**Science** for Policy

Research findings in brief

Project 3.2.2.3

Threatened Species Recovery Hub

National Environmental Science Programme

# Monitoring wildlife in the Top End

## In brief

Long-term monitoring has been crucial for documenting the status and trends of birds, mammals and reptiles, in northern Australia, especially a drastic decline in small-to-medium sized mammals. Understanding where these species occur in the landscape and how difficult they are to detect during monitoring is crucial for evaluating and designing future monitoring programs, and for broader conservation planning across the Top End.

In this study, we collated and fitted occupancy-detection models to data from long-term monitoring across eight major Top End conservation reserves (five national parks, two Indigenous Protected Areas and one private conservation area), which were collected by the Northern Territory Government Department of Environment and Natural Resources.

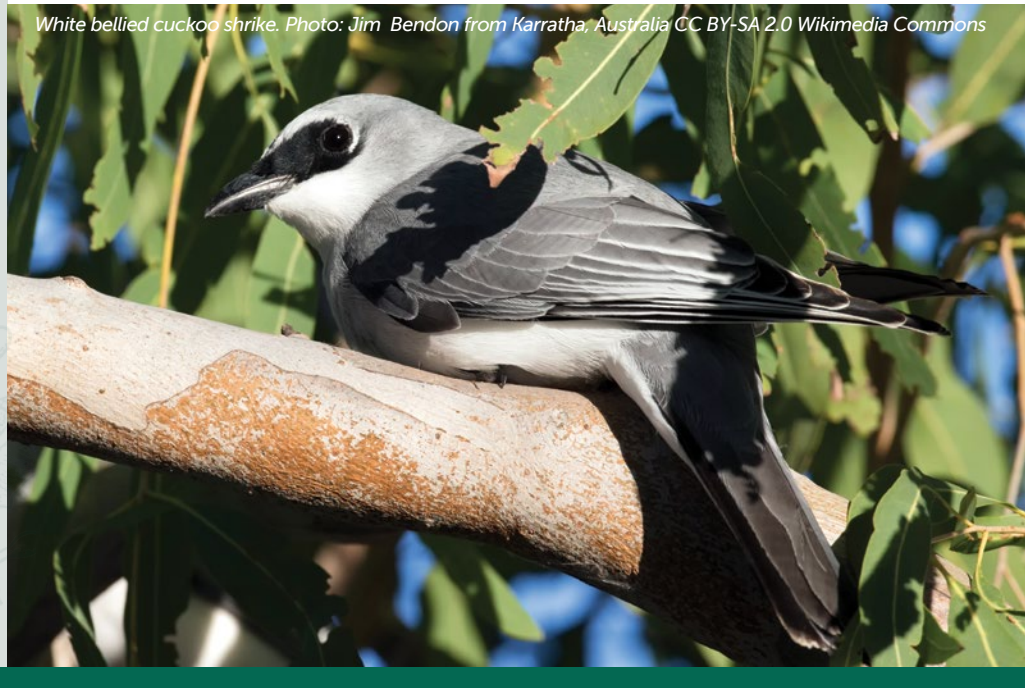
The findings provide a snapshot of the current occupancy of a large proportion of the mammal, reptile and bird community across the Top End, and the drivers of current species distributions for more common species. We have also estimated the effectiveness of existing sampling methods (live trapping methods, camera trapping and active searches) at detecting species present at sites.

## Why the research is needed

The Northern Territory Government's Department of Environment and Natural Resources has been undertaking long-term monitoring of vertebrate wildlife (birds, mammals and reptiles) across major Top End conservation areas. This long-term monitoring program has been crucial for documenting the status and trends of vertebrate communities in this region, as well as their responses to threats and management interventions. In particular, it has tracked a drastic decline in small-to-medium sized mammals, especially over the period from 1996 to 2009.

While the existing monitoring program has been instrumental for setting conservation priorities, the Northern Territory Government sought to evaluate the program's effectiveness at meeting existing and new monitoring objectives. Given the logistical constraints, such as the size, remoteness and difficulty of accessing many parts of Top End, conservation managers want a better understanding of where species occur in the landscape, and how effective the existing sampling methods are at detecting species at monitoring sites. These important considerations were the focus of this study.

