Targeting surveys to find the elusive northern brush-tailed phascogale

In brief

The threatened northern brush-tailed phascogale (*Phascogale pirata*) is one of the least-known mammals in Australia. While the few available records indicate a decline in its distribution and numbers, it has not previously been subject to targeted surveys. Consequently, there is little information available to assess population trends or conservation status.

Determining an effective survey and monitoring approach is essential to the ongoing management of this species; we trialled a method tailored specifically to detect it.

We deployed 50 closely spaced motion-sensor cameras on Melville Island over 10 months in 2018–19. The cameras were baited and secured about 3 m above ground to trees with relatively large diameter trunks.

We detected northern brush-tailed phascogales 16 times on eight cameras, with detections most likely on large Darwin stringybark (*Eucalyptus tetrodonta*) trees during the wet season. The results suggest that survey efforts for this shy, cryptic species should be seasonally targeted and focused on large trees, as these are more likely to bear hollows, a critical resource for the northern brush-tailed phascogale.

Background

The northern brush-tailed phascogale (*Phascogale pirata*) is one of Australia's most poorly known mammals. It is known only from the coastal savannas of monsoonal northern Australia (the Top End) and is likely to have suffered from widespread declines, although this is very difficult to quantify because so few historical records exist.

Effective biodiversity conservation depends on adequate and reliable information about the distributions and population trends of species.

The northern brush-tailed phascogale is very elusive, only rarely turning up in widespread fauna surveys using conventional methods (e.g., ground traps, pitfalls, spotlight searches). It is also suspected to be highly arboreal. These characteristics mean that general wildlife survey methods are unlikely to be effective in detecting and monitoring this species.

Beyond taxonomy work, very little published research has focused on the northern brush-tailed phascogale. It has often been excluded from the analyses of published research that has dealt with multiple species because there are too few (or no) records.

Without targeted work to monitor this species – in order to fill essential knowledge gaps about its population trends, ecology and threats – this species is at risk of slipping into extinction unnoticed. Only a small amount of work has previously been undertaken to trial monitoring methods for this species and they have had only limited success.

Significance of Melville Island

The most recent records of the northern brush-tailed phascogale derive from Melville Island. Melville Island is one of the two largest of the Tiwi Islands, which lie off the coast of the Northern Territory.

Melville Island retains its complete pre-European mammal assemblage and is thought to be a stronghold for many threatened Top End native mammals.

RIGHT: The elusive northern brush-tailed phascogale. Image: Jaime Heiniger

Background (continued)

Prior work on Melville Island between 2015 and 2017 using camera traps captured nine independent records of the northern brush-tailed phascogale from three nearby plots at a single site (Taracumbi) over two years.

Surveys in other areas

The species has not been recorded in areas on the mainland with good habitat (e.g., Cobourg Peninsula) for more than a decade, despite extensive survey effort that has included methods suitable for highly arboreal species, such as nest boxes.

Several examples of targeted surveys (using camera traps or live traps secured to trees above the ground and nest boxes) have successfully recorded a closely related species of brush-tailed phascogale (*P. tapoatafa*), elsewhere in Australia.

Research aims

We tested a tailored methodology for detecting the northern brush-tailed phascogale, with the aim of informing continuing survey and monitoring of this species.

What we did

With the support of the Tiwi Land Council, Tiwi Land Rangers, Tiwi Plantations Corporation and Plantation Management Partners and two volunteers, we conducted a targeted survey for northern brush-tailed phascogales at Taracumbi on Melville Island over 10 months from late June 2018 to early May 2019.

We established a camera grid (approximately 500 m x 1000 m) consisting of 50 motion-sensor cameras spaced 50–200 m apart, fixed to steel brackets (approximately 60 cm long) and secured to trees 3 m above the ground, with the camera focal point facing the trunk.

We used camera traps because they are non-invasive and can be deployed for a long period of time, giving a potentially higher chance of detection. The grid array was designed to flood the area (i.e., we used a high number of cameras for the area to maximise chance of detection).

We secured the cameras to trees above ground level because this has been shown to be successful for detecting other species of phascogale elsewhere in Australia. We targeted large, rough-barked trees of three dominant Eucalypt species of the savannas of Melville Island, Darwin woollybutt (*Eucalyptus miniate*), Darwin stringybark (*E. tetrodonta*) and Melville Island bloodwood (*Corymbia nesophilia*). Larger trees were targeted because they are more likely to contain hollows, a critical resource for the hollow-denning northern brush-tailed phascogale.

