A Poison-baiting Strategy for Effective Ferret Control

E.B. Spurr, S.C. Ogilvie, C.T. Eason, C.W. Morse
Landcare Research
P.O. Box 69, Lincoln
New Zealand

J. Young
Lincoln University
PO Box 84, Lincoln
New Zealand

Landcare Research Contract Report: LC9697/135

PREPARED FOR:
Animal Health Board,
PO Box 3412, Wellington

DATE: July 1997

DOI: - https://doi.org/ 10.7931/ngh2-8344

Contents

1. Summary

1.1 Project and Client

A poison-baiting strategy for the control of ferrets is being developed by Landcare Research, Lincoln, for the Animal Health Board, Wellington. The research presented in this report was carried out between July 1996 and June 1997.

1.2 Objectives

- To determine the acute dose of diphacinone in fish-paste lethal to >90% of captive ferrets of both sexes.
- To determine the efficacy of fish-paste containing (a) 1080 and (b) diphacinone for control of wild ferrets.
- To determine the direction and distance that ferrets move from their original capture site.

1.3 Methods

- The toxicity of diphacinone to ferrets was determined by feeding captive ferrets different amounts of diphacinone in fish-paste for 1, 2, and 4 days.
- The efficacy of fish-paste containing (a) 1080 and (b) diphacinone was determined in two study areas, 11 km apart, on farmland near Culverden, in North Canterbury.
- Ferrets in each area were live-trapped, weighed, ear-tagged, fitted with mortality-sensing radio-transmitters, and released before poison baits were put out.
- Fish-paste baits containing 0.015% 1080 were then placed in Pest-Off bait stations in one area and 0.03% diphacinone in a combination of Pest-Off and drain-pipe bait stations in the other area.
- A radio-receiver and hand-held yagi aerial were used to determine the location and status (alive or dead) of the radio-tagged ferrets at 1–7 day intervals before and after poison-baiting.
- Dead ferrets were autopsied for signs of poisoning, tissues were analysed for toxicant residues, and teeth were sectioned to determine age.
- The direction and distance that dispersing radio-tagged ferrets moved from their original capture site was determined by re-trapping or using the radio-receiving equipment, initially from the ground and later from a helicopter.

1.4 Results

- All captive ferrets died after a single feeding of 120 mg diphacinone per kg body weight, or repeat feedings of 30 mg per kg per day for 2 or 4 days.
- In the field trials, about 0.5 kg (2%) of the 1080 bait and 7.5 kg (27%) of the diphacinone bait was eaten. More bait was eaten from the drain-pipe bait stations than from the Pest-Off bait stations.
- All four resident radio-tagged ferrets in the 1080 area died 8–21 days after the bait was first put out, and all 19 resident radio-tagged ferrets in the diphacinone area died 5–25 days after the bait was first put out. Autopsies and analyses of toxicant

residues indicated that poisoning was the likely cause of death. All the dead ferrets aged from tooth sections were less than 1-year old.

- Most of the radio-tagged ferrets moved less than 3 km from their initial capture site, but 11 moved further. All the dispersing ferrets aged were less than 1-year old.

1.5 Conclusions

- Both 1080 and diphacinone are suitable poisons for ferret control. Ferrets need to eat about 8 g of bait containing 0.015% 1080 in a single feed or 200 g of bait containing 0.03% diphacinone over 1–4 days to receive a lethal dose. Pregnant females are more susceptible than non-pregnant females to the effects of diphacinone.
- The greater consumption of bait from drain-pipe bait stations, which had a larger diameter than Pest-Off bait stations, may indicate that ferrets preferred the former or that other species (e.g., hedgehogs) were able to eat bait from them.
- Some non-target species are more sensitive than ferrets to 1080 and diphacinone. Bait stations need to exclude valued non-target species from eating baits. The risk of secondary poisoning of non-target species from eating dead ferrets is unknown.
- The field trials with 1080 and diphacinone in fish-paste indicate the potential of poison baits in bait stations as a cost-effective method of ferret control, but they are unreplicated.
- The trials also provide data supporting full registration of both poison baits with the Pesticides Board, although farmers can use only the baits containing diphacinone.

