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Visual Lures for Possums

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1. Executive Summary

Project and Client

Possum preferences for three types of visual lures, and the potential use of this information for enhancing existing possum control technologies, was assessed by Pest Control Research, for the Animal Health Board (AHB). The work presented in this report was carried out between July 2003 and June 2004.

Objectives

- To compare and rank, in order of preference, the attractiveness to possums of three types of visual lures: white; white with a UV additive; and white with a photo luminescent pigment.
- To determine whether possum control technologies can be improved using the preferred visual lure.

Methods

- WaxTags[®] were used to test the attractiveness of three types of visual lures.
- Stations of each of the WaxTag[®] types (plain white, UV enhanced and luminescent) were deployed in Hohonu Forest, central Westland.
- Presence of possums bite marks was recorded for each of the tag types, over 14 days, and this information was analysed to determine which of the three colour types was most attractive to possums.
- Possum kill traps and paper bait bags containing Feratox[®] were deployed in Hohonu Forest in a pair-wise comparison, with and without a luminescent lure.
- The number of possums killed by each device was recorded after 3 nights, and this information analysed to determine if the addition of a visual lure could significantly enhance existing possum control technologies.

Results

- Significantly more WaxTags[®] were bitten by possums when the tags had a luminescent lure, compared to tags with a plain white lure, or a UV enhanced lure ($P < 0.01$ in both cases).
- More possums were killed when luminescent lures were attached to kill traps and paper bags containing Feratox[®]. However this result was not statistically significant, $P = 0.12$ and 0.11 for bait bags and kill traps respectively. Larger sample sizes may provide more conclusive evidence that luminescent lures improve possum captures.

Conclusions

- Luminescence is more attractive as a visual lure to possums than is plain white or UV enhanced material.
- No advantage is gained by adding UV pigments to white materials used to attract possums.
- The sensitivity of monitoring methods such as Waxtags[®] could be enhanced using luminescent visual lures.
- Possum control devices such as bait bags and traps could catch more possums if used in association with luminescent lures.

Recommendations

- The effectiveness of luminescent lures should be compared to the flour blaze with the aim of providing a long-life lure for the sustained control of low-density possum populations in field trials.
- Luminescent lures should be examined as a method to improve the sensitivity of possum monitoring tools such as WaxTags and kill traps.
- Further trials should be conducted using luminescent lures in association with possum control devices such as long-life baits and kill traps. This will determine whether kills can be increased in situations where sustained control of possum populations is required such as bush/pasture margins.

1. Introduction

Possum preferences for three types of visual lures, and the potential use of this information for enhancing existing possum control technologies, was assessed by Pest Control Research, for the Animal Health Board (AHB). The work presented in this report was carried out between July 2003 and June 2004.

2. Background

During the past five years, the Animal Health Board has had a very low control target for possum densities in an effort to reduce bovine tuberculosis (Tb) transmission from possums to domestic stock. This has been achieved in many areas using control techniques that rapidly knockdown possum populations over short time periods. As a result, the AHB's emphasis has now shifted to maintaining these possum populations at low levels (maintenance control) to prevent possum numbers rapidly increasing (see Thomas et al. 1995 and Cowan 2000). Therefore, it is important to have tools that will provide sustained possum control over long periods without regular checking. Successful monitoring and control with bait stations and traps relies on the possums interacting with the control/monitoring tools used (Carey et al. 1997). Thus, the control tools need to be highly visually attractive to possums over long periods to maximise their effectiveness.

Three colours that are most likely to be attractive to possums were identified for the purposes of this study i.e. white, white with a UV pigment and photo luminescent pigments.

White

Field-based research trials have demonstrated that white visual lures can significantly increase possum captures in traps and visitations to potential baiting sites. Significantly more possums were captured in traps that had a white backing board with a flour blaze (Warburton and Yockney 2000) and significantly more WaxTags[®] were bitten when used with a flour blaze (M. Thomas unpubl. data). However a flour blaze is not suited as a long-term attractant for sustained control of low-density possum populations as it can be eaten by rodents or washed off by rain.

UV Pigments

It is likely that possums are similar to many other animals and have only dichromatic (two colour) vision. With this type of vision the ability to discriminate colours in the middle to long wavelengths i.e. green, yellow, brown, orange and red is less effective. In contrast the transmission of short wavelength light is very high for the lens of animals that are active at dusk, dawn and night. In low light situations some animals can detect light up to 1000 times below human thresholds in the blue and UV wavelengths i.e. 430-440 nanometers (Fig.1).

