IMPROVING TECHNIQUES FOR THE WAXTAG® POSSUM (*TRICHOSURUS VULPECULA*) MONITORING INDEX

S.C. OGILVIE[1], A.M. PATERSON[1], J.G. ROSS[2] and M.D. THOMAS[3]

[1]*Bio-Protection & Ecology Division, PO Box 84, Lincoln University*
[2]*Landsdowne Ventures Ltd., 35 Landsdowne Tce, Cashmere, Christchurch*
[3]*Pest Control Research Ltd., PO Box 7223, Christchurch*

Corresponding author: james.ross@paradise.net.nz

ABSTRACT

To manage brushtail possums (*Trichosurus vulpecula*) accurate estimates of abundance are essential. Direct counts are not feasible for large populations and index techniques are normally employed. A new index technique for estimating possum abundance is the WaxTag®. They are potentially more effective than traps because they are small, easier to use, very lightweight and, therefore, higher numbers can be set out in the field. Whilst a national monitoring protocol for WaxTag®s has been developed, it is important to determine whether improvements can be made. This study investigated firstly whether luminescent-coloured WaxTag®s were more attractive than the WaxTag® with a 'flour blaze' and, secondly, whether raising the WaxTag®s 700 mm above the ground reduced detectability. Possums significantly preferred the flour blaze over luminescence and raising WaxTag®s did not significantly reduce detectability. Accordingly, WaxTag®s could be raised up above ground-dwelling non-target species without reducing statistical precision.

Keywords: possum monitoring, *Trichosurus vulpecula*, WaxTag®, luminescent lures.

INTRODUCTION

To effectively manage populations of brushtail possums (*Trichosurus vulpecula*), accurate estimates of possum abundance are essential. Direct counts are impossible for large populations, and surveying techniques that give an index of the number of animals are normally employed (Caughley 1977).

In New Zealand, a national protocol for monitoring the abundance of possums, termed the residual trap catch index (RTCI), was adopted in 1996 (NPCA 2002). This method is based on the percentage of possums captured in leg-hold traps over a period of three nights (Batcheler et al. 1967). The ratio of the two estimates of RTCI (pre-and-post control) can then be used to calculate the effectiveness of possum-control operations.

Whilst the RTCI is a relatively robust monitoring technique (Ramsey et al. 2005), it is problematic for several reasons. First, leg-hold trapping creates risk for flightless birds, such as weka (*Gallirallus australis*) and kiwi (*Apteryx* spp.; Reid 1983). An attempt has been made to overcome this problem by raising traps above the ground, but this may reduce the ability of the method to capture possums (i.e. decreased sensitivity; Thomas & Brown 2001a). Second, leg-hold trapping is labour-intensive because all traps need to be checked at least once every day in accordance with the Animal Welfare Act, 1999. Third, traps are heavy and bulky and this limits the numbers deployed thus reducing monitoring precision (Brown & Thomas 2000).

Non-toxic bait (Spurr 1995) and wax blocks (Thomas et al. 1997) have been investigated as alternatives to leg-hold traps. Non-toxic bait interference was found to be highly variable, but the bites left by possums on wax blocks were easily identified and

the results looked promising. Since this early research, the wax block has been refined, with the wax now placed on a plastic tag to enhance visibility (McGlinchy & Warburton 2000). This new device is sold specifically for possum and rat monitoring and is called the WaxTag® (N.Z. patent 516900).

The WaxTag® has a number of advantages as a monitoring device. They are small, easy to use, lightweight and take less time to set and check than conventional monitoring techniques (Fraser et al. 2004). This means more can be deployed in the field, increasing both accuracy and precision (Brown 2002). Recent research suggests that they are also more sensitive than leg-hold traps at detecting the presence of possums and the relationship between WaxTag® indices and the RTCI is approximately linear at low densities (M.D. Thomas, unpubl. data).

Whilst a national monitoring protocol for WaxTag®s has recently been developed (NPCA 2005), it is important to determine whether improvements can be made. For example, Warburton & Yockney (2000) found that visual lures increased the numbers of possums caught in leg-hold traps. Accordingly, the first objective of this study was to investigate whether luminescent-coloured WaxTag®s are more attractive to possums than plain-coloured WaxTag®s that are accompanied with a flour blaze. It is known that the flour blaze increases possum encounter rates, but they are quickly washed off by rain (Thomas et al. 2003). Luminescent-coloured WaxTag®s were selected because photo-luminescent pigments can store and reemit ambient light without the need for a battery. Accordingly, this is the cheapest and most practical way of providing a permanent visual attractant for possums in the field.

As detailed above, leg-hold traps pose a risk to native ground birds and the Department of Conservation requires contractors to used raised traps (700 mm above the ground) in some regions. In a study investigating this issue, fewer possums were caught using raised traps, but the difference was not statistically significant (Thomas & Brown 2001b). This is a research issue that could be further investigated using WaxTag®s. Accordingly, the second objective of this study was to quantify any impact on the sensitivity of WaxTag®s when they were raised 700 mm above the ground.