1.6 Recommendations

- The Animal Health Board should encourage Animal Control Products Ltd to apply to the Pesticides Board for registration of both 1080 and diphacinone in fish-paste baits to provide pest control operators and farmers with an additional method to trapping for controlling ferrets.
- The cost-effectiveness of poison-baiting compared to trapping should be assessed in replicated trials involving farmers, Regional Councils, and the Department of Conservation.
- Trials are also needed to determine (a) the optimum time of year for putting out poison baits, (b) the optimum density of bait stations, and (c) the risks to non-target species (e.g., Australasian harriers, weka, moreporks, cats, and dogs) from both primary and secondary poisoning.

2. Introduction

A poison-baiting strategy for the control of ferrets is being developed by Landcare Research, Lincoln, for the Animal Health Board, Wellington. The research presented in this report was carried out between July 1996 and June 1997.

3. Background

Ferrets (*Mustela furo*) are of concern to the Animal Health Board because they are considered to play a role in the transmission of bovine tuberculosis (Tb) in New Zealand (Livingstone 1996; Ragg & Walker 1996). They are also predators of native wildlife (Murphy 1996). There is, therefore, an urgent need for effective methods of ferret control.

The main method of ferret control at present is trapping. Poison-baiting is a potentially effective alternative method of control that we have been developing in recent years (Ogilvie *et al.* unpubl. Landcare Research contract reports 1994, 1995, 1996a; Ogilvie *et al.* 1996b). The method is being designed specifically to target ferrets and to be useable by farmers.

In our last report (Ogilvie *et al.*unpubl. Landcare Research contract report 1996a), we identified a fish-paste bait, bait station, and field baiting strategy that were highly effective for targeting feral ferrets. We suggested two toxicants that could be incorporated into the fish-paste baits. Sodium monofluoroacetate (1080) has a median lethal dose (LD_{50}) to ferrets of 1.2–1.4 mg/kg of body weight (Eisler 1995). Diphacinone, an anticoagulant, killed about 80% of captive ferrets that ate 30 mg/kg of body weight in earlier trials (unpubl. data). Thus, the first objective of the present project was to determine the dose of diphacinone lethal to >90% of ferrets.

As a result of our earlier research, Animal Control Products Ltd, Wanganui, produced two types of fish-paste bait; one containing 0.015% 1080, and another containing 0.03% diphacinone (Ferrovex Predator Paste). They also produced a bait station (Pest-Off™ tunnel bait station) specifically for ferrets. These products were tested in the present project.

An additional objective was added part-way through the project when some ferrets moved out of the study areas. The Animal Health Board wanted to know the direction and distance that these ferrets moved to help in understanding the spread of Tb in cattle and deer.

4. Objectives

- To determine the acute dose of diphacinone in fish-paste lethal to >90% of captive ferrets of both sexes.
- To determine the efficacy of fish-paste containing (a) 1080 and (b) diphacinone for control of wild ferrets.
- To determine the direction and distance that ferrets move from their original capture site.

5. Methods

All research presented in this report was undertaken with the approval of the Landcare Research Animal Ethics Committee. Poison-baiting with fish-paste baits containing 1080 was done with the permission of the Medical Officer of Health.

5.1 Toxicity of diphacinone to ferrets

Wild-caught and captive-raised ferrets were housed with adequate food and water at the Landcare Research animal facility at Lincoln. They were observed daily and acclimatised for at least 1 week before trials.

The acute toxicity of diphacinone to ferrets was determined by giving ferrets single doses of diphacinone in 50 g of fish-paste in three trials as follows: four females and three males received doses of 45 mg/kg of body weight, four females and three males received 60 mg/kg, and three ferrets of each sex received 120 mg/kg. In each trial, three or four ferrets of each sex received no diphacinone.

The chronic toxicity of diphacinone to ferrets was determined in two trials. In trial 1, three males and two females were each given 50 g of fish-paste containing the equivalent of 30 mg diphacinone per kg body weight per day for 2 days (i.e., a total of 60 mg/kg). In trial 2, three males and three females were each given 50 g of fish-paste containing the equivalent of 30 mg diphacinone per kg body weight per day for 4 days (i.e., a total of 120 mg/kg).

5.2 Field efficacy of 1080 in fish-paste baits

The 1080 study area covered about 400 ha on the properties of R. Burrows, E. Francis, and J. Walker, near Mouse Point, about 7 km north of Culverden, on the south bank of the Waiau River.

