Pen Test of the Killing Performance of Traps for Control of Vertebrate Pests

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GOAL

To determine the killing performance of:

Possum Master for killing possums and ferrets
Sentinel for killing possums*
Holden Multi Kill for killing ferrets

* The original objective included the testing of the Set & Forget trap on ferrets, but because of problems with availability of these traps, the Sentinel trap was selected as an alternative to test on possums.

CONTEXT OF PROJECT

Recently a range of new kill traps have been developed for capturing and killing possums and ferrets, but because there is no requirement for trap developers to test the killing performance of their traps, there is no information available on how quickly or consistently these traps kill captured animals. For NAWAC to be able to assess whether a trap should be recommended for prohibition (because it causes unreasonable pain and/or distress) they need objective information on the killing performance of these traps. Landcare Research, Lincoln, assessed the killing performance of two trap types for killing possums and two for killing ferrets, for the Ministry of Agriculture and Forestry between July 2006 and June 2007.

APPROACH

The killing performance of the traps was tested by setting them in a pen that housed acclimatised wild possums and ferrets. Animals were observed and, when caught in a trap, the time to loss of the palpebral reflex was monitored. For a trap to meet the NAWAC trap-testing guideline requirements the traps had to render 10 of a sample of 10 animals irreversibly unconscious within 3 minutes.

OUTCOMES

Only one trap model (Sentinel) tested against possums met the requirements of the NAWAC trap-testing guidelines. This trap can be recommended for trapping possums and should provide a high probability that captured possums are killed quickly and consistently. Nevertheless, some of the times to loss of consciousness in possums captured in the Sentinel trap were close to the maximum 3 minutes allowed, and this suggests the trap is marginally acceptable and should be improved if possible.

The Possum Master trap failed to kill 10 of 10 possums, and also failed to kill two ferrets tested. The Holden Multi Kill trap also failed to consistently kill ferrets quickly. The results of the current ferret testing, along with results from previous tests on ferrets, suggest this species is very difficult to kill quickly. The only trap that has performed acceptably for ferrets is the DOC 250.

SUMMARY

The performance of two trap models (Possum Master and Sentinel) for killing possums and of two trap models (Possum Master and Holden Multi Kill) for killing ferrets was tested. Individual possums and ferrets were observed entering and triggering the traps, and once caught their palpebral reflexes were monitored to determine the time to loss of consciousness. Only the Sentinel trap (tested on possums) met the requirements of the NAWAC trap-testing guidelines.

1. Introduction

Recently a range of new kill traps have been developed in New Zealand for capturing and killing possums and ferrets, but because there is no requirement for trap developers to test the killing performance of their traps, there is no information available on how quickly or consistently these traps kill captured animals. For members of the National Animal Welfare Advisory Committee (NAWAC) to be able to assess whether a trap should be recommended for prohibition (because it causes unreasonable pain and/or distress) they need objective information on the killing performance of these traps. Landcare Research, Lincoln, assessed the killing performance of two trap types (Possum Master and Sentinel) for killing possums and two (Possum Master and Holden Multi Kill) for killing ferrets, for the Ministry of Agriculture and Forestry between July 2006 and June 2007.

2. Background

Possums (*Trichosurus vulpecula*) and ferrets (*Mustela furo*) are major conservation and animal health pests, and traps are widely used in New Zealand to control these species. In 1999, animal welfare legislation was updated (Animal Welfare Act 1999), enabling kill traps to be set and left indefinitely between checks. Such liberalisation increased the potential cost-effectiveness of using kill traps and as a consequence several new kill trap models were developed to capitalise on the potential increase in demand.

The Animal Welfare Act does not require traps to be tested and/or approved before sale, so trap developers/marketers can sell any trap for any species. However, the Act does enable the Governor General, through advice from the Minister of Agriculture in consultation with NAWAC, to prohibit or restrict traps that are considered to cause unreasonable pain or distress to target species.

To provide an objective basis for assessing the welfare-related performance of traps, NAWAC developed a trap-testing guideline (NAWAC 2005) to formalise how kill and restraining traps are to be tested, along with criteria for determining whether they have satisfactory performance. This guideline was based on the International Organisation for Standardisation (ISO) trap standard (Warburton 1995; ISO 1999). To assess whether a kill trap is acceptable in terms of its ability to kill quickly, the time to loss of brainstem reflex in the captured animal is measured with either 10 of 10 or 13 of 15 target animals having to be rendered irreversibly unconscious within 3 minutes of capture. Consciousness is determined using the palpebral (blinking) reflex, which stops when the animal has lost consciousness (Rowsell et al. 1981).