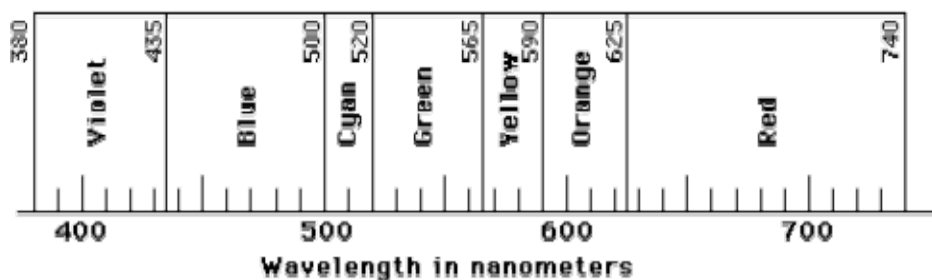


Figure 1. The visible light spectrum.

Research suggest that deer are better able to see clothing that is washed in soap powder containing UV brighteners see <http://home.adelphia.net/~geffert/deervis.htm>. Optical brighteners create brilliance by absorbing UV light, modifying the wavelength of light and then emitting the light as blue fluorescent light between 400 – 500 nm. Consequently special soap powders are manufactured in the USA that do not contain UV brighteners to help improve hunting success. It is possible that possum vision is also sensitive to materials that contain UV light emitting pigments.

Photo luminescent pigments

Carey et al. (1997) concluded that a light source may attract possums to control devices. The simplest, cheapest and most practical light source available for field use is photo luminescent pigment. Photo luminescent pigments can absorb store and reemit ambient light without the requirement of a power source such as a battery.

3. Objectives

- To compare and rank, in order of preference, the attractiveness to possums of three types of visual lures: white; white with a UV additive; and white with a photo luminescent pigment.
 - To determine whether possum control technologies can be improved using the preferred visual lure.
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4. Methods

Objective 1: Attractiveness of white, UV and luminescent tags as visual lures

WaxTags[®]

The WaxTag[®] is a recently developed device for estimating possum abundance (Thomas et al 2003). Each WaxTag[®] consists of a 40 cm² piece of triangular-shaped sheet plastic, with a 12 cc block of wax moulded to the sharpest point of the triangle. Possums are attracted to the tag and their presence is recorded by species specific bite marks on the wax. Development of this device has provided a means of measuring possum activity from the numbers of WaxTags[®] that contain possum bite marks.

For this research, three types of WaxTags[®] were produced (Fig. 1). The first type had a plain white plastic visual lure. The second type had a UV brightening agent added to the plastic

when the tag was moulded. The third type was constructed of plain white plastic, with a 3.6 cm² luminescent strip attached.

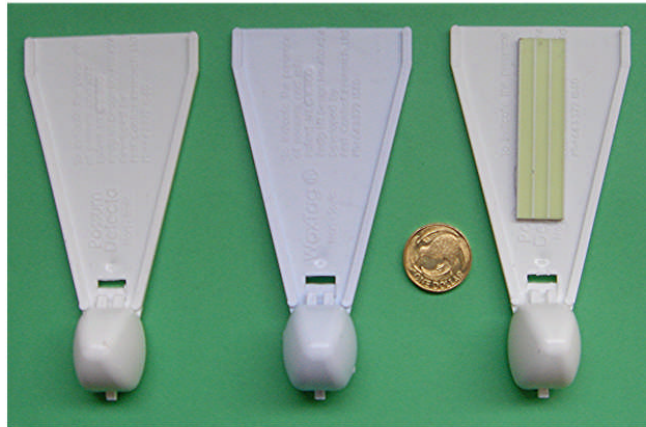


Fig. 1. Three types of WaxTags[®] presented to possums in the field (left to right): white, UV enhanced and luminescent. A dollar coin is used for scale.

Study site and possum population

This study was undertaken in a mixed podocarp forest at Hohonu Forest, central Westland. In other research (Thomas and Maddigan 2004), it was found that the possum population had a residual density of 8% RTCI.

