Paired trial of fresh and long-life stoat baits in a warm, coastal environment

DOC SCIENCE INTERNAL SERIES 100

Nigel Miller

Published by
Department of Conservation
PO Box 10-420
Wellington, New Zealand

DOC Science Internal Series is a published record of scientific research carried out, or advice given, by Department of Conservation staff, or external contractors funded by DOC. It comprises progress reports and short communications that are generally peer-reviewed within DOC, but not always externally refereed. Fully refereed contract reports funded from the Conservation Services Levy (CSL) are also included.

Individual contributions to the series are first released on the departmental intranet in pdf form. Hardcopy is printed, bound, and distributed at regular intervals. Titles are listed in the DOC Science Publishing catalogue on the departmental website http://www.doc.govt.nz and electronic copies of CSL papers can be downloaded from http://www.csl.org.nz

ISSN 1175–6519

ISBN 0–478–22381–1

In the interest of forest conservation, DOC Science Publishing supports paperless electronic publishing. When printing, recycled paper is used wherever possible.

This report originated from work carried out under Department of Conservation investigation no. 3401. It was prepared for publication by DOC Science Publishing, Science & Research Unit; editing and layout by Lynette Clelland. Publication was approved by the Manager, Science & Research Unit, Science Technology and Information Services, Department of Conservation, Wellington.

CONTENTS

Paired trial of fresh and long-life stoat baits in a warm, coastal environment

Nigel Miller

Northland Conservancy, Department of Conservation, PO Box 147, Whangarei

ABSTRACT

This study compared the use of fresh rabbit meat with freeze-dried rabbit meat as bait in Fenn traps to catch stoats (*Mustela erminea*) at two different coastal locations (Mimiwhangata and Whananaki) in the far north of New Zealand. Previous experience had indicated that baiting traps with fresh rabbit meat was more effective than baiting with hen eggs. However, the baiting of traps with fresh meat is labour-intensive, as the meat rapidly deteriorates, particularly in warm environments, and has to be replaced. The aim of this study was to determine whether preserved (freeze-dried) meat, which would last longer in traps before needing to be changed, would retain its attractiveness as bait. For warmer climates, such baits are likely to be more cost-effective than fresh meat.

Both the total numbers caught and bait preference varied between the two study sites for stoats and total mustelid species combined (ferrets (*Mustela putorius*), weasels (*Mustela nivalis*) and stoats). At Whananaki, where most mustelids were caught, significantly more mustelids preferred freeze-dried rabbit to fresh rabbit. Stoat captures mirrored this result, but the results were not statistically significant. This trend was reversed at Mimiwhangata, where mustelid species preferred fresh rabbit. A study of the degree of decay of carcasses of animals caught in traps at Whananaki showed that animals caught on fresh bait in a once-weekly re-baiting regime were significantly more decayed than those caught on freeze-dried bait. This indicates that fresh rabbit meat was more attractive in the first part of the week when it was, indeed, fresh. Later in the week the dried meat was preferred.

Miller, N. 2003: Paired trial of fresh and long-life stoat baits in a warm, coastal environment. *DOC Science Internal Series 100*. Department of Conservation, Wellington. 11 p. http://www.csl.org.nz/dsis100.pdf

1. Introduction

The stoat (*Mustela erminea*) is an introduced predator that is contributing to the decline of several species of native birds in New Zealand (Dowding & Murphy 1996; Elliot et al. 1996; McLennan et al. 1996; O'Donnell et al. 1996). Stoat numbers have commonly been controlled using Fenn traps set in tunnels baited with hen eggs (King et al. 1994; O'Donnell et al. 1996). However, in Northland, Fenn trap operators have noted a general reduction in stoat catch rates when eggs have been used periodically during trapping operations which otherwise use fresh rabbit meat as the primary bait. Although this apparent preference by stoats for fresh rabbit meat has not been well quantified, other researchers have also noticed that fresh rabbit meat appears to be more attractive to stoats than fresh hen eggs (K. Clapperton, C. Gillies and E. Murphy, pers. comm.).

Fresh rabbit meat has, however, the disadvantage of quickly decaying, especially in warm, damp climates (such as that of Northland), thus requiring more frequent replacement than whole eggs. This increases labour costs and limits the number of traps able to be serviced by an operator.

Some recent trials have assessed freeze-dried rodents as alternative long-life baits to eggs (Burns et al. 2000).

