

Weka- and kiwi-safe possum trap sets

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Weka- and kiwi-safe possum trap sets

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ABSTRACT

Leg-hold traps are used by hunters and pest control staff for controlling and monitoring possum (*Trichosurus vulpecula*) populations in New Zealand. However, leg-hold traps set on the ground to catch possums also catch flightless birds such as weka (*Gallirallus australis*) and kiwi (*Apteryx* spp.). To address this problem, trap-set methods designed to exclude weka were developed and tested in three sequential trials. Trap sets that excluded weka were assumed to also exclude kiwi. In the first trial, weka in pens at Orana Park were able to jump onto a platform at 900 mm above the ground but not at 1000 mm; and they could walk up boards and poles sloped at 42° and 45° but not 55° to this height. They also breached low fencing exclosures. The successful sets were then field-tested in the second trial using leg-hold traps in an area with high weka numbers. Only one weka was caught, on a board set. These same trap sets, along with an extended platform ('branch') set were then tested for possum capture efficiency in the third trial in an area with a high possum density and no flightless birds. The capture efficiencies for possums of trap sets designed to exclude weka were not significantly different from those of leg-hold traps set on the ground. The only significant differences were between the platform sets (the least efficient) and the sloping board and pole sets (the most efficient). However, fewer modified sets can be carried and established per unit effort than those used for ground sets, which would reduce trapper efficiency. Platform and 'branch' sets would, however, give the next best trapper efficiency compared with ground sets.

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1. Introduction

The Nelson/Marlborough Conservancy of the Department of Conservation (DOC) requested Manaaki Whenua - Landcare Research, Lincoln, to test a variety of weka- and kiwi-safe possum trap sets for use in areas inhabited by these flightless birds. Pen trials with weka were carried out at Orana Park, Canterbury, in September 1995. The successful set designs were then refined and field tested for their effectiveness at excluding wild weka at Tennyson Inlet, Marlborough Sounds, during October - November 1995 and tested for possum capture efficiency at Goose Bay, North Canterbury, during April - June 1996.

2. Background

Leg-hold traps are used by commercial fur hunters, contract hunters, and pest control staff of DOC and Regional Councils to control possums (*Trichosurus vulpecula*), a major pest species in New Zealand. Trapping is an important control method, particularly in areas where possums have become bait- or poison-shy, where toxins are not favoured as a control technique, or where legal restrictions prevent the use of toxins. Traps are also used extensively for monitoring possum populations. In some areas with populations of weka and/or kiwi where traps are used, both species have been caught in traps. At worst, such non-target trappings may put the bird populations at risk.

Trap users have suggested a variety of trap-set types to avoid capturing flightless birds, but none of these have been tested for their effectiveness at excluding these birds, particularly weka, or for how they affect the capture rate of possums.

DOC's draft guidelines on the use of traps in areas with weka and kiwi recommend that all traps must be set 700 mm above the ground, either on platforms, attached directly to tree trunks, or attached (above 700 mm) to a sloping board set at 38° to the ground. These guidelines were based on trap sets used in the possum eradication programme on Kapiti Island (Sherley 1992) and, in particular, on bait station trials carried out on kiwi in the Wellington zoo (Robinson 1983, unpublished report). The requirements may significantly impair the performance of trappers by decreasing capture efficiency, increasing the time required to set traps, and increasing the amount of gear carried. As a consequence, the number of possums captured will be reduced per unit effort. Operational costs may therefore be significantly increased when the guidelines are followed.

Because of these problems, we evaluated a number of potential ways of excluding flightless birds from trap sets, both for their effectiveness at preventing captures of flightless birds and for their effect on possum capture rates. Although trials were restricted to weka, it was assumed that successful methods would also exclude kiwi.

3. Objectives

- To develop several methods of setting leg-hold possum traps that will prevent captures of flightless birds.
- To compare the possum capture efficiency of these sets with standard ground sets.

4. Methods

4.1 EFFECTIVENESS OF TRAP SETS AT EXCLUDING WEKA

4.1.1 Pen trials

Trials were carried out in pens at Orana Park, Canterbury, on five adult western weka (*Gallirallus australis australis*) captured from the Chetwode Islands in 1993 (2 females, 1 male, 2 unknown sex) and one adult buff weka (*Gallirallus australis hectori*) captured from the Chatham Islands in 1988 (sex unknown).

The weka were offered a highly favoured food (freshly killed newly hatched domestic chicks) to lure them to the potential trap sites (traps were not used in the trial). Platforms, sloping boards and poles, and fencing were first tested on a single weka, and when that bird failed on five separate occasions to reach the chick within 30 minutes, the set was then tested on the other five naive weka. The sets that excluded each of the six weka on five separate occasions were selected for field trials.

