Ferret Neophobia to Traps

Andrea E. Byrom, Eric B. Spurr, and Cheryl E. O'Connor

Landcare Research
PO Box 69, Lincoln 8152
New Zealand

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Reviewed by:	Approved for release by:
Grant Norbury Scientist	Phil Cowan Science Manager
Landcare Research	Biosecurity and Pest Management

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Project and Client

It has been suggested that one reason why ferrets are not trappable during the period July – December is that they are averse to novel objects ("neophobic") at this time of year. Ferret neophobia to traps was investigated by Landcare Research for the Animal Health Board (Project R-10508) from March 200 to March 2002.

Objective

To identify cost-effective and practical means of killing a minimum of 80% of female ferrets in the rabbit-prone areas of the South Island, during late winter and spring, by:

- comparing the percentage of females caught in long-established ("permanent") traps with that of females caught in recently established ("novel") traps, in late winter/spring and summer/autumn.

Methods

We investigated the possibility that ferrets are wary of novel objects (neophobic) during late winter and spring, on four sites in the Mackenzie Basin during 2000 and early 2001. On two sites, traps were placed in the field three months before being set in the first field trial. On the other two sites, traps were placed in the field immediately before being set. Females were radio-collared in March–May 2000 and capture rates of radio-collared females were compared in winter/spring (September/October 2000) and summer/autumn (February 2001).

Results

The capture rate of radio-collared female ferrets was faster in permanent traps than in novel traps in winter, but not in summer. Permanent traps also caught a greater proportion of radio-collared ferrets after 3 nights of trapping. However, there was no significant difference between permanent and novel traps after 10 nights.

Two other lines of evidence supported a neophobic response of ferrets in late winter and spring: the capture rate of new (previously unmarked) ferrets was faster in permanent traps in winter, and the total number of "capture events" (new captures plus recaptures) was greater in permanent traps in winter, compared with novel traps.

Conclusions

- Female ferrets showed strong neophobia to novel traps when they were first placed in the field in late winter.
- This neophobia diminished after 10 nights.
- There was some suggestion that neophobia exhibited by male ferrets was not as strong as for female ferrets.
- Ferrets that are naturally more wary of novel objects, or ferrets that do not enter a trap immediately after they encounter it, may be more likely to enter traps if they are left in permanent locations, or after they have been in place for 10 nights in winter.

- It may therefore be possible to reduce the neophobic response by ferrets by placing traps in permanent locations and/or trapping for longer periods of time.

Recommendations

- When trapping ferrets in winter and spring, traps should be placed in permanent locations so that they become a familiar part of a ferret's environment.
- If it is not possible to place traps permanently, at least 10 nights of trapping should be carried out to capture up to 80% of the adult female population.
- A third, cheaper, option might be to place traps in situ for 7 nights without setting them, then run them for 3 nights. This option should be tested experimentally to see whether it reaches the desired 80% capture rate.
- Trap spacings do not need to be reduced in winter (300-m spacing is acceptable to achieve an up to 80% capture rate).
- Strict adherence to the 3-night ferret monitoring protocol may result in a low rate of capture in winter unless traps are placed in situ in advance. We therefore recommend that the monitoring protocol should be updated, taking into account the new information presented here.

1. Introduction

It has been suggested that one reason why ferrets are not trappable during the period July – December is that they are averse to novel objects ("neophobic") at this time of the year. Ferret neophobia to traps was therefore investigated by Landcare Research for the Animal Health Board, from March 2000 to March 2002.

2. Background#

Ferrets (*Mustela furo*) were introduced into New Zealand in the 1880s to control burgeoning populations of European rabbits (*Oryctolagus cuniculus*). Ferrets are now considered a vertebrate pest of both economic and conservation importance (Lavers & Clapperton 1990). Ferrets are potential vectors of bovine tuberculosis (Tb), and as such may pose a significant threat to New Zealand's international beef, dairy and venison industries (Ragg et al. 1995; Lugton et al. 1997; Byrom 2001). They also prey on indigenous wildlife as secondary prey (Pierce 1986; Murphy 1996; Alterio et al. 1998).