Design of field experiment

The WaxTags[®] of the three different colours were located in ‘stations’ of five tags positioned in a cruciform pattern with one central tag and the other four tags evenly spaced 10 m from the central tag (Fig. 2).

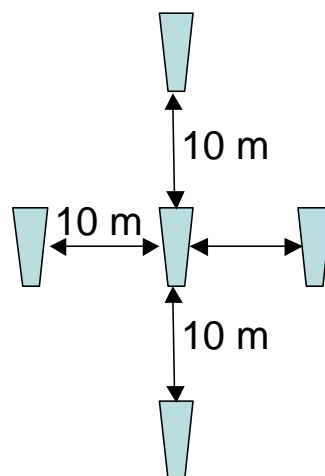


Fig. 2 WaxTag[®] station with five tags spaced at 10 m intervals and arranged in a cruciform pattern. A total of 300 of these stations were deployed.

Stations were deployed in lines with three stations per line, with each station containing one of the three tag types (white, UV- enhanced and luminescent, Fig. 3). Stations were located in random order along the lines. The minimum of 100m spacing between stations (for both stations on the same line and between neighbouring lines) was adopted to ensure that stations could be treated as independent units (NPCA 2002). A total of 100 lines were deployed giving a total of 500 WaxTags[®] for each lure type.

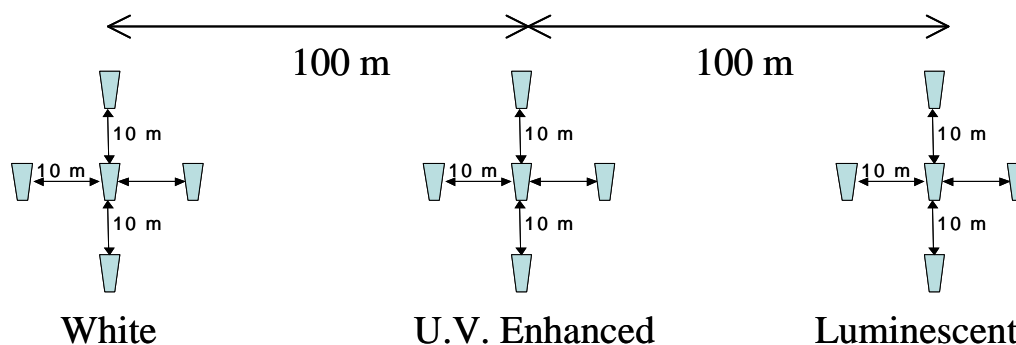


Fig. 3 Layout of one experimental line, containing one station each of the three tag types. A total of 100 lines were deployed. Order of the tag stations was randomised, with neighbouring lines at least 100 m away.

Every tag was checked for the presence of bite marks after 1, 2, 4, 7 and 14 nights. Where a tag was bitten, a record was kept of the tag colour type, the cruciform station and the position of the tag in the station (North, South, East, West or Central). For each colour type, we calculated the mean number of bitten tags per station for each sampling period, and paired t-tests were used to analyse differences between means for each of the colour types (i.e. white vs. UV, white vs. luminescent and UV vs. luminescent).

Objective 2: Using visual lures to improve existing control technologies

In Objective 1 it was found that luminescent WaxTags[®] were significantly more attractive to possums than the other two lure types tested. We therefore undertook further research to determine if luminescence could be used to increase possum kills with kill traps and paper bait bags. The kill traps used were the Sentinel Kill Trap (Pest Management Services Ltd) and the paper bags contained 3 capsules of encapsulated potassium cyanide (Feratox[®], Connovation Ltd).

This work was also conducted in the mixed podocarp forest at Hohonu, central Westland. For each control device (i.e. either kill traps or paper bait bags), a total of 20 lines were located at least 200m apart. Each line contained 10 control devices that were spaced at 20m intervals from neighbouring devices (for a total of 200 of each control device; Fig. 4). Experimental control devices containing standard white trap covers (for the kill traps) or blue bags (for the bait bags) were alternated with trap covers and bags with luminescent lures attached (Figs. 5, 6 and 7). The devices were all located on trees at a height of 700 mm above ground and were deployed for a total of 3 nights. Mean possum kills per line for treated and untreated devices were calculated, and means for the 20 lines were compared using paired t-tests (bait bags vs. bait bags + lure, and kill traps vs. kill traps + lure).

