

## Supplementary Information

**Appendix S1.** Sample size required for estimating the relationship between each of the new abundance index methods (chew cards and wax tags) and the trap catch abundance index.

Our original analysis proposed to estimate a correction factor multiplier ( $m$ ) between each of the two alternative abundance indices, the chew card index (CCI) and wax tag index (WTI), and the trap catch index (TCI) such that (using the example of CCI):

$$\text{CCI} = \text{TCI} \times m. \quad (1)$$

This proposed analysis was superseded for reasons described in the main manuscript, but the sample size for our field study was estimated based on it. Two previous studies that assessed the relationship between the chew card and trap catch abundance indices spaced devices at 20-m intervals along transects (the ‘McKerrow 2008’ and ‘Kumara 2008’ studies reported in Table 2 of Sweetapple & Nugent 2011). These studies estimated  $m$  to be 4.88 and 6.46 for forest habitats (i.e. these values suggest that a density of possums that gives a CCI of 50% will give a TCI of 10.4% or 7.74%, respectively). These estimates of  $m$ , however, were based on a different spatial array of devices that were set for six (McKerrow 2008 study) and seven (Kumara 2008 study) nights. Furthermore, a value of  $m$  in forest habitat may not be applicable in non-forest habitat and even within a habitat the relationship between  $m$  and the underlying possum density may be non-linear.

### Sampling variation

For any fixed ‘true’ density of possums, there will be a range of TCI and/or CCI/WTI values (i.e. there is uncertainty in the sampling of possums, regardless of the method). There will also be variation in TCI and/or CCI/WTI for a fixed possum density due to underlying behavioural differences and spatial aggregation.

Even assuming a fixed value for  $m$ , the observed values of CCI/WTI and TCI may not be exactly as shown in Eqn. 1. We therefore expect the observed values of CCI/WTI, TCI and  $m$  to vary among sites, such that (using the example of CCI):

$$\text{CCI}_i = \text{TCI}_i \times m_i \quad (2)$$

for each site  $i$ . The mean value for  $m$  will, therefore, have a standard error associated with it. The more sites that are sampled the better the estimate of the mean and the smaller the standard error.

We were interested in the minimum number of sites that needed to be sampled in order to obtain an estimate of  $m$  that has an acceptable level of uncertainty. For the purpose of this study, we specified that the acceptable level of uncertainty had a coefficient of variation (CV) of 0.20 (where  $\text{CV} = \text{SD}/\text{mean}$ ). This minimum number of sites would depend on the variation in CCI/WTI and TCI for a fixed level of possum abundance. We used a normal distribution to simulate CCI/WTI and TCI data with combinations of levels of variation (i.e.  $\text{CV} = 0.25, 0.50, 0.75, 1.00$  and  $1.25$ ). The simulation results are summarised in Table S1.

The more uncertainty there is in the relationship between true abundance and either index, the more sites are needed to achieve an acceptable estimate of  $m$ . For moderate levels of

variation in CCI/WTI and TCI (i.e.  $\text{CV} = 0.50$ ) the number of sites required is 40–50. This result is in broad agreement with Jones and Warburton (2011), who determined that “at least 30 lines per habitat per season for each bite-mark index method should be run to ensure the maximum precision around the relationship subsequently generated”.

**Table S1.** Results of simulations conducted to assess the number of sites needed to determine the multiplier between the trap catch index (TCI) and the chew card index (CCI) or the wax tag index (WTI) with precision of 0.20. CV, coefficient of variation.

TCI CV	CCI or WTI CV				
	0.25	0.50	0.75	1.00	1.25
0.25	20	30	40	50	60
0.50	40	50	60	70	80
0.75	50	60	70	80	90
1.00	60	60	80	90	90
1.25	90	90	100	100	120

**Appendix S2.** Protocol for setting wax tags, chew cards and leg-hold traps in our study.

### Overarching sampling design

Possum monitoring will be conducted along twelve 200-m transects with preset bearings offset by 30° (Fig. S2.1). Possum transects extend from a central point, and each possum monitoring device (PMD); wax tag (W), chew card (C) or leg-hold trap (T) will be set at 20-m intervals along each transect. Each pellet transect line (P) is parallel to a possum trap line, maintaining 3.5 m distance from the trap line. Faecal pellets will be counted at 5-m intervals along each transect.

Sampling will occur over three nights (4 days). Two transects of wax tags and chew cards will be set on the first day and removed on the second day. The remaining two wax tag and chew card transects will be set on the second day and removed on the third day. The four trap transects will be set on the third day and removed on the fourth day. Four pellet lines will be completed over the four days—these can be completed on any day (as time permits).

### Weather requirements

PMDs are to be set for one fine night—i.e. when there has been no rain within 4 h after darkness. No rain is defined as less than 1 mm of rain in the first 4 h of darkness in the habitat where the PMDs are set. Darkness is as per NZ Land Transport’s definition: hours of darkness are ‘any period of time between half an hour after sunset on one day, and half an hour before sunrise on the next day.’

Ideally, the devices will be set over three consecutive fine nights. If rain occurs during the sampling, the sequence of nights can be broken to allow weather to pass as long as there are no more than 10 nights between the first and last nights. For example, it is possible to set for one night, break for two nights of bad weather, set again for one night, break for three nights and set again.

If devices have been set and it rains on that night, then that night must be repeated to obtain valid data. It is therefore important to only set on fine forecasts.

If wax tags / chew cards are set and it rains:

- (1) Record results of any chews/bites (additional booklets may be required)
- (2) Replace any device with chews/bites (from both possums and non-target). In this case only, it is acceptable to re-use unbitten devices.
- (3) Set the devices for an additional night (weather must be fine).

If traps are set and it rains:

- (1) If possums are caught in traps, record the data from the first night and set for an additional night (weather must be fine).
- (2) If no possums are caught in traps, set the traps for an additional night (weather must be fine).

