

Rabbit meat and rodent-scented
lures as attractants for stoats
(*Mustela erminea*)

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CONTENTS

Abstract	5
1. Introduction	6
2. Objective	6
3. Methods	6
3.1 Lures	8
3.2 Footprint or track identification	9
3.3 Statistical analysis	9
4. Results and discussion	10
4.1 Meat lures, types, and cost	10
4.2 New ink for use in tracking tunnels	11
5. Conclusions	12
6. Recommendations	12
7. Acknowledgements	12
8. References	13
Appendix 1	
Stoats and mice attracted to tracking lines	14

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ABSTRACT

A field trial comparing the ability of meat and rodent-scented lure to attract stoats (*Mustela erminea*) to tracking tunnels was undertaken in beech forest during a beech mast year in Craigieburn Valley and Arthur's Pass national park. Four lines spaced no less than 1 km apart were baited with lures for 4 days at a time and visited on 8 consecutive occasions. The two different lures were rotated around lines. A total of 160 tunnels were baited with rabbit meat and 160 tunnels were baited with rodent-scented lure. Stoat attendance at tracking tunnels with rabbit meat was nine times greater (at 22.5%) than attendance at tunnels with rodent scents (2.5%). Tunnel attendance by mice for both lures was 63%. The use of an improved ink gave clear, rain-fast prints in the tracking tunnels.

Keywords: rodent-scented lure, rabbit meat, stoat, lure, tracking, tunnel, tube, Black Track Ink, *Nothofagus solanderi*, *Mustela erminea*

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1. Introduction

In 1885 stoats *Mustela erminea* were introduced to New Zealand by European settlers in a vain attempt to control rabbit damage to sheep pasture (King 1990). The subsequent invasion of forested areas by stoats and their predation of native animals by stoats led to the current belief that stoats should be removed from areas of high conservation value. In 1999 the New Zealand Department of Conservation (DOC) allocated NZ\$6.6 million over five years to support an integrated stoat control research programme. This paper reports on the results of a field trial set up to examine the potential of using a new rodent-scented lure to attract stoats to traps and bait stations. In the past stoats have commonly been lured to tracking tunnels and bait stations using pieces of meat (King & Edgar 1977; E. Murphy pers. comm.) and chicken eggs (Grant et al. 2000).

2. Objective

The objective of the trial was to compare the ability of rodent-scented lure and rabbit meat lure to attract stoats to tracking tunnels in beech forest.

3. Methods

The field trial was undertaken north-west of Christchurch at Craigieburn Valley (43°08' S, 170°43' E, lines 1 and 2), and Klondyke Corner, Arthur's Pass (43°01'S, 171°34' E lines 3 and 4, see Fig. 1). Each line consisted of 10 tracking tunnels. Tunnels were placed either side of tracks that run through stands of mountain beech *Nothofagus solandri*. Both 1999 and 2000 were beech mast years in the Craigieburn Valley and at Arthur's Pass, so numbers of mice and stoats were probably higher than in non-masting years. Mice were seen running about during the day at Arthur's Pass.

Lines were placed a minimum of 1 km apart. Along each line tunnels were spaced at 100 m intervals. Lines were installed on 7 October 2000, 14 days prior to the trial commencing, and checked every four days after that for 8 further visits (i.e. a trial duration of 32 days). Two of the four lines were baited with approximately 20 g of meat as the control (Treatment A) and the other two were baited with a rodent-scented lure (Treatment B). Treatments were sequentially rotated around lines 1-4 to minimise spatial and temporal effects (Table 1). Lures were placed on aluminium foil that was then placed inside each tunnel for four days. Foil was used to prevent maggots contacting the ink film and to keep tunnels clean. After four days the lures and foil were removed and disposed of away from the study area.