Meeting the requirements of the guidelines does not approve a trap per se (or qualify it as humane), but if a trap fails to meet the guidelines then the trap can be considered for prohibition or restriction.

3. Objectives

To determine the killing performance of:

- Possum Master for killing possums and ferrets.
- Sentinel for killing possums.*
- Holden Multi Kill for killing ferrets.

- The original objective included the testing of the Set & Forget trap on ferrets, but because of problems with trap availability, the Sentinel trap was selected as an alternative to test on possums.

4. Methods

This work was carried out with approval of the Landcare Research Animal Ethics Committee (AEC 06/02/04).

A sample of six traps was obtained from the trap-suppliers (Table 1) along with written and verbal instructions on how to set and bait the traps. The test personnel set the traps many times until they became familiar with their use.

Table 1 Traps and suppliers of the three models tested

Trap model	Supplier
Possum Master (Fig. 1)	Possum Master Industries Limited 52 Sea Vista Drive Pukerua Bay 5026
Sentinel (Fig. 2)	Pest Management Services P O Box 751, Paraparaumu Kapiti Coast, 5254
Holden Multi Kill (Fig. 3)	Trappers Cyanide Ltd 303 Laidmore Rd RD2 Amberley

For each trap test, a sample of 10 possums or ferrets was selected with all 10 animals required to be rendered unconscious within 3 minutes for the trap to pass the test.

Wild-caught possums and ferrets were acclimatised to captivity over a period of at least 4 weeks, and for testing they were transferred to individual outdoor pens (10 þ 5 þ 2 m) at the Landcare Research animal facility and allowed to acclimatise over at least 2 nights. A trap was set in each pen, and the test animals were observed from inside an observation hut. When a possum or ferret triggered a trap, the observer quickly moved into the pen to monitor the palpebral reflex by gently touching and/or puffing air onto the corner of the eye. The time to loss of the palpebral reflex and the time for the heart to stop beating were recorded.

Figure 1: Possum Master trap set for possums (left) and ferrets (right). This trap is the only commercially available kill trap in New Zealand that uses a string noose as the killing mechanism.

Figure 2: Sentinel trap showing plastic bait holder on trigger plate (left) and with Corflute® cover (right).

Figure 3: Holden Multi Kill trap (unset) with large perforated trigger plate (left) and with cover (right).

When testing the Possum Master traps on possums, the traps were baited with a piece of apple pushed onto the trigger bar with as little apple as possible extending forward of the trigger. For capturing ferrets the trap was baited with cubes of beef pushed onto the trigger bar. The Sentinel traps were supplied with a clip-on plastic bait holder, and peanut butter was smeared onto this as bait. The Holden Multi Kill traps were baited for ferrets with rabbit meat that was placed at the rear of the trap to encourage the ferrets to enter well into the trap and step on the treadle trigger.

When the first tests of a trap failed to kill the target animals, the test was stopped and the trap deemed to have failed the requirements of the NAWAC trap-testing guidelines. Although a trial could be stopped if the first test failed to render the captured animal unconscious, because of the risk of rejecting a potentially acceptable trap, testing continued until there were either two or sometimes three failures or all 10 animals were tested. If two or three tests failed, this provided greater confidence that the trap was not performing acceptably.

The trap sets used for capturing possums (Figs 1- 3; with minor modifications) included setting the trap vertically on a wooden post with a wooden plank leaning on the post (at an angle of 45º) 60 cm below the attachment point of the trap (about 30 cm below the mouth of the trap). Apart from the first three possums tested, the Possum Master trap was set to fall off the attachment nail when it was sprung and hang from a cord linking the end of the spring arm and the wooden post. This ensured the captured possum hung in the trap and could not get any significant leverage off the ground.

The Possum Master and Holden Multi Kill traps were set on the ground when being tested with ferrets, and each trap had an additional cover attached at the front of the trap cover to restrict the entrance hole and ensure the ferrets were aligned in the centre of the trap entrance. The Possum Master was pegged to the ground but the Holden Multi Kill was not.