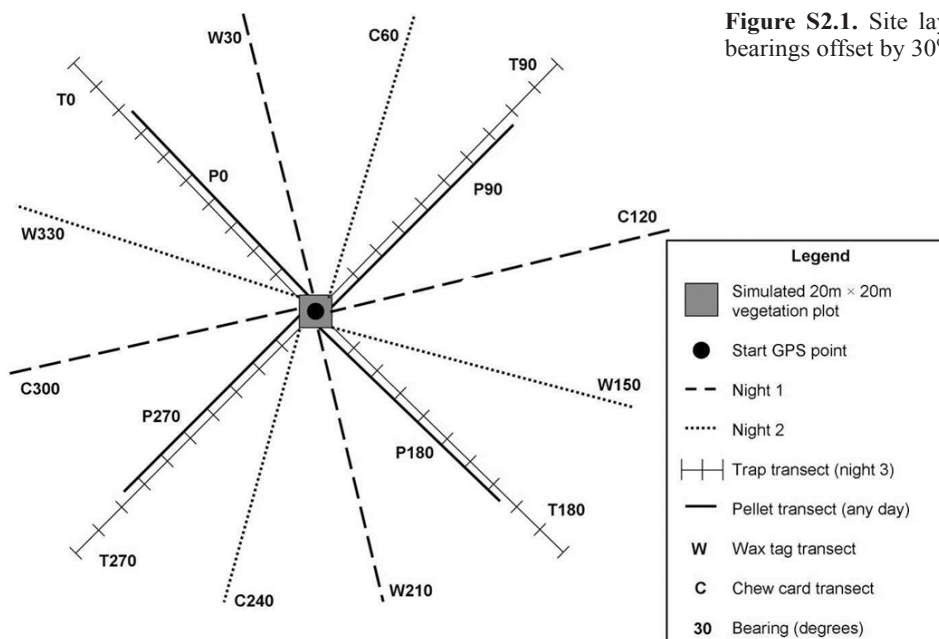
### Timeline

Transects must be sampled in the order prescribed below (see also Table S2a):

Day 1: The field staff will locate the start GPS point of the site. Two 200-m wax tag® transects (W30 and W210) and two 200-m chew card transects (C120 and C300) will be laid out and monitoring devices set as per the field protocols. Some (or all) of the four 150-m pellet transects can be sampled on this day (as time permits).

Day 2: The detection devices placed out on day 1 will be checked and removed. The remaining two 200-m wax tag transects (W150 and W330) and two 200-m chew card transects (C60 and C240) will be laid out and monitoring devices set as per the field protocols. Any remaining 150-m pellet transects can be sampled on this day (as time permits).

Day 3: The detection devices placed out on day 2 will be checked and removed. Four new 200-m trap-line transects will be laid out and traps will be set along these four transects according to the BMRS protocol. Any remaining 150-m pellet transects



**Figure S2.1.** Site layout: twelve 200-m transects with preset bearings offset by 30°.

**Table S2a.** Timeline for setting of possum-monitoring devices.

	W30	C120	W210	C300	C60	W150	C240	W330	T0	T90	T180	T270	Pellet lines
Day 1	Set	Set	Set	Set									As time permits
Day 2	Close	Close	Close	Close	Set	Set	Set	Set					
Day 3					Close	Close	Close	Close	Set	Set	Set	Set	
Day 4									Close	Close	Close	Close	

can be sampled on this day (as time permits).

Day 4: The traps set on day 3 will be checked and removed. If pellet counts were not completed on days 1–3 then they must be completed today. Team cleans up site and departs.

Important note: When setting transects, each night should be treated independently. For example if a line needs to turn at a barrier, minimum distance criteria must be applied to other transects set on the same day. However no consideration is required for transects from the previous/next nights. This may result in transects being set in the same location as the previous night.