Ferrets are a domesticated form of the European polecat (*Mustela putorius*) and are generally much less trap-shy than truly wild mustelids such as stoats (*M. erminea*) (Moller et al. 1996). However, several researchers, contractors, and managers in New Zealand have observed that ferrets are hard to trap in the period July to December (Moller et al. 1996). They are also hard to control by poison baiting during this period (Spurr et al. 1997). This phenomenon of low trappability appears to occur in mustelid populations worldwide (Buskirk & Lindstedt 1989).

One possible reason why ferrets are more difficult to trap in the period July to December is that they may become more wary of (neophobic to) novel objects in the environment, such as traps and bait stations, resulting in lower trap catch and bait take in late winter and spring (Spurr et al. 2001). The Animal Health Board has indicated that they would like to achieve a reduction of at least 80% of female ferrets during this period. The aim of this study was therefore to examine the possibility that ferrets exhibit neophobia toward traps during winter and spring, and to determine whether the neophobic response could be reduced or prevented if ferrets were more familiar with permanently-placed traps or bait stations.

Two recent models make conflicting predictions about the best season to trap ferrets (summer/autumn or winter/spring). Roberts et al. (1999) suggested that killing ferrets in winter and spring may be more effective at reducing the next generation of ferrets than culling during summer and sutumn (although they also concluded that autumn culling might be a better option when ferrets are at naturally low densities). Conversely, Barlow & Norbury (2001) concluded that autumn culling was generally better if control operations are episodic (as they often are) and not continuous. Even though the models conflict in their conclusions, there is at least some evidence from both models that culling ferrets during winter and spring might be effective under certain conditions. Methods for overcoming the observed neophobia in winter and spring are therefore urgently needed.

3. Objective

To identify cost-effective and practical means of killing a minimum of 80% of female ferrets in the rabbit-prone areas of the South Island, during late winter, by:

- comparing the percentage of females caught in long-established ("permanent") traps with that of females caught in recently established ("novel") traps, in winter/spring and summer/autumn.

4. Methods

The study was conducted on rabbit-prone sites in the Mackenzie Basin, South Canterbury, on the following four high-country stations: Grays Hills, The Wolds, Holbrook, and Simons Hills. The area of each study site was 500–1000 ha.

Trapping of ferrets on all four sites commenced in March 2000. Ferrets were live-trapped in cantilever plastic box traps (using rabbit meat as a lure) from March to May 2000 and ear-tagged to identify individuals. In addition, at least 20 adult female ferrets were radio-collared on each site with 30-g Sirtrack ferret collars (Table 1). Not all radio-collared ferrets survived the winter, and some ferrets moved off the treatment sites. At the beginning of the winter field trial, 15 radio-collared female ferrets were re-located on the sites with permanent traps and 19 were re-located on the sites with novel traps. At the beginning of the summer field trial, 13 radio-collared female ferrets were re-located on the sites with permanent traps and 16 were re-located on the sites with novel traps (Table 1).

Table 1 Number of adult female ferrets radio-collared at each of four sites in the Mackenzie Basin, and number of females remaining on each site for the field trials.

Site	Number of female ferrets collared in March – May 2000	Sample size for winter trial in September 2000	Sample size for summer trial in February 2001
Grays Hills (novel)	23	7	8
The Wolds (novel)	20	12	8
Holbrook (permanent)	20	5	3
Simons Hills (permanent)	24	10	10

The winter field trial commenced on 15 September 2000 and the summer trial on 6 February 2001. (We call these trials the "winter" and "summer" trials respectively, although the winter trial spans late winter and early spring and the summer trial spans late summer and early autumn). At each of the four sites, 100 cantilever plastic box traps were set out in a grid pattern approximately 250–300 m apart. On two of the sites (Holbrook and Simons Hills), traps were placed (but not set) during June 2000, and left in situ for 3 months during winter. These same traps remained in situ from October to January also (between the winter and

summer trials). These were designated "permanent" trap sites. On the other two sites (Grays Hills and The Wolds), traps were placed only during the period of trapping in September 2000, and again during the period of trapping in February 2001. These were designated "novel" trap sites, because ferrets had not been exposed to the traps for 3 months prior to the trial. Traps on all sites were set for 10 nights during the trials. All ferrets captured were ear-tagged and released if they were not already marked. Capture rates of radio-collared females were compared in September/October 2000 (winter/spring) and February 2001 (summer/autumn).

