Science for Saving Species

Research findings factsheet

Project 1.1.6

Threatened Species Recovery Hub

National Environmental Science Programme

How feral cats respond if rabbit numbers are suddenly reduced

In brief

In Australia, especially in the arid and semi-arid zones, introduced predators the feral cat and red fox have caused devastating losses of native mammals. Their impacts are amplified by high densities of introduced prey species like rabbits.

In addition to boosting cat and fox populations, rabbits have negative effects on their environments including over 300 threatened species, most of which are plants. As such, rabbit control programs are an important land and conservation management tool.

Previous research, based on scat and stomach content analysis, has shown that following large reductions in rabbit densities achieved by a bio-control there is an increase in the occurrence of alternative prey in the diet of feral cats, known as "prey-switching".

We conducted an experimental study that investigated prey-switching in more detail than scat and stomach analysis allows, by collaring cats to monitor their survival, health, diet and hunting rates before and after rabbit removal, and comparing the results to those from a nearby control site.

We found that cat diet changed substantially and quickly; in particular, due to hunger, cats were more likely to eat non-mammalian prey and carrion. Although cats do not readily take baits, in the trial we found that they were far more likely to do so when rabbit numbers were reduced.

Our research indicates that control for feral cats and their introduced prey should happen at the same time, with baiting and lures likely to be highly successful at such times. Reducing densities of rabbits and cats will have beneficial effects for small native mammals that are preyed upon by feral cats.

Rabbit. Hugh McGregor/Arid Recovery

Context

Invasive predators like feral cats (*Felis catus*) and red foxes (*Vulpes vulpes*) are a major threat to native animals across Australia, and have been strongly implicated in extinctions and declines of mammals in the critical weight range of 35–5500 g. The regions with the greatest loss of mammals have been the arid and semi-arid zones of southern Australia.

The impacts of introduced predators can be amplified by high densities of introduced prey species, and this is the case in southern Australia, where abundant populations of rabbits support high densities of feral cats and foxes.

In addition to boosting populations of feral predators, the European rabbit (*Oryctolagus cuniculus*) negatively impacts 321 threatened species in Australia, which includes many plant species and also some animals due to competition and habitat modification. As such, rabbit control programs are important conservation tools.

When rabbit densities are reduced, the abundance of cats and foxes is also reduced, which eases predation on native wildlife. An example of a major reduction in numbers of rabbits was the release of the bio-control agent Rabbit Haemorrhagic Disease Virus (RHDV1, or calicivirus) in 1995. Before this, plagues of rabbits

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Context (continued)

led to some of the highest known densities of feral cats in Australia, outside of islands and townships. After the release of RHDV1, cat numbers plummeted in parts of arid Australia, and have not recovered since. At least four mammals have substantially increased in range and abundance as a result, three of them threatened species: the plains mouse (*Pseudomys australis*), dusky hopping mouse (*Notomys fuscus*) and crest-tailed mulgara (*Dasycercus cristicauda*).

However, in the period immediately following the rabbit reduction, before cat numbers stabilise to match the lower densities of rabbits, there is narrow window when cats can switch prey and can increase their predation on native species. Prior studies have reported an increase in the proportion of native animals in cat scats when rabbit numbers drop. This raises several questions:

- Does this finding represent an increase in the kill rate of native animals, or does the proportion of native animals in the cat diet increase simply because the numbers of rabbits in the diet has decreased?
- Are cats just eating more carrion? So, the increase of native animals in the scats does not reflect increased predation of live animals; and
- If there is short-term prey-switching leading to increased predation on native mammals, is this offset by an overall reduction in cat numbers, or are native mammals at risk of local declines or extinctions during this period?

Answering these questions is critical to properly assessing the likely impacts of rabbit management.