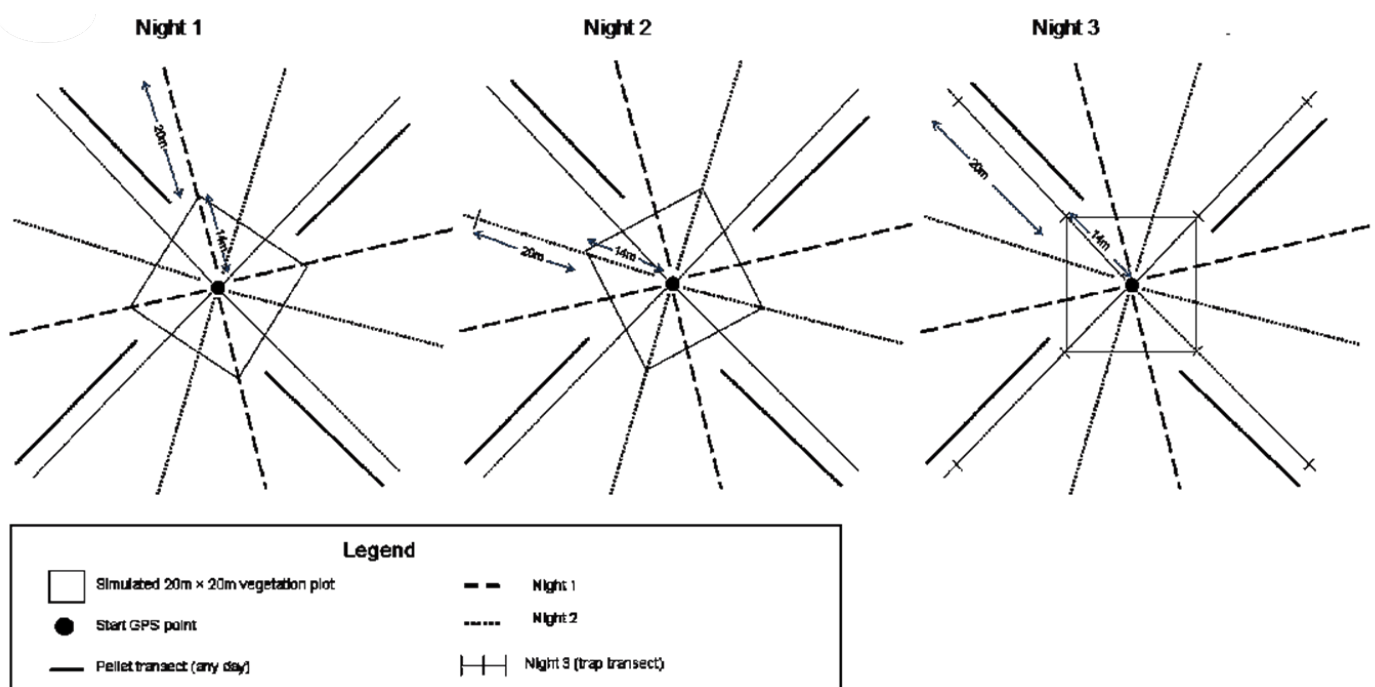
### Transect layout

The first PMD position will be 34 m along the transect from the central GPS start point (Fig. S2.2). That is, at 14 m the transect starts and the first PMD is set 20 m further from this point. The 34 m rule applies to every transect method (wax tag, chew card and trap). For each of the possum transect lines:

- (1) Navigate to the central point of the transect lines.
- (2) Mark the transect start point (e.g. with flagging tape); you do not need to permanently mark or record the GPS waypoint of the transect start point.
- (3) Set the first PMD (wax tag, chew card or trap) 34 m from the start point on the transect bearing. Walk as closely and safely as possible along the transect bearing, using a hip-chain to measure the distance between PMDs and the

flagging tape to mark the track. All hip-chain cotton must be removed upon completion of measurement to prevent entanglement of birds.

- (4) All subsequent PMDs should be set at 20-m intervals on the nearest acceptable site:
  - (i) For a ground-set trap site, this is defined as: the nearest tree or fence post that will hold a fence staple and is a minimum of 5 cm in diameter, up to the required lure height ( $50 \pm 10$  cm). For soft trees (e.g. tree fern) that cannot hold a staple securely, use wire or nylon cord to secure traps. A backing board is to be used when no other suitable trap site is available.
  - (ii) For a raised-set trap site, this is defined as: the nearest suitable tree or fence post that is appropriate for setting raised brackets, will hold a fence staple and is a minimum of 5 cm in diameter up to the required lure height above the trap ( $50 \pm 10$  cm).
  - (iii) For a wax tag site, this is defined as: the nearest tree or fence post that will hold a nail and is a minimum of 5 cm diameter up to the required lure height ( $30 \pm 5$  cm). A backing board is to be used when no other suitable wax tag site is available.
  - (iv) For a chew card site, this is defined as: the nearest tree or fence post that will hold a nail. There is no minimum diameter. A stake is to be used when no other suitable chew card site is available.

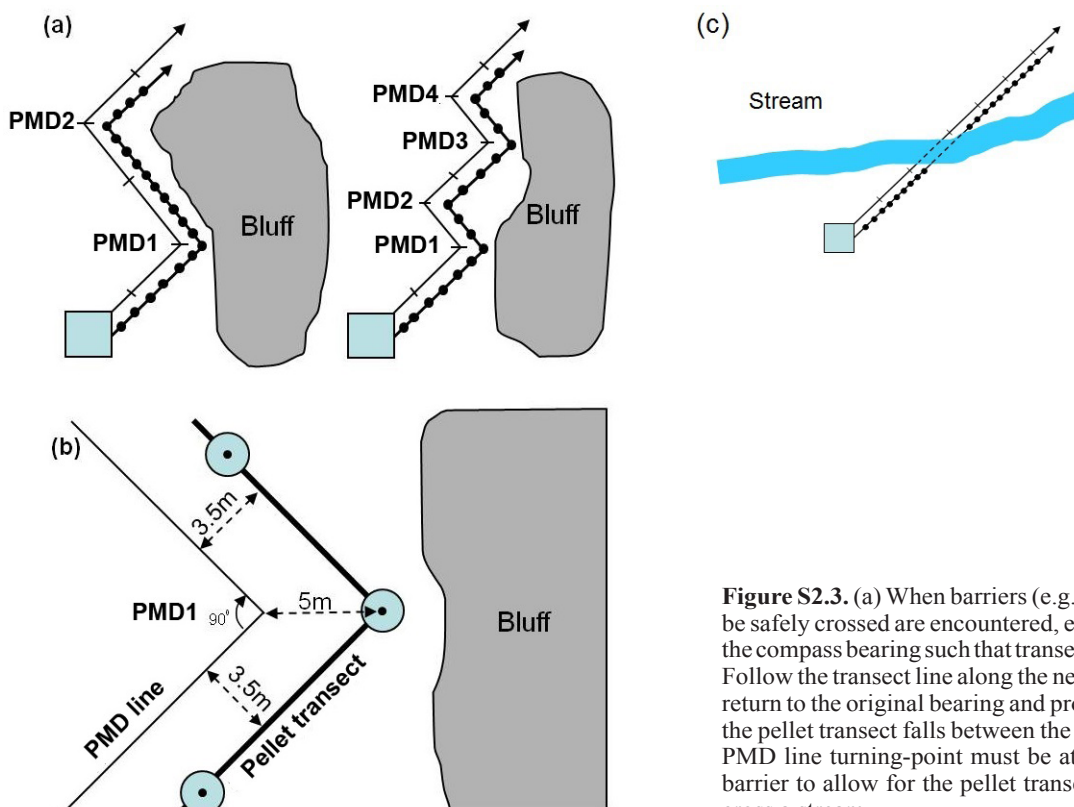


**Figure S2.2.** Design used to sample possum occupancy and relative abundance using leg-hold traps, wax tags and chew cards at sites in our study.