Test animals that remained conscious for 3 minutes were either euthanased using a sharp blow to the head if accessible, or with an intracardiac (0.5 ml/kg bodyweight) injection of pentobarbitone. An exception to this was the two ferrets caught in the Possum Master that were released unharmed.

5. Results

5.1. POSSUM MASTER

Possums

Initial testing on three possums (Test 1, Table 2) resulted in one escape. After discussing this outcome with the trap supplier, the trap-set was modified by attaching the end of the spring-arm cord to the vertical pole following their recommendations (Fig. 1). However, the subsequent test using seven possums resulted in three escapes (Test 2, Table 2). It was suggested to the supplier that the escapes appeared to be occurring because the animals were sometimes being held in front of the ears and this may have enabled them to ”slide‘ the noose off their heads. The supplier then recommended that the trap should be attached two hammer lengths (about 60 cm) above the top of the leaning board to ensure the possums were not bending their heads back when getting access to the bait. A new test was started resulting in seven successful captured; however, the eighth possums remained conscious for longer than 3 minutes (Test 3, Table 2).

Table 2: Outcomes of tests using the Possum Master trap for capturing possums

Date	Weight (kg)	Sex	Loss of palpebral reflex (min:s)	Heart stop (min:s)	Strike location(s)	Notes
Test 1 (2006)[1]						
17 Dec	3.25	M	2:55	7:39	Behind jaw and in front of ears	
18 Dec	4.04	M	3:10	6:32	Behind jaw and ears	Triggered trap, held briefly, then escaped
19 Dec	NK	M	1:43	6:45	Behind jaw and ears	
Test 2 (2007)[2]						
22 Jan	3.46	M	1:15	3:50	Behind jaw and in front of ears	
22 Jan	2.92	M	2:22	5:47	Behind jaw and in front of ears	
22 Jan	3.75	M	1:24	4:17	Behind jaw and in front of ears	
22 Jan	3.21	M				Held by trap for c. 15 s then escaped
22 Jan	3.89	M				Held by trap for c. 15 s then escaped
25 Jan	3.53	M	1:38	4:05	Behind jaw and ears	
25 Jan	4.31	M				Held by trap for c. 15 s then escaped
Test 3 (2007)[3]						
31 Jan	3.53	M	1:24	3:09	Behind jaw and in front of ears	
31 Jan	4.05	M	1:36	3:48	Behind jaw and in front of ears	
31 Jan	2.07	F	1:08	4:44	Behind jaw and in front of one ear	
17 Feb	2.50	F	0:55	5:41	Behind jaw and in front of one ear and across the other	
17 Feb	2.68	F	1:43	5:07	Behind jaw and in front of one ear	
7 Mar	2.89	F	0:55	6:18	Behind jaw and in front of one ear	
7 Mar	3.74	M	1:25	3:39	Behind jaw and in front of ears	
7 Mar	3.81	M	3:29	7:29	Behind jaw and ears	

NK = not known

[1] Trap was set vertically on post with leaning board (at 45º) immediately beneath trap. End of snare cord not attached to post

[2] As above with end of snare cord attached to nail in post as recommended by trap supplier

[3] As in footnote 2 except the bottom of the trap was set 60 cm above the leaning board and the bait (apple) on the bait hook protruded less to maximise the distance that possums had to reach into the trap

Ferrets

Two ferrets were tested but both were conscious at 3 minutes and still breathing easily. Both animals were released unharmed and no further testing was undertaken (Table 3).

Table 3: Outcome of tests using the Possum Master trap for capturing ferrets

Date (2007)	Weight (kg)	Sex	Loss of palpebral reflex (min:s)	Heart stop (min:s)	Strike location(s)	Notes
20 Mar	0.70	F	-	-	Neck and front right paw	Still breathing easily, released
20 Mar	0.91	M	-	-	Neck	Still breathing easily, released

5.2. SENTINEL

Possums

A total of 10 possums were tested with all being rendered irreversibly unconscious within 3 minutes (Table 4). Several of the possums were struck in front of one or both ears suggesting the bait holder should be further back to ensure the possums' heads are well into the trap (Fig. 2) and struck behind the ears.