The wooden platform tested (200 × 200 × 25 mm) was attached to a free-standing post by an L-shaped bracket. The platform was set at increasing heights up the post, beginning at 500 mm above the ground, until the trial weka was unable to jump onto it. This height was then tested on the other five weka and raised if any were successful at jumping onto it.

The sloping rough-sawn boards (100 × 25 × 1800 mm) tested were placed against a free-standing post and the slope (set by hypsometer) gradually increased from 25° until the initial trial weka was unable to climb the board to reach the chick (nailed to the post above the maximum jumping height). This angle was then tested on the five other weka.

Initial trials with sloping poles used manuka poles, but the irregular nature of the wood and bark meant the surface friction and angles were difficult to measure. To ensure consistency in angle and surface friction, doweling poles (35 mm diameter × 2000 mm) were substituted. The poles were tested in a similar manner to the boards. Light saw cuts (1 mm depth) gave consistent surface friction to the board and pole surfaces.

The fences tested included wooden doweling pickets (15 mm diameter), tomato stakes (22 mm × 28 mm), and wire chicken netting (30 × 40 mm mesh). Food

was placed out of reach behind the fence which either spanned one side of a three-sided box or surrounded the potential trap site entirely.

Bait of flour, icing sugar, and cinnamon flavour (a standard possum lure) instead of freshly killed chicks was offered once to all weka.

4.1.2 Field trials

Three sets that excluded penned weka (platform at 1000 mm, 55° sloping board, and 55° sloping pole) were tested at Tennyson Inlet, Marlborough Sounds, an area with high numbers of western weka and low numbers of possums.

Victor No.1 Soft Catch leg-hold traps were set 1000 mm above the ground on trees, either on single horizontal platforms or on 20°–45° platforms at the top of 55° sloping rough-surfaced boards or poles. Traps were offset to the right on the board and pole platforms, and placed centrally on the single horizontal platforms (Appendix 1) with holes cut and strategically placed small blocks of wood to stabilise the trap and chains lengthened to allow a captured possum to fall to the ground. In all sets, the centre of the trap trigger plate was about 14 cm out from the tree trunk. Board and pole angles were set by hypsometer and all set sites were positioned so that weka could not access traps from surrounding higher ground, tree roots or branches. A standard possum lure was placed on the tree trunk above each trap.

The sets were spaced at 200-m intervals in forest, and each site tested all three sets in sequence, with the six possible set sequences randomly allocated for each site. Mud trays to detect weka footprints and upturned paper cups (red dot placed in centre) for weka to peck were placed close to all trap sets. Sets were checked each day and changed to the next set type after a weka encounter (i.e. weka footprints in mud tray or pecks on paper cup), provided there was no possum, rat, or other interference with the trap. Some weka were directly observed near trap sets.

Enough sets were laid out to obtain at least 60 weka encounters per set type. If no weka were captured from 60 encounters, we would be 95% confident that the set would exclude weka on at least 95% of visits.

4.2 EFFICIENCY OF TRAP SETS FOR CAPTURING POSSUMS

The three successful trap sets used in the weka exclusion trials (platform at 1000 mm, 55° sloping board and 55° sloping pole) and an extended platform ('branch') set (Appendix 1) were compared with a ground set for their efficiency at capturing possums at Goose Bay, North Canterbury—an area with a high possum density and no flightless birds. The ground set comprised a trap bedded into the ground in front of a tree with lure placed on the trunk directly behind the trap. No barriers (rocks or sticks) were placed at the side of the traps. The 'branch' set had a 30-cm extension of the platform (width of 5–10 cm) out the front and offset to one side on which lure could be placed. To reach the lure a possum would have to cross over the trap, increasing the probability of a capture.

All sets used standard Victor No.1 leg-hold traps with chains extended to 75 cm on the weka-excluding sets. To minimise potential injuries, the trap end of the chain was fastened to the back corner of the trap platform by a twist-tie with the other end pulled tightly down diagonally behind the tree and stapled. This prevented the trap from being dislodged by possums and non-target animals, but allowed a captured possum to fall to the ground from one side of the set.

Twenty lines, each of 25 traps, including five of each of the five set types were set with at least 200 m between lines and 20–40 m between each trap site, depending on the availability of suitable sites. Set types were randomly selected for each site. To avoid bias, the trap-set type was not known until after the site was chosen. Possum lure was placed above the traps, on the platform extension of the 'branch' set, and up tree trunks, boards, and poles. Traps were set for 3 fine nights (two lines were set for 4 nights) giving a total of 310 trap nights for each set type. Trap sets were checked daily and notes kept on the trap state, catch, sex, maturity, leg caught, and injuries (bruising, cuts or fractures) of trapped animals. The time taken to set up each set was recorded for about 50 of each set type.