- (5) A transect line bearing is required to be within  $\pm 10^\circ$  from the ideal sampling layout design. Staff are encouraged to find suitable PMD sites on the line of the compass bearing. However, if the nearest suitable site is located off the line of the compass bearing, then staff must return onto the line before proceeding to the next PMD site.
- (6) Transect lines are required to be within 10% of their overall design length. For instance, a 5-PMD line must be  $100 \pm 10$  m long, and a 10-PMD line must be  $200 \pm 20$  m long.
- (7) When barriers (e.g. bluffs, roads or rivers) are encountered that can be safely crossed but are unsuitable for establishment of PMDs, continue along the same bearing without establishing any PMD sites (=break in the line) until the barrier has been crossed or skirted. The maximum permitted distance between PMDs should only be used in terrain that is unsafe to cross or unsuitable for setting devices (e.g. water, landslide, scree/rock). If the maximum permitted distance between PMDs would be exceeded, then staff are required to go back to the previous PMD site and treat the barrier as impassable. When breaking the line there are rules that must be adhered to:
  - (i) A PMD can be moved  $\pm 10$  m from its 'planned' location along the line.
  - (ii) The minimum permitted distance between two PMDs on the same transect line is 10 m (note the minimum distance between two PMDs on separate lines is 20 m).
  - (iii) The maximum permitted distance between two PMDs is 40 m.
  - (iv) The possum transect line cannot exceed 200 m in length.
  - (v) Where the break-protocol has been applied (i.e. when a PMD is not at its 'planned' location), record the hip-chain length in the device notes of the field sheet.

If two PMDs are established 40 m apart (i.e. one PMD moved back 10 m and the next PMD moved forward 10 m) then the next (third) PMD must be set 10 m past the second PMD to align the traps back to the correct spacing. The fourth PMD would then be 10 m further along, at its 'planned' location. For example, when 12 m after the previous PMD and encountering a river, staff can establish a PMD site at this location ( $< 10$  m from the 'planned' location) and 'break' the line for a maximum distance of 38 m before a new PMD site needs to be established (8 m to 'planned' site + 20 m to next + 10 m movement allowed for next trap = 38 m). On the other hand, when encountering a barrier at 8 m after the previous PMD site, staff cannot establish a PMD site at this location ( $> 10$  m from 'planned' location) and can break the transect line up to a maximum of 22 m (12 m to 'planned' site + 10 m movement allowed = 22 m).

- (8) When barriers (e.g. bluffs or rivers) that cannot be safely crossed are encountered, add or subtract  $90^\circ$  from the original compass bearing such that the transect turns away from the barrier. If a deviation from the original bearing is required, it must be made at the last PMD before the barrier. Follow the transect along the new bearing. If the barrier ends, return to the original bearing at the next PMD site and proceed (Fig. S2.3). Note that transect lines cannot be turned back towards the vegetation plot. Staff cannot set a PMD and then double-back along the line, e.g. if a PMD has become a 'dead-end', then this is the end of the line.
- (9) Note that PMD sites can be established in dry riverbeds or similar habitats using backing boards.
- (10) There may be instances when several barriers (e.g. bluff and/or cliff) affect the possum transects in a site such that



**Figure S2.3.** (a) When barriers (e.g. bluffs and rivers) that cannot be safely crossed are encountered, either add or subtract  $90^\circ$  from the compass bearing such that transect turns away from the barrier. Follow the transect line along the new bearing. If the barrier ends, return to the original bearing and proceed. (b) In the situation that the pellet transect falls between the PMD line and the barrier, the PMD line turning-point must be at sufficient distance from the barrier to allow for the pellet transect. (c) Breaking transects to cross a stream.

they are converging. If a transect line cannot be completed (e.g. safety concerns or the transect line changes course and comes within 20 m of another transect line), as many PMDs as possible should be set while staying within these guidelines. It is acceptable that a transect line has less than 10 PMDs set. Since the minimum distance between two PMDs on separate lines is 20 m, a transect line must be discontinued if it cannot avoid coming within 20 m of another transect line of the same method. It is permitted to turn a transect directly from a corner of the vegetation plot, provided the transect returns to the original bearing at the first PMD site. After that the 20-m rule is applied as per normal. If a transect extends into private land, where permission is granted continue setting PMDs along the original bearing; if permission is not granted then treat this as an impassable barrier and turn 90 degrees.

- (11) Save transect end point in GPS unit and record GPS coordinates.
- (12) If a stake cannot be placed into the ground securely in non-forested habitat, you can move the PMD site. Search within a 5-m radius to find a suitable site. If no suitable site is found, then proceed along the original bearing (including 5 m either side) until either a suitable site is found or you have travelled a maximum of 20 more metres (i.e. a maximum of 40 m from previous PMD) looking for a site. If you do not find a suitable site within 20 m along the original bearing, then treat the area as a barrier and return to the last PMD site and turn the line 90 degrees.

### Setting wax tags

#### Labelling wax tags

All wax tags should be labelled with site, transect ID and wax tag number (1–10). Label wax tags with a permanent marker.

#### Non-forest

Wax tags, incorporating a luminescent strip, are to be used. Use

a corflute ‘backing board’ 50 cm long and 10 cm wide held in place with a 50-cm metal spike. Drive the stake approximately 20 cm into the ground and cable-tie the wax tag so that the wax part of the wax tag is  $30 \pm 5$  cm above the ground. Attach the luminescent strip using either nail or wire (Fig. S2.4a). No lure is to be used.

#### Forest

New wax tags, incorporating a luminescent strip, are to be used (Fig. S2.4). The wax tag and luminescent strip are nailed to a tree or post (using a flat-head nail) so that the wax part of the wax tag is  $30 \pm 5$  cm above the ground.

A blaze of flour and icing sugar (5:1 ratio) is applied from the ground up to the wax tag. No other lure or attractants are to be used. The width of the lure blaze should be 5–10 cm. Figure S2.4b shows how a wax tag, luminescent strip, and flour blaze should be placed.

Ensure all wax tags can be relocated. To assist with this, use flagging tape as a marker. If markers are used, do not place them directly above the wax tag where they may act as an additional attractant.

