Science for Saving Species

Research findings factsheet

Project 4.4.11

Threatened Species Recovery Hub

National Environmental Science Programme

Using detection dogs and potential habitat models to find and monitor cryptic Endangered antechinus species

In brief

The Endangered silver-headed antechinus and black-tailed dusky antechinus are restricted to tiny populations in a few mountain ranges found in mid-eastern Australia.

Effective conservation depends on a good understanding of core habitat areas where they persist so that management can be directed to these areas. However, their distributions are not well known, and they are hard to detect with traditional fauna survey methods.

This project tested the effectiveness of conservation detection dogs to survey for these species and optimised the selection of survey sites using potential habitat models.

Detection dog surveys are an effective method for rapidly surveying sites to assess for the presence or absence of small cryptic mammal species.

We found that, once a dog is trained, dog surveys are much faster and less resource intensive than Elliott trapping and are much more likely to detect these species when they occur at low densities.

However, Elliott trapping will continue to play an important role in providing data on abundance, sex ratios, growth rates and reproduction. This method also enables the collection of samples such as tissue samples (for genetics or disease studies), scats (for dietary analyses), and scats/hair samples or swabs (for training and validating detection dogs).

Detection dog surveys detected both species of antechinus at new sites. However, following extreme fires and droughts over the last few years, our surveys have suggested reductions in the population sizes and number of sites occupied by each of these species. Nevertheless, we are hopeful that with the recent 2021 rains, we may see some signs of recovery, particularly for black-tailed dusky antechinus populations.

The silver-headed antechinus suffered significant loss of habitat during recent bushfires. Image: Mark Sanders, EcoSmart Ecology

QUT Queensland University of Technology · The University Of Queensland Australia · Queensland Government · NSW Government Saving Our Species · Canines for Wildlife · Gidarjil Development Corporation Limited

Background

The silver-headed antechinus (*Antechinus argentus*) and black-tailed dusky antechinus (*Antechinus arktos*) are Endangered carnivorous marsupial species that survive only in tiny populations in small areas of certain mountain ranges in Queensland and/or NSW. They were recently ranked in the top 20 Australian mammals at greatest risk of extinction.

These two species are facing major threats from climate change, as their cool and high-elevation habitats become hotter, possibly drier and subjected to worsening droughts and increased severe fire weather conditions. They are also subject to pressures from feral species, as both species likely fall prey to cats and foxes and, in the case of silver-headed antechinus, have their habitat modified by the trampling and grazing of pigs, cattle and horses.

There is an urgent need to effectively monitor these two threatened antechinus species, identify as-yet unknown populations, and better understand their habitat and climate requirements to improve management programs.

Traditional detection methods such as Elliott (metal box) traps are time consuming and have been providing low trap success for these rare species. Similarly, camera traps can take months or even years to detect the species at sites where they occur in low densities. Detection dogs offer the promise of faster and more efficient detection.

We need to understand the most appropriate combination of detection techniques to be used to better conserve these rare and threatened marsupials before more populations become extinct.

If numbers become too low, the populations are likely to experience a reduction in genetic diversity, which would make recovery even more difficult. The loss of genetic diversity would also reduce their capacity to adapt to altered future conditions caused by climate change.

Research aims

We aimed to identify the most appropriate combination of detection techniques to better support conservation of the silver-headed antechinus and black-tailed dusky antechinus.

We compared the effectiveness of detection dogs to traditional survey methods to detect these two cryptic small mammals and tested the optimisation of canine detection surveys by combining them with potential habitat modelling.

We applied these methods to increase understanding about the distribution and habitat requirements of these poorly known species and find out how they are faring in light of recent droughts and bushfires.

PhD candidate Stephane Batista setting Elliott traps in the field. Elliott traps have a spring-loaded door that snaps shut when animals step on the trigger inside the trap. Image: Nicolas Rakotopare TSR Hub

LEFT: Lynn the handler with one of the detection dogs, Ash. Surveys by detection dogs can be optimised by using potential habitat models to identify likely sites. Image: Canines for Wildlife

What we did

As the actual and potential distributions of these species are not well known, potential habitat models were developed – see box.

We undertook surveys from 2019–21 using conservation detection dogs at sites with recent and historical records and also at sites predicted by the model. We targeted each species in the few months before breeding, to maximise our chance of detection.