Ferrets were live-trapped in wire cage traps or wooden cantilever box traps baited with rabbit meat, weighed, ear-tagged, fitted with mortality-sensing radio-transmitters, and released. The

pulse rate of the transmitters was programmed to double after 22 hours of inactivity, indicating the death of the animals carrying them. Our aim was to attach transmitters to 20 ferrets before the poisoned bait was put out. With this sample size we would have about an 80% chance of detecting a 30% difference between the poisoning treatments (significant at the 95% level of probability); e.g., between a 100% kill and a 70% kill (R. Barker pers. comm.).

Between 14 January and 14 February 1997, radio-transmitters were attached to 23 ferrets (11 females and 12 males). However, 18 of the ferrets either lost their transmitters, died, disappeared without trace, or moved out of the area before poison-baiting (Appendix 11.1). Another ferret was killed by a farmer after the poisoned bait was put out, leaving only four radio-tagged ferrets (one female and three males) susceptible to the poison-baiting. A radio-receiver and yagi aerial were used to determine the location and status (alive or dead) of these ferrets at 1–7 day intervals from January to May 1997 (before and after poisoned bait was laid).

Forty-seven plastic Pest-Off™ tunnel bait stations, with an oval entrance 55 mm x 75 mm at each end (supplied by Animal Control Products Ltd, Wanganui), were located at approximately 250-m intervals on a grid of seven lines of five to seven bait stations, over about 200 ha of the study area. About half a tube (200-250 g) of green-dyed 1080 fish-paste bait (supplied by Animal Control Products Ltd, Wanganui) was placed in each bait station on 18 February 1997. The bait was replaced after 6 and 12 days. In total about 28 kg of bait was put out. All uneaten bait was removed after 36 days. The 1080 content of the bait, nominally 0.15 g/kg (0.015%), was determined before use by gas liquid chromatography. Dead ferrets were recovered wherever possible, autopsied for signs of poisoning, muscle tissues were analysed for 1080 residues, and teeth were sectioned to determine age.

5.3 Field efficacy of diphacinone in fish-paste baits

The diphacinone study area covered about 600 ha on the property of D. Norrie, Long Plantation Road, about 4 km south of Culverden, on the south bank of the Pahau River. Ferrets were live-trapped and mortality-sensing radio-transmitters attached using the same methods as in the 1080 study. Trapping started in December 1996 but no ferrets were caught until 21 January 1997. Between 21 January and 12 March 1997, radio-transmitters were attached to 29 ferrets (20 females and nine males). However, nine ferrets either lost their transmitters, died, disappeared, or moved out of the area before poison-baiting (Appendix 11.2). Another ferret disappeared without trace after the poison bait was laid, leaving 19 ferrets (12 females and seven males) susceptible to poison-baiting.

Seventy-four bait stations were placed on a grid of 10 lines of 6–10 bait stations, 250–500 m apart, in likely ferret habitat, over the entire study area. Forty-nine of the bait stations were plastic Pest-Off™ tunnel bait stations, with an oval entrance 55 mm x 75 mm at each end (the same as in the 1080 study), and 25 were plastic T-shaped bait stations constructed from PVC drain-pipe, with an internal diameter of 85 mm, open at both ends (Ogilvie *et al.* 1996b). About half a tube (200–250 g) of green-dyed Ferrovex Predator Paste (supplied by Animal Control Products Ltd, Wanganui) was placed in each bait station on 12 March 1997. The bait was replenished as necessary after 1, 6, 8, and 13 days. In total about 28 kg of bait was put out. All uneaten bait was removed after 21 days. The diphacinone content of the bait, nominally 0.3 g/kg (0.03%), was determined before use by high performance liquid chromatography based on the

method of Hunter (1984). Dead ferrets were autopsied for signs of poisoning, livers were analysed for diphacinone residues, and teeth were sectioned to determine age.

5.4 Direction and distance moved by dispersing ferrets

The direction and distance that dispersing radio-tagged ferrets moved from their original capture site was determined initially by locating them using a radio-receiver and hand-held yagi aerial. Some were trapped accidentally by local farmers and others were trapped specifically to recover their radio-transmitters. A helicopter equipped with a scanning receiver, omni-directional and yagi aerials, and a Global Positioning System was used in early May in an attempt to locate six missing ferrets that could not be located from the ground.

6. Results

6.1 Toxicity of diphacinone fish-paste to captive ferrets

A single feeding of fish-paste containing 120 mg diphacinone/kg body weight killed all ferrets (Table 1). The average time to death was 10.7 days for males and 8.7 days for females. Single feedings of lower doses of diphacinone did not kill all ferrets. None of the non-treated ferrets died during the trial.