We examined winter trappability of ferrets by comparing five different parameters:

(a) The *percentage of radio-collared female ferrets captured*, and the rate at which they were captured, in winter and summer. We used radio-collared females because they provided a known sample of available ferrets. We expected that permanently placed traps would capture a greater proportion of this known sample of females, at a faster rate, than traps that were new (novel) to these ferrets. We compared the percentages of radio-collared females captured after 3 nights, and again at the end of the 10-night trapping period. We did this because the current ferret monitoring protocol recommends 3 nights of trapping for ferrets, and we wanted to determine whether the desired 80% capture rate was feasible after 3 nights of trapping. We compared the percentage of radio-collared females captured with "novel" and "permanent" traps using logistic regression.

(b) The *total number of ferrets captured* (both males and females) on permanent and novel sites in winter and summer. We expected that, if ferrets of either sex were neophobic to novel traps, fewer ferrets would be captured in these traps overall.

(c) The *cumulative number of capture events of ferrets*, both males and females, in winter and summer. We examined the total number of captures, including recaptures, because we were interested in whether ferrets would be more likely to enter (and re-enter) permanently placed traps compared with novel traps.

(d) The *number of ear-tagged male ferrets captured* at permanent and novel traps in winter and summer. A key assumption in our comparison of captures of ear-tagged male ferrets between the two trap types is that the number of male ferrets was approximately similar between the four sites. We expected that male ferrets might also show some neophobia to traps in winter.

(e) The *number of new ferrets captured* at permanent and novel sites, and the rate at which they were captured, in winter and summer. We used "new" ferrets as a measure of those ferrets in the population that might naturally be more wary of traps. We expected that these ferrets might be less likely to enter novel traps compared with permanently placed traps.

The *main objective* of this study was to focus on (a) above (the measure of trappability of radio-collared female ferrets). However, the other results obtained from the 10 nights of captures and recaptures of ferrets ((b) – (e) above) also highlight aspects of the winter trappability of ferrets that we think are important.

5. Results

5.1 Percentage of radio-collared female ferrets captured

There was strong evidence for a difference in the capture rates of ferrets between permanent and novel traps after 3 nights of trapping, but not after 10 nights. Sites with permanent traps caught a higher proportion of radio-collared females, at a faster rate, than sites with novel traps during winter, but not in summer (Fig. 1).

In winter, many radio-collared female ferrets (60%) were caught over the first 3 nights using permanent traps, whereas novel traps captured only 16% of available radio-collared female ferrets in the same time period. This difference between permanent and novel traps after 3 nights was significant (logistic regression; $\chi^2 = 7.01$; d.f. = 1, $P = 0.007$). Moreover, in the winter trial, sites with permanently located traps achieved the desired 80% capture of available radio-collared female ferrets after 7 nights of trapping, whereas sites with novel traps had captured only 42% of available females over the same period. Novel traps captured a maximum of 68% of available radio-collared females (compared to 80% for permanent traps), although at the end of the 10-night period there was no significant difference between permanent and novel traps in the proportion of radio-collared females caught (logistic regression; $\chi^2 = 0.05$; d.f. = 1, $P = 0.44$).

In the summer trial, sites with permanently located traps captured 77% of radio-collared female ferrets after 8 nights of trapping, whereas sites with novel traps captured a maximum of 81% of available female ferrets after 7 nights; the differences between the two trap types in summer were not significant.