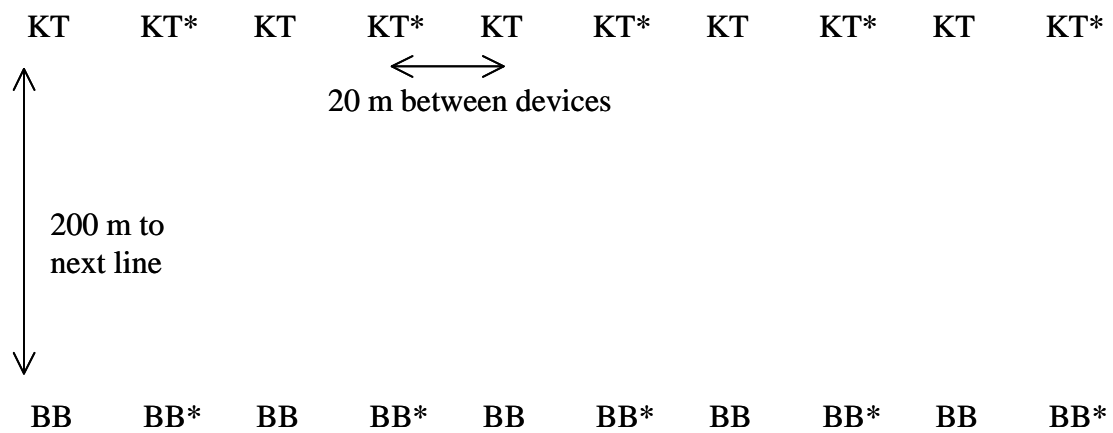


Fig. 4 Arrangement of possum control devices in the field trial. *KT* = Kill Trap, *BB* = Bait Bag, * = Luminescent lure attached.



Fig. 5 Attachment of luminescent lure next to a paper bait bag.



Fig. 6 Attachment of luminescent lures to the sides and top of a Sentinel Kill Trap cover.

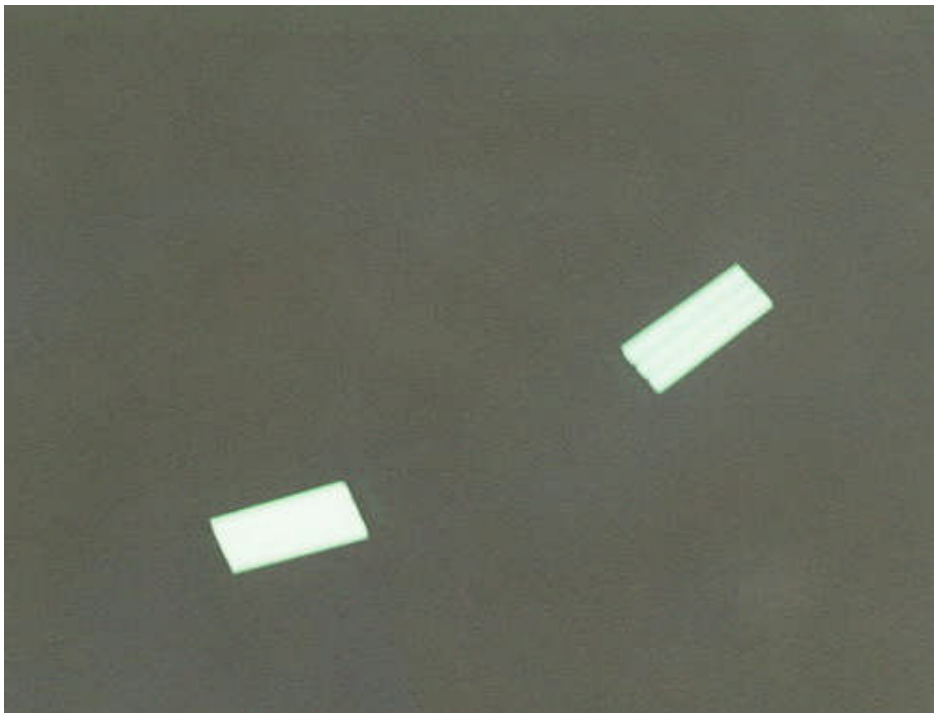


Fig. 7 Kill trap in Fig. 6 viewed at night.

