Location of 1080-poisoned marsupial herbivore carcasses in relation to their home ranges

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Abstract

*The location of six dead radio-collared animals—two male common brushtail possums (*Trichosurus vulpecula*), one male and two female red-bellied pademelons (*Thylogale billardierii*) and one female Bennett's wallaby (*Macropus rufogriseus rufogriseus*)—killed during a 1080 (sodium monofluoroacetate) poisoning operation, were examined in relation to their home range. Home range of the six animals was estimated over an 11-month period, using both night and day data, and calculated using two different methods (minimum convex polygon [MCP] and fixed-Kernel [KE] home range). All six animals died within their MCP and 95% KE home range. These results indicate that the animals did not travel beyond their normal home range before dying from 1080 poisoning.*

Introduction

The red-bellied pademelon (*Thylogale billardierii*), Bennett's wallaby (*Macropus rufogriseus rufogriseus*) and the common brushtail possum (*Trichosurus vulpecula*) (hereafter pademelon, wallaby and possum) can reduce productivity in commercial Tasmanian plantations by browsing *Eucalyptus* seedlings (Cremer 1969; Coleman *et al*. 1997; Bulinski and McArthur 1999). The most commonly used management method for reducing this browsing damage involves poisoning native herbivore populations with 1080 (sodium monofluoroacetate). Use of 1080 for this purpose meets with opposition from some sectors of the general public, and quantitative information, such as the reduction in animal numbers and movement of individuals before death, is useful for management purposes and is also of public interest. We have previously reported the effects of a 1080-poisoning operation, at one plantation in north-western Tasmania, on both densities of herbivores and on distance between dead radio-collared animals and the bait-line (le Mar and McArthur 2000, 2001). Poisoning significantly reduced pademelon density on the plantation (decline of 98%), and wallaby density also appeared to decline as a result of the operation. Radio-collared carcasses were found between 8 m and 83 m from the bait-line (mean distance 31 m) (le Mar and McArthur 2000). The aim of the current study was to examine the location of six animals killed during that same 1080 operation, in relation to their known home range.

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Methods

Study site

The 770 ha study area was located in Gunns Ltd's (formerly North Forest Products) 'Surrey Hills' tree farm in north-western Tasmania (41°28'S, 145°48'E). Five habitats dominated this site (Figure 1): (1) a prepared forestry plantation site with relatively high weed cover, planted with *Eucalyptus nitens* seedlings (approximately 20 cm in height) in November 1997 (hereafter referred to as the 'young plantation'), 18 ha; (2) older plantations of *E. nitens* (5–7 years of age,