The aim of this study was to determine whether freeze-drying rabbit meat would produce a bait that retained its attractiveness to stoats over a longer period (two weeks) than fresh rabbit meat.

2. Methods

The study was undertaken at two locations—Mimiwhangata Coastal Park and Whananaki—on the east coast of Northland, approximately 30 km north-northwest of Whangarei.

At each location, 45 pairs of single Fenn trap sets were used, and different re-baiting regimes were applied. Trapping began in February 2001 and continued until July 2001 (Whananaki) and May 2001 (Mimiwhangata) due to a delay in bait processing. Trapping then re-commenced at both locations in December 2001 and continued until 30 May 2002.

Paired Fenn trap sets were chosen as the most appropriate method to field test the relative attractiveness of the experimental (freeze-dried) bait against standard (fresh) bait because this would limit the effects associated with variability in trap sites and thus remove the need to test each treatment separately at each site.

Single entrance/single trap sets with covers were used. A pair of traps was set at each trapping site and placed within a metre of each other with entrances generally facing. The non-entrance end of each cover was closed with netting.

Within each trap cover, bait was placed on a 'pig-tail' of wire. Baits consisted of 50-mm square pieces of fresh (thawed from frozen) un-skinned rabbit meat or freeze-dried un-skinned rabbit meat.

At Mimiwhangata, wooden trap covers were used. The fresh meat baits were replaced at 3–4 day intervals (twice weekly) while the freeze-dried baits were replaced every second week (fortnightly). All traps were 'cleared' (of trapped animals, if present) and re-set twice weekly.

At Whananaki, trap covers were black plastic 'Philproof' double Fenn covers. Fresh baits were replaced weekly rather than twice weekly. Dried baits were replaced fortnightly and traps 'cleared' weekly.

Field data sheets were filled in at each trap check and data loaded onto a spreadsheet for statistical analysis. Data collected for each site included trap number, bait type, species captured or sprung traps. Additional data was also collected during a 4-month period at Whananaki on the 'state of decay' of 80 animal carcasses. During this time 69 rats and 11 mustelids were captured. At the regular trap clearance time, the state of decay of the captured animal was assessed as being one of the following three classes: 1.'fresh', 2. 'rotten' or 3.'very rotten'. The state of decay was used to assess comparative attractiveness of the two baits within a weekly trapping period.

Statistical analysis of results was done using a binomial approach (2-sided) for bait preference, and a Fishers exact test (2-tailed) for the state of carcass decay, which required the first two categories (1. fresh and 2. rotten) to be combined.

3. Results

Almost 500 trapping events were recorded during the trial. Table 1 provides a summary of catch results, excluding sprung traps, or those which caught hares, rabbits, possums or cats. In addition to stoats, weasels (*Mustela nivalis*), ferrets (*Mustela putorius*), rats and hedgehogs were caught.

No effort was made to clean or replace sets following mustelid captures, but this did not appear to have had a significant 'residual' effect, as evidenced by consecutive mustelid captures in the same location. Mustelids (all stoats) were

TABLE 1. SUMMARY OF TRAPPING RESULTS.

	WHANANAKI			MIMIWHANGATA		
	FRESH	DRY	TOTAL	FRESH	DRY	TOTAL
Stoat	7	15	22	5	0	5
weasel	2	10	12	6	2	8
Ferret	2	3	5	0	0	0
Rat	73	124	197	78	48	126
Hedgehog	23	23	46	15	16	31
TOTAL	107	175	282	104	66	170

caught in the same or consecutive weeks within the same paired set on only two occasions (both in consecutive weeks), once in the same trap and once in the paired trap. All other consecutive mustelid captures were at least a month apart.

Mimiwhangata

Despite more frequent trap checks and replacement of fresh baits, Mimiwhangata catch rates were considerably lower than those at Whananaki (Table 2). This could be attributed to several factors, including greater trap density at Mimiwhangata compared with Whananaki, and the fact that Mimiwhangata had been trapped prior to this study. The main effect on this trial of the low catch rate is the limited amount of data that results from it. Only 13 mustelids were captured during the trial period (cf. 39 at Whananaki). Results are summarised below:

- 11 (85%) of the mustelids trapped at Mimiwhangata were caught on fresh bait (n = 13)
- All (100%) of the 5 stoats caught were on fresh bait
- 78 (62%) of rats caught during the trial were on fresh bait (n = 126)
- Almost equal numbers of hedgehogs were caught on both bait types (n = 31)

Whananaki

Trapping results for Whananaki differed considerably from those at Mimiwhangata:

- 28 (71%) of all mustelids were caught on freeze-dried bait (n = 39)
- 15 (68%) of all stoats caught were on freeze-dried bait (n = 22)
- 124 (63%) of all rats caught were on freeze-dried bait (n = 197)
- Equal numbers of hedgehogs were caught on both baits (n = 46)

Statistical analysis of the trapping results using the Binomial approach (2-sided) for each of the three mustelid species is summarised in Table 2.