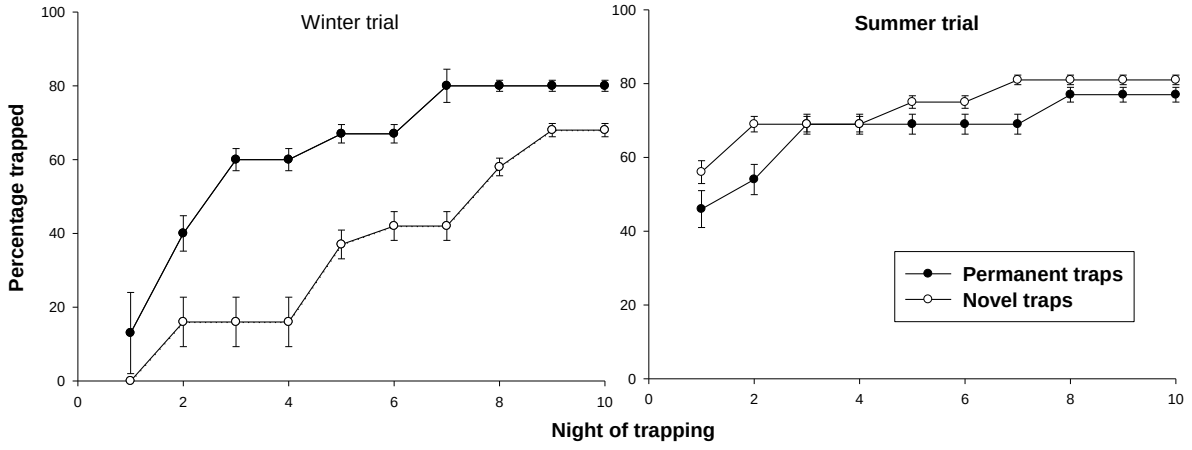

Fig. 1 Capture rates of radio-collared female ferrets in permanent and novel traps in winter and summer. Error bars are the standard errors of the proportions of collared females trapped.

5.2 Total number of individual ferrets captured

The total number of different ferrets captured after 10 nights (radio-collared, ear-tagged, and unmarked ferrets excluding recaptures) did not differ between permanent and novel sites, or between male and female ferrets (Table 2). A higher number of ferrets was captured in summer, a reflection of juvenile recruitment. We had expected that permanently placed traps might catch more ferrets than novel traps (particularly in winter). However, this was not the case.

Table 2 Total number of individual ferrets (both males and females) caught in permanent and novel traps in winter and summer.

	Winter trial			Summer trial		
	Males	**Females**	**Total**	**Males**	**Females**	**Total**
Permanent	21	19	40	50	60	110
Novel	18	21	39	64	59	123

5.3 Cumulative number of ferret captures ("capture events")

The total number of capture events of ferrets (males and females combined and new captures and recaptures combined) after 10 nights was higher in permanently placed traps than in novel traps in the winter trial, but not in summer (Fig. 2). We expected that ferrets would be more likely to enter (and re-enter) permanently placed traps.

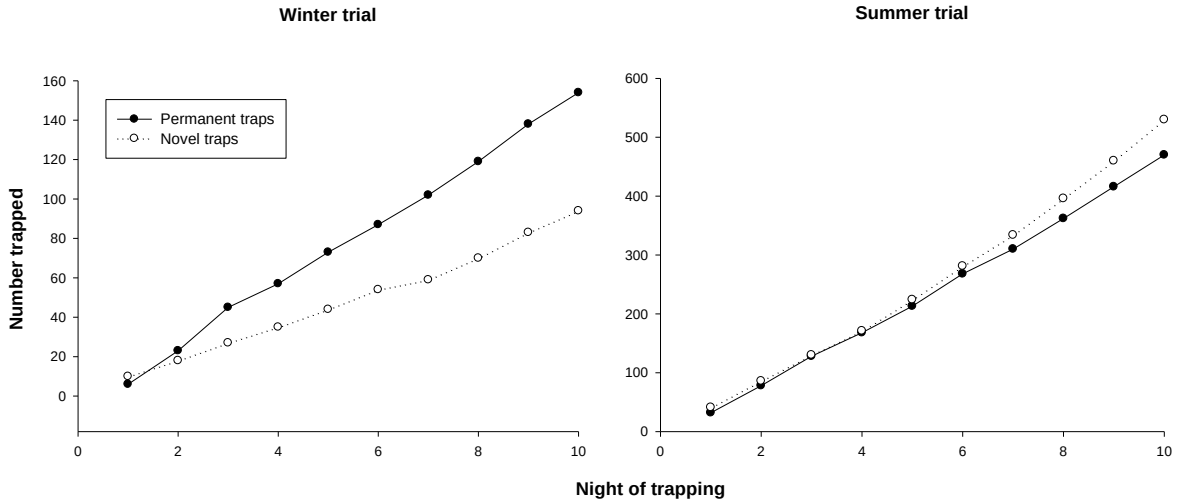

Fig. 2 Cumulative number of "capture events" of ferrets (males and females combined; first captures and recaptures combined) in permanent and novel traps in winter and summer. Note the different scales on the y-axes.

