Science for Saving Species

Research findings factsheet

Project 3.3.2

Threatened Species Recovery Hub

National Environmental Science Programme

Tracking Leadbeater's possum in regrowth mountain ash forest

In brief

The distribution of the Critically Endangered Leadbeater's possum (*Gymnobelideus leadbeateri*) is largely confined to a small area of the Victorian Central Highlands. This species relies on hollows in large old trees for denning and nesting. Tree hollows are usually only found in mountain ash trees over 120 years of age. However, most of the known distribution of Leadbeater's possum is in forest that is 80 years of age or younger, and our understanding about how this animal uses and moves through young forest is limited. To address this knowledge gap, we designed a new harness and GPS tracker system that could safely track the nocturnal movements of Leadbeater's possum. We refined the harness design during repeated trials on captive animals at Healesville Sanctuary.

The project has been challenging. We found Leadbeater's possum difficult to trap in mountain ash regrowth forest. However, we have solved many technical problems and are currently tracking the movements of multiple Leadbeater's possums through signal detection arrays. Our preliminary tracking work indicates that individual possums are moving up to 600–700m between nest sites. The animals could be moving these long distances between den trees due to the dwindling number of hollow-bearing trees in the mountain ash forests. Our tracking research will continue for several years, and will provide new insights into how far Leadbeater's possum colonies travel through forest of different ages. This information will be vital to ensuring the development of effective management strategies for the species.

A Leadbeater's possum fitted with a tracking device on a nesting box. The photo was taken with a camera trap. Image Lachlan McBurney

Background

Leadbeater's possum (*Gymnobelideus leadbeateri*) is a Critically Endangered arboreal marsupial that is found in Victoria and nowhere else. The species is well-studied, and extensive data have been gathered on its distribution, habitat, denning requirements and diet. However, several key knowledge gaps remain. For example, we have limited understanding about how Leadbeater's possum uses, and moves through, areas of young forest. This information is crucial as most of the known distribution of Leadbeater's possum is in mountain ash (*Eucalyptus regnans*) forest, and almost 98.8% of this forest is 80 years or younger.

Leadbeater's possum requires large old hollow-bearing trees for denning, and a dense mid-storey layer of vegetation dominated by Acacia spp. trees. However, mountain ash trees take over 120 years to begin developing hollows, and the abundance of hollow-bearing trees has declined rapidly due to logging, fire and natural attrition, resulting in > 50% of our long-term monitoring sites no longer supporting hollow-bearing trees.

The lack of data on how Leadbeater's possum moves through forest of different ages has meant that the current management

Australian National University · Healesville Sanctuary · Zoos Victoria · Werribee · Melbourne · Healesville · Parks Victoria · Healthy Parks Healthy People · Victoria State Government · Environment, Land, Water and Planning

Background (continued)

of this species focuses only on the protection of their denning habitat. A better understanding of the spatial ecology of Leadbeater's possum will be vital to develop enhanced guidelines for logging operations that better integrate wildlife conservation and timber and pulpwood production.

Animal movements have traditionally been examined using radio-tracking with hand-held equipment on the ground during the daytime, but this is difficult in the dense forests where these possums live. The wetness of the vegetation also leads to high levels of signal bounce during night-time tracking, especially as these animals are extremely agile and move at a rapid pace. This method also tends to flush animals out, meaning that their natural movements through the forest may not be captured. Therefore, we set out to develop an alternative method of tracking the animals' nighttime movements.

Main aims of the research

Our first aim was to design an effective harness and GPS tracker that could be safely used to track the nocturnal movements of Leadbeater's possum in the wild. We wanted to track the possums to answer the following questions:

- How far do they travel each night from their den tree?
- What is their pattern of habitat use?
- Do animals move continuously throughout the night, or do they return repeatedly to a den tree?
- How many den trees does an individual Leadbeater's possum use in regrowth forests, and what is distance between these trees?

What we did

This research was conducted in regrowth mountain ash forests in the Central Highlands of Victoria and trials at the Healesville Sanctuary.

Tracking harness design

Leadbeater's possum is small, with a body shape that is difficult to fit with conventional radio-collars. We had to develop a special harness fitted with a contact GPS that was also lightweight (8.2 g). The harness had to be light due to its limited body weight. Past studies have found animals up to 160 g; however, most adult animals we have trapped recently weighed 100 g or less, and we could safely fit our harness only to those animals above 120 g.

The harness has a small VHF beacon incorporated in the design to allow us to follow the animal during the day or locate the harness if it is lost.

Trapping Leadbeater's possum in the wild

We initially tried to trap animals in the wild to trial our GPS harness. We attempted to trap possums from six sites using Elliot traps and small cage traps. We used a range of baits and managed to trap other native wildlife, but no Leadbeater's possums. We concluded that all six trapping sites had very low densities of possums. If Leadbeater's possums were present, they were in very low numbers. We then decided to explore nest boxes as a source of animals for use in our tracking studies.