Statistical analyses used analysis of variance (ANOVA) with pairwise comparisons, chi-square, and 2-tail t-tests. Significance was accepted at the 95% probability level ($P \leq 0.05$).

The number of sets and traps able to be carried in a 20-kg pack-load was determined using 350-g platforms for all sets (the pole platform weight), boards with their backs routed out for lightness, boards and poles hinged for portability, 100-g platform extensions for the 'branch', Victor No.1 traps weighing 335 g, and 60-g trap-chain extensions for the weka-excluding sets. Calculations used the field capture efficiency of sets and 100 possums caught in the ground sets. Expected catch per unit effort was then compared between set types.

5. Results

5.1 EFFECTIVENESS OF TRAP SETS AT EXCLUDING WEKA

5.1.1 Pen trials

All weka were keenly interested in the chick bait. They attempted to reach it by jumping, climbing, or pulling at or digging under the fences with their beaks. Five of the six penned weka could easily jump onto a platform 700 mm above the ground, three of these reached 800 mm, and one reached 900 mm (Table 1). Five weka could easily walk up a 38° board, four of these were able to walk up boards set at 42° and 45°, and two were able to jump half way up the 55° board, sometimes taking a step before falling off. Only one weka attempted any of the pole sets. This weka could easily walk up a doweling pole set at 45°. During initial trials, it also walked up a manuka pole set at 55°–63°, but the irregular nature of the bark and wood gave it additional traction. The buff weka was less agile than the five western weka.

TABLE 1. MAXIMUM HEIGHTS AND ANGLES ACHIEVED BY THE PEN WEKA AT ORANA PARK.

	PLATFORM HEIGHT ABOVE GROUND (mm)	BOARD ANGLE (°)	POLE ANGLE (°)
Western weka 1	900	42	0
Western weka 2	800	50 (few steps)	45
Western weka 3	800	55 (one step)	0
Western weka 4	800	55 (one step)	0
Western weka 5	600	38	0
Buff weka	700	29	0

The weka ate the possum lure when it was offered to them on the ground but they did not attempt to breach any of the sets to reach it.

Pickets hammered into the ground were forced apart by weka so subsequent fences were nailed to a solid structure surrounding part of the trap site. Fencing trials were discontinued when weka were able to breach a 380-mm-high fence, as we felt higher fences would divert possums away from the trap.

Three sets (platform at 1000 mm, 55° sloping board, and 55° sloping pole) excluded all six weka on five separate occasions and were subsequently recommended for the field trials.

5.1.2 Field trials

All the trap sets tested in the field successfully excluded weka on all occasions except one (Table 2), giving a 0.5% capture rate. This weka was caught on a board set. Most of the 32 weka observed near trap sites ignored them, with only 10 looking up at the trap set. Some weka (9) scratched around the base of the set and one attempted to climb the trap tree.

For the sets that successfully excluded all weka (platform at 1000 mm and 55° sloping pole) we can be 95% certain that weka will be excluded on more than 97.3% of encounters. For the 55° sloping board set that captured one weka out of 67 encounters we can be 95% certain that weka will be excluded on at least 92.5% of encounters.

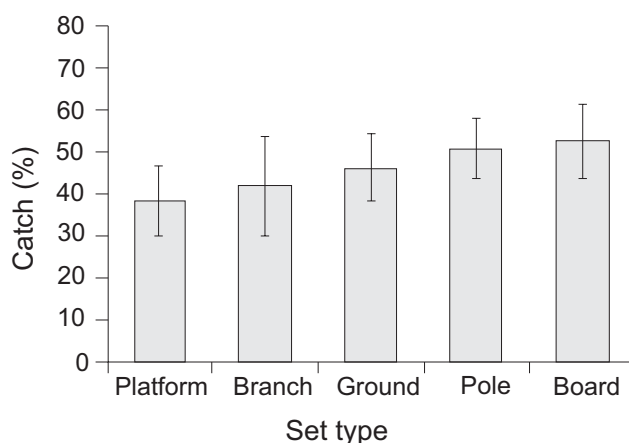
TABLE 2. NUMBER OF WILD WEKA CAUGHT AND EXCLUDED FROM THE TRAP SETS.