We examined capture events of male and female ferrets separately, to determine whether either sex was more or less likely to enter novel or permanently placed traps. We found that both male and female ferrets contributed to the higher number of capture events in permanent traps in winter (i.e., no particular sex was responsible for the observed higher number of capture events in winter; Table 3). In permanent traps in winter, 36% of capture events were females, whereas in novel traps, 46% of capture events were females. In summer, 46% of capture events in permanent traps were females, exactly the same (46%) as for novel traps (Table 3).

Table 3 Total number of "capture events"[1] of male and female ferrets in permanent and novel traps in winter and summer.

Trap type	Winter			Summer		
	Females	Males	Total	Females	Males	Total
Permanent	55	99	154	218	252	470
Novel	43	51	94	246	284	530

[1] Note that these figures do not represent the number of individual ferrets captured (those results are presented in Table 2 above).

We also examined new captures (first-capture events) and recaptures (subsequent capture events) separately to determine whether first captures or recaptures of ferrets were responsible for the observed higher number of total capture events of ferrets in winter. We found that both first captures and recaptures contributed equally to the observed difference (Table 4).

Table 4 Total number of capture events of ferrets in winter and summer, by first-capture or recapture.

Trap type	Winter			Summer		
	First captures	Recaptures	Total	First captures	Recaptures	Total
Permanent	40	114	154	110	360	470
Novel	39	55	94	123	407	530

In a situation where contractors are carrying out ferret control, ferrets are killed when they are captured. However, the information on recaptures is still useful because it gives us an indication of whether ferrets might be willing to re-enter traps that they have escaped from, or traps that they have encountered and investigated but not entered the first time.

5.4 Number of ear-tagged male ferrets captured

There was no difference in the rate of capture or total number of ear-tagged male ferrets captured at sites with permanent and novel traps during the winter field trial, but more were caught in the summer trial (Fig. 3). A key assumption in our comparison of captures of ear-tagged male ferrets between the two trap types is that the number of male ferrets was

approximately similar between the four sites (i.e., that there were no differences in population size between the sites). It was therefore not possible to compare the *percentage* of males captured at each site because we did not have radio-collars on male ferrets. Hence the result that more male ferrets were captured at sites with permanently placed traps during the summer field trial (14 male ferrets compared with 10 male ferrets in novel traps) should be treated with caution.

All ear-tagged females were also radio-collared, so the results for ear-tagged females are the same as for radio-collared females.

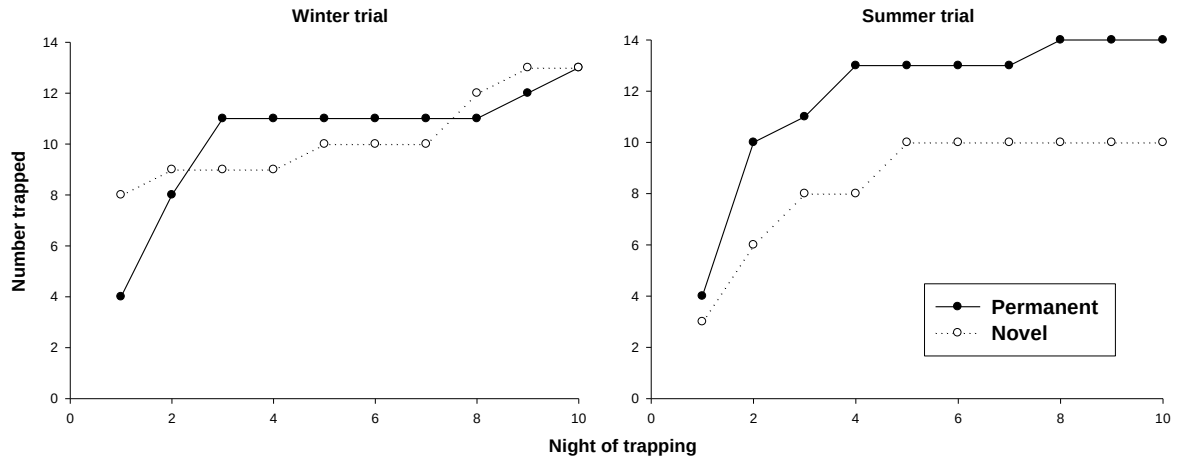

Fig. 3 Cumulative number of ear-tagged male ferrets caught in permanent and novel traps in winter and summer.