Table 4: Outcome of tests using the Sentinel trap for capturing possums

Date (2007)	Weight (kg)	Sex	Loss of palpebral reflex (min:s)	Heart stop (min:s)	Strike location(s)
11 June	3.56	M	1:07	4:59	Behind jaw and ears
11 June	2.50	F	1:36	6:12	Across neck
11 June	3.97	M	1:47	3:51	Behind jaw, behind left ear, in front of right ear
13 June	2.86	M	2:46	4:59	Behind jaw and in front of ears
13 June	2.96	F	2:11	4:52	Behind jaw and ears
25 June	2.86	F	2:34	6:42	Behind jaw and ears
25 June	2.60	F	2:49	6:58	Behind jaw, behind left ear, in front of right ear
25 June	3.25	M	1:50	5:59	Behind jaw and ears
26 June	2.82	M	1:24	4:07	Behind jaw, behind right ear, in front of left ear
26 June	2.39	F	1:45	4:48	Behind jaw and ears

5.3. HOLDEN MULTI KILL

For trapping ferrets the Holden Multi Kill trap is supplied with a modified trigger plate that attaches onto the bait hooks used when targeting possums (Fig. 3). Four ferrets were tested using the trigger plate supplied, but only one ferret was rendered unconscious within 3 minutes (Table 5). Because of these failures, the trigger plate was modified (shortened) twice to try and increase the probability that the animals were struck across the chest rather than the shoulders (Fig. 4). However, these trigger modifications did not resolve the initial problem (Table 5), so a further modification (extension of the jaws; Fig. 5) with and without a modified trigger plate was also tested. Unfortunately this modification also failed to perform adequately (Table 5).

Table 5: Outcomes of tests of the Holden Multi Kill trap for capturing ferrets. Note the trap had four modifications

Date (2007)	Weight (g)	Sex	**Loss of palpebral reflex (min:s)**	Heart Stop (mins:s)	Strike locations(s)
Initial trigger design					
3 July	913	F	0:48	3:02	Behind shoulders, in front of chest
3 July	906	F	>5:0	Euthanased	Across shoulders, left shoulder blade fractured
3 July	1010	M	>5:0	Euthanased	Across shoulders
3 July	866	F	>5:0	Euthanased	In front of shoulder, right leg caught
Trigger shortened by 15 mm					
19 July	894	F	>5:0	Euthanased	In front of shoulders, left leg caught
Trigger shortened by 35 mm					
1 Aug	1300	M	>5:0	Euthanased	Across left shoulder and front of right shoulder
Initial trigger design with trap jaws extended by 35 mm					
6 Aug	867	F	1:20	3:00	Across chest
6 Aug	1540	M	>5:0	Euthanased	On angle across shoulder and chest
6 Aug	1170	M	>5:0	Euthanased	Across shoulders
Trigger shortened by 15mm with trap jaws extended by 35 mm					
14 Aug	1500	M	3:30	6:30	Across front of chest

Figure 4: Initial Holden Multi Kill trigger plate (left) and modified (middle shortened by 15 mm and right shortened by 35 mm).

