RATS OF TH

HE TREE TOPS

Ask most Australians if they know what a tree-rat is and you would probably get a blank look.

Until recently, this group of fascinating native rodents was little known, even to most scientists studying small mammals.

Thanks to recent work in the Kimberley and the Top End of the Northern Territory, we now know something about the distribution and ecology of these tree dwellers.

by
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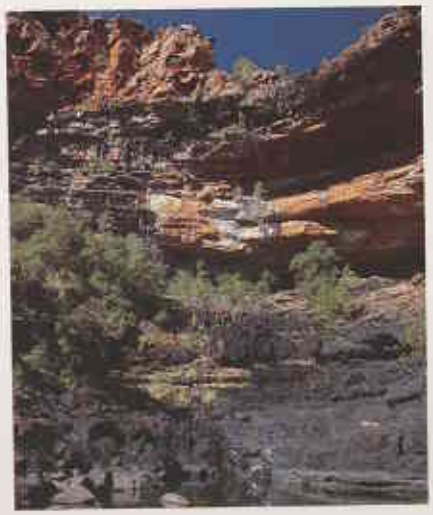
The three species in the tree-rat group are sparsely distributed throughout tropical northern Australia: the golden-backed tree-rat (*Mesembriomys macrurus*), the black-footed tree-rat (*Mesembriomys gouldii*) and the brush-tailed tree-rat (*Conilurus penicillatus*). Another species, the white-footed tree-rat (*Conilurus albipes*), occurred through much of south-eastern Australia in the 1800s but has not been recorded since the turn of the century.



Top:
Only the black-footed tree-rat has been studied in detail in the wild.
Photo - Gordon Friend

Above:
One of several nest trees used by a young black-footed tree-rat radio-tracked on the Mitchell Plateau.
Photo - Gordon Friend

Above left:
Sandstone gorges and rainforest patches in the Kimberley are a favoured habitat of the golden-backed tree-rat.
Photo - Gordon Friend

Previous page:
The brush-tailed tree-rat, smallest of the three species that inhabit the tropical north of Australia.
Photo - Cath Kemper

APPEARANCE, TEMPERAMENT AND HABITS

The golden-backed tree-rat is particularly handsome, weighing around 300 g - it is about the same size as a female numbat. It has coarse, brown-grey fur with a distinctive golden colour on the head and shoulders and along the back. It is white underneath. This tree-rat's most notable feature is the long tail, about a third of a metre long, which is brown near the body, changes to white and ends with a white brush.

The black-footed tree-rat is more robust, weighing around 800 g, with the strength and agility to match. It, too, has a long white-tipped tail, but the body fur is coarser, and a grizzled grey-black colour. The Aboriginal people of northern Australia prized this species as a food item. They would locate animals in hollow gum trees, chop a hole in the trunk and seize the animal by the tail, then deftly whirl it around to make it dizzy before throwing it into a collecting bag. Such an operation took some skill and bravery - this species has a savage temper and a formidable bite. When aroused, individuals make a noise like a whirring machine-gun.

The brush-tailed tree-rat, weighing around 180 g as an adult, is more delicate. Its back is grey to golden brown with a rufous patch on the neck, and the underside is white to cream, often with a grey T-shaped patch on the chest. Its long, dark tail has a black or white brush on the tip; the proportion of white-tipped individuals varies according to the area from which the population comes. This species is often called the brush-tailed rabbit-rat because of its large ears and rabbit-like face. Like the black-footed species, these animals can vocalise when threatened, but they can usually be handled with reasonable ease

All three species are tree dwellers, nesting in gum tree hollows, screw pines (*Pandanus* species) and fan palms (*Livistona* species), or occasionally in buildings. They move effortlessly up and down trunks and along branches under the veil of darkness. The tail is not prehensile like that of large possums, but does curl around the branches a little and helps with balancing. On the ground, tree-rats bound along with the tail held high, almost like a signal or banner.

DISTRIBUTION AND HABITAT PREFERENCES

Golden-backed tree-rats are most common in the north-western Kimberley, preferring rainforest patches, some woodlands with fan palms or screw pines and, occasionally, rugged sandstone screes. Most of the populations are near the coast. There are also a few sightings from the Northern Territory, the most recent being in 1967 from Deaf Adder Gorge in Kakadu National Park.

By contrast, the black-footed species is most abundant in tall northern woollybutt (*Eucalyptus miniata*) and stringybark (*Eucalyptus tetrodonta*) forest in the Top End of the Northern Territory. Areas with a relatively dense understorey of small trees and shrubs and fan palms or screw pines are preferred. These areas are often associated with perennial soaks that keep moisture levels high throughout the year

and provide some protection from fire. Black-footed tree-rats are considered rare in Western Australia, with populations known only from the Mitchell Plateau and Kalumburu. Here, the favoured habitat is similar to that occupied in the Northern Territory. A few specimens have also been recorded from the east and west coastal areas of Cape York, but little is known about the Queensland populations.