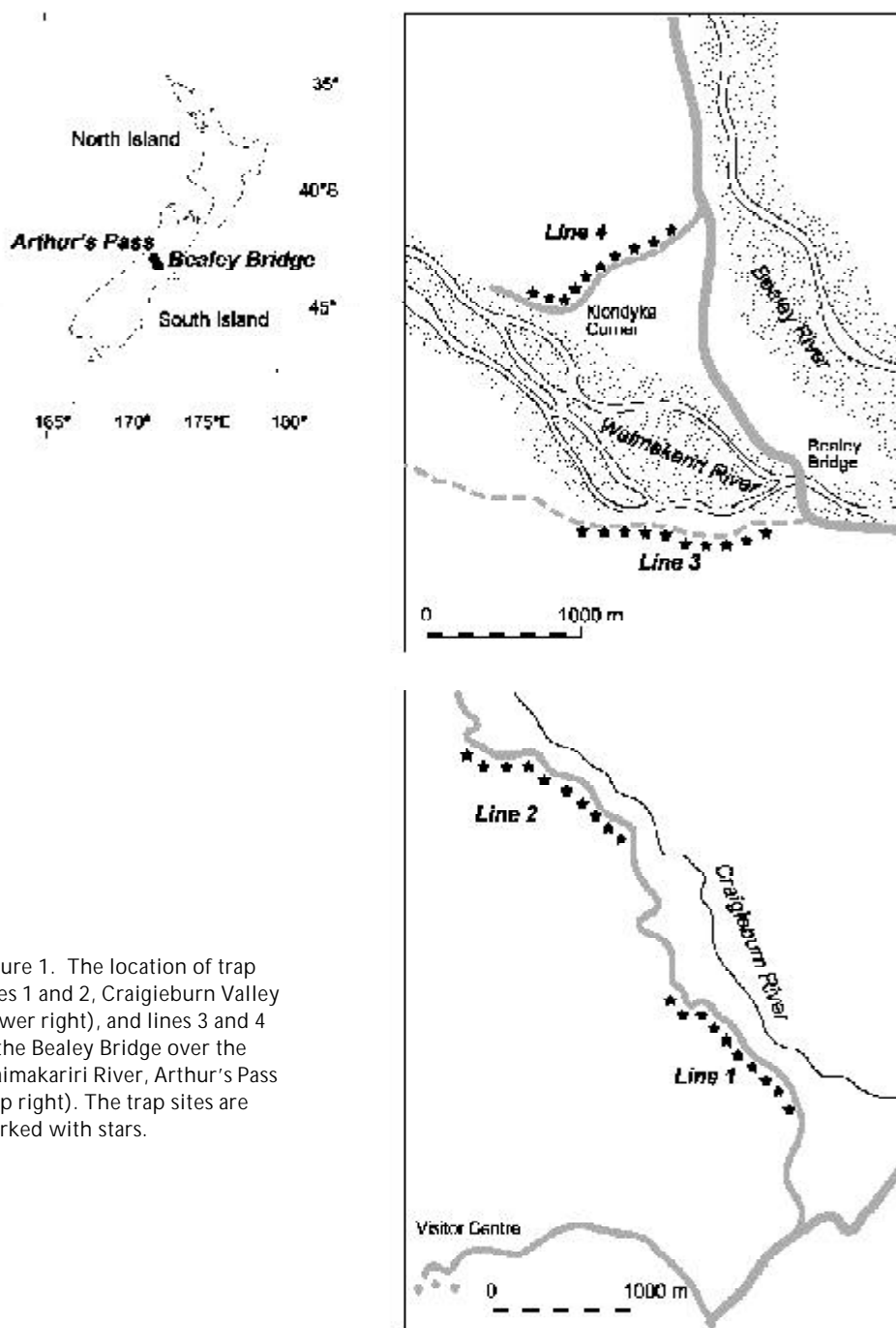


Figure 1. The location of trap lines 1 and 2, Craigieburn Valley (lower right), and lines 3 and 4 at the Bealey Bridge over the Waimakariri River, Arthur's Pass (top right). The trap sites are marked with stars.

TABLE 1. SEQUENTIAL ROTATION OF LURES (TREATMENT A OR B) ALONG LINES 1-4 WITH TIME (VISITS WERE FOUR DAYS APART).

VISIT	LINE 1	LINE 2	LINE 3	LINE 4
1	A	A	B	B
2	A	B	A	B
3	A	B	B	A
4	B	A	B	A
5	B	B	A	A
6	A	B	A	B
7	B	A	A	B
8	B	A	B	A

Treatment A = meat as the control

Treatment B = rodent-scented lure

Tunnels were made of corrugated plastic (corflute) purchased as tree guards (67 cm long and 10 × 10 cm in cross section. A corflute tray 60 × 10 cm and 5 mm thick was inserted inside the tunnel (Fig. 2). The tray was divided widthways into three equal sized portions (20 × 10 cm). The central portion was coated with a film of Black Track ink (Pest Control Research, Christchurch) and the two outer portions held pieces of pre-cut coarse-grade brown paper. The observed benefits of the ink are discussed below. The papers provided a permanent record of prints of animals running through the tunnel, which could be removed for later identification and analysis. Used papers were numbered with the tunnel and line number (line 1, tunnel 10 or L1/10) and the date, and stored in envelopes for later reference.