What the research looked at

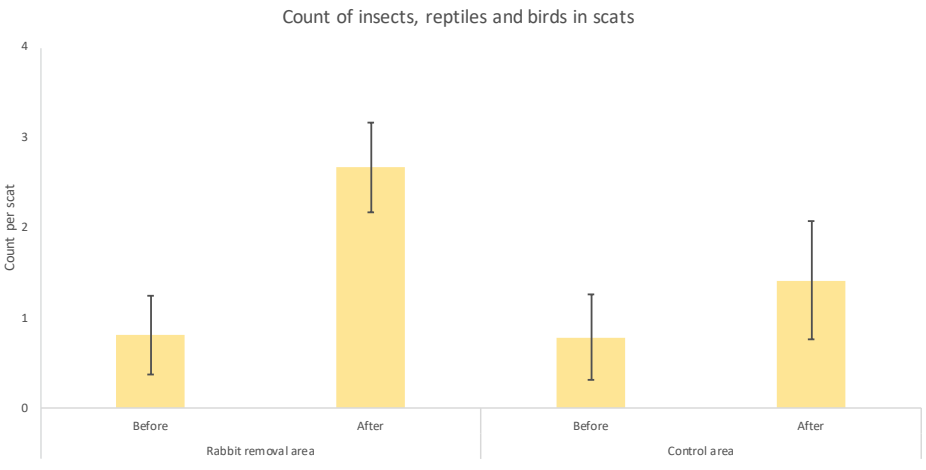
Our research looked in detail at the short-term effects of feral cats on native mammals in Australia's arid zone when the abundance of rabbits is suddenly reduced. In particular, we examined whether individual feral cats switched from hunting rabbits to other prey. We posed the following questions: Does the size of the cat population reduce under prey-switching? How do populations of native mammal respond?

Understanding prey-switching is important because if cats do prey-switch to the extent that populations of native species are adversely affected, then reducing rabbit populations could have poor conservation outcomes for threatened species in the short term. For example, if a new rabbit biocontrol was released in Australia, some populations of threatened species may be at risk from greater predation rates from hungry feral cats.

Alternatively, if cats are more likely to eat carrion or novel food sources after a sudden reduction in rabbits, they may be more likely to eat poison baits or become easier to trap. This would enable control programs aimed at cats to be more effective immediately after reduction of rabbit numbers.

Before this study, our understanding of the impacts on native prey of prey-switching by cats was limited to evidence from analysis of diet composition from scats or the stomach contents of predators. However, this presented three problems. First, consumption of native prey is measured as frequency in the diet not as an absolute kill rate. Second, cats can kill prey when they are not hungry without consuming them, so such analysis may not reveal kill rates. Third, it is difficult to differentiate between freshly killed prey and carrion from scat and stomach analysis, again possibly skewing the kill rate.

We therefore set out to gain a more detailed understanding of how cats respond when their primary prey populations are reduced to assess how prey-switching under these circumstances affects the survival of native prey.



What we did

We investigated how feral cats responded when a dense population of rabbits was suddenly reduced. We did this in an experimental setting at the Arid Recovery reserve in South Australia, where we conducted a study of feral cats and their prey. The study used a BACI (before/after/control/impact) experimental design to ensure that the results observed were a true reflection of the rabbit reduction and not due to environmental fluctuations.

The research team removed around 80% of the rabbit population from within a 37 km^2 experimental enclosure in a two-week period (2215 rabbits removed from an estimated population of 2800).

We radio-collared 20 cats, and also deployed animal-borne video collars on many of them, to monitor their survival, health, diet and hunting rates before and after the removal of the rabbits. We monitored the population sizes of cats and small mammals by counting their tracks (activity) on a large number of small transects. Monitoring was carried out in the experimental area (where rabbits were removed) as well as in an adjacent control area (where rabbits were not removed).