TABLE 2. MUSTELIDS CAUGHT (BY SPECIES) ON THE TWO BAIT TYPES (FRESH AND FREEZE-DRIED RABBIT) UNDER DIFFERENT RE-BAITING AND TRAP-CLEARING REGIMES AT MIMIWHANGATA AND WHANANAKI, NORTHLAND.
* = significant; ** = highly significant; ns = not significant.

SPECIES CAUGHT	FREEZE-DRIED RABBIT BAIT	FRESH RABBIT BAIT	*P*	SIGNIFICANCE
MIMIWHANGATA				
Stoat	0	5	0.06	ns
Weasel	2	6	0.29	ns
Ferret	–	–	–	–
TOTAL	2	11	0.02	*
WHANANAKI				
Stoat	15	7	0.13	ns
Weasel	10	2	0.04	*
Ferret	3	2	1.0	ns
TOTAL	28	11	0.01	**

Over a 4-month period at Whananaki, 80 trapped animals—mostly rats but including 11 mustelids—were assessed to gauge the approximate time since capture by assigning them to one of three categories of decay. (At Whananaki traps were cleared and fresh bait replaced weekly). Thirty-six of these animals were caught on fresh bait (including 5 mustelids) and 44 on freeze-dried bait (including 6 mustelids).

Of all animals caught on fresh bait, 97% were assessed to be 3.'very rotten' on the 3-point scale. This suggests they were caught early in the week when the fresh bait was, indeed, fresh. One hundred percent (n = 5) of the mustelids caught on fresh bait, 4 of which were stoats, were 3.'very rotten' on the scale.

Only 8 (18%) of the 44 animals caught on freeze-dried bait were 3.'very rotten' on the 3-point scale.

Of the 44 animals, 16% were judged to be 1.'fresh' on the scale and the remainder (46%) were 2.'rotten'. Of the 6 mustelids caught on freeze-dried bait, 3 were assessed as 1.'fresh' on the scale, 2 were 2.'rotten' and 1 was 3.'very rotten'. 1 stoat appeared in each category.

Table 3 shows that animals caught on fresh bait in the once-weekly re-baiting regime at Whananaki were more decayed than those caught on freeze-dried bait (P = 0.015). This indicates that fresh rabbit was only more attractive than freeze-dried rabbit for a short period of time (3–4 days), after which the dried bait was preferred.

TABLE 3. STATE OF DECAY OF CARCASSES OF MUSTELIDS CAUGHT ON DIFFERENT BAIT TYPES AT WHANANAKI (ONCE-WEEKLY TRAP-CLEARING AND FRESH BAIT REPLACEMENT).

BAIT TYPE	DECAY STATE	
	FRESH–ROTTEN	VERY ROTTEN
Freeze-dried rabbit	5	1
Fresh rabbit	0	5

4. Discussion

Without the benefit of statistically robust sample sizes, it is not possible to be completely confident in all the results. However, there is at least a strong indication that 'fresh is best'. This is supported by the lower proportion of 'very rotten' carcasses trapped on freeze-dried bait at Whananaki where most 'very rotten' carcasses were caught on fresh bait. The degree of decay indicates that these animals would have been caught when the bait was at its freshest. This is further supported by the high proportion of mustelids captured on fresh bait at Mimiwhangata, where the availability of fresh bait was maintained by twice-weekly bait replacement.

