Kiwi-safe kill traps for possums

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Abstract

Trappers in New Zealand have traditionally used ground-set leg-hold traps to catch possums (*Trichosurus vulpecula*) but these sets also occasionally catch kiwi (*Apteryx* spp.) and weka (*Gallirallus australis*). To prevent the trapping of these birds, the Department of Conservation (DoC) requires all traps to be placed 70 cm above the ground in areas with kiwi and weka. To set leg-hold traps at this height, additional materials need to be carried, such as platforms or boards, and this reduces trapper efficiency. An alternative approach which has the potential to improve trapper efficiency and address welfare concerns due to leg-hold trapping is to use kill traps set on tree trunks 70 cm above the ground. Two trunk-set kill-trap types (BMI 160 and LDL 101) were tested for possum capture efficiency and compared with ground-set Victor No.l unpadded leg-hold traps. Possum capture efficiencies were similar for both trunk-set kill traps but were much less than for ground-set leg-hold traps. However, capture efficiency of kill traps on a per visit basis could be increased if traps were left for several nights before being checked (assuming the pending animal welfare legislation will allow this). The BMI 160 kill trap has the potential to catch more possums than the LDL 101 kill trap, but animal welfare impacts appear greater in the BMI 160, with more possums escaping, being inhumanely caught, or not being killed quickly. Although the weight and size of the kill traps tested would not significantly impair trapper efficiency, both kill traps took longer to set than the ground-set leg-hold traps. We do not currently recommend the use of trunk-set kill traps by DoC possum control staff, as they do not provide a cost-effective alternative to leg-hold traps. However, improved setting methods of these kill traps might reduce the high number of escapes, sprung traps, and inhumane captures. Raised leg-hold trap sets should continue to be used for capturing possums in areas with kiwi and weka.

1. Introduction

The need for cost-effective solutions to the problem of kiwi and weka captures in ground-set leg-hold traps has resulted in the Science and Research Division of the Department of Conservation contracting Landcare Research, Lincoln, to test two trunk-set kill traps as possible kiwi- and weka-safe possum traps for use in areas inhabited by these flightless birds. Field trials were carried out between October 1996 and April 1997.

2. Background

DoC has recently introduced a trap policy that restricts the setting of traps to 70 cm above the ground in areas where kiwi and weka are found. This policy has met with considerable opposition both from DoC field staff and from private trappers because of the increased costs of having to carry additional materials to prepare the trap sets. Thomson *et al.* (1996) evaluated four above-ground leg-hold trapsets for their percentage capture-efficiency (number of possums caught per 100 trap nights), animal welfare impacts, and trapper efficiency (number of trapsets able to be carried and the time required to set them). The capture efficiencies of these sets were not significantly different from standard ground sets but trapper efficiency was significantly reduced because of the additional materials that needed to be carried and the time required to prepare the sets. Subsequent field use of platform sets (Scott boards) indicates that the relative percentage catch of possums using these sets is variable, with the catch being significantly less than that obtained from ground sets when used in areas with high possum densities (N. Burley, J. Whitford pers. comm.).

A potential alternative to leg-hold traps used on raised platforms was to use kill traps that do not require additional materials and set them directly on the side of tree trunks. These trap sets are used in North America for trapping species such as marten *(Martes americana)* (Peterson 1996). Kill traps may also have advantages in animal welfare (animals are killed quickly) and trapper efficiency. Two kill traps (BMI 160 and LDL 101) which had previously been tested in ground sets and found to be effective at killing possums (Warburton 1996) were selected for testing.

Although the risk to flightless birds will be eliminated by using these set types, it was not known how effective the sets would be for capturing possums. Because of the potential benefits of these types of sets they needed to be assessed for their possum capture efficiency, welfare impacts, and trapper efficiency.

3. Objectives

- Determine the relative possum capture efficiency of trunk-set kill traps.
- Identify any animal welfare problems.
- Compare trapper efficiency when using kill traps relative to ground-set leg-hold traps.