SET TYPE	WEKA EXCLUSIONS	WEKA CAUGHT	TRAP NIGHTS
Platform 1000 mm above ground	70	0	228
55° sloping board	66	1	256
55° sloping pole	69	0	279
TOTALS	205	1	763

5.2 EFFICIENCY OF TRAP SETS FOR CAPTURING POSSUMS

From a total of 1550 trap nights (310 for each set type) 714 possums were caught. The capture efficiency of the weka-excluding set types ranged from 38% to 53% (Fig. 1), and did not differ significantly from the capture efficiency of the ground set (46%). Platform sets (38%) were significantly less efficient than sloping board (53%, $P = 0.01$) and sloping pole (51%, $P = 0.02$) sets. There was weak evidence, although not significant, that there was a difference between the 'branch' sets (42%) and the sloping board sets ($P = 0.06$).

Figure 1. Capture efficiency of trap-set types.



There were no significant differences between set types for sex ratio, maturity, injuries sustained, or night captured of the possums caught. Of the 714 possums caught, 369 were females and 345 males, with 522 adults and 192 juveniles. Only one non-target animal (feral cat) was caught. Most possums (64%) were caught by a rear foot.

Visible injuries were identified in 61% of possums over all set types, with 7% of these being fractures, 32% cuts, and 22% bruising (Appendix 2).

A total of 76 traps were sprung (unknown cause), sprung with fur in the jaws (possum escape) or knocked off the sets (Table 3). There were no significant differences between set types for traps sprung due to unknown causes, but ground sets had significantly more possum escapes than the platform ($P = 0.05$), 'branch' ($P = 0.02$), or sloping pole ($P = 0.05$) sets. Also,

TABLE 3. POSSUMS, NON-TARGETS, AND TRAPS INTERFERED WITH FOR EACH OF THE FIVE SETS TESTED.

TRAP CATCH	GROUND	1000 mm PLATFORM	1000 mm 'BRANCH'	55° SLOPING POLE	55° SLOPING BOARD	TOTALS
Possums	144	119	130	158	163	714
Feral cat	1	0	0	0	0	1
Possum escapes	8	3	2	3	6	22
Sprung	5	5	5	6	6	27
Knocked off	0	1	3	12	11	27
TOTALS	158	128	140	179	186	791

significantly more traps were knocked off the boards than the platforms ($P = 0.003$) and 'branches' ($P = 0.02$) and also off the poles than the platforms ($P = 0.001$) and 'branches' ($P = 0.01$).

Ground sets took significantly less time to set up than any of the other sets ($P < 0.001$). The platform and 'branch' sets were significantly quicker to set up than the board and pole sets ($P < 0.05$ for all), although there was only a few seconds difference (Table 4). Board and pole sets were difficult to set up on sloping ground, often resulting in the trap platform being higher than 1000 mm above the ground, and use of the hypsometer was difficult in poor light conditions within the forest.

TABLE 4. AVERAGE TIME TAKEN TO SET UP DIFFERENT TYPES OF TRAP SETS.

TRAP-SET TYPE	AVERAGE TIME TO SET UP TRAP SET
Ground	53 sec
1000 mm platform	2 min 42 s
1000 mm 'branch'	2 min 44 s
55° sloping board	2 min 56 s
55° sloping pole	3 min 3 s

As well as the time factor involved in setting up trap sets, the additional logistics of carrying the sets will affect the number of possums caught per unit effort. Using 20 kg as a maximum pack-load of sets and traps, we compared expected catch rates between sets (Table 5). Sets would need to be modified for stackability as the present size of some of them would mean fewer than stated could be carried. From these figures, ground sets would be expected to catch the most possums per unit effort followed by platform and 'branch' sets. Sloping boards would catch the lowest number of possums.

Appendix 3 gives target weights of sets needed to give certain percentage catches relative to ground sets.

TABLE 5. NUMBER OF TRAPS AND SETS MAKING UP A 20-KG PACK-LOAD AND THE EXPECTED CATCH.

Calculations used 100 possums caught in ground sets, field-capture efficiencies, 335-g Victor No. 1 traps, 60-g chain extensions, routed-out boards, 100-g platform extensions, and 350-g platforms for all sets. Bulk of sets and set-up times are not taken into account.

SET TYPE	SET WEIGHT (g)	PACK-LOAD		CAPTURE EFFICIENCY (%)	EXPECTED POSSUM CATCH *
		No.	kg		
Ground	-	60	20.1	46	100
1000 mm platform	350	27	20.1	38	37
1000 mm 'branch'	450	24	20.3	42	37
55° sloping pole	850	16	19.9	51	30
55° sloping board	1330	12	20.7	53	23

* Equivalent to percentage catch relative to ground sets.

