Tasmania) the suppression of feral cats by Tasmanian devils. By extension, the role of cats is likely to have been greatest in arid Australia.

Previous page
Feral cat devouring a native bird.
Photo – Jiri Lochman

Above Feral kitten litter on Heirisson Prong, Shark Bay.
Photo – Andrew Hide

Left Feral cat.
Photo – Jiri Lochman



Above Rufous hare-wallaby or mala.

Above right Jeff Short at Heirisson Prong, Shark Bay, studying burrowing bettongs.
Photos – Jiri Lochman

Failure of reintroductions

Feral cats have been identified as the primary cause for the failure of reintroductions of native mammals to arid and semi-arid Australia. Researchers have successfully controlled foxes at these sites but their valiant efforts to control feral cats have been unsuccessful. Boodies, or burrowing bettongs, (*Bettongia lesueur*) and golden bandicoots (*Isoodon auratus*) reintroduced to the Gibson Desert in the early 1990s were wild animals sourced from Barrow Island. Once introduced, the animals persisted for less than three months, with most deaths attributed to cats. Barrow Island lacks a mammalian predator so the native animals may have been naïve.

Rufous hare-wallabies, or mala, (*Lagorchestes hirsutus*) reintroduced to the Tanami Desert were captive bred in a 100-hectare enclosure from wild mainland stock. Again, cats killed most released animals. Could it be that their wild heritage was over ridden by their immediate experience of captivity making them easy targets for feral cats?

Woylies (*Bettongia penicillata*) reintroduced to Yathong Nature Reserve in central New South Wales originated largely from the wild population at Dryandra Woodland in Western Australia. All 31 radio-collared bettongs were dead within 13 months, with most deaths attributed to cat predation. In this case a wild heritage without a period of captive breeding was not sufficient to permit survival.

These reintroductions failed quickly, allowing little time for individual animals to acclimatise to their new surroundings and the new predatory regime.

In contrast is the reintroduction of threatened mammals to Heirisson Prong at Shark Bay—a peninsula that a community group from the small mining town of Useless Loop fenced to exclude predators. CSIRO's Principal Research Scientist Jeff Short reintroduced burrowing bettongs and western barred bandicoots (*Perameles bougainville*) to the peninsula in 1992 and 1996 respectively. In the absence of cats, both established large populations of 300 to 500 animals and these have persisted for many years and many generations. The bettongs developed a burrow network and had additional shelter in rabbit warrens while the bandicoots established nests in leaf litter under dense low prickly kurara bushes. Despite this, after some time reinvading cats were able to eliminate both species as free-range populations. Both survived only because a small handful of animals were transferred at the eleventh hour to a high-security enclosure to re-start the population once cats were removed.

Contributing factors

So were reintroduced stock captive-bred and naïve, with no experience of complex natural environments as claimed by Flannery? Only one of the reintroductions described above used captive stock (albeit raised in a 100-hectare enclosure of natural habitat). Two others used animals sourced from offshore islands free of mammalian predators and this may have contributed to a naïvety to novel predators. However, bettongs and bandicoots at Heirisson Prong were exposed to feral cats over a 10-to-15-year period. Was this still insufficient exposure to override their island heritage of naïvety? The reintroduction of woylies to Yathong used wild-caught stock with a mainland heritage. Hence, in this last case the notion of naïvety cannot be invoked. Clearly, cats can eliminate medium-sized mammals under some circumstances.

Both Heirisson Prong and Yathong have abundant prey of European rabbits and house mice. This generates higher feral cat populations and higher densities. This increased predation due to the inflated density of a predator built on an abundant alternate prey is known as 'hyper-predation'.

Another contributing factor in the loss of populations of bettongs at

Above Red-tailed phascogale.

Left Western barred bandicoot.
Photos – Jeff Short

both Yathong and Heirisson Prong was drought. Australian marsupials occupying arid habitats are typically resilient to drought, but a part of this process is shutting down all reproduction. Females begin by losing young in the pouch from lactation failure and progress to anoestrous (sexual inactivity) as conditions deteriorate further. Unfortunately, drought is a time of plenty for carnivores that feast on dead and dying animals. Rabbit numbers collapse early in drought at Shark Bay allowing cats to persist in numbers. These cats switch to native mammals when rabbit numbers are exhausted. In the absence of breeding, populations of native mammals are quickly overwhelmed.