We tested the dogs at known sites that had been previously surveyed by traditional trapping methods. We also used the dogs to survey previously unsurveyed sites. At sites where dogs made positive detections, we deployed Elliott traps where logistics and resources allowed.

At sites where Elliott traps were set without success and/or in sites where they could not be deployed, we left camera traps for several months or more.

In this way, we tested the relative efficacy of each detection method and gathered important information about the distribution and abundance of the threatened antechinuses.

We surveyed for the silver-headed antechinus within Blackdown Tableland, Kroombit Tops and Bulburin National Parks. For the black-tailed dusky antechinus, we conducted surveys in Springbrook and Lamington (Qld), and Border Ranges, Nightcap and Washpool (NSW) National Parks.

This project was undertaken as a partnership between Queensland University of Technology (QUT) the University of Queensland (UQ), the Queensland Government Department of Environment and Science (DES), Canines for Wildlife, the New South Wales Department of Planning, Industry and Environment (NSWDPIE) and Gidarjil Indigenous Rangers.

DES contributed significant resources to the project through staff and volunteer time, institutional knowledge, data, modelling, expertise and on-ground logistical capabilities. Canines for Wildlife trained and deployed the detection dogs. NSWDPIE contributed staff expertise and assisted with on-ground logistics. Gidarjil Indigenous Rangers assisted with field surveys of silver-headed antechinus. Volunteer students from QUT and UQ also contributed to the project.

This was a many-faceted research project that presented significant field logistical challenges into remote areas, and it was only possible via contributions of all members of the team.

The value of potential habitat models

At the start of this project, there were only a small number of geographic records for these two recently described species. We knew they were likely to occur at additional sites but knowing where to look for them was challenging. Building an understanding of the preferred habitat and other factors that shape habitat preferences is important for managing small and cryptic mammals.

To tackle this problem, we used potential habitat models created by DES. These models incorporated habitat characteristics derived from existing DES records and predicted the areas most likely to support suitable antechinus habitat. The models assume that the known distribution of a species is a good indicator of its ecological requirements. The models can identify other sites that share these characteristics to map a potential distribution.

As new sites are surveyed and where presence is confirmed, the results are fed back into the models to refine them. To maximise the opportunity to test and refine a model, we surveyed habitat predicted with high probability but also included a selection of medium and low probability areas for comparison.

The models have reinforced our views that some areas are quite likely to support the species, and typically, this was subsequently corroborated by either targeted trapping and/or dog work. The potential habitat modelling has thus proven invaluable in identifying potential sites and detecting new populations. These models will be used as a basis to develop and test subsequent models that can be applied to both threatened species.

Potential habitat models can be projected to model habitat distribution under future climates and to predict how these antechinus species may be affected by ongoing impacts of climate change, including bushfires.

Key findings

Survey methods

We successfully piloted the detection dog technique in field trials during 2017 and 2018. This technique has now been used to detect the two antechinuses each field season from 2019.

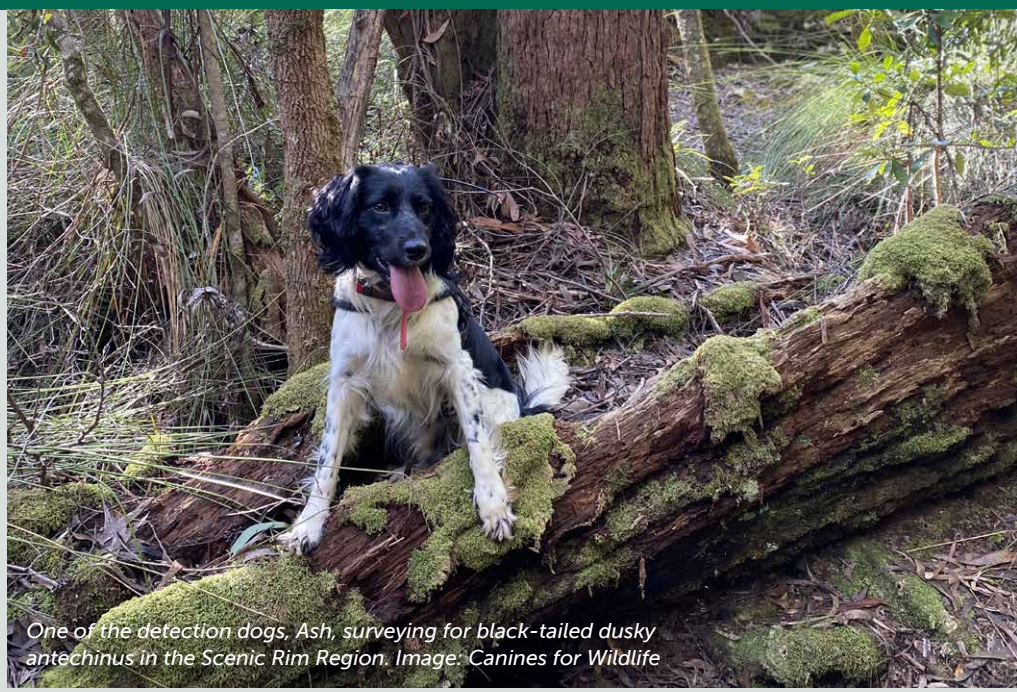
The detection dog surveys are much faster than Elliott or camera trap surveys and are able to indicate presence or absence more effectively, especially when species occur at low densities.