The difference in bait preference between Mimiwhangata and Whananaki may reflect the different checking and re-baiting regimes at the two sites. At Whananaki, the traps were checked and fresh bait replaced weekly, and mustelids caught with fresh bait were more decayed when the traps were checked than those caught on freeze-dried bait. This indicates that the mustelids caught with fresh bait were caught soon after re-baiting, suggesting that mustelids prefer fresh bait when it is freshest, but that freeze-dried bait will catch over a longer period of time. This result may explain why, under the more frequent, twice-weekly trap checking and fresh bait replacement regime at Mimiwhangata, most mustelids were caught on fresh bait. Other differences between the two study sites may have influenced catch rates. For example, the area trapped at Mimiwhangata is smaller, has a greater trap density, and a longer trapping history than Whananaki. Also, trap covers differed differed between the two sites. The differences in bait preference between the two sites may need to be explored further, and extrapolation of these results to other sites would, at this stage, be inappropriate.

The much higher overall catch rate with freeze-dried bait within the once-weekly fresh bait re-baiting regime at Whananaki indicates that freeze-drying is useful in prolonging the attractiveness of bait, and that freeze-dried bait is probably significantly better at controlling target animals in once-weekly (or longer) re-baiting regimes than fresh bait. This suggests that the demonstrated improvement in kiwi chick survival at Trounson Kauri Park (up to 70%), where stoats are controlled using once-weekly re-baiting with fresh rabbit meat, could be further improved if either freeze-dried rabbit meat baits were used, or traps were re-baited twice weekly with fresh rabbit meat. The safest and most cost-effective option is probably to use both bait types within each trap on a weekly fresh bait re-baiting regime.

It is surprising that, despite more than a decade of active stoat control around New Zealand, there is still debate about what constitutes the 'best' bait for stoats. The two most likely contenders—fresh rabbit meat and fresh hen eggs—have never been formally tested against each other. The popularity of hen eggs appears to reflect managers' wishes to be 'cost effective'. As a result, high-maintenance baits like fresh rabbit meat have been rejected as being 'too expensive', especially for large-scale trapping operations. Eggs, on the other hand, are seen as being convenient, clean and cost-effective as labour costs are much less than for meat baits which decay more quickly. But just how attractive are hen eggs to stoats? Recent pen trials suggest a 'low-level response' by stoats to cracked hen eggs with best responses to rabbit, rodent and sparrow meat (K. Clapperton et al., pers. comm.). Until the fundamental question of what is the best bait for stoats is answered, 'best practice' will only ever be a 'best compromise'.

5. Recommendations

- Further test existing and experimental long-life baits designed to maintain attractiveness to mustelids over time.
- Expand paired trap numbers, especially at Mimiwhangata, to improve the robustness of the collected data set.

6. Acknowledgements

I thank Craig Gillies for initial design suggestions and database development, and Jenny Christie, Tony Beauchamp and Ian Westbrooke for assistance with statistical analysis.

Thanks also to the Stoat Technical Advisory Group for providing the funds for this trial.

7. References

Burns, R.; Harrison, A.; Hudson, J.; Jones, G.; Rudolf, P.; Shaw, P.; Ward, C.; Wilson, D.; Wilson, L. 2000: Northern Te Urewera Ecosystem Restoration Project, summary annual report, July 1999 to June 2000. East Coast-Hawkes Bay Conservancy, Department of Conservation.

Dowding, J.E.; Murphy, E.C. 1996: Predation of Northern New Zealand dotterels (*Chaladrius obscurus aquilonius*) by stoats. *Notornis 43*: 144–146.

Elliot, G.P.; Dilks, P.J.; O'Donnell, C.F.J. 1996: The ecology of yellow-crowned parakeets (*Cyanoramphus auriceps*) in *Nothofagus* forest in Fiordland, New Zealand. *New Zealand Journal of Zoology 23*: 249–265.

King, C.M.; O'Donnell, C.F.J.; Phillipson, S.M. 1994. Monitoring and control of mustelids on Conservation lands. Part 2: Field and workshop guide. *Department of Conservation Technical Series No. 4.*

McLennan, J.A.; Potter, M.A.; Robertson, H.A.; Wake, G.C.; Colbourne, R.; Dew, L.; Joyce, L.; McCann, A.J.; Miles, J.; Miller, P.J.; Reid, J. 1996: Role of predation in the decline of kiwi, *Apteryx* spp., in New Zealand. *New Zealand Journal of Ecology 20:* 27–35.

O'Donnell, C.F.J.; Dilks, P.J.; Elliot, G.P. 1996: Control of a stoat population irruption to enhance mohua (yellowhead) (*Mohoua ochrocephala*) breeding success in New Zealand. *New Zealand Journal of Zoology 23*: 279–286.