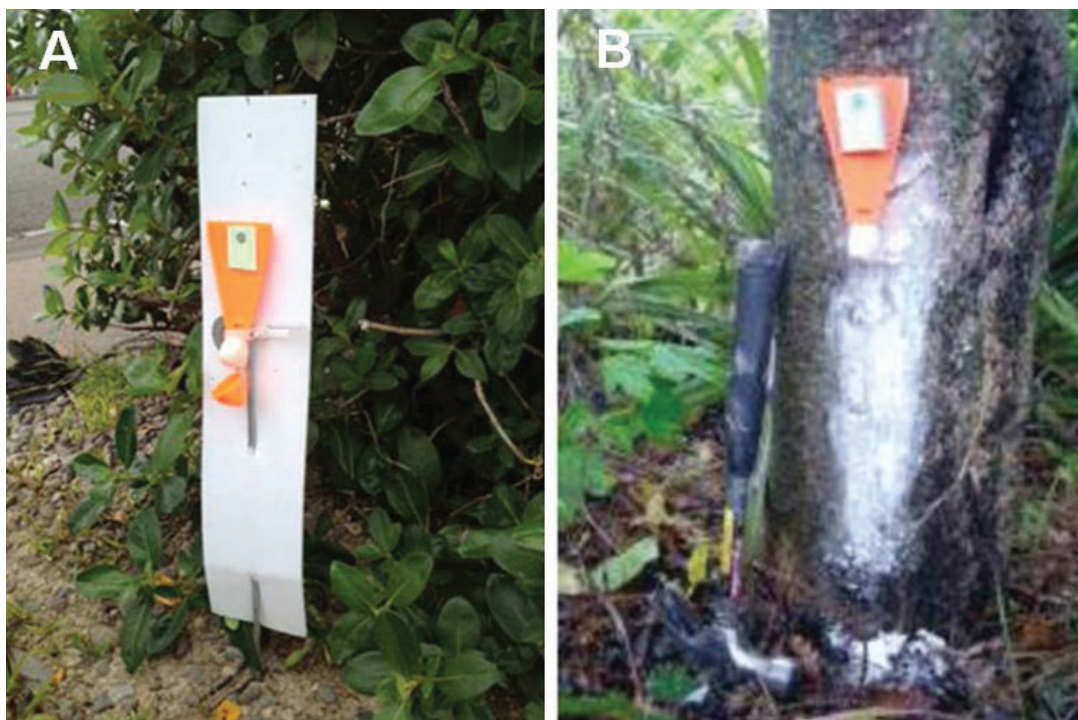
### Setting chew cards

#### Chew card preparation

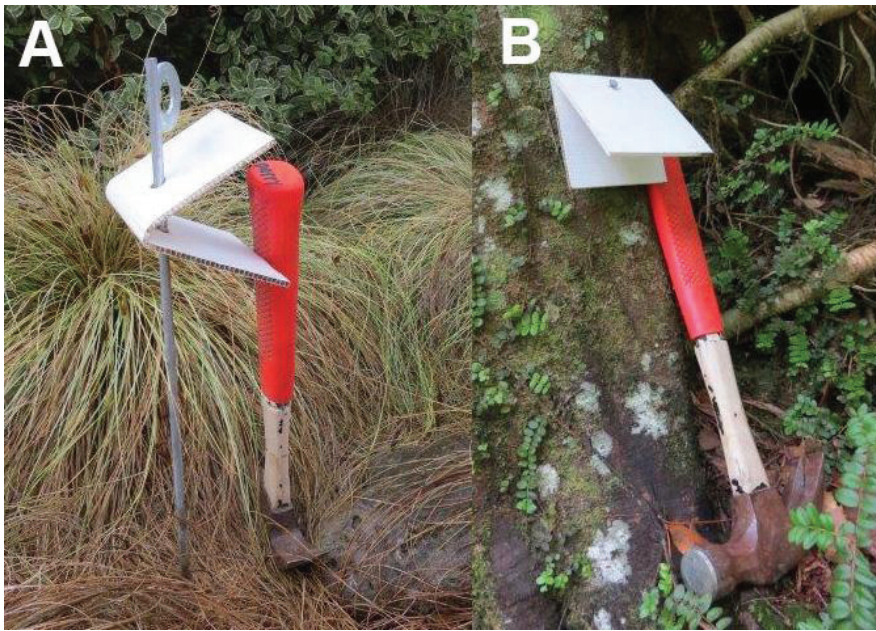
Chew cards pre-baited with ‘possum dough’ are to be used. All chew cards should be labelled before deployment with site, transect ID and chew card number (1–10). Chew cards are labelled with a permanent marker on the top side of the card before deployment.

#### Non-forest

New chew cards are to be used (Fig. S2.5a). The chew card is folded in half and nailed on a spike so that the bait part of the chew card is  $30 \pm 5$  cm above the ground. No blaze, luminescent strip or lure is to be used. Figure S2.5a shows how a chew card should be placed.



**Figure S2.4.** Wax tag sets in non-forest (a) and forest (b) habitat.



**Figure S2.5.** Chew cards set in non-forest (a) and forest (b) habitat.

#### Forest

New chew cards are to be used (Fig. S2.5b). The chew card is folded in half and nailed to a tree or post (using a flat-head nail) so that the bait part of the chew card is  $30 \pm 5$  cm above the ground. No blaze, luminescent strip or lure is to be used. Figure S2.5b shows how a chew card should be placed.

Ensure all chew cards can be relocated. To assist with this use flagging tape as a marker. If markers are used, do not place them directly above the chew card where they may act as an additional attractant.

#### Recording wax tag and chew card results

Before recording bite marks, staff must ensure they are confident of the identification (especially for possum). If unsure of the identity of any bite marks on a wax tag or chew card, a © symbol must be written after the bite mark result (e.g. P©). This indicates that later identification is required. Record the best estimate of the bite mark identification, unless completely uncertain; in that case, record it as unknown (U).

There are seven possible results for each wax tag or chew card:

- (1) Includes possum bite marks (P).
- (2) No possum bite marks, but identifiable non-target bite mark (NT, and record species in device notes).
- (3) No possum bite marks, but unknown bite marks (U).
- (4) No bite marks [record as 0 (zero)].
- (5) Wax tag or chew card is beyond interpretation (BI).
- (6) Wax tag or chew card is lost (L).
- (7) Wax tag or chew card not set (NOT SET).