It takes a single dog and handler approximately 30–45 minutes per site, and they are able to cover 4–6 sites per day. In comparison, previous Elliott trapping surveys in new areas typically invested 300–600 trap nights of effort at each site, equivalent to 100–200 traps laid each night, for three nights by a team of at least two people.

When antechinuses occur at very low densities, Elliott trapping surveys often fail to detect them, while dogs are still likely to locate them.

Dogs detected our target species at a subset of sites consistently between 1–2 years following initial detection, and repeat visits to negative sites were undertaken in this period. Camera traps deployed following dog detections were usually able to record the target species, corroborating canine results, although sometimes this took up to a year or more of camera deployment. There was also Elliott trapping at a number of these sites before and after dog detections that was useful in validating the method.

The combination of potential habitat models and canine surveys resulted in the discovery of black-tailed dusky antechinus in several montane sites within one new national park location. We also found new sites for the silver-headed antechinus within several known locations and at one new national park location.



One of the detection dogs, Ash, surveying for black-tailed dusky antechinus in the Scenic Rim Region. Image: Canines for Wildlife

Intensive dog surveys are also helping us to better understand the patchy distribution of both species within the national parks where they occur. We are investigating this by deploying the dogs in sites about 1 km apart, and in the future, we may be able to relate this to fine-scale habitat and environmental variables.

However, while detection dogs are extremely efficient at confirming presence or absence, Elliott trap surveys remain a critical tool in the management of these species as they enable us to collect information on abundance, sex ratios, reproduction, growth and health, and to collect genetic samples and scats/hair samples or swabs for training and validating detection dogs.

Elliott trapping was not always logistically possible and even when employed, often did not confirm detections. Our research found that camera traps were more successful than Elliott trapping in terms of corroborating dog detection locations. Camera trapping can also be resource intensive due to the need to attend sites multiple times to set, rebait and collect traps, and then to analyse the resulting images. It also does not allow data or samples to be collected from live animals.

The antechinus species

The 2019–20 bushfires burned large forest tracts in south-eastern Australia. Some areas had already been subjected to prolonged drought. The two Endangered antechinus species were found during annual monitoring in 2020, after the drought and fires, but populations of each species have suffered. The black-tailed dusky antechinus appears to have been severely drought-affected, whereas habitat of the silver-headed antechinus was impacted by both drought and bushfires (in 2018, 2019 and 2020 fire seasons).

LEFT: PhD candidate Stephane Batista setting up a camera trap at Bilborough, Springbrook National Park. Camera traps are useful for corroborating detection dog surveys. Image: Tomas Poch

Key findings (continued)

Black-tailed dusky-antechinus

Populations in the Scenic Rim region where this species occurs in Queensland appear to have contracted to the highest and wettest areas, and some populations have declined. Importantly, the Scenic Rim populations are patchy, separated and some are genetically distinct, so they may warrant independent management.

In 2019, black-tailed dusky antechinus were detected by dogs, cameras and Elliott traps at several high-altitude sites in Lamington National Park. However, based on annual monitoring since 2014, the species appears to have suffered major population declines since 2019 in Springbrook National Park. None of its known habitat was burnt.