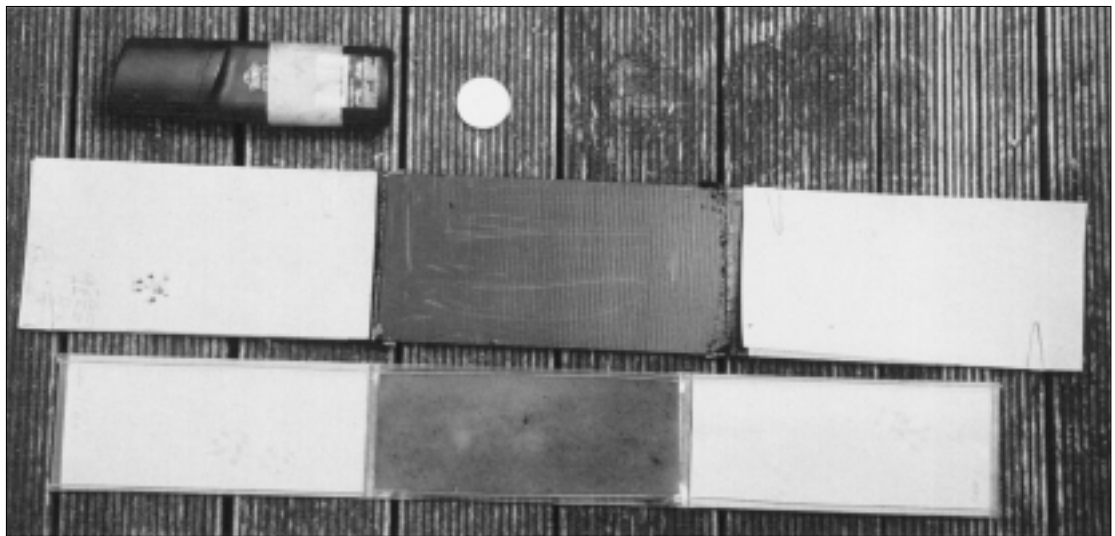


Figure 2. The new corflute tracking tunnel base with Black Track Ink (upper), and a perspex tracking tunnel base with food dye (lower). Coin is ## mm in diameter.

3.1 LURES

The rodent-scented lure used was a proprietary formulation based on mouse urinary proteins (MUPs) that give mouse urine its characteristic smell (Robertson et al. 1973; Brennan et al. 1999). The rodent-scented lure was formulated into a paste and dispensed from a tube onto a small tray of aluminium foil.

Meat lure used was minced rabbit meat obtained from Rangiora Pet Foods. Meat was divided into 20 g balls, wrapped in aluminium foil, frozen and stored in zip lock bags (10 balls per bag) prior to use. One bag containing 10 balls was used per line. Just prior to placing the meat in each tunnel the foil was peeled back to expose the meat and form a tray. This helped to keep tunnels clean while making it possible for stoats to smell and gain access to the meat.

3.2 FOOTPRINT OR TRACK IDENTIFICATION

Stoat footprints were identified based on paw marks shown in Ratz (1997) and by discussing and comparing tracked papers held in a reference collection by J. Dowding (Christchurch) and E. Murphy.

3.3 STATISTICAL ANALYSIS

Tracking tunnel attendance was scored as stoat present or not present during the four-day interval between visits. A tunnel was scored as having being attended when papers from either end of tunnel had one or more stoat footprints on it. The relative attractiveness of the lures was contrasted by comparing the tunnel attendance of lines with the different lures over the 8 weeks using a 2×2 chi-square, two-tailed test where the null hypothesis was there was no difference in the attendance rates of tunnels with meat and rodent-scented lure. A difference was considered to be significant at the $P < 0.05$ level. The total tunnel visits per treatment was 160 (20 tunnels \times 8 visits).

The analysis outlined above was designed to test the ability of a lure to attract (or not attract) one or more stoats over a four-day period. The trial is analogous to a feeding or repellent trial where animals are attracted to or repelled from a potential food source.

In this study the presence or absence of stoats at each tracking tunnel in response to the lure has been considered to be an independent event with the sample unit being attendance at the tunnel not attendance along the line. In such trials it is irrelevant whether it is the same or a different stoat that is attracted or repelled by the compound presented. What is important and what is being tested here is the attractiveness of the luring compounds to one or more stoats. The responses of stoats to lures placed in tunnels were taken as independent events (and the unit of measure). There is no reason to suspect that the decision of a stoat to enter a tunnel and examine a lure is in anyway influenced by the presence of a lure placed in a tunnel 100 m away (even if the stoat knew the tunnel was there). This assumption seems reasonable, especially when lures used along lines were systematically rotated over time to minimise effects of learning (see Table 1).