NOTE: Multiple chew card and wax tag results need to be recorded by separating results with a comma, for example: (1) P©, U©; (2) P, NT

**Table S2b.** Result bag details for wax tags and chew cards.

Bag	Bag type – wax tag and chew card results		Bag labelling protocol
(i)	Positively identified	– Result 1 and 2	[Site][Transect]_ID
(ii)	Collected for later identification or beyond interpretation	– Result 3 and 5	[Site][Transect]_©
(iii)	Blank, with no bite marks	– Result 4	[Site][Transect]_0 (zero)

Chew card interpretation guide:

[http://www.landcareresearch.co.nz/publications/researchpubs/chew-card\\_a\\_guide\\_to\\_the\\_interpretation\\_of\\_animal\\_tooth\\_impressions.pdf](http://www.landcareresearch.co.nz/publications/researchpubs/chew-card_a_guide_to_the_interpretation_of_animal_tooth_impressions.pdf)

#### Collecting and bagging wax tags and chew cards for expert assessment

After recording the result(s) of a wax tag or chew card, collect the wax tag or chew card and place in the appropriate bag, depending on the result type. For each possum transect line there will be three different result bags for the wax tags and three different result bags for chew cards (Table S2b). Ensure all zeros (blank wax tags and chew cards) are sent to Christchurch from every site.

Combine ‘result bags’ into a single transect ‘line bag’, labelled: *Site\_transect\_CHEW* or *Site\_transect\_WAX*. Use ‘CHEW’ to identify as chew cards and ‘WAX’ to identify as wax tags. Assemble all four possum line bags into a prelabelled ‘site bag’ (SITE\_CHEW for chew cards and SITE\_WAX for wax tags) and send to Christchurch for expert assessment.

#### Setting traps

##### Important notes about traps

Traps are to be set for one fine night (i.e. there is no rain for 4 h after darkness).

Raised traps must be used in areas where kiwi or weka are present. Raised traps must be  $\geq 70$  cm above ground height.

Use No. 1 double-coil spring traps with a triggering weight of approximately 500 g (acceptable range 450–550 g). Do not use any protective coatings or oils on traps. Remove all fur from trap jaws to enable you to clearly identify an escapee when checking traps the following day.

Traps must be lured with a mixture of plain white flour and icing sugar (5 kg flour/1 kg icing sugar with no flavours added).

If traps are sprung by ungulates, then make a note of it in the trap outcome (e.g. 'likely sprung by domestic sheep').

Do not set traps in non-forest areas where kea are present.

Stock on private land: follow protocol and continue setting PMDs along original bearing unless the risk of trapping stock is deemed too high, then treat as an impassable barrier and turn 90 degrees.

#### *Setting traps on the ground*

Spread flour behind the trap up the trunk of the tree, stump or backing board to a height of  $50 \pm 10$  cm above the ground to make a white blaze. The width of the lure blaze should be 5–10 cm (Fig. S2.6a).

When using a horizontal log as backing for the trap, smear the flour along the log behind the trap, creating a blaze  $30 \pm 10$  cm horizontally and vertically  $20 \pm 5$  cm directly above the trap (Fig. S2.6b). Do NOT set a trap at a site that does not have a backing for the lure that is at least 20 cm high.

In areas with no suitable anchor points for traps and/or backing for lure (e.g. open tussock or flax areas), use a corflute 'backing board' 50 cm long and 10 cm wide held in place with a 50-cm metal spike (Fig. S2.6c).

Chain length should be as short as necessary to minimise escapes and injuries. Use wire or nylon cord to secure traps to soft or small sites that cannot hold a staple securely (e.g. tree fern).

The trap site should be cleared of any vines or saplings to prevent captured possums from entangling the chain. Do not cover traps or fence them on the sides with sticks or rocks. Traps must be firmly bedded.

Ensure all traps can be relocated (e.g. by placing flagging tape nearby). When markers are used, ensure they are not placed directly above the trap where they may act as an additional attractant to possums and also non-target species such as kea.

#### *Setting raised traps*

**Raised trap using leaning board:** Use a wooden 'leaning board' (Fig. S2.7) in an area where raised sets are required and where there are no suitable trees for attaching the trap. Leaning boards should measure 1250 x 50 x 25 mm and have one sharp end. Drive the stake 25–30 cm into the ground with a steel mallet, with wide side up on an approximately 50–60° angle. Secure the trap to the leaning board with two 25 mm-wide rubber bands cut from mountain bike inner tube (Fig. S2.7). Firmly attach the trap 10 cm down from the top of the leaning board, with the trap dog facing up. Secure the chain to the base of the board using a metal 'collar' of 50 mm diameter with a 400-mm chain extension with metal clip.

Ensure that the upper rubber band is rolled over the back of the dog such that when the trap is sprung, the dog levers the rubber off and the trap is allowed to fall free without being caught up.

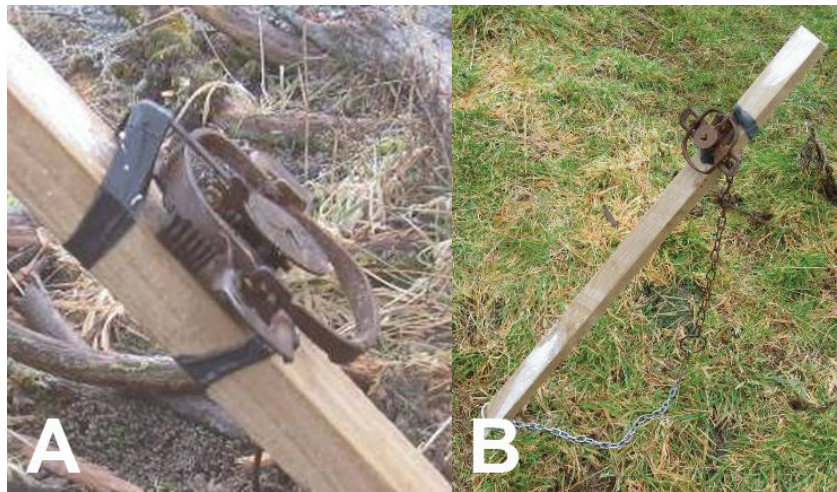
Stakes should be blazed to a height of 10 cm from the bottom of the stake, then directly above the trap to the top of the stake.

