

Science for Saving Species

Research findings factsheet

Project 1.1.12



National Environmental Science Programme

Status of Tiwi Island mammals and lessons for management

Context

Australia has experienced both the highest number and proportion of mammal extinctions of any continent on Earth in the two centuries since European arrival. In that time around 10% of Australia's native mammal species have been lost forever.

While most of these extinctions occurred through southern and arid Australia, over the past three decades widespread mammal declines have been recorded across tropical northern Australia.

The causes of these more recent declines in the north may be similar to the causes of the southern and arid extinctions, as the mammals affected are similar (e.g., bandicoots, large rodents and dasyurids in the "critical weight range" of 35 to 5500g). Causes are likely to be multiple and interacting, and to include predation by feral cats, which favour hunting small mammals in the critical weight range, habitat disturbance by large exotic herbivores (especially buffalo, cattle and horses),

and the breakdown of traditional burning practices.

The Tiwi Islands, a group of islands around 20 km off the coast of the Northern Territory, remain one of the only bioregions in Australia to retain its complete mammal assemblage. However, mammals still face threats on the Tiwi Islands, including feral cats, large exotic herbivores, and frequent fire. So, while the Tiwi Islands have not yet lost mammal species, their continued persistence cannot be taken for granted.



Brush-tailed rabbit-rat. Photo: Hugh Davies

Our research aims

The research team aimed to conduct a health check of Tiwi Island native mammals in 2015 by resurveying historic sites last surveyed in 2000–02.

We set out to discover whether our survey would capture all of the same species and as many animals as the earlier surveys. We were also interested to see if environmental factors could explain the current distribution of each species.

In particular, we wanted to gain a better understanding of how fire management might influence native mammal populations.

While the direct mortality of animals from fire is low, fire can have a significant indirect effect on mammal populations by depleting critical resources and increasing the efficiency of predators, including feral cats. Feral cats have been shown to focus their hunting in areas recently burnt by high-intensity fires, where they have higher predation efficiency. We were especially concerned about the fate of species who both depended on resources destroyed by fire for food or shelter (e.g., fruit-bearing shrubs, logs, tree hollows) and are vulnerable to predation by cats

(i.e., are in the critical weight range). We expected these species to be the first to exhibit a decline in numbers and contraction in range.

Our general expectations were that a range of native mammals on these islands would be in decline due to the presence of feral cats, large introduced herbivores and frequent fire. We also expected that the species most affected would be species that have also declined most dramatically on the mainland, and that we would find fewer native mammals in places where feral cats are more abundant and high-intensity fires more frequent.





What we did

In 2015, with help of the Tiwi Land Rangers, the team resurveyed 88 sites across Melville Island that had originally been surveyed in 2000–02. Our surveys used the same live-trapping method at 82 of the 88 sites. Additionally, we also deployed five camera traps for a minimum five-week period at each of the 88 sites. The sites were all located in the habitats that dominate Melville Island – savanna woodland and open forest – and were chosen to give a good sample of the large variation in both annual rainfall

and fire history on the island.

We also surveyed native mammals in 18 experimental fire plots that were established as part of the Tiwi Carbon Study led by CSIRO. This fire experiment involved manipulating fire frequency, with experimental burns being similar to those that would be lit during prescribed fire management burns: six plots burnt annually in the early dry season, six burnt triennially in the early dry season and six that remained unburnt.

Key findings: Ecological

The most important finding from our surveys is that native mammal populations on the Tiwi Islands remain generally healthier than most other areas of northern Australia. Unfortunately, our results also suggest that Tiwi mammals are showing initial signs of population decline. These signs are similar to those recorded earlier in Kakadu National Park, and across the northern Australian mainland more generally.

Our live-trapping of small mammals found a 62% reduction in relative abundance between 2000 to 2015, and a 36% decline in the number of species caught at trapping sites.

The proportion of sites where no native mammals were trapped doubled from 13% to 26%. Also in line with our predictions, the three species that showed the greatest declines on Melville Island have also suffered considerable declines on the mainland of northern Australia: the northern brown bandicoot (90% decline), brush-tailed rabbit-rat (64% decline) and black-footed tree-rat (63% decline). These declines

are especially concerning because the local subspecies of the black-footed tree-rat is only found on Melville Island and the local subspecies of the brush-tailed rabbit-rat is only found on Melville and Bathurst islands. We found that brush-tailed rabbit-rat populations contracted on Melville Island over the period 2000 to 2015 to areas where feral cats are not detected and where shrub density is highest.

Our camera trapping in the 18 experimental fire plots showed that the populations of the various native mammal species respond differently to fire frequency, which has implications for effective management of different species.

For now, the Tiwi Islands remain a relatively safe haven for native mammal species, with black-footed tree-rats, northern brown bandicoots and common brushtail possum still widespread on these islands. However, if these initial signs of decline on the Tiwi islands are indeed indicative of population decline, that may mean these

mammals could disappear and not recover, as has happened on the northern Australian mainland, where the patterns of decline two decades previously were very similar.

