

What do predator diets tell us about mammal declines in Kakadu National Park?

In brief



Dingo diets were examined based on 1100 dingo scats collected in 2013-15 and 6722 dingo scats collected in the 1980s. Image: Northern Territory Government

This study compares the diet of two mammalian predators (dingo and feral cat) in Kakadu National Park based on fieldwork conducted in the 1980s and again in the 2010s, a period over which most small and medium-sized native mammal species declined precipitously. Notwithstanding this decline, we found that both predator species are still consuming native mammals as prey, including many species that are now rarely captured by researchers, with this predation pressure likely to continue to drive declines. Natural resource management in Kakadu National Park and northern Australia more generally may need to consider not only the management of predators but also the management of factors that may compound their impacts, notably fire and feral livestock.

Background

Small- and medium-sized native mammals have suffered severe declines in much of northern Australia over the past 20 to 30 years, including within protected areas such as Kakadu National Park. These declines differ from declines in southern Australia, where large-scale habitat loss and predation by the introduced red fox (*Vulpes vulpes*) have been key drivers. In northern Australia, foxes are absent and large areas of extensive native vegetation remain intact.

The northern declines are likely due to complex interactions between several factors including

predation, fire, introduced livestock and poisoning by cane toads; but predation, particularly by feral cats (*Felis catus*), has been identified as potentially the most direct cause of decline of the small- and medium-sized mammals in these regions. However, feral cats are not the only predators in Kakadu National Park; dingoes (*Canis familiaris*) also prey on many of the same species. Further, a reduction in ground and middle storey vegetation due to large frequent fires and grazing and trampling by livestock, may be increasing vulnerability to predators.

Northern brown bandicoot remains were found in 29.8% of cat scats and 3.5% of dingo scats collected in Kapalga in 2014 and 2015. Image: Jaana Dielenberg





*In the 1980s 86% of cat scats collected contained small-sized native mammals, in the 2010s this had dropped to 24%.
Image: Northern Territory Government*

What the research looked like

We compared how often different native mammal species occurred in cat and dingo scats collected in Kapalga, in the northern part of Kakadu National Park, from two time periods; the early to mid-1980s and 2013–15.

This time period spans a severe decline in small- and medium-sized native mammal fauna. Kakadu is a region with high fire frequency, and between the first and second time periods in this study the extent of floodplain and lowland rainforest that was affected by fire increased significantly.

We set out to test a prediction that the frequency of small- and medium-sized native mammals being preyed on by cats and dingoes would reflect changes in

the availability of these species, as measured by trapping rates during wildlife surveys. We further predicted that the composition of dingo prey would be dominated by larger mammals, and feral cat prey composition by smaller mammals.

Our aim was to draw conclusions from the temporal comparison that would serve to enhance the management of declining and threatened native mammals in these northern regions. Such management, we projected, should also take into account changes in the structural complexity of savanna landscapes from intense fire and grazing by introduced herbivores, and how this may influence hunting behaviour of predators.

What we did

We conducted wildlife surveys using Elliot and wire traps and collected predator scats (1100 dingo scats, 84 cat scats) in Kapalga on five occasions across three seasons from 2013 to November 2015.

This provided us with a seasonal spread of data that was comparable to the historical data for 1980–1986 (6722 dingo scats, 49 cat scats). We then had the scat content analysed to identify prey to at least genus level. This enabled us to compare the contemporary frequency of prey in predator scats with what had been reported for the 1980s.

Prey species were grouped as follows: feral herbivores, large native mammals (body mass

< 5500 kg), medium-sized native mammals (500–5500g), small-sized native mammals (< 500g), and birds. Historical cat diet data was not reported to species level but instead grouped native animals weighing from 500 g to 15 kg as medium-sized mammals, which could include agile wallabies; therefore we categorised our cat diet data in the same manner for this comparison only. Reptile and invertebrate prey items, which collectively made up < 3% frequency within scats, were excluded from the comparison. We also assessed the similarity between the diets of dingoes and cats at the species level in the contemporary study.