#### *Raised trap using bracket*

In an area where raised traps are required and where there are suitable trees, use a wire bracket to mount traps. The wire bracket should be attached to the nearest suitable tree so that the trap, when set, is  $\geq 70$  cm up the tree trunk (Fig. S2.8). The wire bracket must be firmly attached to the tree using a 10–20 mm



**Figure S2.6.** Trap ground sets. (a) Bed trap bed into the substrate approx. 1 hand-width from the tree, with trap dog nearest the tree. Clear trap site of obstructions. (b) If using a log (or tree root) that is <50 cm high as a backing for the trap, smear the flour along the log behind the trap creating a horizontal blaze of 30 cm ( $\pm 10$  cm) directly above the trap. (c) Backing board.



**Figure S2.7.** Raised trap set using leaning board.

staple so that the bracket is stable and does not wobble when a possum climbs on it. The forks on the bracket should be of the same length to help with stability. Traps should be fine-set with the trigger plate horizontal (in relation to the trap) and the dog towards the tree. The trap site must be cleared of any vines or saplings potentially within reach of a trapped possum.

When setting a raised trap using a bracket, ensure the chain anchor point is chosen such that the chain length is long enough to allow the trap to rest on the ground. The recommended technique is to put the trap on the ground, extend the chain ring up as high as it can go, attach the ring to the tree, and then attach the bracket at the point as high as the chain will

extend (with a bit of slack to allow the trap to be mounted). When a shorter length of chain is required, a chain-link can be used for the anchor point.

Spread the lure up the tree trunk from the trap to a point 50 cm above the trap. Also, spread flour on the base of the tree (up to a height of 10 cm from the ground) directly below the trap (Fig. S2.8).

#### *Checking traps*

All leg-hold traps must be checked and cleared within 12 h of sunrise, as required by the Animal Welfare Act, 1999. Remove any fur from the trap jaws.



**Figure S2.8.** Raised trap set using bracket. Note: position of trap is horizontal and trap dog is towards the tree; lure on tree base below and 50 cm above the trap.



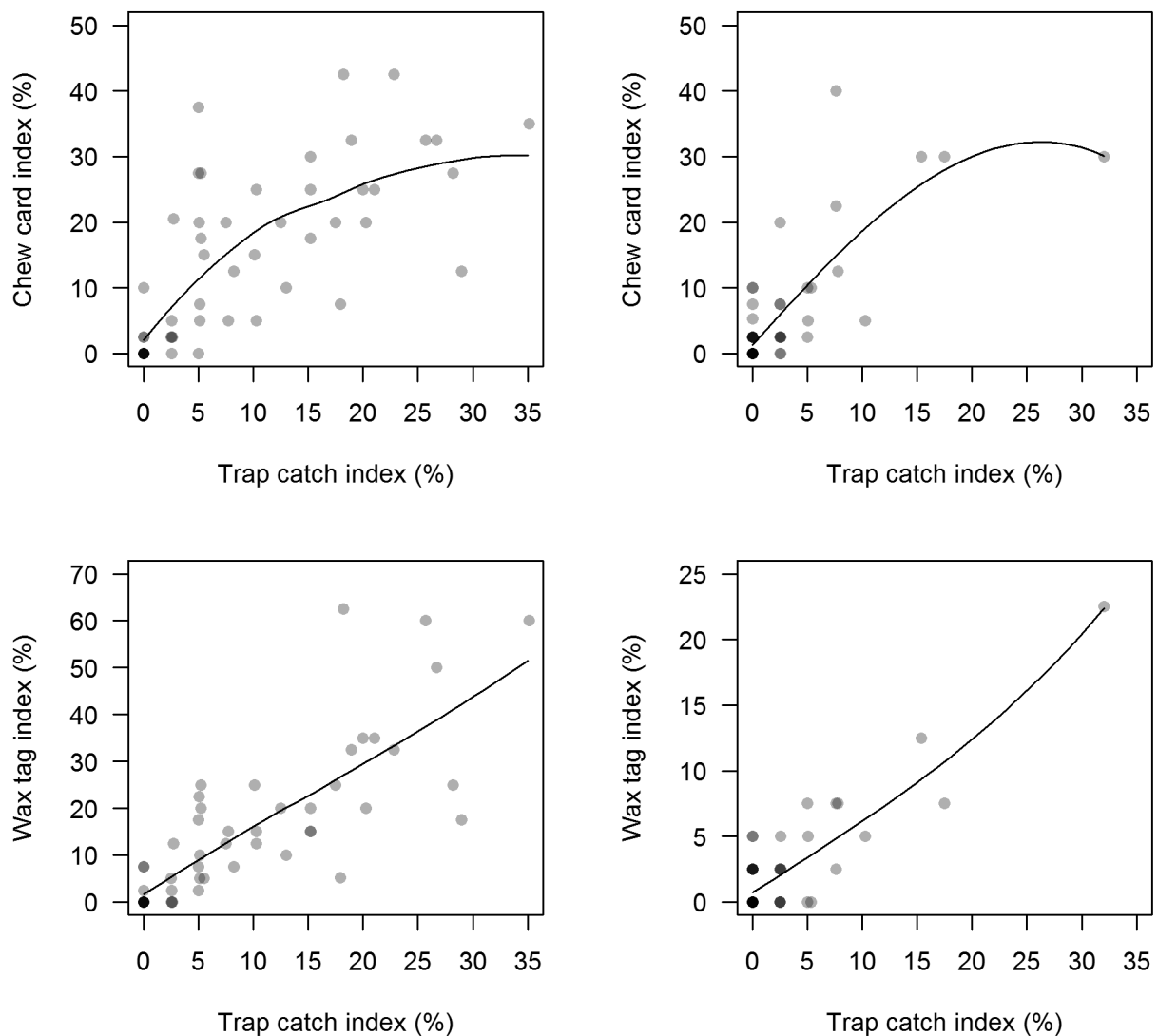
**Appendix S3.** Summary of sites at which sampling was conducted during February–May 2015.