Table 1. Mortality of captive ferrets given a single feeding of fish-paste containing diphacinone.

Diphacinone (mg/kg)	Males		Females	
	Dosed	Died	Dosed	Died
≤10	2	0	4	0
15	4	1	4	2
30	3	3	4	3
45	3	2	4	3
60	3	2	4	3
120	3	3	3	3

In the repeat dose trials, all five ferrets (three males and two females) given 50 g of fish-paste containing the equivalent of 30 mg diphacinone per kg body weight per day for 2 days (i.e., a total of 60 mg diphacinone per kg body weight) died after an average of 8.7 days for the three males and 5.0 days for the two females, both of which were pregnant.

All six ferrets (three males and three females) given 50 g of fish-paste containing the equivalent of 30 mg diphacinone per kg body weight per day for 4 days (i.e., a total of 120 mg diphacinone per kg body weight) died after an average of 9.7 days for the three males, 11.5 days for two females, and 5.0 days for one female which was pregnant.

The ferrets that died from diphacinone-poisoning appeared to behave normally until 1–2 days before death, when they showed loss of appetite and other signs typical of anticoagulant poisoning.

6.2 Field efficacy of 1080 in fish-paste

The 1080 fish-paste (nominally 0.015%) contained 0.023% 1080 in the samples analysed. Bait was eaten from 25% of the 47 bait stations. However, in total, only about 500 g (2%) of the bait was eaten. Of the bait that was eaten, 35% was eaten in the first week and the remainder in the next 4 weeks.

All four resident radio-tagged ferrets died 8–21 days after the bait was first put out (Appendix 11.1). One was found with green-dyed vomit beside its carcass. Another had green-dyed fish-paste in its stomach when autopsied. Laboratory analysis confirmed that 1080 was the likely cause of death of all four ferrets. The ferret killed by the farmer after the poison bait was put out also contained residues of 1080 (0.004 mg/kg). All the dead ferrets that were aged from cross-sections of teeth were less than 1-year old (Appendix 11.1).

6.3 Field efficacy of diphacinone in fish paste

The diphacinone paste (nominally 0.03%) contained 0.028% diphacinone in the samples analysed. Bait was eaten from 78% of the 74 bait stations (from 77% of the Pest-Off bait stations and 80% of the drain-pipe bait stations). In total, about 7.5 kg (27%) of the bait was eaten. Only 19% of the bait was eaten from the Pest-Off bait stations but 42% of the bait was eaten from the drain-pipe bait stations. Of the bait that was eaten, 68% was eaten in the first week.

All 19 resident radio-tagged ferrets died 5–25 days after the bait was put out (Appendix 11.2). Most ferrets died above ground but all were in cover (e.g., tree stumps, blackberry, etc.) not in the open. On autopsy, all had sub-cutaneous and internal bleeding, symptomatic of anticoagulant poisoning. Most had pale livers and pale noses. All except two had empty stomachs. One had meat (possibly rabbit) and one had green-dyed fish-paste in the stomach. Diphacinone residues have yet to be determined. All the ferrets that were aged from tooth cross-sections were less than 1-year old (Appendix 11.2).

6.4 Direction and distance moved by dispersing ferrets

Most of the 51 radio-tagged ferrets that could be relocated moved less than 3 km from their initial capture site. However, 11 moved longer distances (Appendix 11.3). Five of the dispersing ferrets that were aged from tooth sections were less than 1-year old. Based on body weights, the others are also likely to be less than 1-year old. One juvenile female crossed the Waiau River, and another crossed the Pahau River. The distances shown in Appendix 11.3 are minimum distances because the ferrets were caught before they could move further.

Six of the 51 ferrets could not be relocated, either from the ground or from the helicopter. One of the missing ferrets was later found dead on the roadside with its radio-transmitter smashed, run over by a car.

7. Conclusions

Both 1080 and diphacinone are suitable poisons for ferret control. Assuming a median lethal dose of 1080 of 1.2 mg/kg (Eisler 1995), a 1-kg ferret would need to eat only about 8 g of bait containing 0.015% 1080 to receive a lethal dose. The 500 g of bait eaten in the 1080-poisoning area would have been enough to kill about 62 ferrets if each ate only 8 g, or five ferrets if each ate 100 g, a more realistic daily consumption.