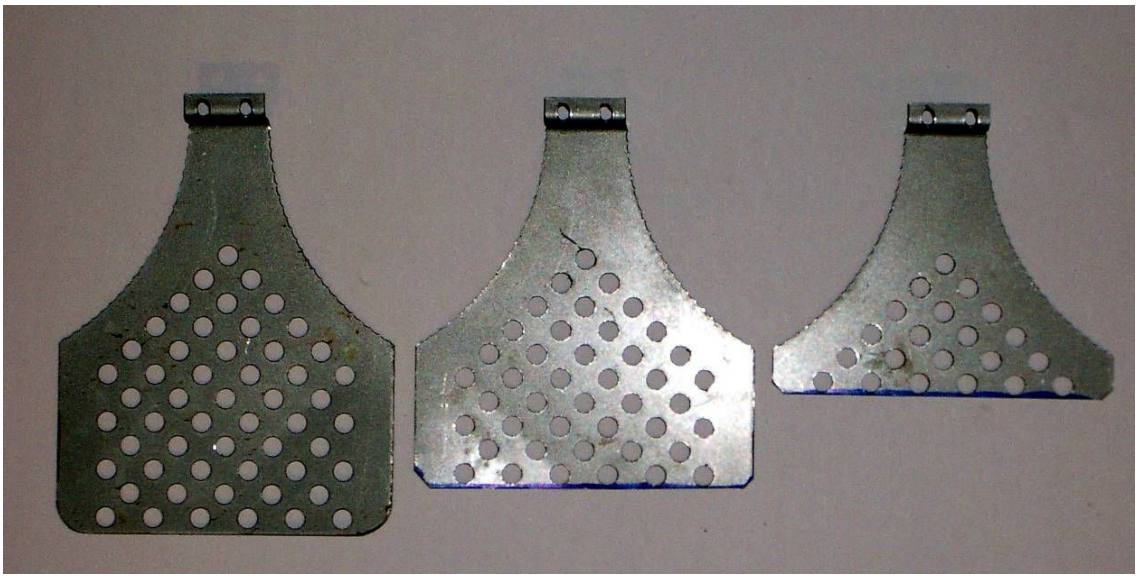

Figure 5: Original (left) and modified (jaws extended 35 mm and trigger plate shortened by 15 mm) (right) Holden Multi Kill trap.

6. Discussion

The Possum Master trap is the only noose-operated trap commercially available, and because of its ease of use and the low risk it poses to users, it has been favoured by many trappers. Unfortunately the pen tests showed that some possums can escape from the trap and others were not rendered irreversibly unconscious within 3 minutes. Many of the captured possums had the noose close around the head but in front of the ears, and this could have contributed to the traps' poor performance. If the trap could be modified to ensure all captures resulted in the noose being around the neck then the trap might have a higher probability of passing the NAWAC trap-testing guidelines. An additional problem that arose when using the trap was the damage caused to the rubber hooks that hold the noose open. These hooks were either broken or chewed off and had to be replaced to keep the trap operational. The Possum Master trap failed to kill ferrets, as have several other traps that are sold commercially for trapping ferrets (Warburton et al. 2002; Warburton & Poutu 2003).

The Sentinel trap passed the NAWAC trap-testing guidelines and provides another acceptable kill trap for controlling possums. Nevertheless, some of the possums captured did take close to 3 minutes before losing consciousness and this suggests that the trap is killing as a result of strangulation rather than effectively occluding the carotid arteries, which generally results in loss of consciousness within 45 seconds (Warburton et al. 2000).

Although the Holden Multi Kill trap delivers significant impact momentum and clamping force, the trap failed the trap-testing requirement for ferrets because of its inability to consistently strike the captured animal in a vital location. Previous trap trials targeting ferrets indicate that ferrets are very difficult to kill quickly, and to do so requires them to be struck either across the head (resulting in a cranial fracture) or across the chest (to compress the heart and/or lungs). Strikes across the neck or shoulders consistently fail to render animals unconscious within 3 minutes.

The original objectives of this research included the testing of the Set & Forget kill trap that is sold by Pest Tech Ltd. Unfortunately this trap was not made available because of the reluctance of the supplier to provide traps for testing. Their reluctance was a result of a concern they had about the limited number of test animals used in a test (i.e. 10) and the probability the trap would fail the test by chance. Although this concern has some justification, the tests to date that have failed a trap have generally shown the trap performs very poorly and not just marginally so. No trap has been recommended for prohibition when there have been nine successes and one failure (i.e. just failed). Such a result has generally led to a recommendation that the supplier of the trap makes some modifications to the trap so that it can then be retested. An alternative solution is to increase the number of animals tested with each trap (e.g. 15 or 20), however this will significantly increase the cost of testing. The difficulty in sourcing one trap type specifically for these trials highlights a contradiction for trap manufacturers/suppliers when they have no requirement to test their product œ i.e. a supplier who volunteers their trap for testing may be penalised by reduced sales if their trap fails, whereas another supplier may continue to sell an inferior trap that has not been tested.

7. Recommendations

- That Sentinel traps be accepted as a kill trap that can effectively kill possums.
- The Possum Master and Holden Multi Kill traps should be prohibited for trapping ferrets.
- Suppliers of the Possum Master kill trap should be encouraged to modify the trap to prevent possum escapes and to increase the killing performance of the trap.
- Trap suppliers should be encouraged to submit traps for testing and be encouraged to pass on any concerns they have related to testing the welfare performance of their traps to NAWAC.

8. Acknowledgements

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