**Table S3.** Summary of sites at which sampling was conducted during February–May 2015. A total of 108 sites were sampled: 54 in forest habitat and 54 in non-forest habitat. TCI, Trap Catch Index.

Possum abundance index <sup>a</sup>	Habitat							
	Forest				Non-forest			
	TCI	Ground	Raised	Total	TCI	Ground	Raised	Total
Low	<5%	4	17	21	<1%	18	16	34
Medium	5–15%	7	10	17	1–5%	9	2	11
High	>15%	12	4	16	>5%	4	5	9
Total		23	31	54		31	23	54

<sup>a</sup>Abundance index classes differed in forest and non-forest habitats (see Materials and methods).

**Appendix S4.** Scatter plots of observed chew card, wax tag and trap catch abundance index values at sites in forest and non-forest habitats.



**Figure S4.** Scatter plots of observed chew card, wax tag and trap catch abundance index values at 54 sites in forest habitat (left column) and at 54 sites in non-forest habitat (right column). The darker the circle the more sites with those observed values. The solid lines are from LOESS models. Note that the y-axis scales vary between plots.

**Appendix S5.** Outcomes of independent expert assessment of wax tag and chew card field assessments.**Table S5.** Outcomes of independent expert assessment of wax tag and chew card field assessments. Only 13 devices (7 wax tags and 6 chew cards) were expertly assessed as ‘low confidence’.

Device and field assessment	Expert assessment outcome		
	Number assessed	Possum	Not possum
Wax tag			
No bite marks	540	6	534 <sup>a</sup>
Possum bite marks	350	344	6
Non-target bite marks	246	3	243
Unknown	54	7	47
Chew card			
No bite marks	500	16	484 <sup>b</sup>
Possum bite marks	365	340	25
Non-target bite marks	154	5 <sup>c</sup>	149
Unknown	66	40	26

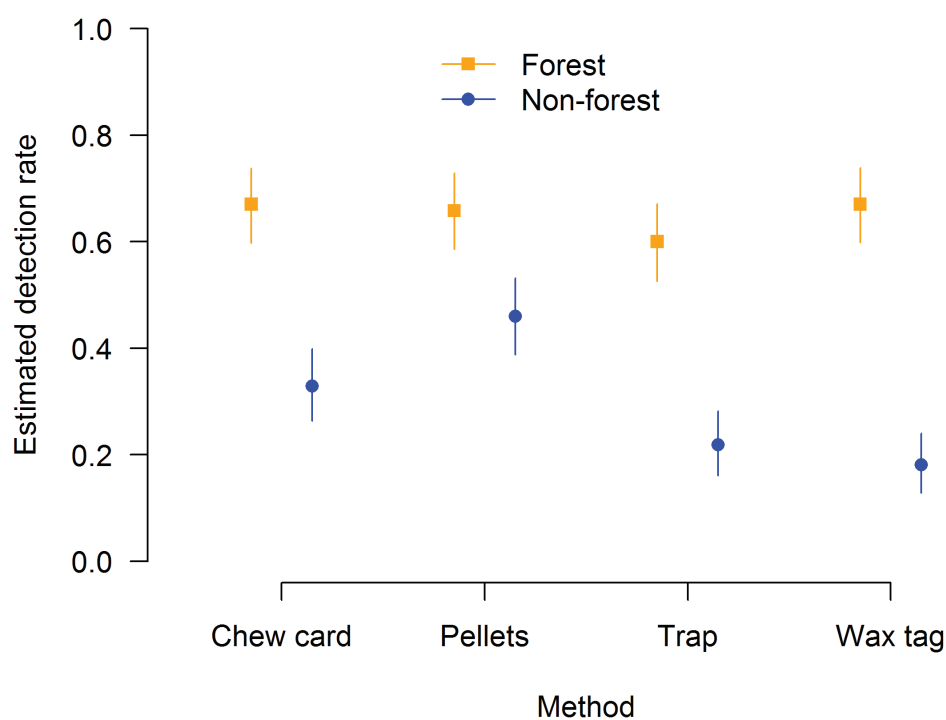
<sup>a</sup>Includes 7 devices determined by experts to be bitten by non-target species. <sup>b</sup>Includes 17 devices determined by experts to be bitten by non-target species. <sup>c</sup>Includes 2 devices determined to be bitten both by possums and by non-target species.

**Appendix S6.** Detection of possums at sites using chew cards, wax tags, leg-hold traps and faecal pellets.**Table S6a.** Detection of possums at sites using chew cards, wax tags, leg-hold traps and possum faecal pellets.

Habitat	Detected by								Total
	All 4 methods	No methods	Pellets only	Traps only	Wax tags only	Chew cards only	2 or 3 methods incl. pellets	2 or 3 methods excl. pellets	
Forest	33	10	0	0	1	1	5	4	54
Non-forest	11	11	8	0	1	4	16	3	54
Total	44	21	8	0	2	5	21	7	108

**Table S6b.** Detection of possums at sites using chew cards, wax tags, leg-hold traps, with and without possum faecal pellets.

Method, habitat	Detected by			
	Method + pellets	Method only	Pellets only	Neither
Chew cards, forest	37	4	1	12
Chew cards, non-forest	22	7	13	12
Chew cards, all	59	11	14	24
Wax tags, forest	36	4	2	12
Wax tags, non-forest	17	4	18	15
Wax tags, all	53	8	20	27
Traps, forest	35	4	3	12
Traps, non-forest	19	1	16	18
Traps, all	54	5	19	30



**Figure S6.** Detection rates (i.e. probability that a possum was detected on a single transect, given possums were present) for each of the four methods that were used to estimate occupancy in forest and non-forest habitats. Medians and 95% credible intervals obtained from posterior distributions are shown.

## References

- Jones C, Warburton B 2011. Relationships between commonly used indices of possum abundance. Landcare Research Contract Report LC709. Lincoln, Landcare Research. 20 p.
- Sweetapple P, Nugent G 2011. Chew-track-cards: a multiple-species small mammal detection device. *New Zealand Journal of Ecology* 35: 153–162.