4. Results and discussion

Stoat attendance at tunnels baited with meat was nine times higher and significantly greater than that of tunnels baited with rodent-scented lure (chi-square = 27.31, df = 1, $P < 0.001$, Table 2). This suggests that stoats are more attracted to meat than a rodent-scented lure, although it is possible the response may be different in a year when beech is not masting and when rodent (mouse) numbers are low. For this reason comprehensive field trials of stoat lures should probably be undertaken in mast as well as non-mast years.

TABLE 2. FREQUENCY OF STOAT AND MOUSE ATTENDANCE* AT TRACKING TUNNELS, OCTOBER–NOVEMBER 2000.

SPECIES	MEAT LURE	RODENT-SCENTED LURE	TUNNEL VISITS PER TREATMENT
Stoat	36 (22.5%)	4 (2.5%)	160
Mouse	101 (63.1%)	101 (63.1%)	160

* See Appendix 1 for raw data

4.1 MEAT LURES, TYPES, AND COST

Although a rodent-scented lure was found not to be as effective as meat it became apparent during this trial, that there is little readily available information on the use of meat lures for stoats. This raised several questions:

- What type of meat (e.g. rabbit, possum, rat, mouse, beef, deer) makes the best stoat lure?
- What form of meat is most readily available and easily used (fresh, frozen freeze-dried, pieces or mince)?
- How long does it remain attractive (1–7 days)?
- How much meat is required per tracking tunnel or trap (5–20 g)?
- How much does the lure cost and how important is the unit cost of lures (i.e. 10 cents to \$3) when considering other costs such as planning, labour and transport?

Anecdotal observations made when using tracking tunnels at Craigieburn in September this year suggest rabbit meat is a better stoat lure than possum meat (J. Ladley pers. comm.).

Rabbit meat is readily available from animals shot for the purpose or from pet food suppliers, such as Rangiora Pet Food supplies, who sell it as either mince or pieces. Frozen minced rabbit meat was used as a lure with good results in this study while pieces of rabbit meat have also been used with good results (E. Murphy pers. comm.). The use of mince or pieces of rabbit meat as a lure both have advantages but it is not clear whether one or the other produces a better result. A piece of meat is unlikely to dry out as quickly as a mince and a solid

piece of meat is not easy for mice to eat or take away. During this study mice occasionally ate and removed a lure, and the mince balls dried to a hard crust after four days. Minced meat is, however, easy to weigh out in standardised amounts, wrap in foil, and freeze into packs of 10 balls (10 balls were used for each line that was baited with meat).

The amount of meat that is best to use is also unclear, although rabbit mince is cheaper to buy than pieces of rabbit meat. At the time of writing a 20 g ball of rabbit mince cost 9.6 cents (\$4.80/kg), while the cost of rabbit fillets (rabbit pieces) was slightly higher at 11.0 cents or \$5.50/kg. Just for comparison, the cost of using eggs as a lure is about double the cost of rabbit at around \$2.39/doz or 19.9 cents each. At current prices the cost of rabbit meat (or eggs) is probably insignificant when compared with other costs likely to be associated with attending stoat lines, such as transport and labour.

4.2 NEW INK FOR USE IN TRACKING TUNNELS

Prior to this study the standard design of a tracking tunnel consisted of a tree guard 630 mm long laid horizontally, into which was inserted a perspex base plate made by Jurgen Fiedler Plastics, Rotorua which costs about \$10. These base plates typically have a reservoir in the middle portion to hold a foam pad soaked in a 1:4 mixture of water and food dye. Either side of the reservoir are placed tracking papers made of brown wrapping paper (see Fig. 2). This study was to use a similar design, but the numerous mice encountered at Arthur's Pass in 2000 ate the foam pad, so an alternative design was required. The design used consisted of the usual tree guard, but the perspex base plate was replaced by a piece of corflute (10 × 600 mm). Tracking papers (100 × 200 mm) were attached to either end of the base plate using paper clips, and a film of Black Track was applied to the middle portion. The advantages of this technique were that tracks obtained were better quality than those using food dye (Fig. 3).



In some instances definition was so good that the concentric circles on stoat pads could be seen. Tracks left on paper were waterproof and the ink did not dry out over time so very little ink was used, other than the initial 2 ml used to coat the 200 × 100 mm central portion of the base plate. The corflute base plate cost about \$1 or one tenth of the price of one made out of perspex.