Key findings and their implications

There was a change in the occurrence of prey types in both cat and dingo scats between the 1980s and 2010s. In the 1980s, small-sized native mammals were the prey item occurring at the highest frequency in scats for both dingoes and cats, but this was not the most common prey group for either predator in the 2010s. The percentage of scats containing small-sized native mammals declined from 34% to 0.9% for dingoes and from 86% to 23.8% for cats between the 1980s and 2010 sampling periods. Meanwhile, the frequency of occurrence of medium-sized native mammals remained constant in dingo scats and increased in cat scats, from 12% to 44%.

Over the same period, from the 1980–86 sampling period to 2013–15, the relative abundance of both small- and medium-sized mammals in Kapalga decreased by 95–98%. However, the incidence of these prey groups in the diet of dingoes and cats did not follow the same pattern. This indicates either that the actual abundance of small mammals in the study area is lower than that of medium-sized mammals despite similar capture rates, or that both predators preferentially select for, or have greater predation success with, medium-sized mammals over smaller-sized mammals.

While there is some overlap in prey species between cats and dingoes, dietary overlap in the 2010s sampling was relatively low. For dingoes, large mammals, particularly macropods predominated (68.9% of scats), with medium-sized native mammals (6.5%) and small-sized

Kakadu is a region with high fire frequency, and between the 1980s and 2010s the extent of floodplain and lowland rainforest that was affected by fire increased significantly.
Image: Jaana Dielenberg



native mammals (0.9%) also present in scats at lower frequency.

The frequency of macropods in the diet of dingoes increased significantly from the 1980s to the 2010s, which may be attributed either to a decline in the proportional availability of small mammals and geese, a greater availability of macropods or a combination of the two factors.

For cats, medium-sized native mammals predominated in scats (44%), with small-sized mammals making up almost a quarter of prey (23.8%) while large mammals were infrequent (8.3%). Feral cats also took a greater diversity of small-sized prey species than dingoes.

These results suggest only a slight overlap in diets of dingoes and cats in the 2010s in Kakadu National Park. However, notable prey overlap was found for cats and dingoes in the case of bandicoots, with this species ranking in the top four most frequently occurring species in both dingo and cat scats.

Species detected in predator scats represent a sample from a suite of species available to the predator at a particular time and place. Small mammals, as we have noted, were a much more significant component of the diets of both dingoes and cats in Kakadu in the 1980s, when small mammals were much more abundant. Despite marked reduction from the 1980s to the 2010s in the capture rates of both small- and medium-sized native mammals, some of these species continue to persist in the diets of cats and dingoes at disproportionately high frequencies. This evidence seems to suggest that both predators continue to exert predatory pressure on these native mammal populations that have already experienced substantial declines.

Table 1. Frequency of occurrence (as a percentage of scats) of prey species and prey groups, identified in dingo and cat scats collected between June 2014 and November 2015 at Kapalga. Note frequency occurrence of prey groups accounts for multiple prey occurring within scats

Prey item	Cat	Dingo
Small native mammal (<500 g)	23.8	0.9
<i>Leggadina lakedownensis</i>	1.2	0.0
<i>Melomys burtoni</i>	3.6	0.4
<i>Petaurus breviceps</i>	13.1	0.5
<i>Pseudomys calabyi</i>	1.2	0.0
<i>Pseudomys sp.</i>	1.2	0.0
<i>Sminthopsis bindi</i> ^A	1.2	0.0
<i>Zyzomys sp</i> ^A	1.2	0.0
Rodent, unidentified	1.2	0.1
Medium native mammal (500–5500 g)	44.0	6.5
<i>Dasyurus hallucatus</i> ^B	3.6	0.0
<i>Isoodon macrourus</i>	29.8	3.5
<i>Mesembriomys gouldii</i> ^B	3.6	0.0
<i>Pteropus alecto</i>	0.0	0.3
<i>Tachyglossus aculeatus</i>	0.0	0.9
<i>Trichosurus vulpecula</i>	11.9	1.7
Mammal, unidentified	0.0	0.1
Large native mammals (>5500 g)	8.3	68.9
<i>Notamacropus agilis</i>	7.1	37.5
<i>Osphranter antilopinus</i>	0.0	16.8
<i>Osphranter bernardus</i> ^A	0.0	0.4
<i>Osphranter robustus</i>	0.0	8.2
Large macropod, unidentified	1.2	4.6
<i>Canis familiaris</i>	0.0	1.5
Feral herbivores	0.0	4.4
<i>Bubalus bubalis</i>	0.0	0.2
<i>Bos taurus</i>	0.0	1.9
<i>Sus scrofa</i>	0.0	2.3
Other		
<i>Felis catus</i>	0.0	0.4
Birds, unidentified	16.7	3.6
Invertebrates, unidentified	7.1	0.3
Reptiles, unidentified	4.8	0.1
Human	0.0	0.1
Bone fragments, unidentified species	2.4	17.3

^ASpecies that have not historically been detected in the Kapalga area.