METHODS

Attractiveness of luminescent-coloured WaxTag®s

This study was undertaken in an exotic pine plantation (Eyrewell Forest, North Canterbury) during 2004. Within the plantation, WaxTag® 'stations' were set along transect lines spaced at 75 m intervals. The distance between the transect lines was measured using a hip chain, which is a roll of cotton attached to a metre counter. The beginning of each line was set at least 10 m from the forest edge and a total of 13 lines (with 3-10 WaxTag® stations per line) were set out. Each line had alternating plain (blue-coloured) and luminescent-coloured WaxTag® stations. A total of 200 luminescent and 200 plain WaxTag®s were used in this trial. This provided a sample size of 40 stations for each colour.

Each WaxTag® station was made up of five WaxTag®s of the same colour nailed to trees in a cruciform pattern (Fig. 1). The cruciform pattern is derived from the sampling methodology described by Linhart & Knowlton (1975), who developed a standardised method to monitor coyotes in the USA. Having a number of WaxTag® stations along transect lines also increases the number of sampling units when compared to analysis where each transect line is the sampling unit. One tag formed the centre of the cruciform pattern and the remaining four tags were set approximately 10 m away from it (or to the closest tree) at the end points of the cruciform. Stations with plain WaxTag®s also received approximately 30 g of 'flour blaze' (1 part icing sugar: 4 parts flour) applied to the tree trunks 100-500 mm above each WaxTag®.

After 14 nights, the WaxTag®s were collected and the number of WaxTag®s bitten by possums recorded, along with their location within the cruciform (e.g. North, South, East, West and Centre). These data were analysed using a Mixed-Linear Model (GenStat

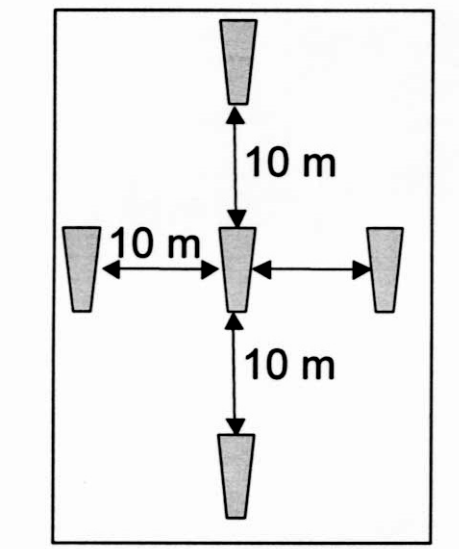

FIGURE 1: Cruciform arrangement of five WaxTag®s within each station.

Release 8.2). The colour and aspect factors were fixed effects in the model. Colour is the colour of the tag (plain or luminescent) and aspect was the location of the WaxTag® within the cruciform station.

The sensitivity of raised WaxTag®s

This study was undertaken in a separate location within Eyrewell Forest (North Canterbury) during 2005. Within the plantation, pre-numbered individual WaxTag®s were spaced approximately 20 m apart along rows of mature trees, with distance measured using a hip-chain (see above). Along each line, the WaxTag®s were nailed alternately either at the base of the tree or 700 mm above the ground. To attract possums approximately 30 g of flour blaze (1 part icing sugar: 4 parts flour) was applied to the tree trunks 100-500 mm above each WaxTag®. A total of 355 tags were used in the experiment.

After three nights, the WaxTag®s were collected and ranked into six categories (0-5) depending on the degree of possum interference. Tags chewed by other animals were excluded from the analysis and untouched tags given a value of zero. A low level of interference by possums was shown by a value of one and very high interference shown by a value of five, with the remaining tags ranked in between. These data were analysed using a χ^2 test of independence.

RESULTS

Attractiveness of luminescent-coloured WaxTag®s

Analysis of the results indicated that significantly more plain WaxTag®s with the flour blaze (56%) were interfered with by possums than the luminescent-coloured WaxTag®s (44%) (P=0.03; Fig. 2). The data also indicated that the WaxTag® in the centre of the cruciform had the highest levels of interference, but position of the WaxTag® in the cruciform was not statistically significant (P=0.142).

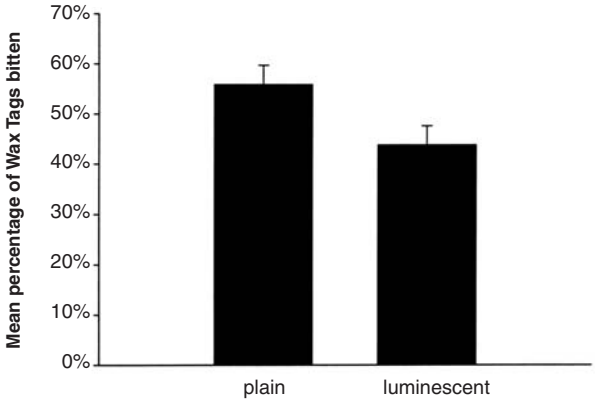

FIGURE 2: Mean percentage of WaxTag®s bitten for plain WaxTag®s with flour blaze versus luminescent-coloured WaxTag®s. Error bars are ± SEM.