Predation by feral cats is considered a key threatening process under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. Species declared at risk by cat predation include 37 mammal, 35 bird, seven reptile and three amphibian species or sub-species. In WA these include species such as the Gilbert's potoroo (*Potorous gilbertii*), burrowing bettong, red-tailed phascogale (*Phascogale calura*), malleefowl, western ground parrot, and purple-crowned fairy-wren.

Control of feral cats

Despite considerable effort, feral cats have proved to be very difficult to control. Most success has come from targeting smaller sites with high biodiversity values and with the possibility of limiting reinvasion by cats once control has been successfully achieved. This has required an island or peninsula or a site capable of being fenced. Major victories in WA have come from DEC's eradication of cats from the Australian Wildlife Conservancy's Faure Island at Shark Bay (see 'Return to Faure Island', *LANDSCOPE*, Autumn 2007) and Hermite Island in the Montebello Islands. These were sites with a limited prey base for cats—importantly, neither had rabbits. In contrast, peninsula sites such as Heirisson Prong and Peron Peninsula at Shark Bay have experienced difficulties in eradicating cats because of the high densities and rate of increase of cats, fuelled by high rabbit and house mouse numbers. Key methods of control are exclusion fencing, trapping and baiting. The first WA example of the large-scale use

Above left Jeff Short at Heirisson Prong, Shark Bay, radiotracking burrowing bettongs.
Photo – Jiri Lochman

Above Cage traps tend to catch younger feral cats.
Photo – Jeff Short

Left Shark Bay DEC's *Project Eden* program has led to the installation of a solar powered vermin-proof electric fence.
Photo – Jiri Lochman

of a protective fence to re-establish threatened mammals was that by the Useless Loop community, which erected a fence across the narrow neck of Heirisson Prong in 1990 to exclude foxes and feral cats from a 1200-hectare area. Since then, fence designs have steadily improved and have been used by DEC to protect the endangered western swamp tortoise on the Swan Coastal Plain as well as other native animals through *Project Eden* at Shark Bay, which, despite many achievements, has been largely unsuccessful in excluding predators from the 1000-square kilometre Peron Peninsula.

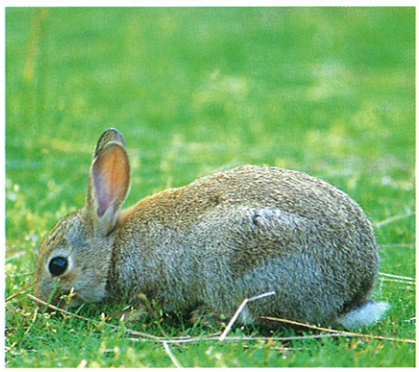
In addition to fencing, trapping is also used to control cats. CSIRO introduced the use of humane foot-hold traps to capture cats at its reintroduction site at Heirisson Prong in 1993. CSIRO research indicated a difference in the ease with which adult and juvenile cats were trapped. Juveniles were typically easily caught using cage traps, but catching experienced adults usually required the use of concealed foot-hold traps with food or scent lures.

Baiting is the third major cat control method. In 1995 CSIRO began testing the use of mouse carcases poisoned with the toxin, 1080, to control cats. This achieved a total kill of all radio-collared cats and there was a 74 per cent reduction in spotlight sightings. However, subsequent baitings were far less successful and this was linked to the abundance of rabbits as food for cats. This work suggested that cats were only likely to be effectively controlled every four out of seven years on average at Shark Bay, and that the 'window of opportunity' for effective baiting was most likely to be in autumn or early winter before the emergence of the annual crop of rabbit kittens.

DEC also uses baits containing 1080 across 3.9 million hectares of the State's conservation estate in a bid to control foxes and cats as part of its *Western Shield* program. In addition, DEC has developed a sausage bait effective at controlling cats under certain circumstances (see 'Taking the bait', *LANDSCOPE*, Winter 2007).