The study findings are informing broader conservation planning and management across the Top End and will be essential to evaluating and designing future monitoring programs.



*White bellied cuckoo shrike. Photo: Jim Bendon from Karratha, Australia CC BY-SA 2.0 Wikimedia Commons*

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*Short-eared rock wallaby* (Petrogale brachyotis).
*Photo: Jon Connell CC BY 2.0 Wikimedia Commons*

## What we did

The research team collated long-term survey data collected by the Northern Territory Government for 242 native species of reptile, bird and mammal (excluding bats) from 333 sites located in eight conservation reserves. This included five national parks (Kakadu, Litchfield, Nitmiluk, Garig Gunak Barlu and Gregory), two Indigenous Protected Areas (Wardekken and Djelk) and one privately owned conservation reserve (Fish River Station).

Sites covered all major vegetation types within dryland habitats in the Top End, including eucalypt woodlands and eucalypt open forest, monsoon rainforest, sandstone heath, floodplain, wetland and riparian communities.

A standardised monitoring protocol was conducted for three to four days and four nights at sites, which included:

- Birds – daily timed-area searches and nocturnal spotlight searches
- Reptiles – pitfall traps and nightly spotlight searches
- Mammals – pitfall traps, cage traps, Elliott traps, camera traps and spotlight searches.

In addition, 5 camera traps were deployed at sites for five weeks.

We only considered monitoring data collected between 2011 and 2015 in order to provide the most up-to-date picture of the status of each species. The team also collated information on a range of variables, such as:

- Climatic variables – rainfall, temperature
- Topographic variables – elevation, ruggedness, distance to perennial creeks
- Fire history – number of fires, time since last fire, fire extent, proportion burnt, fire patchiness for each site.

We fitted statistical occupancy-detection models with the survey data to estimate the presence/absence of species and their richness across the Top End, as well as to determine how effective sampling methods were at detecting species using sites.

We could only fit statistical models to those species for which we had sufficient data, which was a total of 136 species (83 birds, 33 reptiles and 20 mammals). This is less than a quarter of the approximately 600 terrestrial vertebrates known to occur in the study region. The models therefore cover the more common and/or detectable species in the region.