4. Methods

4.1 POSSUM CAPTURE EFFICIENCIES PER TRAP NIGHT

Possum capture efficiencies of trunk-set kill traps were determined for two kill-trap types: BMI 160 (USA) and LDL 101 (Canada). Both traps are designed to strike the possum on the head or neck (LDL being modified with an extended trigger plate) (Figure 1). These trap types were compared with ground-set Victor No.1 unpadded leg-hold traps.

Trials were carried out with all three trap types in three forested areas of the South Island (Geraldine Forest, mid-Canterbury; Pigeon Flat, Otago; and Humphrey's Forest, Westland) between October 1996 and April 1997.

Ten trap-lines of 18 traps were established in each area using six traps of each type (BMI 160, LDL 101, Victor No.l). Eight lines were run for 4 nights and two were run for 3 nights. Trap sites were selected along the trap-lines at about 50 m intervals with the trap type to be set selected randomly. Trap lines were kept at least 200 m apart to ensure each trap line was independent. The weather was fine for all trapping nights except three during which some rain fell after 10 pm, but this rain had little effect on trap catch rates.

Both kill traps were set on tree trunks about 120 cm above the ground (Figure 1) and the Victor No. 1 leg-hold traps were set at the base of trees. The LDL 101 traps were hung on a length of dowelling (18 cm x 1.5 cm diameter) which was nailed securely to the tree trunk. A protruding nail at each end of the dowelling prevented the trap from sliding sideways. Possums could only access the bait through the trap entrance, as a wire mesh (12 mm mesh size) was placed over the top of the trap. The BMI 160 traps were set horizontally out from the tree and held in place by 4 flathead nails (4-6 cm). Possums were able to access the bait in these traps from both the top and bottom. For both kill traps, loose bark and small branches were cleared from the attachment site of the traps to prevent any obstruction of the trap action.

Possums were attracted to the traps by a lure of flour and icing sugar spread on the tree trunks. The lure was spread directly below the kill traps and directly above the leg-hold traps. Peanut butter (smooth) was also placed in the bait holder, on the lower striking bar of the LDL 101 traps, and on a piece of carrot (about 25 mm in diameter x 8 mm in length) placed 2-3 cm down the trigger prongs of the BMI 160 traps. All traps were secured to the tree trunks by a staple and length of chain (BMI 160 and Victor No. l) or string (LDL 101).

Average percentage capture efficiency (number of possums caught per 100 trap nights), possum escapes, and sprung traps per line were calculated per trap night and compared between trap types by a repeated measures analysis of variance.

The gender and maturity of all possums caught was recorded.

4.2 POSSUM CAPTURE EFFICIENCIES PER TRAP VISIT

Using the possum capture results from the trial (where traps were checked every day) we determined the theoretical capture efficiency of the kill traps on a trap-visit basis (after 1, 2, and 3 nights). If traps could be left for several nights before being checked, the number of possums caught should increase after each extra night. We therefore calculated how many possums would have been caught if the kill traps had been visited only once after either 1, 2, or 3 nights and compared it to the number of possums that were caught per night (average for the whole trial) in the ground-set leg-hold traps. The catch was calculated as a percentage capture efficiency for possums only, and for possums including escapes (assuming setting methods could be improved to prevent the escapes). Once a trap had caught a possum, a non-target animal, or had been interfered with (sprung, knocked off, etc.) on a particular night, it was treated as unable to catch a possum on a future night.

4.3 TRAPPER EFFICIENCY

Time taken to set traps was recorded for 24 setting occasions of each trap type. An average setting time was then calculated for each trap type. Average resetting times were also measured for 29 Victor No.1, 15 LDL 101, and 10 BMI 160 trap resets. Setting and resetting times for each trap type were compared using analysis of variance.

Trapper efficiency for each trap type was calculated from the number of traps able to be carried in a 20 kg pack-load and the percentage capture efficiency of each trap type. Calculations used the weight of each trap type with chain included in the BMI 160 (18 cm) and Victor No. 1 (43 cm) trap weights, and string (60 cm), wire mesh (80 g), and dowelling (19 g) included in the LDL 101 trap weights. We used the percentage capture efficiency per trap night and also the percentage capture efficiency based on one visit after 3 nights for the two kill traps.