Trapping in nest boxes

Thirty-eight Project Possum nest boxes have been deployed in active Leadbeater's possum territories along Dowey Spur near Powelltown, Victoria. We surveyed these nest boxes with a thermal camera to differentiate occupied boxes from unoccupied ones, and detected 11 colonies.

In early May 2018, we obtained a large adult male from an occupied nest box in an isolated colony. After sedating the possum, veterinary staff from the Healesville Sanctuary oversaw the attachment of the first design of the GPS harness. The flexible neoprene harness fitted well but was a little bulky on a small animal. Unfortunately, the neoprene was so flexible that the animal was able to remove it.

Second harness attachment

We sourced a second large adult male from a nest box in late May 2018 and transported it to Healesville Sanctuary for fitting with a second harness design. This design had a leather strap instead of neoprene (Figure 2). This conventional leather attachment reduced the ability of the possum to squeeze out of the harness.

Third attachment trial

Leadbeater's possum colonies will sometimes flush from a nest box that has been disturbed by people. This meant that two of the 11 occupied nest boxes along our target area at Dowey Spur had been "used up" for these two trials,

What we did (continued)

and we could not know when a colony might re-occupy them. This reduced the pool of nest boxes available for the trial of the finalised harness design. To overcome this problem, we used unpaired animals from a breeding program for the next harness attachment trial. We have since shown that we can successfully capture and recapture animals from nest boxes without flushing the animals from their nest box.

In April 2019, an animal from the Healesville Sanctuary's breeding facility was successfully fitted with a harness (Figure 3). Behaviours and activity of the harnessed animal were recorded regularly 24 hours a day for three days. After the trial fitting, the animal was found to be in good health with no signs of wear to the harness. This trial was repeated a second time, with similar results. The trials indicated that the harness design was suitable and had no impact on natural behaviours.

ABOVE: Figure 2: The final harness design, with no neoprene straps. Both straps are made of leather instead, and use a method of attachment that is known to work for conventional radio collars. Image: Lachlan McBurney

Key findings

This project has been immensely challenging. However, we have solved many technical problems that have thwarted other previous tracking studies involving small, highly agile mammals. We are currently tracking the movements of multiple Leadbeater's possum in regrowth forest through signal detection arrays. We have been able to radio track the possums through during the day to their den trees.

We have now successfully harnessed five wild possums that were sourced from nest boxes and tracked their movements using the GPS harnesses. The GPS signal strength proved to be very weak on fast moving arboreal marsupials which prefer to spend most of their time in very dense vegetation. The signal strength proved far weaker than during static trials of the harness in similar forest.

Our preliminary tracking work indicates that individual possums are moving up to 600–700 m between nest sites, sometimes in a large old hollow-bearing tree and at other times in nest boxes. This is similar to what we found in our earlier radio tracking work – that the animals move long distances between multiple den trees. They could be moving these long distances due to the dwindling number of hollow-bearing trees.

We found that Leadbeater's possum is extremely difficult to trap in regrowth forest, even on sites that appeared to support potentially suitable habitat. The abundance of hollow-bearing trees – which provide critical denning habitat for this animal – has rapidly declined, and we have found a 50% decline in site occupancy by Leadbeater's possum since 1997. For example, the trapping sites we used near Dowey Spur used to be a known hotspot for Leadbeater's possum, but their habitat suitability has declined significantly over the past five years. The number of Leadbeater's possums has also declined, from 12 to zero in 2018, at one of our long-term monitoring sites. We have also seen a decline in the weight range of adult possums along Dowey Spur and are investigating long term weight measurements across the Central Highlands.

LEFT: Figure 3: A harness fitted to a Leadbeater's possum at Healesville Sanctuary in April 2019. Image: Lachlan McBurney

Implications and future research

Our tracking research will continue for several more years to qualify movement patterns, inter-den movements, within-territory habitat selection, and rates of contact between individuals and interaction within colony members. This research will provide new insights into habitat use by Leadbeater's possum.

We have now developed a method of tracking the possums overnight using signal detection arrays. These are small base station 'nodes' set up in an array, that help triangulate the locations of miniature vhf collars in the area. It uses a local network, rather than satellites/GPS. We plan on setting up multiple detection points throughout the forest so that when a harnessed animal passes one of these locations its presence is detected. We will then be able to download this real-time location data from stationary point networks set out in the forest.

Understanding how far Leadbeater's possum colonies travel through forest of different ages is vital to ensure the development of effective management prescriptions for the species. This is especially important in regrowth forest that is targeted for timber harvesting and in areas that still feature the increasingly scarce hollow-bearing trees on which Leadbeater's possum depends.

This study provides key insights for increasing the success of trapping Leadbeater's possum.

A prolonged period should be dedicated to ground-truthing for signs of large colonies. If a presence detection record of Leadbeater's possum is used as the sole basis for site selection, the chances of successfully trapping an animal is small. It is more valuable to connect a location record of Leadbeater's possum with knowledge of occupied den trees, as our trapping success was generally higher when we trapped close to known den trees.

Mountain ash single age class regrowth forest, Maroondah catchment, Victorian Central Highlands. Image: David Blair

Further Information

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Further reading

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