5.5 Number of new ferrets captured

Sites with permanent traps caught new ferrets (ferrets of both sexes that had never been trapped before) more quickly in winter but not in summer (Fig. 4). We used "new" ferrets as a measure of those ferrets in the population that might naturally be more wary of traps. We expected that these ferrets might be less likely to enter novel traps compared to permanently placed traps. This was certainly the case in the winter trial, but not in summer (Fig. 4). By the end of 10 nights of trapping in the winter trial, permanently-placed traps had scored 16 new captures of ferrets, compared with 13 new captures in novel traps, again suggesting that differences between permanent and novel traps were small after 10 nights of trapping. As expected, many more new ferrets were captured in summer (after the breeding season) compared to winter.

These results should also be treated with caution (like our results for male ferret captures above) because the available population of "new" ferrets was not known for each site, and this analysis makes the assumption that the available population of "new" ferrets was similar among all four sites.

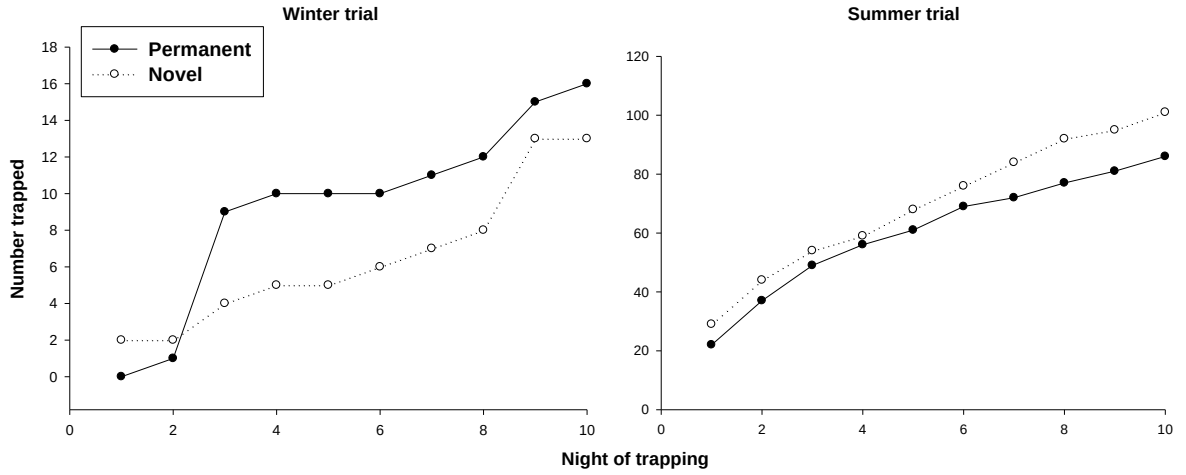

Fig. 4 Cumulative number of first captures of "new" individual ferrets (males and females combined) in permanent and novel traps in winter and summer. Note the different scales on the y-axes.

6. Conclusions

We used radio-collared female ferrets as a measure of the proportion of the population available to be trapped in winter and summer. These females showed strong neophobia to newly placed ("novel") traps in late winter. Neophobia appeared greatest for the first 3 nights of trapping, but diminished after 10 nights of trapping. Traps that had been placed in the field over winter, thereby becoming a familiar part of the environment ("permanent" traps) had a faster rate of capture of radio-collared female ferrets than novel traps (i.e., they caught a greater percentage of available female ferrets more quickly). Other measures of neophobia (total capture events, and total number of new individual ferrets captured) supported this result. The finding that more ear-tagged male ferrets were captured in permanent traps than in novel traps in summer compared to winter should be treated with caution because we do not know the percentage of male ferrets available to be trapped on our four sites. Nevertheless, this finding does suggest that male ferrets might not exhibit as strong a neophobic response as female ferrets in winter. This suggestion has previously been made by several contractors and researchers.

It may therefore be possible to reduce a neophobic response of ferrets by placing traps in permanent locations, and/or trapping for longer periods of time. Both these options are more costly than the current system of commencing trapping as soon as traps are set, and trapping for only short periods of time. However, permanent trap locations, and longer trapping periods, may be the only option if higher trap catch rates (80% and above) are required during winter and spring. Traps that were novel to ferrets only ever captured a maximum of 68% of the available radio-collared females, although this was not significantly different from the desired 80% capture rate. With larger sample sizes this difference might have been

significant, which raises the possibility that novel objects like traps are slightly less attractive to ferrets even after 10 nights of trapping.