5. Results

5.1 POSSUM CAPTURE EFFICIENCIES PER TRAP NIGHT

A total of 681 trap nights from 10 lines were used in the analysis (226 for the BMI 160 traps, 224 for the LDL 101 traps, and 231 for the Victor No. 1 traps). From these, a total of 192 possums were caught, 42 in BMI 160s, 29 in LDL 101s, and 121 in Victor No. 1 s (Table 1).

Possum capture efficiencies of both kill-trap types (19% for BMI 160 and 13% for LDL 101) were significantly less than the 53% capture efficiency achieved with Victor No. 1 traps ($p<0.001$, for both). There was no significant difference between the two kill-trap types (Fig. 2).

The BMI 160 traps had a significantly higher percentage (11%) of possum escapes (sprung traps with fur left on the jaws) than either the LDL 101 (3%) or Victor No.1 traps (3%, $p<0.05$) (Table 1). Both kill traps had a similar number of traps interfered with (sprung or knocked off) due to unknown causes (7% for BMI 160 and 6% for LDL 101). This was significantly more often than for the Victor No.1 traps (1 %, $p<0.01$).

The BMI 160 kill trap struck possums on the head or neck significantly less often than the LDL 101 kill trap ($p<0.001$) and therefore would not have achieved as rapid a kill. Thirteen possums (75% immature) were incorrectly struck by the BMI 160 traps, 12 were struck on one or two legs and one across the middle of the body. Possums caught in the BMI 160 traps tended to rake themselves with their claws before dying indicating that the onset of unconsciouness was not rapid. All possums trapped by Victor No.1 traps were caught by the leg.

The BMI 160 traps caught equal numbers of both sexes and equal numbers of mature and immature possums. However, the ratio for the LDL 101 andVictor No.l traps was about 70:30 male to female and 70:30 mature to immature animals.

Few non-target animals were caught, with only two hedgehogs caught in the Victor No.1 traps.

5.2 POSSUM CAPTURE EFFICIENCIES PER TRAP VISIT

Assuming that the kill traps were checked only once after 1, 2, or 3 nights, the cumulative percentage capture efficiencies (number of possums caught per 100 traps) for both kill traps would increase the longer the traps were left out (Table 2). By the third night, the percentage capture efficiency of the BMI 160 traps would be about 75% of the percentage capture efficiency per trap night of the ground-set leg-hold traps (average for the whole trial). The percentage capture efficiency of the LDL 101 traps, however, would be less than 50% of the percentage capture efficiency per trap night of the gound-set leg-hold traps. Including possum escapes in the calculations (assuming setting methods could be improved to prevent the escapes), the percentage capture efficiency after 3 nights of the BMI 160 traps would exceed the percentage capture efficiency of the ground-set leg-hold traps.

5.3 TRAPPER EFFICIENCY

Victor No.l traps were the fastest to set, followed by the LDL 101 traps, and then the BMI 160 traps (Table 3). Trap setting times varied significantly between all trap-set types ($p<0.01$ for all combinations). Resetting times were faster than setting times for both kill-trap types but still significantly slower than the leg-hold traps ($p<0.01$ for both). There was no significant difference between resetting times for the two kill-trap types.

Trapper efficiency is also affected by the number of traps able to be carried in a pack-load. More Victor No.1 traps could be carried in a 20 kg pack-load than either of the kill-trap types (Table 4). Using the number of traps able to be carried in a 20 kg pack-load, and their capture efficiencies, the expected possum catch for each kill-trap type (expressed as a percentage of the Victor No.1 trap catch) was only 19% for the BMI 160 and 16% for the LDL 101. However, if the kill traps were left out for 3 nights before being checked, their relative percentage catch would increase to 42% for the BMI 160 and 26% for the LDL 101 traps. If possum escapes were also included as captures, the catch would increase to 61% of the Victor No.l trap catch for the BMI 160 traps and 39% for the LDL 101 traps.

6. Conclusions

Both trunk-set kill traps caught significantly fewer possums than ground-set leg-hold traps. The low capture efficiency combined with the extra weight of both trunk-set kill traps compared to ground-set leg-hold traps meant that they do not provide a cost-effective alternative to them. Increasing the number of nights between visits has the potential to significantly improve trapper efficiency when using kill traps, but this cannot be done unless the animal welfare legislation is changed. The capture efficiency of both kill traps was significantly affected by the number of escapes and sprung traps, and if these could be avoided, the efficiency of these traps would be markedly improved.