Feral cat carrying a GPS collar. Image: Hugh McGregor

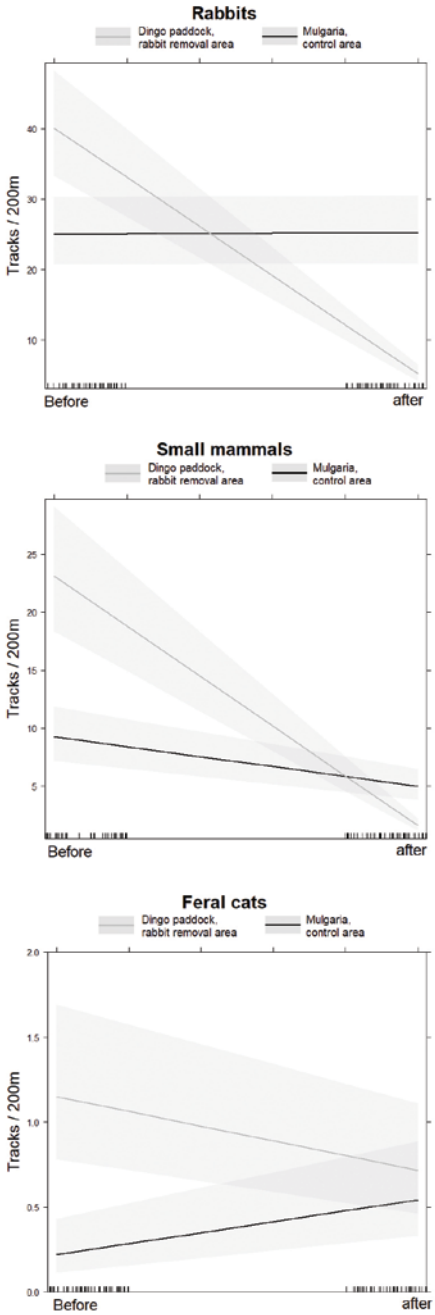
Key findings

The effects on feral cats of the rabbit removal were rapid. The activity and survival of VHF-collared feral cats decreased by 40% in the month afterwards. Half the cats in our collared sample died in the two months following the rabbit decline, and the surviving cats lost weight, and showed evidence of hunger by increasing their intake of experimentally supplied sausages. No change in cat body condition or activity was observed in the nearby control area where rabbits were not removed.

We found that prey-switching by cats will occur after rabbit populations are reduced. However, much of this involves switching to foods that are easy to find but were previously not preferred, such as carrion and insects. Before the rabbit cull, we had even seen some instances on video collars of cats walking past reptiles and carrion without eating them. Data obtained from video collars showed that after the rabbit reduction, cats were more likely to eat dead rabbits and insects than before the cull.

Cats may be less likely to switch to harder-to-kill prey, such as small native mammals. We found that cats did not increase their per capita consumption of small mammals like plains mice or hopping mice. The activity of these small native mammals showed decline in the experimental area, but also declined – though to a lesser extent – in the control area with no rabbit control, so other factors such as drought might have been operating. This study did not measure the impact of prey-switching on native birds, reptiles or insects.

Due to the high rabbit densities in the study area, it is likely that many individual cats within the study population were rabbit-hunting specialists. This is not evidence that rabbits are the preferred prey of feral cats Australia-wide. Cats in other areas may be more flexible in their hunting strategies.



ABOVE: Trajectory of animal abundances after a major rabbit knockdown was conducted.

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Recommendations and implementations

The sudden removal of rabbit populations by biocontrols (e.g., RDHV1, RHDV2, myxomatosis) may present a short-lived prey-switching threat to native wildlife; however, in this study we found that native mammals were not significantly impacted and feral cats are most likely to switch to food that is easier to find and catch, such as carrion and insects. The impacts to reptiles and insects in an area could still be significant.

Our key recommendation is to couple rabbit control with cat control. A widespread drop in rabbit numbers will reduce cat numbers and presents an opportunity for land managers to achieve even greater reductions in cat numbers because food-limited cats are more likely to eat novel food and would be more susceptible to control techniques that rely on hunger, for example, trapping using food lures or using cat poison baits such as Eradicat™. Such techniques are in fact likely to be extremely effective at these times. These findings will be valuable to informing feral cat management in all areas where rabbits are present.

The decrease in survival of cats in our study happened within weeks of reducing rabbit abundance. While the rapidity of this change may have been influenced by the extreme heat and humidity around the time of the rabbit reduction, potentially giving cats a greater need for energy and moisture, managers should note that they will need to be prepared to react quickly at these times to protect vulnerable wildlife and/or to take most effective advantage of cat hunger by using cat control options like baiting.

Lowered densities of feral cats can allow other non-native prey species to increase. Overall, we recommend that, whenever practicable, cat and rabbit control be accompanied by removal of other non-native prey sources for feral cats (such as introduced rodents) or alternative food sources (such as town dumps), with this management action integrated with further cat control.

In summary, rabbit control is likely to deliver substantial benefits to the conservation of native wildlife. By removing a major food source for cats, managers can prevent cats from living at high densities, when they can cause their most devastating impacts on native wildlife.

Further reading

McGregor, H., Moseby, K., Johnson, C. N., Legge, S. (2019). The short-term response of feral cats to rabbit population decline: Are alternative native prey more at risk? *Biological Invasions*. https://doi.org/10.1007/s10530-019-02131-5

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Images from the lives of cats obtained by video camera collars, including a) playing with a dragon; b) eating a gecko; c) rabbit; and d) a mouse.

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