A neophobic response to many different types of traps and bait stations has been observed in ferrets (Spurr et al. 2001). We have no reason to believe that the type of traps we used (yellow plastic treadle traps commonly used by farmers and pest contractors) would elicit a greater or lesser neophobic response than any other type of trap or bait station. We are therefore confident that the conclusions we draw from using this type of trap could be extended to other trap types.

7. Recommendations

- When trapping ferrets in winter and spring, traps should be placed in permanent locations so that they become a familiar part of a ferret's environment.
- If it is not possible to place traps permanently, at least 10 nights of trapping should be carried out to capture up to 80% of the adult female population.
- A third, cheaper, option might be to place traps in situ for 7 nights without setting them, and then run them for 3 nights. This option should be tested experimentally to see whether it reaches the desired 80% capture rate.
- Trap spacings do not need to be reduced in winter (300-m spacing is acceptable to achieve an up to 80% capture rate).
- Strict adherence to the 3-night ferret monitoring protocol may result in a low rate of capture in winter unless traps are placed in situ in advance. We therefore recommend that the monitoring protocol should be updated, taking into account the new information presented here.

8. Acknowledgements

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9. References

Alterio, N.; Moller, H.; Ratz, H. 1998: Movements and habitat use of feral house cats *Felis catus*, stoats *Mustela erminea* and ferrets *Mustela furo*, in grassland surrounding yellow-eyed penguin *Megadyptes antipodes* breeding areas in spring. *Biological Conservation 83*: 187–194.

Barlow, N. D.; Norbury, G. L. 2001: A Simple Model For Ferret Population Dynamics And Control In Semi-Arid New Zealand Habitats. *Wildlife Research 28*: 87-94.

Buskirk, S. W.; Lindstedt, S. L. 1989: Sex biases in trapped samples of mustelidae. *Journal of Mammalogy 70*: 88–97.

Byrom, A. E. 2001: Ferrets as vectors of bovine Tb: a review. *Proceedings of the New Zealand Society of Animal production 61*: 60–63.

Lavers, R. B.; Clapperton, B. K. 1990: Ferret. *In*: King, C. M. (*ed*.). The handbook of New Zealand Mammals. Auckland, Oxford University Press. Pp. 320–330.

Lugton, I. W.; Wobeser, G.; Morris, R. S.; Caley, P. 1997: Epidemiology of *Mycobacterium bovis* infection in feral ferrets (*Mustela furo*) in New Zealand: I. Pathology and diagnosis. *New Zealand Veterinary Journal 45*: 140–150.

Moller, H.; Norbury, G.; King, C. M. 1996: Ecological and behavioural constraints to effective control of ferrets (*Mustela furo*). *The Royal Society of New Zealand Miscellaneous Series 36*: 78–84.

Murphy, E. 1996: Ferrets as threats to conservation values. *In*: Ferrets as vectors of tuberculosis and threats to conservation. *The Royal Society of New Zealand Miscellaneous Series 36*: 48–51.

Pierce, R. J. 1986: Differences in susceptibility to predation during nesting between pied and black stilts (*Himantopus* spp.). *The Auk 103*: 273–280.

Ragg, J. R.; Moller, H.; Waldrup, K. A. 1995: The prevalence of bovine tuberculosis (*Mycobacterium bovis*) infections in feral populations of cats (*Felis catus*), ferrets (*Mustela furo*) and stoats (*Mustela erminea*) in Otago and Southland, New Zealand. *New Zealand Veterinary Journal 43*: 333B337.

Roberts, M. G.; Kao, R. R.; Moller, H.; Norbury, G. L.; Ragg, J. R. 1999: The optimal control of ferret populations. Unpublished report to the Animal Health Board No.R-30496.

Spurr, E. B., Morse, C. W.; Eason, C. T. 1997: Poison-baiting of ferrets in winter. Landcare Research Contract Report LC9798/67 (unpublished), 15 p.

Spurr, E. B.; O'Connor, C. E.; Byrom, A. E. 2001: Review of research on improving the effectiveness of ferret control in winter and spring. *Proceedings of the 12th Australasian Vertebrate Pest Conference*. Pp. 353–357.