The sensitivity of raised WaxTag®s

There were significantly different numbers of WaxTags in each of the categories ($P<0.001$), with the highest numbers of numbers of WaxTag®s in the Level 0 ('Untouched') category and the lowest numbers of WaxTag®s in the Level 5 ('High' interference) category. Within the Untouched category there tended to be higher numbers of raised WaxTag®s, but there was no statistically significant overall preference for ground-set or raised WaxTag®s ($P=0.127$; Fig. 3).

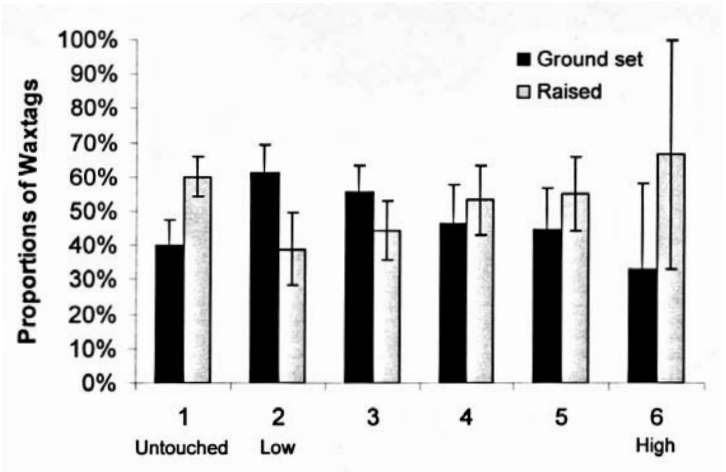

FIGURE 3: The proportions of WaxTag®s (± SEM) in each of six categories of degree of interference by possums. WaxTag®s were set at ground level or raised 700 mm above ground level.

DISCUSSION

This study indicates a possum preference for the plain WaxTag®s with a flour blaze, which is an interesting result as previous research had indicated a preference for kill-traps traps with a luminescent–coloured plastic strip (Thomas & Maddigan 2004). A confounding variable in the above experimental design was the flour blaze, which accompanied the plain WaxTag®. There have been several studies indicating that flour blazes or white-coloured backing boards increase visitations by possums to traps and/or poison baits (Thomas et al. 2003; Warburton & Yockney 2000). It is speculated that the flour blaze is not only a visual lure, but a feeding and olfactory lure. The flour blaze contains a high percentage of sugar and this could contribute to the higher numbers of visits. A problem with flour is that it is quickly washed off by rain and also eaten by rodents (Thomson et al. 2002). As the WaxTag® monitoring protocol specifies that WaxTag®s should remain in the field for 3-7 days, the plain WaxTag® is now coloured bright white to mimic the flour blaze. Recent research (M.D. Thomas, unpubl. data) comparing luminescent and white-coloured WaxTag®s (both without a flour blaze) suggests that the luminescent-coloured WaxTag®s are more attractive, and the use of these devices is now recommended in the latest edition of the monitoring protocol (NPCA 2005). Whilst the flour blaze is no longer used, the results of this research indicated that blue-coloured WaxTags and a flour blaze are more attractive to possums than luminescent-coloured WaxTag®s. Accordingly, it is suggested that if researchers are looking to attract possums to monitoring and/or control devices over a short-time frame, the use of a flour blaze may increase encounter rates.

The use of leg-hold traps puts flightless birds at risk of capture and can either kill or permanently injure them (Sherley 1992). Previous data collected by Thomas & Brown (2001a) showed no significant difference in catch rates between ground and raised trap sets. However, the authors raised a concern that their sample sizes were insufficient. The results from this study support the findings of Thomas & Brown (2001a) with no significant difference between ground-set and raised WaxTag®s detected. This is a key result and indicates that WaxTag®s could be raised up out of the reach of ground-dwelling non-target species (e.g. hedgehogs) without significantly reducing possum encounter rates. Whilst this result is informative, the WaxTag® data do not detail the age and/or sex of possum interfering with the monitoring device. For example, trap-catch data supplied by the Department of Conservation indicates that raised traps catch significantly more juvenile possums (Thomas & Brown 2001a). Accordingly, whilst this research indicates that ground-set or raised WaxTag®s have equivalent levels of interference, no comment can be made on any differences between adults and juveniles and/or males and females. This is an important consideration as it is the adult female survivors that contribute to subsequent population recovery following control. It is recommended that future research investigates whether there are any gender or age differences for possums interfering with the WaxTag®s.

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