5. Results and Discussion

Objective 1: Attractiveness of white, UV and luminescent tags as visual lures

Significantly more luminescent tags per station were bitten by possums than the other two tag types, and this was consistent for all 5 sampling periods ($P = 0.003, 0.001, 0.001, 0.001, 0.003$ for the white vs luminescent and $0.001, 0.01, 0.007, 0.003, 0.002$ for the UV vs luminescent for the 1 – 14 day sampling periods respectively, Fig. 8). There was no significant difference between the white and UV tags ($P = 0.67, 0.33, 0.17, 0.46, 0.89$ for the 1 – 14 day sampling periods respectively, Fig. 8).

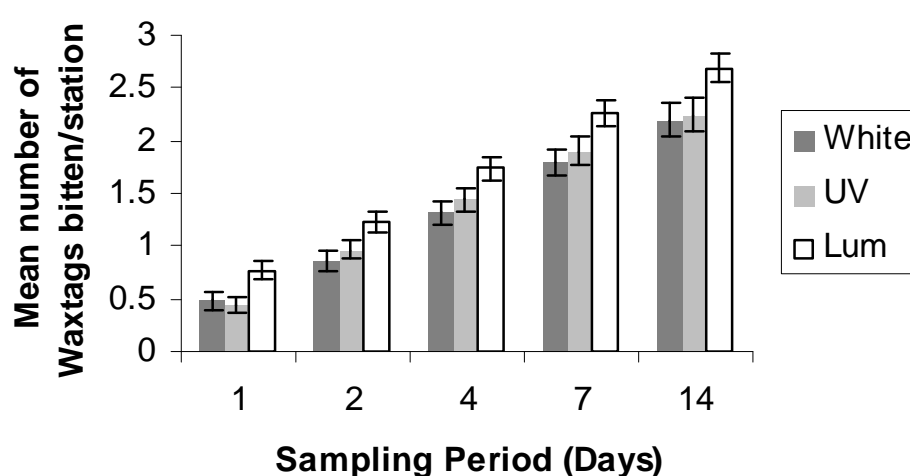


Fig. 8. Mean number of 3 types of WaxTags (white, UV pigment, and photo luminescent) bitten per cruciform station (5 WaxTags per station). Number of stations = 300, error bars are \pm SEM.

The luminescent tags also made up the greatest proportion of the total bitten tags on every sampling day (Fig. 9). It appeared that possums were able to find luminescent tags quicker than the other two tag types. After one night, 77 of the luminescent tags were found (and bitten) by possums, as opposed to 48 white tags and 44 UV tags. Possums have good night vision, and so it is perhaps not surprising that possums could find luminescent tags more quickly than UV and white tags, especially on Day 1.

These results are strong evidence that luminescent lures are more attractive to possums than plain white or UV-enhanced lures. Therefore, luminescence may be an improvement on plain white tags, to increase the number of possums that will find and bite tags. This could increase the sensitivity of possum monitoring when using WaxTags. Luminescent lures also have the advantage of being long-life which is an advantage over the flour blaze which can be washed of by rain or eaten by rats. It is possible that the luminescent lure will work as well as the flour blaze so it could be used as a replacement or an enhancement to the flour blaze.

