

# Relocating radio-collared targeted marsupials after a 1080-poisoning operation

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## Abstract

*The fate of 26 radio-collared individuals from three targeted marsupial species were followed during a 1080 (sodium monofluoroacetate)-poisoning operation on a eucalypt plantation, to investigate where animals die in relation to the bait-line. Fifteen of the 26 animals died during the poisoning operation: eight of ten Tasmanian pademelons (*Thylogale billardierii*), one of seven Bennett's wallabies (*Macropus rufogriseus rufogriseus*), and six of nine brushtail possums (*Trichosurus vulpecula*). The proportions of radio-collared animals that died within each species did not reflect kill-rates calculated from more reliable absolute density data. Radio-collared carcasses were found between 8 m and 83 m from the bait-line (mean distance 31 m). Seventy-five per cent of carcasses were found inside shelters (i.e. inside windrows, hollow logs, dens or under fallen vegetation). Twelve of the 15 poisoned, radio-collared carcasses were found intact. Three carcasses were not found but recovered collars showed carnivores' teeth marks, suggesting that Tasmanian devils (*Sarcophilus harrisii*) or spotted-tailed quolls (*Dasyurus maculatus*) had moved and/or consumed them.*

## Introduction

Three native marsupial species reduce productivity in commercial Tasmanian plantations by browsing seedlings (Bulinski

and McArthur 1999; Coleman *et al.* 1997; Cremer 1969). These species are the red-bellied pademelon (*Thylogale billardierii*), Bennett's wallaby (*Macropus rufogriseus rufogriseus*) and the brushtail possum (*Trichosurus vulpecula*). To reduce browsing damage, forestry companies poison local herbivore populations with 1080 (sodium monofluoroacetate), as it is assumed that fewer animals will result in less damage. A handful of studies have examined the large-scale effects of poisoning operations at reducing herbivore abundance (Bulinski 1999; Marsh 1998; Statham 1983; Johnson 1978). However, the fine-scale effects of 1080 operations have never been quantified and documented. Information such as how far animals travel from the bait-line before death, and where carcasses are located, have important implications for the forestry industry in relation to carcass retrieval and potential effects of poisoning near private land. Consequently, the aim of this study was to quantify how far targeted marsupials travelled from the bait-line before death, and where carcasses were located following a 1080 operation on one eucalypt plantation.

## Study area and methods

### *Study area*

The study area was located in North Forest Product's 'Surrey Hills' Tree-farm, north-western Tasmania (41°28'S, 145°48'E). Five habitats dominated this site (refer to Figure 1):

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**LEGEND**

- ▣ Radio-collared pademelon
  - ⊠ Collar from pademelon
  - △ Radio-collared Bennett's wallaby
  - ⊙ Radio collared possum
  - ⊖ Collar from possum
  - - - Bait-line
  - Dirt road
  - Gravel road
  - ~ Waterway
- 
- ▭ Coupe (Windrows shown in black) - poisoned plantation
  - ▭ Older plantation
  - ▭ Uncleared harvested land
  - ▭ Native forest
  - ▭ Grassland

*Figure 1. Map of the study site, showing the five habitats, location of the bait-line, and sites where dead radio-collared animals (or collars only) were found.*

(1) a young *Eucalyptus nitens* plantation with an area of 17.8 ha and with relatively high weed cover (hereafter referred to as 'the coupe'); (2) older plantations of *E. nitens* (5–7 years of age, approximately 5 m tall); (3) grassland; (4) native forest (rainforest and wet eucalypt forest); and (5) uncleared harvested land that consisted of scrub and fallen vegetation.

The coupe was planted with *E. nitens* seedlings (approximately 20 cm in height) in November 1997, five months before this study began. The coupe had not been treated with 1080 poison or herbicide before planting, but vegetation within a 0.5 m radius of individual seedlings was treated with Roundup (glyphosate) herbicide approximately one week after planting.

#### *1080 poisoning*

Staff of North Forest Products carried out the baiting operation under a permit from the Tasmanian Parks and Wildlife Service. Three weeks before poisoning, bait stations were established at 10 m intervals along the coupe's central access road, the plantation boundary, and nearby firebreaks. Twenty grams of fresh, chopped carrots were placed at each bait station on five occasions (referred to as 'free-feeds'), three to six days apart, over a period of 17 days in April 1998. Fifty kilograms of bait were distributed during the first two free-feeds; this was increased to 60 kg during the last three free-feeds. Sixty kilograms of poisoned bait (chopped carrots mixed with 0.014% 1080 in liquid solution and blue dye) were distributed at the bait stations (hereafter referred to as the 'bait-line', see Figure 1) three days after the final free-feed. Bait stations were checked by company staff for remaining poisoned bait 24 hours after distribution.

#### *Radio-collared animals*

Animals to be radio-collared were caught on or near the coupe. Macropods were caught using two methods: (a) dart-gunning animals on the coupe, and (b) trapping on a grassland approximately 75 m north-east of

the coupe. Possums were caught using cage-traps on the coupe and within nearby native forest. Animals were lightly anaesthetised using Zoletil (tiletamine hydrochloride and zolazepam hydrochloride) during radio-collar attachment (7 mg/kg for dart-gunned macropods, 4 mg/kg for trapped macropods and 2 mg/kg for possums). Animals were released at the site of capture within 6 hrs of being caught.