^BEndangered, Environmental Protection and Biodiversity Conservation (EPBC) Act 1999.

Cited material

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Further information

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Key findings (continued)

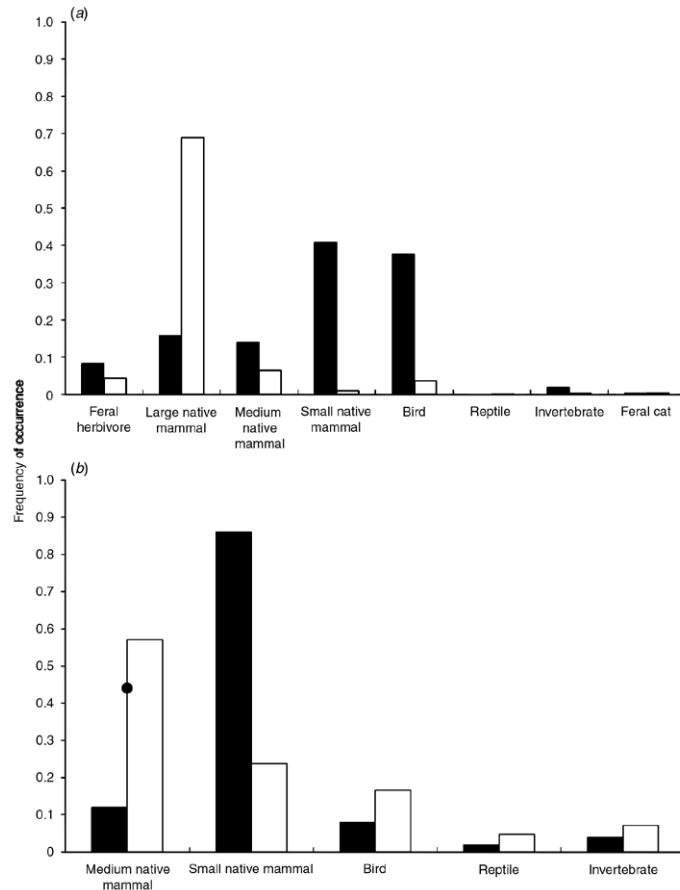


Figure 1. Frequency of occurrence of prey in dingo and cat scats collected at Kapalga in the 1980s (black bars) and 2010s (white bars). Frequency of occurrence is the percentage of scats that contain a particular species. For example, looking at prey items in cat scats (lower graph) and the bars for small native mammals we can see that they were found in more than 80% of the cat scats collected in the 1980s and in around 25% of cat scats collected in the 2010s. (Note: the agile wallaby is a large native mammal, but due to ambiguity in the historical data it has been classified as a medium-sized mammal in cat scats in this comparison. The black dot represents prey frequency of medium-sized native mammals in cat scats if agile wallabies are excluded).

Acknowledgment

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Recommendations

The ecologies of feral cats and dingoes in savanna ecosystems and the interactions between these two predators and native mammals are likely to be complex. Current knowledge of their interactive effects in Kakadu and similar ecosystems remains poor, presenting opportunities for further research into the top-down effects of these predators on small and medium-sized mammals.

However, our findings indicate some matters that will be of importance to natural resource managers. First, although predation by feral cats is a major threat to small- and medium-sized native mammals, dingoes may also play an important role in limiting their recovery. Further, disturbance from fire and grazing by introduced herbivores has been shown in other studies to amplify the predatory impacts of feral cats on native mammals. Predation more generally, not just by feral cats, may be exacerbated by these disturbance processes. Management programs therefore need to be planned holistically and take an integrated approach to mitigating the impacts of all relevant pressures, including but not limited to feral cats, particularly in landscapes with other significant disturbance regimes and populations of predators.