The results of the diphacinone lethal dose trials indicate that about 80% of ferrets weighing 1 kg will die after eating 100 g of bait containing 0.03% diphacinone (the concentration in Ferrovex Predator Paste). The remainder will need to eat 100 g of bait per day for 2 days, or 50 g of bait per day for 4 days, to receive a lethal dose. Larger ferrets will need to eat slightly more. The 7.5 kg of bait eaten in the diphacinone poisoning area is enough for a lethal dose for about 75 ferrets if each ate 100 g. However, some would have eaten more than this, over a period of several days, because the poison is slow-acting.

Although all radio-tagged ferrets were killed in the field trials, the small sample sizes meant that the confidence limits around the percentage of ferrets killed were reasonably wide. In the 1080 area, with only four radio-tagged ferrets, the 95% binomial confidence limits indicate that 47-100% of the ferrets were killed. In the diphacinone area, with 19 ferrets, we can say with 95% confidence that 85-100% of the ferrets were killed.

Susceptibility to diphacinone was greater for captive pregnant females than for non-pregnant females. Most females are pregnant in September (King 1990), so this could be a good time of year for poison-baiting. This is also after winter mortality and before spring births give rise to increased numbers of ferrets. However, other factors such as seasonal bait acceptance will also influence the optimum time of year for poison-baiting.

The difference between bait consumption from drain-pipe and Pest-Off bait stations may indicate that ferrets preferred bait stations with larger openings. However, the sample size of drain-pipe bait stations was smaller than for Pest-Off bait stations, and we do not know whether other species (e.g., hedgehogs) were eating bait from the larger diameter drain-pipe bait stations.

Some non-target species are much more sensitive than ferrets to 1080 and diphacinone. The LD_{50} of 1080 for dogs is 0.06 mg/kg and for cats is 0.3 mg/kg (Eisler 1995). Thus, a 10-kg dog and 2-kg cat both need to eat only about 4 g of bait containing 0.015% 1080 to obtain a lethal dose. Dogs and cats are also sensitive to diphacinone. The LD_{50} of diphacinone for dogs is approximately 3 mg/kg and for cats is 15 mg/kg (Tasheva 1995). Thus, a 10-kg dog and 2-kg cat both need to eat about 100 g of bait containing 0.03% diphacinone to obtain a lethal dose. Bait stations need to exclude both these species when bait is used on farmland or near private houses. Birds are unlikely to enter or break open bait stations, but some species (e.g., Australasian harriers, weka, and moreporks) may scavenge dead ferrets or prey on sub-lethally poisoned rodents.

The field trials reported here are unreplicated, but indicate the potential of poison baits in bait stations as a cost-effective method of ferret control. Poison baits for ferrets should also attract stoats, weasels, and rodents, and thus also reduce populations of these pests. Poison-baiting for ferret control should reduce both the incidence of Tb in cattle and the incidence of predation on wildlife. It is a method useable by farmers and pest control operators, although farmers can use only the diphacinone baits. The field trials provide data supporting full registration of both poison baits with the Pesticides Board.

8. Recommendations

- The Animal Health Board should encourage Animal Control Products Ltd to apply to the Pesticides Board for registration of both 1080 and diphacinone in fish-paste baits to provide pest control operators and farmers with an additional method to trapping for controlling ferrets.
- The cost-effectiveness of poison-baiting compared to trapping should be assessed in replicated trials involving farmers, Regional Councils, and the Department of Conservation.
- Trials are also needed to determine (a) the optimum time of year for putting out poison baits, (b) the optimum density of bait stations, and (c) the risks to non-target species (e.g., Australasian harriers, weka, moreporks, cats, and dogs) from both primary and secondary poisoning.

9. Acknowledgements

We thank J. Oliver (Animal Health Board) for assistance with locating study areas and liaison with farmers; R. Burrows, E. Francis, D. Norrie, J. Walker, and neighbouring farmers in the Culverden area for allowing us access to their farms; R. Burrows, E. Francis, R. Hammond, J. Hawker, and J. Walker for returning radio-tagged ferrets caught in their traps; G. Wright, M. Potts, and L. Street for laboratory analyses; L. Milne, A. Rhodes, P. Wenmoth-Hann, and N. Young for looking after captive ferrets; R. Barker for statistical advice; M. Ogle-Mannering for editorial assistance; and W. Weller for final word processing.

10. References

Eisler, R. 1995: Sodium monofluoroacetate (1080) hazards to fish, wildlife, and invertebrates: a synoptic review. U.S. Department of the Interior, National Biological Service, Washington D.C., U.S.A. Biological Report 27. 47 p.