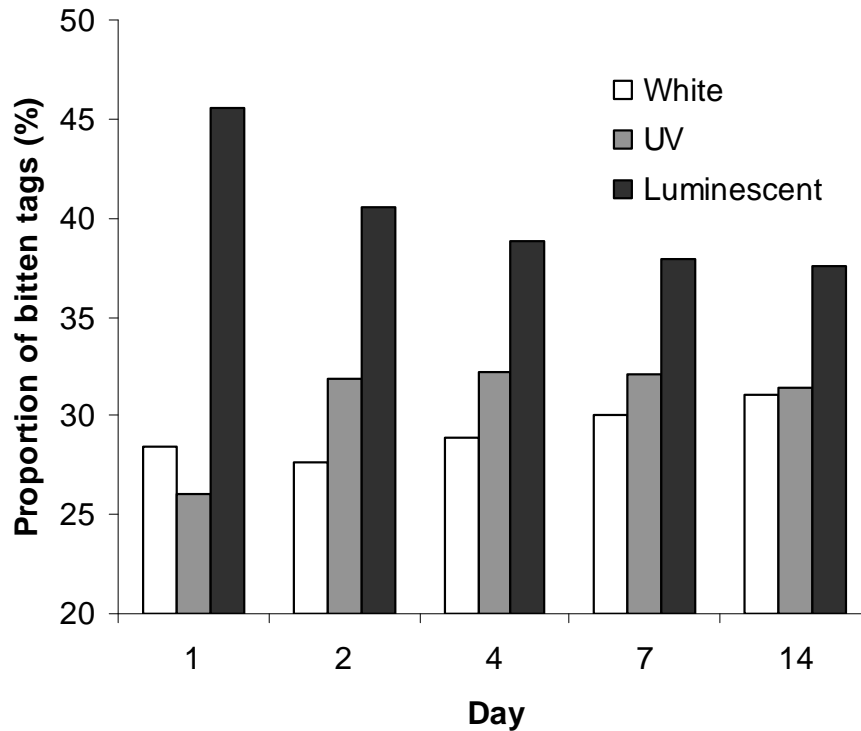


Fig. 9. Tags bitten according to visual lure type, as a proportion (%) of all bitten tags per sampling period.

Objective 2: Using visual lures to improve existing control technologies

A total of 13 possums (38%) were killed at bait bags without the luminescent lure and 21 (62%) were killed at bait bags with the luminescent lure ($P = 0.12$, Fig. 10). For kill traps a total of 10 possums (37%) were killed without the luminescent lure and 17 (63%) were killed with the lure ($P = 0.11$, Fig. 10).

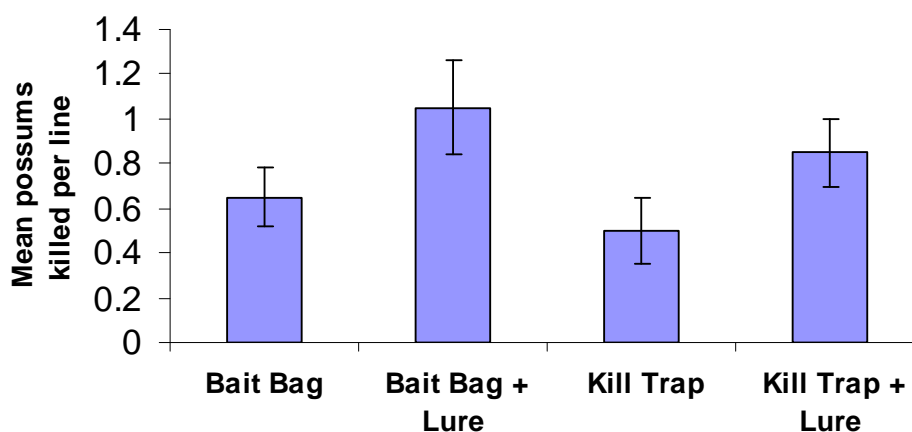


Fig. 10. Mean number of possums killed per line with each control device, with and without a luminescent lure. Each of the four types were deployed for a total of 300 device nights. Error bars are \pm SEM.

While these probabilities were not significant at the 5% level, they are nevertheless suggesting that there is a lure effect and this may have been evident if larger sample sizes were gained. If it can be shown that the luminescent lure is effective it would be more suitable than the standard flour blaze for providing sustained control of low-density possum populations in high-risk Tb transmission areas such as forest/pasture margins when using long-life possum control devices such as kill traps and long-life baits.

6. Conclusions

- Luminescence is more attractive as a visual lure to possums than is plain white or UV enhanced material.
- No advantage is gained by adding UV pigments to white materials used to attract possums.
- The sensitivity of monitoring methods such as Waxtags[®] could be enhanced using luminescent visual lures.
- Possum control devices such as bait bags and traps could catch more possums if used in association with luminescent lures.

7. Recommendations

- The effectiveness of luminescent lures should be compared to the flour blaze with the aim of providing a long-life lure for the sustained control of low-density possum populations in field trials.
- Luminescent lures should be examined as a method to improve the sensitivity of possum monitoring tools such as WaxTags and kill traps.
- Further trials should be conducted using luminescent lures in association with possum control devices such as long-life baits and kill traps. This will determine whether kills can be increased in situations where sustained control of possum populations is required such as bush/pasture margins.

8. Acknowledgements

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9. References

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