We baited the cameras twice over the duration of the survey, with two types of bait; (1) cotton wadding soaked in a mixture of honey, peanut butter and linseed oil, encased inside PVC pipe canisters and sealed on either end by a vent cowl (which was made up of a heavy-duty mesh material, allowing the scent to escape the otherwise sealed cannister), and (2) a mixture of honey and water, sprayed along the trunk of the tree from 2 m above the camera to ground-level.

Key data recorded

We recorded the species and diameter at breast height (DBH) of each tree to which we secured a camera.

We sourced monthly rainfall data (averaged over the preceding decade) from the Bureau of Meteorology. Rainfall is likely to influence net primary productivity of the phascogale's habitat, which may influence numbers of the species, and its food: spiders and insects in the canopy of trees.

We recorded detections of northern brush-tailed phascogales on each tree. We defined a detection as a set of camera images separated by 30 minutes.

Because the cameras were deployed for such long periods

What we did (continued)

(around 300 days), we summarised the data, pooling it by month, so that there were 10 observations for each camera.

The age (and persistence) of baits may influence detections, so we calculated the time since bait deployment for each observational month (scaling from 1 for within one month of bait replacement to 7 for within six months of bait replacement).

Key analyses undertaken

We used models to investigate the influence of our four variables (tree species, DBH, average monthly rainfall and time since bait deployment) on the likelihood of detecting the northern brush-tailed phascogale at Taracumbi.

Given previous records, we suspected that the detectability of phascogales might differ between the wet (summer) and dry (winter) seasons. We therefore allocated each month to either "wet season" (average monthly rainfall >100 mm) or "dry season" (average monthly rainfall <25 mm) categories, and compared them statistically.

Northern brush-tailed phascogales favour Eucalyptus tetrodonta *species. Image: Cassandra Holt*

Hayley Geyle affixing a camera trap to a tree. Image: Cassandra Holt

What we found

We successfully detected the northern brush-tailed phascogale 16 times on eight cameras over the duration of the survey.

In summary, the factors that were found to influence detections were:

- Type of tree – most of the detections occurred on *E. tetrodonta*, though they were also detected on other trees.

- Size of tree – all detections occurred on trees with a DBH greater than 41 cm.

- Season – all detections occurred between October and April (build-up and wet season)

- We found no significant effect of time since bait deployment on the likelihood of detecting a phascogale.

Our results suggest that surveys that aim to monitor the northern brush-tailed phascogale should include intensive effort, and target large, rough-barked trees (especially *E. tetrodonta*) during the late dry/build-up and wet seasons.

Implications and recommendations

The findings of this study will be of greatest importance to conservation managers and researchers wanting to survey populations of the northern brush-tailed phascogale.

Very little is currently known about the ecology, population trends, threats and conservation status of this shy and cryptic species. Effective survey work and monitoring are urgently needed, as the current lack of information constrains the direction and effectiveness of management responses and could allow the species to slip to extinction unnoticed.

General wildlife surveys aimed at multiple species are unlikely to detect this species adequately to estimate population sizes or trends, and therefore would not be adequate to inform the continuing management of the species and its habitat. However, our study has shown that with suitable, intensive and targeted sampling, successful survey and monitoring is possible. Surveys should focus on large rough barked trees during the build-up and wet season.

Given the importance of having an effective survey method to provide evidence on population changes and to inform management decisions, we recommend undertaking additional work to develop an optimal survey regime for the northern brush-tailed phascogale.

It would be worthwhile testing the efficacy of ground-based motion-sensor cameras set to face the trunks of trees, as this would be far easier to implement logistically, and has proven a successful approach for monitoring other phascogale species elsewhere in Australia.

It would also be worthwhile complementing cameras with nest boxes or tree-sited Elliott traps to provide additional information that cannot be obtained from cameras alone (e.g., population size and structure, breeding and genetics, disease and health status). The efficacy of such approaches should also be tested.

Nevertheless, the method we describe here would be useful for assessing whether previously reported populations of the northern brush-tailed phascogale have persisted, and to survey for currently unknown populations (with guidance from habitat mapping).

Cited material

Geyle, H.M., Woolley, L-A., Davies, H.F., Woinarski, J.C.Z. and Murphy, B.P. (2020). Targeted sampling successfully detects the cryptic and declining arboreal marsupial (*Phascogale pirata*) in northern Australia. *Pacific Conservation Biology*. DOI: 10.1071/PC20008.

We secured 50 cameras to trees about 50 to 200m apart in a grid of approximately 500m x 1000m. Image: Cassandra Holt

Further Information

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