Brush-tailed tree-rats are less fussy about their habitat than the two other species. They are most common in open forest and eucalypt woodlands with a relatively sparse shrub layer and a ground cover of tall grass (such as sorghum). This vegetation type is widespread throughout northern Australia, but is frequently burnt. Populations of brush-tailed tree-rats are found in the Kimberley, the northern third of the Northern Territory and on a few islands in the Gulf of Carpentaria. The species also occurs in southern Papua New Guinea.

Records from some of the early naturalists who collected in the tropics during the middle to late 1800s (for example, Knut Dahl, 1894-95) suggest that the golden-backed and black-footed tree-rats were at one time more widely distributed in the drier inland areas of the Kimberley and the Northern Territory. Over the past 50 or so years, populations of these two species appear to have contracted to the wetter, more densely forested areas nearer the coast.

RECENT ECOLOGICAL STUDIES

Survey work carried out by CALM and the WA Museum in the Kimberley, and by CSIRO and the Northern Territory Conservation Commission during the mid-1970s and 1980s, indicated that tree-rats were uncommon. Only a few animals were captured in widely scattered areas during any one of these surveys. In 1980, however, a thriving population of black-footed tree-rats was located in the CSIRO study area at Kapalga in Kakadu National Park. Detailed studies over the next three years provided the first field-based data on how these tree-rats lived in the wild. Little was known of the ecology of the other two species.

However, WA Museum surveys had shown one area where all three species occurred in proximity: the Mitchell Plateau in the Kimberley. Here, a patchwork of rainforest, open forest, woodland and scree slope habitats cater for the tastes of any tree-rat. We set about organising an extended field trip to the area to learn more about these unique rodents.

We spent three weeks on the Plateau in August 1987, and undertook extensive trapping, radio-tracking and spotlighting. Radio-tracking gave the most exciting insight into how these

The large fruits of screw pines (*Pandanus* spp.) are the favourite food of black-footed tree-rats.
Photo - Jiri Lochman

Like the other two species, golden-backed tree-rats are agile climbers. They use their tails to help with balancing.
Photo - Jiri Lochman

animals lived: where they nested, where they foraged, how far they moved, when they were active and how often they came into contact with each other. Collecting and analysing droppings provided much-needed information on what they ate.

We found that both *Mesembriomys* species tend to be relatively solitary and need quite a large area in which to forage. They can move large distances very quickly. For example, a young male black-footed tree-rat rapidly traversed about 500 m each night between his refuge trees and a feeding area on the scree slope at the edge of the plateau. Unfortunately, we were unable to fit brush-tailed tree-rats with radio-collars (because there were no collars that were small enough) so we have little idea of their movements.

Golden-backed tree-rats lived on the edge of the rainforest patches, feeding in trees in the woollybutt forest and the remnant rainforest. The need for a large home area means that a patch of suitable habitat cannot support many individuals - probably an important reason for their sparse distribution. The loss of many patches of remnant rainforest in the north-west Kimberley is also a concern. These remnant patches support most of the known populations of golden-backed tree-rats, though some are found elsewhere.

Black-footed tree-rats may use nest sites in several different trees but forage in areas well away from these refuges. This information made us suspect that suitable food supplies for this species may be very patchy. Since suitable hollows are quite common throughout these northern tropical forests, it is likely that the species' patchy distribution is tied more to food resources than to the availability of shelter. This reasoning also applies to the golden-backed species, but the factors influencing the abundance and distribution of the brush-tailed tree-rat are not yet known.

DIET

Until recently, the food of the three species was poorly known. A detailed study of droppings from the Mitchell Plateau was carried out by Civa Morton at the University of Canberra in 1991. Golden-backed tree-rats ate mostly fruits, flowers and termites and occasionally grasses, leaves, ants and beetles. This explains why they live on the edges of the rainforest patches. Most of the fruits and flowers are rainforest species or are more common in the eucalypt forest along these edges, while the termites are most readily available in the mature open forests.

Similarly, the black-footed tree-rat ate fleshy and hard fruits and large seeds, supplemented by grass and termites. The large fruits of screw pines were particularly favoured. Hard-fruited plants like *Gardenia, Terminalia* and *Petalostigma* tend to grow as understorey species within the patches of tall, open forest frequented by this species. Not surprisingly, a large component of the brush-tailed tree-rat's diet was grass and seed, reflecting the species' preferences for areas with a grassy understorey. Like the others, this species also included some termites in its meals.