6. Conclusions

Weka were able to jump higher and walk up steeper angles than those specified by DOC's present policy for preventing captures of flightless birds in leg-hold traps. Low fencing failed to exclude weka from trap sites. To exclude weka, leg-hold traps should be set at or above 1000 mm on single horizontal platforms or on sloping platforms (0°–45°) at the top of 55° sloping boards or poles. Because weka are more agile than kiwi, the recommended set requirement may be excessive for excluding kiwi.

Even though trap sets designed to exclude weka were no better or worse than ground sets at capturing possums, logistical constraints will reduce the number of possums caught per unit effort, particularly in possum eradication operations where many traps need to be set per day. The platform and 'branch' (extended platform) sets would, however, give better results than the pole and board sets even though the latter two had greater capture efficiencies per trap. Overall trapper efficiency would be improved for all the sets by making them lighter and more portable. For instance, the 'Scott board', a platform developed by DOC Northland, consists simply of a flat board attached to a tree by 3 nails, with the trap stabilised by a rubber band made from an inner tube.

Logistical constraints may not affect monitoring operations to the same extent as eradication operations, as fewer traps would be needed. However, monitoring results would be affected if different set types were substituted, as some set types differ significantly in their capture efficiencies. In all situations where these trap sets are used, the trap-chain attachment procedure used in these trials should be adhered to, to minimise the risk of injuries to captured possums.

7. Recommendations

- To avoid catching weka in leg-hold traps, traps should be set at least 1000 mm above the ground.
- Traps may be set (at or above 1000 mm) on single horizontal platforms or 'branches' (extended platforms) to maximise possum catch per unit effort, or on 0°–45° platforms at the top of 55° sloping boards or poles.
- Set materials should be refined to improve portability and therefore overall trapper efficiency (new materials may need testing for capture efficiency).
- Possum monitoring operations should be consistent in the set type they use to avoid variations in capture probabilities between set types.
- The trap-chain attachment procedure used in these trials should be adhered to, to minimise the risk of injuries to captured possums.

8. Acknowledgements

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APPENDIX 1

Trap sets designed to exclude flightless birds.

Victor No.1 traps were stabilised on the platforms by drilling holes and strategically placing small wooden blocks. To enable captured possums to fall to the ground, trap chains were extended to 75 cm, pulled tightly down diagonally behind the tree and stapled. To prevent the trap being dislodged before a capture, the trap-end of the chain was fastened at the back corner of the platform with a twist-tie.



Platform



Branch



Pole



Board

APPENDIX 2

Injuries sustained by possums in the capture efficiency trials.

INJURIES	GROUND		1000 mm PLATFORM		1000 mm 'BRANCH'		55° SLOPING POLE		55° SLOPING BOARD		TOTALS	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Bruising	27	19	24	20	24	19	22	35	45	28	155	22
Cuts	59	41	41	35	39	30	46	29	46	28	231	32
Fractures	8	5	11	9	8	6	12	8	9	5	48	7
Injury subtotal	94	65	76	64	71	55	93	59	100	61	434	61
No visible injuries	50	35	43	36	59	45	65	41	63	39	280	39
TOTALS	144		119		130		158		163		714	

APPENDIX 3

Number of traps and target weights for sets needed to achieve different percentage catches relative to ground sets. A maximum pack-load of 20 kg, 335-g Victor No.1 traps, 60-g chain extensions, and field-capture efficiencies were used. Bulk of sets and set-up times were not taken into account. Weight of sets will not be relevant if logistics are not a problem, as in some monitoring operations.

GROUND		PLATFORM		'BRANCH'		55° SLOPING POLE		55° SLOPING BOARD	
% OF GROUND CATCH	No. TRAPS	No. TRAPS	TARGET PLATFORM WT. (g)	No. TRAPS	TARGET 'BRANCH' WT. (g)	No. TRAPS	TARGET POLE WT. (g)	No. TRAPS	TARGET BOARD WT. (g)
100	60	73	-	66	-	54	-	52	-
80	48	58	-	53	-	43	70	42	81
70	42	51	-	46	40	38	131	36	161
60	36	44	60	39	118	32	230	31	250
50	30	36	161	33	211	27	346	26	374
40	24	29 ⁺	295 ⁺	26 ⁺	374 ⁺	22	514	21	557
30	18	22	514	20	605	16 ⁺	855 ⁺	16	855
20	12	15	938	13	1143	11	1423	10 ⁺	1605 ⁺

⁺ Trap numbers, set weights, and percentage of ground catch similar to Table 5.