The BMI 160 kill trap has the potential to catch more possums than the LDL 101 kill trap, but more possums escape, are inhumanely caught, or are not killed quickly.

Although both kill traps were lighter (549 g for the LDL 101 and 617 g for the BMI 160) than the platform and leg-hold trap option tested previously (platform and trap weight = 745 g, Thomson *et al.* 1996), the low capture efficiency of the kill traps resulted in the expected catch per 20 kg pack being less than that achievable using Victor No. I traps on platforms (37%). Until the capture efficiency of the kill traps can be improved, raised leghold traps are the best option for trapping possums in areas inhabited by kiwi and weka.

7. Recommendations

- Trunk-set kill traps should not be used by DoC possum control staff as they do not provide a cost-effective alternative to leg-hold traps.
- Alternative trap setting methods should be evaluated to reduce the high number of escapes, sprung traps, and inhumane captures.
- Other trunk-set kill-trap designs should be evaluated for possum capture efficiency.
- Raised leg-hold trap sets should continue to be used for capturing possums in areas with kiwi and weka.

8. Acknowledgements

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9. References

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Table 1. Possums, non-target animals, and traps interfered with for each of the three trap types.

Trap catch	Kill trap BMI 160	Kill trap LDL 101	Ground set Victor No. 1	Totals
Possums	42	29	121	192
Hedgehogs	0	0	2	2
Possum escapes	25	7	7	39
Sprung	12	16	4	32
Knocked off	4	0	0	4
Totals	83	52	134	269
Trap nights	226	224	231	681

Table 2. Cumulative kill-trap percentage capture efficiencies (number of possums caught per 100 traps) after 1,2, and 3 nights. Average capture efficiency of ground-set Victor No. 1 leg-hold traps was 53% for possums and 55% for possums and escapes.

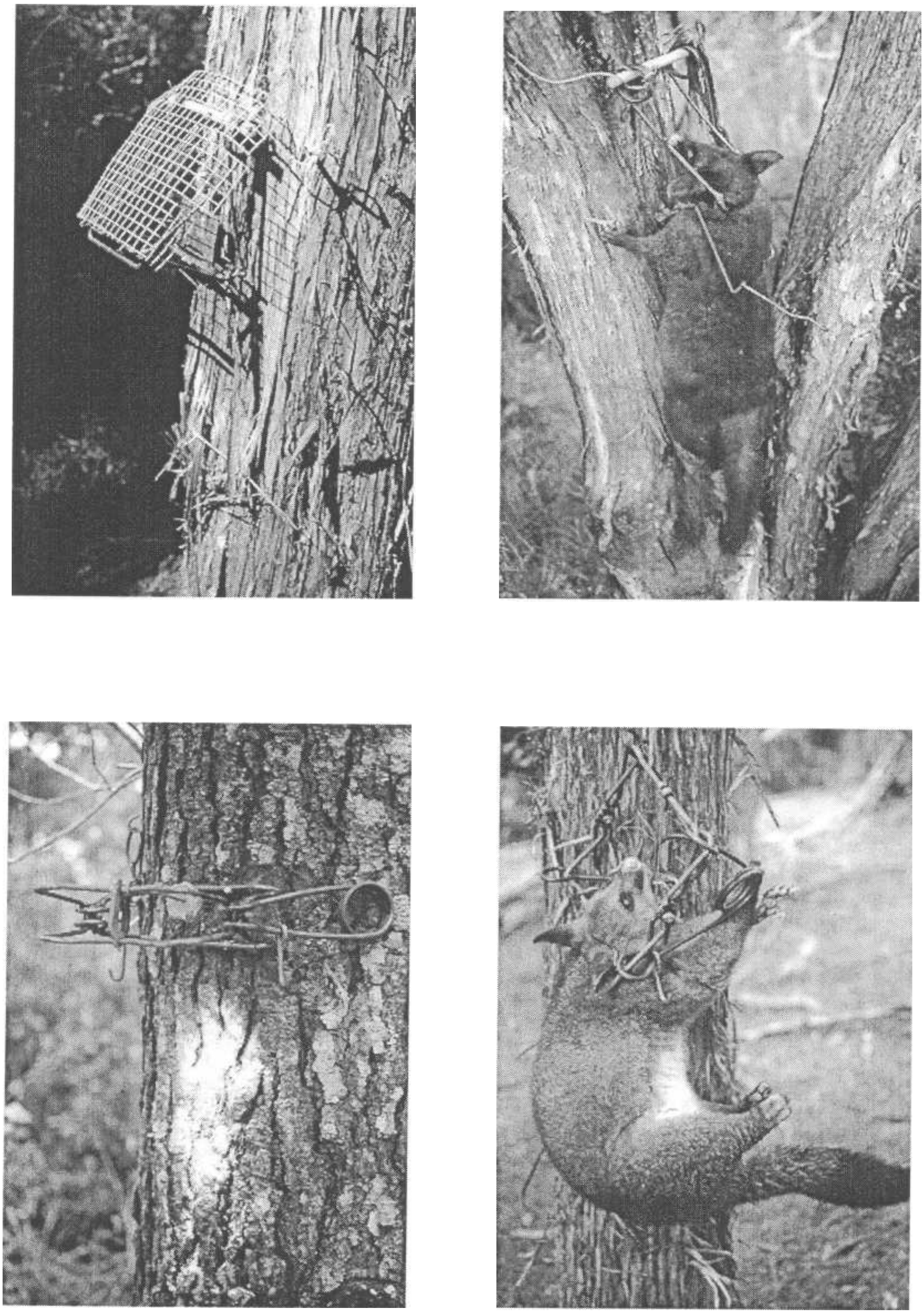
Trap type	Night 1	Night 2	Night 3
Possums			
BMI 160	27%	32%	40%
LDL 101	3%	12%	22%
Possums + escapes			
BMI 160	33%	45%	58%
LDL 101	10%	18%	32%