Ten adult pademelons (seven male and three female), seven adult Bennett's wallabies (five male and two female), and nine adult possums (four male and five female) were fitted with a single-stage radio-transmitter (Sirtrack Electronics, New Zealand) attached to a leather collar. Each transmitter emitted a unique frequency between 150 and 152 MHz. These animals had been used in a larger study to investigate habitat utilisation within the study site (le Mar, unpublished data). Consequently, some individuals had been collared for up to 15 months before free-feeding. Sample sizes of the radio-collared animals represented approximately 7% of the pre-free-feeding pademelon population and 21% of the estimated Bennett's wallaby population that utilised the coupe nightly (le Mar, unpublished data). More possums were radio-collared than were estimated to use the young plantation at any one time. Results from a larger study estimated a mean nightly abundance ( $\pm$  SE) of 2 ( $\pm$  1) possums (le Mar, unpublished data).

An 'Automated Telemetry Systems' receiver and a three-element Yagi hand-held antenna were used to locate animals. Animals were radio-tracked on foot within two days of poisoning. Locations of dead radio-collared animals were mapped and their distances from the closest point on the bait-line were calculated. Females were also checked for pouch-young.

## **Results**

No poisoned bait remained 24 hours after it was distributed. Eleven of the 26 radio-

Table 1. Locations of radio-collared animals killed by 1080.

Habitat	Location	Pademelon	Bennett's wallaby	Possum
Coupe	Open area	1	-	-
	Close to windrow (< 2 m)	2	-	-
	Inside windrow	1	-	1
Older plantation	Inside windrow	1	-	-
Harvested land	Under fallen vegetation	1	1	1
Native forest	Inside hollow log	-	-	1
	Under fallen vegetation	1	-	-
	Moved by carnivore	1	-	2
Grassland	Underground in soil chamber	-	-	1

collared animals were located alive. The remaining 15 animals were killed during the poisoning operation: eight of ten pademelons, one of seven Bennett's wallabies, and six of nine possums. Both male and female radio-collared pademelons and possums were killed: five of seven male pademelons and three of three female pademelons; four of five male possums and two of six female possums. One Bennett's wallaby was killed, a female with a pouch-young (furless, dead in pouch).

Twelve of the 15 animals that died during the poisoning operation were found

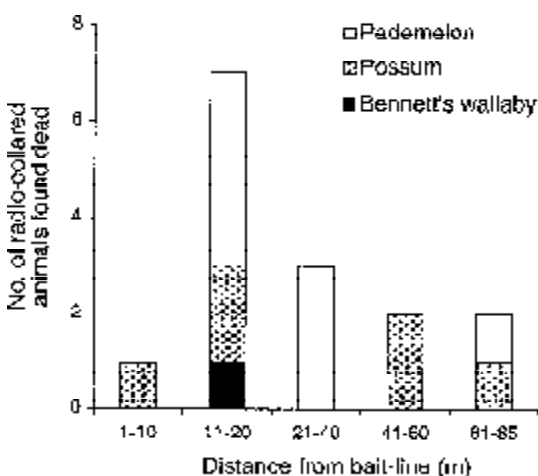


Figure 2. The distances dead radio-collared animals (killed by 1080) were found from the bait-line.

undamaged by carnivores. These animals were found within 83 m of the bait-line (Figure 2); mean distance 31 m (range 8–83 m). Eighty-four per cent of carcasses were located within 40 m of the bait-line (Figure 2). Few animals died out in the open: 75% of carcasses were found inside windrows, under fallen vegetation or inside dens (Table 1). Blood was present in the nostrils and ear canals of two pademelons suggesting internal bleeding as the result of poisoning.

Three of the 15 radio-collared animals that died during the poisoning operation were not recovered. Two of the three radio-collars were relocated and showed evidence of carnivore attack (chewed leather collars and teeth marks in the epoxy resin casing). One of these collars was also located near fur and intestines that were assumed to belong to the radio-collared possum. The third collar was mapped by triangulation of radio-bearings but was not found.

## Discussion

The poisoning operation killed individuals from all three targeted marsupial species. The sample sizes of radio-collared animals were too small to draw conclusions about kill-rates for the three species. However, the effects of the poisoning operation on species densities were collected during another study, and will be reported elsewhere.

Results showed that all possum and pademelon radio-collared carcasses were found within 85 m of the bait-line. Consequently, data for these species are inconsistent with previous speculation that poisoned animals travel several hundreds of metres, even kilometres, between the time they ingest poisoned bait and death (Cahalan 1998). Results for Bennett's wallabies, however, are inconclusive. Only one radio-collared animal was killed during the operation, and a range of distances travelled from the bait-line is required to assess whether this single result was indicative of the species. Furthermore, there is evidence (McArthur, unpublished data) that Bennett's wallabies can travel substantially further (c. 240 m) from the bait-line than indicated by this study. Hence, Bennett's wallabies may travel further from the bait-line than possums or pademelons.

Results from this study also suggest that animals sought shelter after consuming poisoned bait. The use of shelter may indicate that animals were aware that they were unwell and were seeking safety from predators. The main predators of these three marsupial species, the Tasmanian devil (*Sarcophilus harrisi*) and the spotted-tailed quoll (*Dasyurus maculatus*) (Jones and Barmuta 1998), were known to inhabit the study site (K. le Mar, pers. obs.). Results from this study do not, therefore, support previous speculation that animals poisoned with 1080 seek water. Indeed, one possum crossed a river to reach shelter (a known den site). 1080 inhibits citrate and succinate

metabolism in the Krebs cycle, blocking energy production within cells and manifesting as cardiac failure in herbivores (Statham 1983). It seems unlikely, therefore, that animals would seek water from dehydration as a response to this.

A major implication of this research is that animal carcasses are extremely difficult to locate following a poisoning operation. Therefore, routine carcass collection operations following 1080 poisoning are unlikely to be effective at removing most carcasses.

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