There are a few possibilities for why native mammals on the Tiwi Islands have been more resilient than those on the northern Australian mainland. First, evidence suggests that the current threats operating on the Tiwi Islands may be less severe. For example, feral cat densities in some parts of the Tiwi Islands appear to be lower than areas on the mainland of northern Australia. Furthermore, fire intensity may be generally lower on the Tiwi Islands compared to the mainland. The Tiwi Islands are also a highly productive ecosystem, receiving the highest annual rainfall in the Northern Territory. This productivity may lead to increased population resilience due to high resource availability, allowing mammals to survive and reproduce at higher rates than on the mainland. Another possibility is that mammals occurred at higher densities on the Tiwi Islands in the first place.

Key findings: Methodological

A key methodological finding was that camera traps are far more effective than live-trapping at detecting a range of mammal species. Figure 1 shows the proportion of sites where species were detected with each method.

In a separate study, we found that camera traps are not only good at detecting mammals but can also reliably detect the threatened partridge pigeon. The partridge pigeon is one of a number of birds of northern Australia's savannas that has declined significantly in numbers and range from pre-

European times. The populations of this bird on the Tiwi Islands may be particularly important for the long-term survival of the species, but like the small mammals, it may also be at risk of decline. This is likely due to a similar combination of factors as those driving the mammal declines.

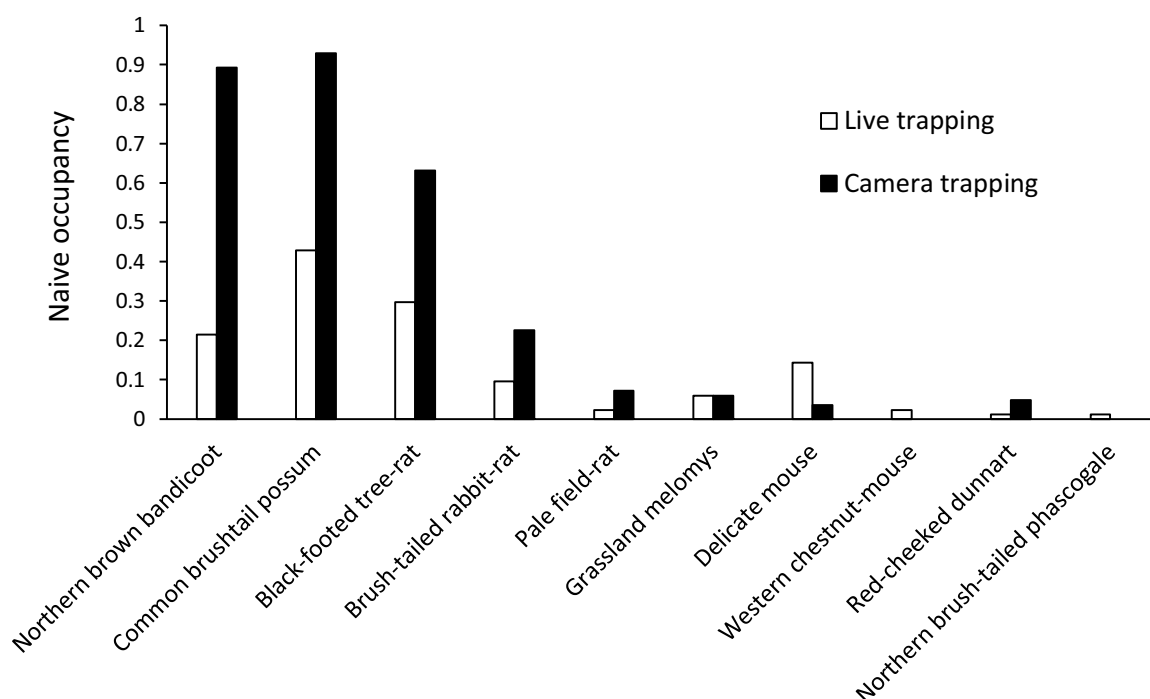


Figure 1: A comparison of the detection rates from live trapping and camera trapping (unpublished data)

A northern brush-tail possum caught during fauna surveys on the Tiwi Islands.
Photo: Tiwi Land Council



Jaime Heiniger and Hugh Davies at work.
Photo: Nicolas Rakotopare



Recommendations

There are likely to be multiple, interacting factors contributing to the declines of native mammals on the Tiwi Islands that we have not yet been able to tease apart. This poses difficulties in making specific recommendations at this stage about management actions. We also acknowledge the limitations to inferring mammal declines from just two instances of trapping spaced 15 years apart.

However, as we found a relationship between the density of the shrubby understorey at sites and the likelihood of finding native mammals, fire management that

maintains and enhances a dense understorey could be important to supporting Tiwi native mammals. Strategic fire and feral herbivore management in the Kimberley bioregion has been shown to benefit small native mammals, and a similar approach to management on the Tiwi Islands could also offer similar advantages.

To help clarify the most effective management actions, we recommend further research to quantify the potential benefits of fire management compared to direct predator control.

Without effective management actions, the native mammals of the Tiwi Islands may be lost from one of their last strongholds, which would likely increase Australia's already disproportionate contribution to global mammal extinctions. The consequences of losing these species would go beyond the ecological, and have significant impact on the expression of culture and Traditional Knowledge on the Tiwi Islands. The need to improve our understanding of the drivers of mammal declines in this, one of the last remaining parts of Australia with an intact assemblage of small mammal fauna, is now critical.

Cited material

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Further Information

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Black-footed tree-rat and her babies.
Photo: Leigh-Ann Woolley