Figure 3. Typical stoat tracks made using food dye and water (upper), and Black Track Ink (lower). Prints are reproduced at approx. actual size.

5. Conclusions

Rodent-scented lures are less effective at attracting stoats to tracking tunnels than lures made of rabbit meat.

In a beech mast year typical attendance rates by stoats at tracking tunnels baited with meat in the Craigeburn/Arthur's Pass beech forest is around 22%.

Tracking tunnels using Black Track Ink provide good quality tracking records and during this study were cheap and easy to use.

6. Recommendations

- Investigations should be undertaken to establish whether meat from different species (such as beef, mutton, chicken, and venison) are more or less attractive to stoats than rabbit meat.
- The potential development of long-life meat lures of an optimal size that are easy to handle should be examined.
- The effectiveness of meat baits as a lure for stoats needs to be examined over a range of forest types and stoat densities.
- The use of Black Track Ink on a corflute base plate should be investigated as a possible replacement for the perspex tray and ink pad soaked in 1:4 mixture of food dye and water.

7. Acknowledgements

This study would not have been possible without the help of a good many people. I would like to thank Wes Whitten for advice regarding mouse urine and olfaction, Elaine Murphy (DOC, Christchurch), John Dowding and Phil Moors for advice on tracking tunnels, footprints, stoat lures. Thanks also to Andy Grant (DOC, Christchurch), and Steve Phillipson (DOC, Waimakarari) who helped with study site suggestions and commented on the manuscript, and the two anonymous referees. Finally I'd like to thank friends and relatives that helped with the field work and DOC for funding the project. The project was funded by DOC under the 2000 Stoat Research Programme.

8. References

- Brennan, P.A.; Schellinck, H.M.; Keverne, E.B. 1999: Patterns of expression of the immediate-early gene *egr-1* in the accessory olfactory bulb of female mice exposed to pheromonal constituents of male urine. *Neuroscience* 90: 1463-1470.
- Grant, A; King, W.; van Dijk, A. 2000: Hurunui "Mainland Island" Project. 1998/99 Report. Department of Conservation, Christchurch (unpublished). 45 p
- King, C.M.; Edgar, R.L. 1977: Techniques for trapping and tracking stoats (*Mustela erminea*); a review, and a new system. *New Zealand Journal of Zoology* 4: 193-212.
- King, C.M. 1990: 27. Stoat. Pp. 288-312 in King, C.M. (Ed.) The handbook of New Zealand mammals. Oxford University Press, Auckland.
- Ratz, H. 1997: Identification of foot prints of some small mammals. *Mammalia* 6: 431-441.
- Robertson, D.H.L.; Beynon, R.J.; Evershed, R.P. 1993: Extraction, characterization and binding analysis of two pheromonally active ligands associated with major urinary protein of house mouse (*Mus musculus*). *Journal of Chemical Ecology* 19: 1405-1416.

Appendix 1

STOATS AND MICE ATTRACTED TO TRACKING LINES

Lines consisted of 10 tunnels placed 100 m apart in stands of mountain beech forest, during October and November 2000. Lines 1 and 2 were at Craigieburn Valley (see Fig.1), lines 3 and 4 were either side of the Bealey Bridge, Arthur's Pass (line 3 was on the true right of the Waimakariri River).

Stoats

VISIT	LINE 1		LINE 2		LINE 3		LINE 4	
	LURE	STOATS	LURE	STOATS	LURE	STOATS	LURE	STOATS
1	A	0	A	0	B	0	B	0
2	A	3	B	0	A	0	B	1
3	A	6	B	0	B	0	A	4
4	B	0	A	2	B	0	A	2
5	B	0	B	0	A	0	A	4
6	A	7	B	0	A	0	B	2
7	B	1	A	3	A	0	B	0
8	B	0	A	3	B	0	A	2
Total		17		8		0		15

Mice

VISIT	LINE 1		LINE 2		LINE 3		LINE 4	
	LURE	MICE	LURE	MICE	LURE	MICE	LURE	MICE
1	A	2	A	1	B	10	B	10
2	A	3	B	2	A	10	B	9
3	A	3	B	5	B	10	A	9
4	B	6	A	5	B	7	A	9
5	B	2	B	4	A	9	A	10
6	A	1	B	2	A	9	B	9
7	B	2	A	3	A	9	B	10
8	B	3	A	8	B	10	A	10
Total		22		30		74		76

A = meat lure, B = rodent-scented lure