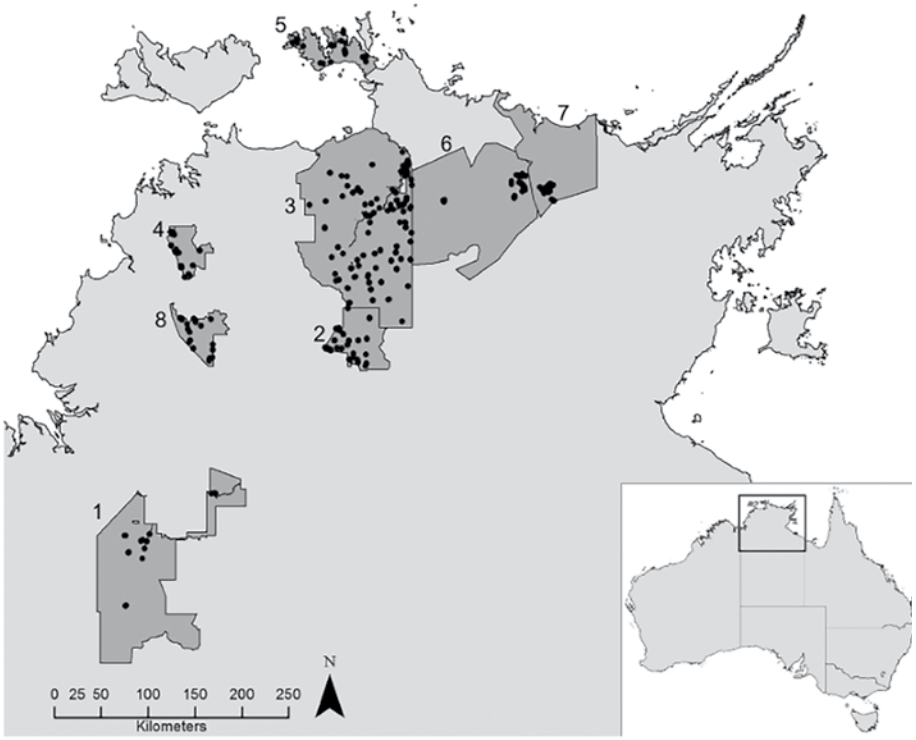



***Figure 1:*** *Location of the 333 sites in the Top End used to model presence/absence and detectability of vertebrates (1: Gregory/Judbarra National Park; 2: Nitmiluk National Park; 3: Kakadu National Park; 4: Litchfield National Park; 5: Garig Gunak Barlu National Park; 6: Warddeken IPA; 7: Djelk IPA; 8: Fish River Station).*

## Key findings

### Presence/absence of species

As expected, we found that occupancy of modelled species was highly variable. All faunal groups contained some species with low frequency of occupation. In general, birds had higher rates of occupancy than other groups, and mammals the lowest rates of occupancy across sites. The buff-striped *ctenotus Ctenotus storri* was the rarest species we could fit models to (predicted to occur at 1% of sites). The most common bird was the white-bellied cuckoo-shrike (*Coracina papuensis*) (81% of sites). The most common reptile was the bauxite (or two-spined) rainbow skink *Carlia amax* (49% of sites). And, the most common mammal was the agile wallaby *Macropus agilis* (30% of sites).

### Species richness

We predicted relatively higher species richness in rugged terrain, especially along the edge of the Arnhem plateau and in the south-west, as well as across coastal lowlands. This pattern, which was particularly evident for mammals and reptiles, might reflect the role of rugged escarpments and densely vegetated areas as refuges for some species from threats such as feral cats and grazing by feral herbivores. In contrast, bird richness was highest across the vast coastal and lowland areas, which is in line with previous findings that suggests occupancy is driven primarily by seasonal temperatures, rainfall and fire frequency.

### Species detectability

We estimated detection probability based on one day/night of live trapping, bird search and nocturnal searches using the protocol described above. Overall, detectability during a day/night of live trapping and searches was lowest for mammals (13% chance of detection), and higher for birds (23%) and reptiles (28%), although estimates varied widely between species and between sampling methods. For example, assuming a bird was present at a site, the chance of detecting it during one day (three 10-minute searches) ranged from 1% for the collared sparrowhawk *Accipiter cirrocephalus* to 74% for the rufous banded honeyeater *Conopophila albogularis*.

Of the 20 mammals detected, six were detected exclusively on camera traps (mainly kangaroos and wallabies), two were not detected using this method, and 13 were detected by cameras and another method. Of this last group of 13 mammals, five were detected with a higher probability on cameras deployed for one week than when using nightly live trapping methods. A one-week deployment of the five camera-trap array had a much higher chance of detecting mammals compared to one day and night of live trapping. Weekly rates using an array of five camera traps at monitoring sites ranged from 2% for the delicate mouse *Pseudomys delicatulus* to 94% for the short-eared rock wallaby *Petrogale brachyotis*.

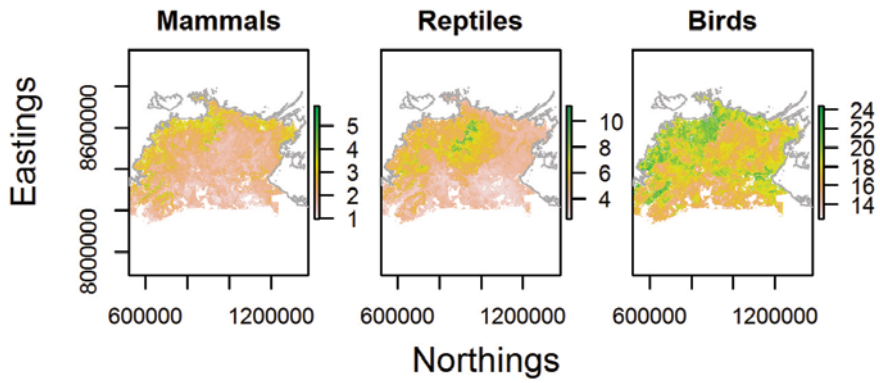



***Figure 2:*** *Relative species richness maps for mammals, reptiles and birds for the 136 species we could fit models to. The scale bar is the probable occupancy for each species modelled, not the expected number of species in the region.*