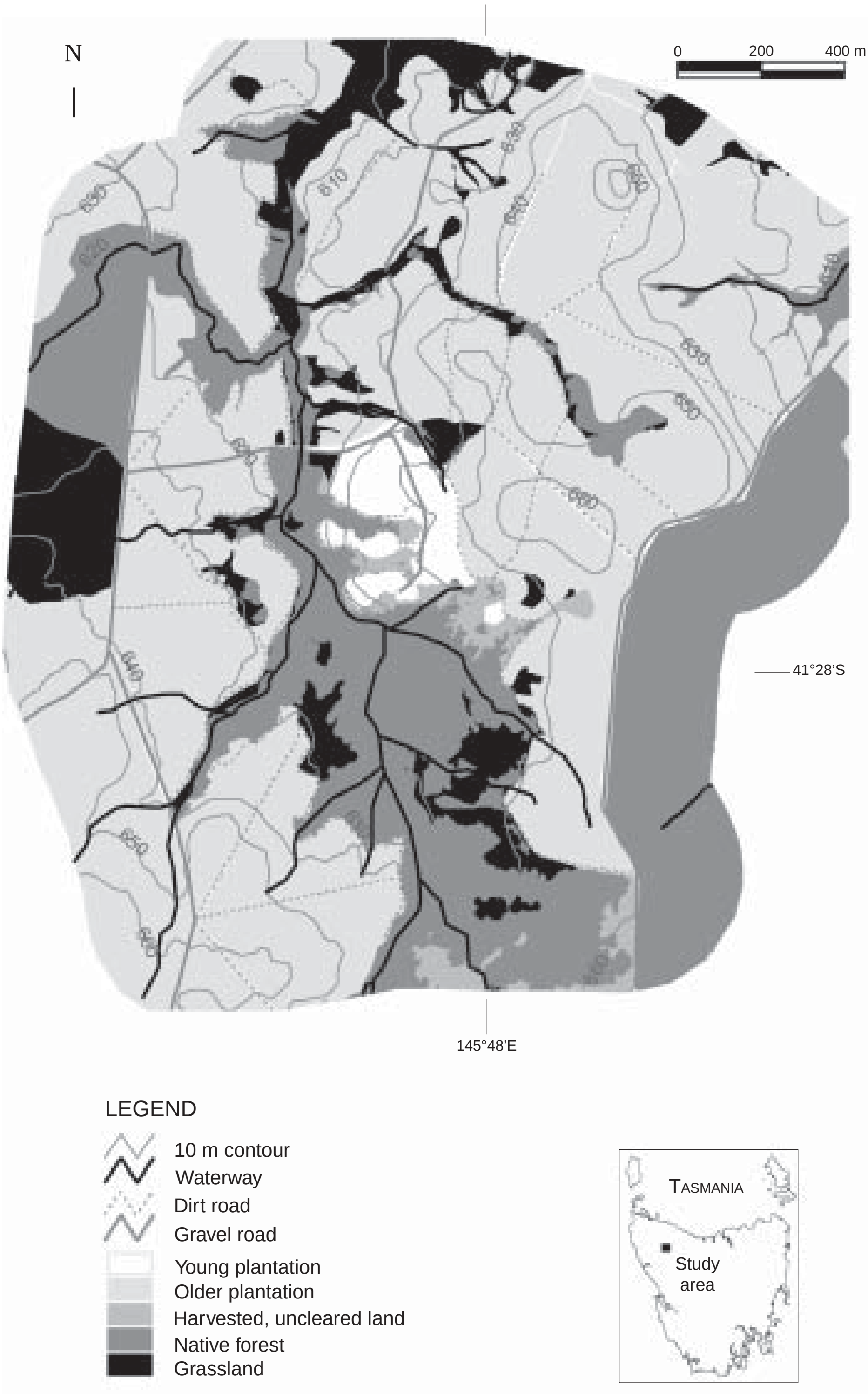

Figure 1. A map of the 770 ha study site showing the distribution of the five main habitat types: young plantation, older plantation, grassland, native forest, and harvested, uncleared land.

approximately 5 m tall), 436 ha; (3) grassland, 78 ha; (4) native forest (rainforest and wet eucalypt forest), 224 ha; and (5) uncleared, harvested land that consisted of scrub and fallen vegetation, 14 ha.

Radio-collared animals

Details of animal capture, radio-tracking and home-range analysis are all described in le Mar (2002) and the free-feeding and 1080-poisoning operation in le Mar and McArthur (2000). Mean linear error (± s.d.) of the telemetry system used was 66 m ± 53 m (n = 135) (le Mar 2002). Home-range data were only available for six of the 26 radio-collared animals that were followed during the 1080 operation (le Mar 2002). These animals were: male possums #03 and #06, male pademelon #38, female pademelons #41 and #42, and female wallaby #74.

Home range was calculated using two estimators as recommended by Harris *et al.* (1990) and Powell (2000). The first estimator was the minimum convex polygon (MCP). The MCP draws the smallest convex polygon possible containing all of an animal's known, or estimated, locations (Hayne 1949). The advantage of the MCP is that it is the oldest, simplest and most commonly used method, thereby enabling direct comparisons between studies. It also defines a limit to the area that the animal can visit, and therefore the habitat types that it can encounter (Kenward 1992). The main disadvantage of the MCP is that it only provides information on the boundary of the home range and ignores the internal areas of greatest use, which are important biologically (Hayne 1949). The MCP is also strongly influenced by small sample sizes, and is sensitive to extreme data points, which can greatly inflate home-range size and include areas that may never actually be visited by the animal (Kenward 1987; Powell 2000).

The second estimator was the fixed-Kernel method (KE). The KE method uses probability density functions to identify areas of concentrated use. The least squares cross-validation smoothing parameter was also used, as recommended by Seaman *et al.* (1999) and Hooge and Eichenlaub (1997). A 95% isopleth was used for calculating home range and a 50% isopleth for calculating the core area.

Home ranges were estimated using the ArcView GIS extension Animal Movement (Hooge and Eichenlaub 1997) for the six animals with relatively complete data sets (le Mar 2002). Although home-range analyses may have contained statistically auto-correlated data, fixes were considered to be biologically independent, as a time period of 45 minutes was sufficient to allow any radio-collared animal to traverse its entire home range. As discussed by Powell (1987) and Goodrich and Buskirk (1998), the problems of serial auto-correlation were assumed to be unimportant, because individual movements were likely to depend upon past experience and knowledge of resources within the home range.

Results

All radio-collars were found within their MCP and 95% KE home ranges (Figure 2). The collar of male possum #03 was found close to the boundary of its home range, but this collar may have been moved from the animal's point of death, as it was found amongst a pile of intestines and the rest of the body was not found. Collars of the other animals were found on carcasses that were undamaged by carnivores.

Discussion

The bodies and / or remains of all six radio-collared animals were found close to the bait-line, as previously reported in le Mar and McArthur (2000), although the actual distance travelled before death cannot be estimated from this study. They were also found inside their home range, which indicates that these six animals did not travel beyond their normal area before dying from

Figure 2. Locations of the six radio-collared study animals (#) killed during the 1080-poisoning operation in relation to their minimum convex polygon home range, 95% fixed-Kernel home range and 50% core area.

the ingestion of poisoned bait. It should be noted that the sample size within the present study was small, so that results should be interpreted with some caution. However, combined with previous information on density reduction and distances between carcasses and the bait-line (le Mar and McArthur 2000, 2001), it does appear that 1080 had a reasonably localised effect on herbivores in this particular operation.

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