



# Using Rainforest Research

## Trial by fire Survival of the northern bettong

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### A problem of balance

Fire has played an important role in shaping Australian ecosystems with many native plants and animals adapting to a fire-prone landscape. Little is known however, about the responses of individual species to fire. An example of such adaptation is the relationship between fire, certain below ground (hypogeous) mycorrhizal fungi and fungi-eating (mycophagous) marsupials. Karl Vernes examined this relationship in his PhD studies.

Many trees in our forests depend on hypogeous fungi for healthy growth. Primarily, hypogeous fungi provide trees with mineral nutrients. They also enhance resistance to disease and the ability to take up water, as well as allowing trees to withstand a greater range of temperature, salinity and pH levels.

Mammals eat the nutritious fruiting bodies of hypogeous fungi which are commonly known as 'truffles'. When they do so, the spores of the fungus not only pass through the digestive system of the animal unharmed but are more likely to germinate as a result of this passage. In this way, mycophagous marsupials help to maintain the health of our forest ecosystem by dispersing mycorrhizal fungal spores and increasing the likelihood of new individual fungi forming.

### The northern bettong (*Bettongia tropica*)

The northern bettong (*Bettongia tropica*) is a small rat-kangaroo (Potoroidae), weighing in at an average of 1.2kgs. The claws on their forepaws are well developed for digging and their tails can be used for carrying nesting material.

Their diet consists mainly of sporocarps (truffles) from hypogeous (underground) fungi that they dig from the soil often around the bases of host trees. At least 35 different truffle species are on the menu. Truffles are eaten all year round, with grass roots, herbs and lilies supplementing the diet at different times of the year.



The northern bettong is an endangered species that in recent times is known to inhabit just four northeastern Queensland locations. It is found in the Lamb Range, the Mt Windsor Tableland, Mt Spurgeon on the Carbine Tableland and has recently been found near Paluma.

The Lamb Range population is the only one considered to be secure although it is still limited to an area only 25km long and 6 kms across at its widest point.

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The Rainforest CRC is a research partnership involving the Commonwealth and Queensland State governments, the Wet Tropics Management Authority, the tourism industry, Aboriginal groups, CSIRO, James Cook University, Griffith University and The University of Queensland

### Objectives of the research

The research was designed to answer two main questions:

1. How does fire effect the availability of hypogeous fungi to the bettong?
2. What impact does fire-related change in the hypogeous fungi community have on the bettong's diet, home range and broad-scale movement within the environment?

Past studies have indicated that fire may initiate changes to fruiting of hypogeous fungi. Since these fungi are an important part of the bettong's diet such information could lead to better ways of managing bettongs and their habitat.

### Playing with fire

In the study area at Davies Creek, experimental fires were conducted over two burning (dry) seasons in 1995 and 1996. These fires were of low to medium intensity and typically only burned the understorey grasses and low shrubs. Fires are a difficult tool to manipulate, so experts from the Departments of Environment and Heritage, Natural Resources and CSIRO were recruited to help with the burning experiments, along with several volunteers.

Close inspection of the site showed that low to medium intensity fires at Davies Creek were regular phenomena, occurring about every two to four years. However, there did not appear to have been a fire at most sites for at least three to four years or longer in some areas. Most sites could be considered due for a fire according to historic fire regimes.

Karl used data from trapped bettongs to estimate numbers and to record or monitor population changes, body weight and reproduction of his animals. Radio collars were fitted to trapped animals so their locations could be determined at any time from the radio signal. Receivers were set up at different points around the study area and compass bearings taken to the signal from each point. The location where these bearings intersect gave the locations of the animals.

### Responding to fire

According to Karl, radio-location and trapping data indicated that most, if not all bettongs experienced no ill effects from the fire itself. Bettong responses to the fire event showed:

- no change in the survival of bettong pouch-young after the fires,
- home range size and location did not change following the fires, and animals still moved around the area as previously, and
- when faced with a choice of burnt or unburnt areas the bettongs preferred to forage in burnt areas.

The animals appeared to be more successful in foraging after the fire, possibly because of the increased availability of fungi on the burnt ground and the decrease in ground-layer vegetation following the burn made travelling easier for this small animal. Fungus remained the major part (56%) of the bettongs diet both before and after the fire, throughout all seasons.

Truffles of hypogeous fungi responded to fires as follows:

- they were more available to bettongs immediately after the fire, mainly because they became easier for the bettongs to detect, and
- several months after the fire, the ability of bettongs to detect fungi on the burnt site decreased to very low levels, whereas this increased on the unburnt control sites. Both burnt and control sites had returned to normal levels within 12 months.

### Conclusions

In this study bettongs appear mostly unaffected by fire, and are quite flexible in their response to changing rates of truffle detection. This indicates that they may be a fire-adapted marsupial, able to survive well under conditions where low to medium intensity fires occur frequently. However, further studies would need to be conducted to see how bettongs adjust to an environment where there were longer intervals between fires or where fires are suppressed altogether.

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