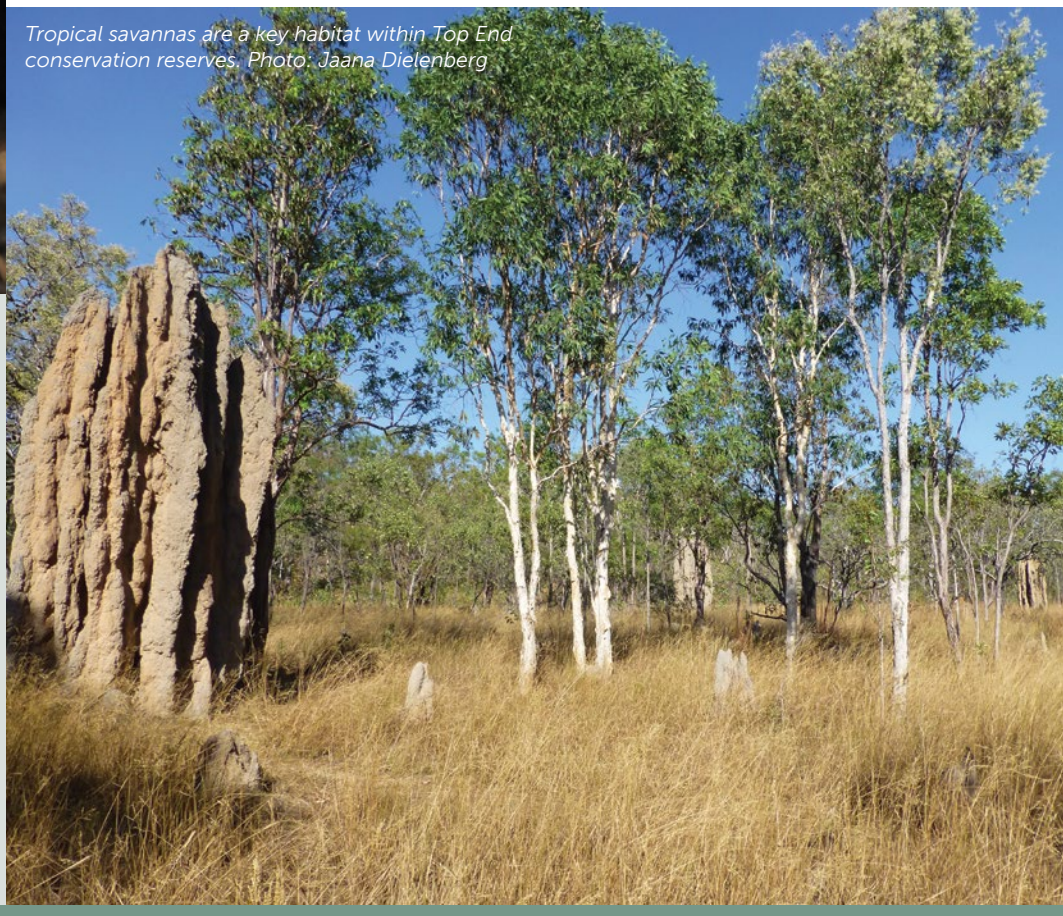
*A northern brown bandicoot caught in a cage trap during mammal monitoring. Photo Jaana Dielenberg*


*ABOVE: A one-week deployment of a five camera-trap array had a much higher chance of detecting mammals compared to one day and night of live trapping. Photo: Jaana Dielenberg*

## Conclusions and recommendations

This research has provided important detail on the current occupancy and detectability of a large proportion of the mammals, birds and reptiles of the Top End of the Northern Territory. This information is valuable to inform the redesign of a long-running monitoring program, in order to make it more effective and to better meet current management priorities.

Because we only had sufficient data to model 136 species, much less than the estimated 600 terrestrial vertebrates known to occur in the study region, our richness maps are consequently biased towards the more common, widespread and detectable species, and are not representative of the true richness of the region.



*Tropical savannas are a key habitat within Top End conservation reserves. Photo: Jaana Dielenberg*

## Citation

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## Further Information

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