Cats as part of a predator–prey system

Greater understanding of the role of cats as part of a predator–prey system comes from CSIRO's work at Heirisson Prong. Feral cats occur



Above left Heirisson Prong at Shark Bay is site of a native mammal reintroduction program.
Photo – Sally O'Neil

Top Concealed foot-hold traps are used to capture cats and foxes.
Photo – Blair Parsons

Above Rabbits are a major food source for feral cats at Shark Bay.
Photo – Marie Lochman

there at densities of up to three per square kilometre and have the ability to double in population size in less than nine months. Cats reach highest population densities in the absence in foxes, with cats on Heirisson Prong reaching densities of nearly twice that of an adjacent area with no fox control. The high rate of increase in cat numbers means that cats are rapidly replaced following control, requiring persistent high-intensity effort to make any headway.

The super-abundant rabbit population on mainland Shark Bay (estimated as peaking at an unsustainable 3700 per square kilometre on Heirisson Prong, but more typically less than 800 per square kilometre), is reflected in the diet of feral cats—rabbit made up some 88 per cent of their diet by weight. One suggestion to control cats is to first deal with the rabbit population, but this is difficult at Shark Bay because of the vast area and low value of the land, the high expense of control and the low prognosis for success. Such approaches have worked elsewhere with much lower rabbit densities, sparser vegetation, and different soil types that concentrate rabbits in localised large warrens that are amenable to ripping.

Research on food-based lures and baits by CSIRO at Shark Bay has shown that a high uptake depends largely on a relative scarcity of alternative foods. Unfortunately, most effective cat control techniques are rendered ineffective by the presence of abundant mammal populations. On Heirisson Prong, reinvading cats were difficult to control because the abundant bettong populations precluded the use of foot-hold traps and their availability as a food source meant that cats were less likely to take baits. Hence, control techniques that worked before the re-establishment of native mammals were ineffective afterwards.

Even worse in terms of cat control was that populations of re-established native mammals did not rise and fall in synchrony with the rabbit population. Hence, when rabbit populations collapsed native mammals remained available as a food source for cats, bridging the food gap until the return of the rains brought more rabbits. Hence, the cat population was supported through dry times by the newly established native mammals, until these collapsed under the weight of predation.

The future

Progress on cat control has been frustratingly slow, but despite setbacks there have been significant conservation gains. These include the eradication of cats from Faure and Hermite islands and the persistence of reintroduced bettongs and bandicoots for up to 15 years at Heirisson Prong in the presence of feral cats.

Future research and management will be directed at new cat baits (including a cat-specific toxin) and

Top left Juvenile western barred bandicoot caught on Heirisson Prong.
Photo – Jeff Short

Top A burrowing bettong is released.
Photo – Bruce Turner

Above left Juvenile burrowing bettong.
Photo – Blair Parsons

Above Useless Loop resident Scott Malasits helps monitor western barred bandicoots.
Photo – Jeff Short

new ways of dispensing them (such as high density aerial drops), better knowledge of how to time control efforts, improved and more extensive use of predator-proof fencing, the creative use of secure refuges, and a better appreciation of where cat control might work.

However, despite the successes, the goal of maintaining populations of cat-vulnerable mammals on mainland Australia over the long-term remains elusive. The major challenge on the horizon is to create a cat-free Dirk Hartog Island at Shark Bay (See 'Dirk Hartog Island: inscribed in history'on page 32). This will permit the reconstruction of Australia's pre-European fauna at an unprecedented scale.

Friend or foe?

While there is still much to be learned, it appears that feral cats have played an historic role in the extinction of Australia's mammals and a current role in limiting reconstruction of our native fauna. Their historic impact was likely greatest prior to the invasion of WA by the fox. Their impact, more subtle and less widespread than that of the fox, was likely tempered by climate (being strongest in dry and drought-prone areas), food base (being greatest in the presence of introduced rabbits and house mice), suppression by more dominant predators (foxes, dingoes and Aboriginal people), and the innate characteristics of some prey (being most effective against small, slow-reproducing species occupying open habitat).

In contrast to this conclusion is Tim Flannery's claim that the majority of those who assert that cats have caused extinctions in Australia are simply cat-haters who have allowed their prejudice to override their scientific reason. You be the judge.

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