Table 3. Average time taken to set and reset trap types.

Trap type	Average time to set up trap type	Average time to reset trap type
BMI 160 kill trap	5 min 32 sec	2 min 38 sec
LDL 101 kill trap	3 min 41 sec	2 min 29 sec
Victor No. 1	1 min 4 sec	1 min 4 sec

Table 4. Expected possum catch after one visit to a trap line using a 20 kg pack-load of traps.

Trap type	Trap set weight (g)	Pack-load No. of traps (kg)	Capture efficiency (%) per trap night	Capture efficiency (%) after 3 nights	Expected possum catch (%) of Victor per trap nights	Expected possum catch (%) of Victor after 3 nights
BMI 160 kill trap	617	32 (19.7)	19	40	6 (19%)	13 (42%)
LDL 101 kill trap	549	36 (19.8)	13	22	5 (16%)	8 (26%)
Victor No. 1	335	59 (19.8)	53	-	31 (100%)	-



A

B

Figure 1. The kill-traps used in the trial: (A) LDL 101, (B) BMI 160, each shown set and with a captured possum.

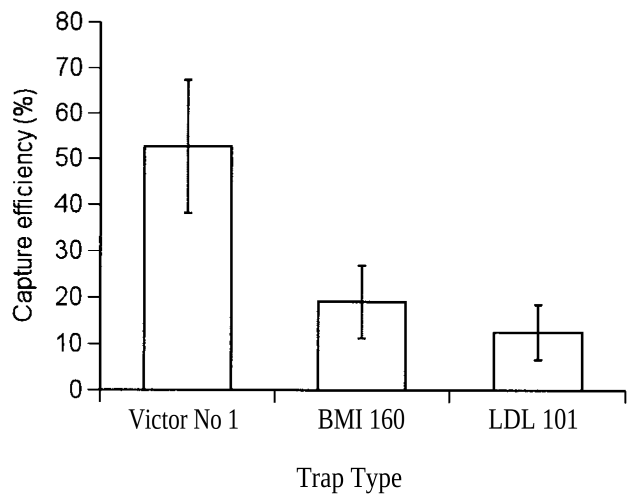


Figure 2. Mean possum capture efficiencies and 95% confidence limits for the three trap types tested.