The fact that tree-rats eat termites is an exciting discovery. Termites are an important part of the Australian fauna, being much more valuable in breaking down plant material and recycling nutrients than herbivores such as kangaroos. No other species of rodent is known to include termites as a significant part of its diet and this may be part of the reason why these tree-rats are restricted to the tropical regions. Termites are much less common in trees in temperate parts of Australia.

Brush-tailed tree-rats are also known as rabbit-rats because of their large ears and rabbit-like faces.
Photo - Bert & Babs Wells

BREEDING PATTERNS

The detailed work in Kakadu on the black-footed species showed that breeding occurs throughout the year. This is somewhat surprising given the highly seasonal nature of the climate (a wet season of six months, followed by a dry season of six months). However, although this species' food plants may not be widespread, most have prolonged fruiting periods. This means that there is always something highly nutritious available to eat. The close link between nutrition and reproduction explains their non-seasonal breeding patterns. Field data on the other two species are limited, but laboratory studies have shown that they are capable of breeding throughout the year.

Both *Mesembriomys* species usually have two young, but litters with one to three young have been recorded. Brush-tailed tree-rats may have up to four young, though three is most common. The periods of pregnancy are quite long for these rodents (especially the two *Mesembriomys*), but the young develop rapidly, are weaned in four to five weeks, and reach adult size at about three to four months. This means that populations can increase fairly rapidly under good conditions. However, limitations in food resources, and factors like predation and perhaps burning, are keeping populations in check.

CONSERVATION

The patchy nature of food resources, and their susceptibility to disturbance, probably explains the decline of tree-rat populations, particularly in the more inland areas of their distributions. Grazing by introduced cattle and buffalo and changes in fire regimes since European settlement may have significantly reduced the understorey trees and shrubs that provide food resources for these animals. These factors probably had a more severe impact in the drier areas near the edges of the species' ranges, leading to populations contracting to wetter, more suitable patches of forest near the coast (for example, rainforest in the golden-backed tree-rat's case).

Although a reasonable body of information exists for the black-footed tree-rat in the Northern Territory, little is known about the other two species. We urgently need to commence detailed work on the ecology of the golden-backed and brush-tailed species. Following this, we should examine the marginal populations of all three species near the limits of their ranges and determine the critical factors affecting their survival. Only through such a strategy can we ensure that these fascinating and unique rodents are conserved in the long term. ⊡

Golden-backed tree-rats need a large area in which to forage, since they feed in both the woollybutt forest and the adjacent rainforest patch.
Photo - Jiri Lochman

Top left:
Black-footed tree-rats were a prized food for the Aboriginal people of northern Australia.
Photo - A. C. Robinson/NPIAW.

Habitat of the brush-tailed tree-rat on the Mitchell Plateau - an open woollybutt woodland.
Photo - Gordon Friend

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LANDSCOPE

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Small and shy and quite unlike their exotic, urban cousins, high climbing rodents live throughout the Kimberley. *See page 10.*

Once it was a traditional battleground for Aboriginal people. Today the competition is between sailboarders while families of picnickers look on. *See page 23.*

The various groups of Aboriginal people around the Swan River lived in harmony with the seasons. *See page 28.*

His name is connected with plants and places around Australia. He was interested in everything from Aboriginal customs to the size of trees. Read about A Man of Science *on page 16.*

Learn about the incredible variety of orchids in the Stirling Range. *See page 36.*

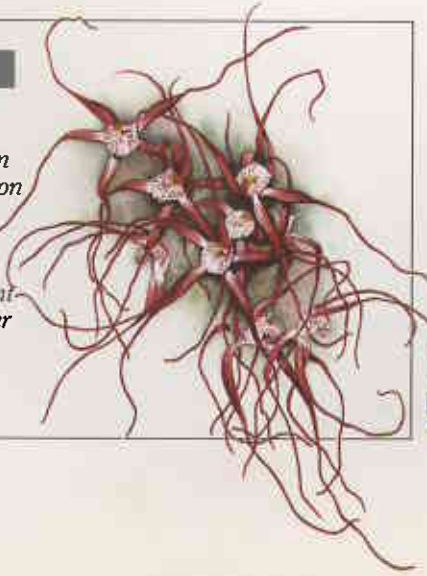
FEATURES

REGULARS

SPECIALS

COVER

*The many coloured orchid (*Caledonia polychroma *) is well named. Aside from the rich pinks there are clumps of lemon yellow and pure white. The orchid is found in the low areas of the Stirling Range, preferring wandoo and sheoak woodlands. While most years its vibrant flowers can be seen, it flowers best after fire. The illustration is by Phillipa Nikulinsky.*



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