Although Elliott and camera trap surveys have failed to detect the species, black-tailed dusky antechinuses were detected by the dog team at Springbrook in both 2019 and 2020. This suggests that numbers are presently very low, but the species is persisting within Springbrook.

Silver-headed antechinus

The silver-headed antechinus suffered extensive impacts to its habitat during bushfires in 2018, 2019 and 2020, across all three protected areas it was known from. Bulburin National Park appears to support the largest population of silver-headed antechinus. In 2019, over 3,000 hectares of rainforest and wet eucalypt forest burnt in this national park. This represents an estimated one third of potential silver-headed antechinus habitat in Bulburin. Additional potential habitat burnt at Bulburin during a fire in 2020.

However, both QUT and DES teams have since captured the species at several regenerating sites in 2020 and 2021. A combination of previous DES trapping surveys and subsequent dog detections allowed us to undertake Elliott trapping at targeted sites within Bulburin National Park to assess the status of the animals and to collect genetic samples (ear clips). In future, we may be able to assess if genetic issues, such as bottlenecking, are occurring.

Our surveys indicate that the silver-headed antechinus is found in both wet open forests and closed forests at high altitude. However, all suitable forest habitat for this species may be affected by bushfires. Pleasingly, our May–June 2021 surveys of silver-headed antechinus indicated that this species still occurs in previously detected populations, even in areas that burnt in the bushfires.

It was believed that high elevation areas of Carnarvon National Park in Central Queensland may support potential habitat for silver-headed antechinus not identified in the modelling (due to masking applied in the modelling/predictions). The area had been previously surveyed and some (genetically corroborated) yellow-footed antechinus (*Antechinus flavipes*) were detected. However, additional dog work conducted during the present project provided further evidence that the elevated cool upland open forests of Carnarvon National Park do not appear to support silver-headed antechinus.

Fieldwork will continue in previous and new sites in 2021, and hopefully beyond. We are also intensifying camera trapping at sites where there have only been detections by dogs for more than two years.

Implications

The findings of this project provide important guidance for government agencies and non-government conservation groups wishing to implement detection dog surveys as part of broad-scale conservation management.

This project has established the utility of conservation detection dogs to detect cryptic small mammals. The method allows rapid surveys of a much greater number of sites than is possible with traditional survey techniques, given constraints of resources and logistics.

There is still a need to employ Elliott trap and camera trap surveys to collect additional information on populations. However, these are resource intensive methods, and by directing these surveys to sites where dogs have already made positive detections, we could greatly reduce wasted effort on surveys of sites where animals are not detected by dogs.

This project has also demonstrated how surveys can be optimised by using potential habitat models to identify likely sites. This, coupled with the more efficient method of using detection dogs, has been demonstrated in this project to result in higher success and the discovery of new populations.

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Implications (continued)

The research has greatly increased knowledge of the distributions of the poorly known silver-headed antechinus and the black-tailed dusky antechinus and the sites where these species are persisting following recent droughts and large-scale bushfires.

While detection dogs have located both antechinus species at slightly lower elevations (500–600 m) at a few sites, the majority of detections have been at very high-elevation sites, which matches expectations based on historical data. It is probable that both species have been, and will continue to be, negatively affected by climate change, because warming temperatures promote lower moisture levels and more pronounced drought and fires.

Despite the silver-headed antechinus having been found this year in sites that burned during the 2019 bushfires, one-third of the species' prime habitat at Bulburin National Park has burned. The silver-headed antechinus occurs in both fire-adapted and fire-sensitive ecosystems. Post-fire recovery in the latter is likely to take much longer than in the former, and at Bulburin National Park this is affected by some significant weeds. In fire-adapted ecosystems at Kroombit National Park and Blackdown National Park, post-fire recovery is not being impacted by weeds but rather by feral cattle, horses and pigs, with only the latter being an issue in all forested habitat supporting silver-headed antechinus at Bulburin. These threats are management priorities, with control efforts boosted in 2020-21 using additional financial support provided through the Australian Government's 'Bushfire Recovery Package for Wildlife and Their Habitat'. Planned burning, to minimise the risk of future bushfires in critical habitat, is considered a priority by park managers. Meanwhile, the black-tailed dusky antechinus and other small mammals at Springbrook National Park have clearly been negatively affected by the prolonged drought through 2019–20, and these areas may also need management intervention (for example, targeted feral cat control) to aid populations to recover.

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