Hunter, K. 1984: Reverse phase ion-pair liquid chromatographic determination of chlorphacinone residues in animal tissues. *Journal of chromatography 299:* 405-414.

King, C.M. 1990: The handbook of New Zealand mammals. Oxford University Press, Auckland. 600 p.

Livingstone, P.G. 1996: Overview of the ferret problem. *In:* Ferrets as vectors of tuberculosis and threats to conservation. *Royal Society of New Zealand miscellaneous series 36:* 2-6.

Murphy, E.C. 1996: Ferrets as threats to conservation values. *In:* Ferrets as vectors of tuberculosis and threats to conservation. *Royal Society of New Zealand miscellaneous series 36:* 48-51.

Ogilvie, S.C.; Morgan, D.R.: Spurr, E.B.; Meikle, L.M. 1994: Development of baits for control of ferrets. Landcare Research contract report LC9495/1 (unpublished) 7 p.

Ogilvie, S.C.; Spurr, E.B.; Morgan, D.R. 1995: A bait, bait marker, toxin, and baiting strategy for the control of ferrets. Landcare Research contract report LC9495/114 (unpublished) 19 p.

Ogilvie, S.C.; Spurr, E.B.; Young, N.; Eason, C.T. 1996a: A field baiting strategy for the control of ferrets. Landcare Research contract report LC9596/129 (unpublished) 15 p.

Ogilvie, S.C.; Spurr, E.B.; Eason, C.T.; Young, N. 1996b: Development of a poison baiting strategy for ferrets. *In:* Ferrets as vectors of tuberculosis and threats to conservation. *Royal Society of New Zealand miscellaneous series 36:* 78-84.

Ragg, J.; Walker, R. 1996: The association of tuberculous (*Mycobacterium bovis*) ferrets (*Mustela furo*) with Tb infected cattle and deer herds in the South island; a review of four predator surveys and the case study of a Tb problem area in East Otago. *Royal Society of New Zealand miscellaneous series 36:* 7-14.

Rammell, C.G.; Fleming, P.A. 1978: Compound 1080. Properties and use of sodium monofluoroacetate in New Zealand. Ministry of Agriculture and Fisheries, Wellington, New Zealand. 112 p.

Tasheva, M. 1995: Anticoagulant rodenticides. Environmental Health Criteria 175. World Health Organisation, Geneva.

11. Appendices

11.1 Ferrets caught in 1080 poison area

(a) Ferrets that lost transmitters, died, or disappeared before poison-baiting (18/02/97)

Ferret number	Sex	Age (years)	Date of capture	Capture weight (g)	Date lost transmitter, found dead, or disappeared	Fate where known
2	M		05/02/97	900	12/02/97	moved out[1]
8	F	<1	14/02/97	720	18/02/97	moved out[2]
10	F		14/01/97	1050	18/02/97	moved out[2]
15a	M		14/02/97	1060	18/02/97	outside[1]
15b	F		04/02/97	770	12/02/97	lost transmitter
18	M		06/02/97	1000	07/02/97	outside[4]
22	F		17/01/97	700	18/01/97	moved out[5]
26	F	<1	05/02/97	650	11/02/97	moved out[3]
37	F		31/01/97	710	18/02/97	moved out[4]
40a	M	<1	13/02/97	760	18/02/97	moved out[1]
44a	M	<1	05/02/97	850	06/02/97	moved out[1]
48	M		14/02/97	960	18/02/97	outside[5]
61a	M		31/01/97	830	06/02/97	died
61b	F	<1	12/02/97	510	13/02/97	outside[1]
67	F		05/02/97	650	06/02/97	outside[4]
70	F		14/02/97	750	18/02/97	outside[4]
74	M		25/01/97	1030	19/02/97	moved out[1]
79a	M		05/02/97	950	11/02/97	moved out[1]
91	F	<1	28/01/97	510	06/03/97	killed by farmer

1=later killed by farmer, 2=found dead scavenged, 3=strangled, 4=lost contact, 5=still alive

(b) Ferrets found dead after 1080 poison-baiting (18/02/97)

Ferret number	Sex	Age (years)	Date of capture	Capture weight (g)	Date found dead (days after poison-baiting)	µg/g 1080 in carcass
30a	M	<1	04/02/97	670	03/03/97 (15)	0.26
52	F	<1	15/01/97	750	04/03/97 (16)	0.20
58	M	<1	30/01/97	1180	09/03/97 (21)	0.23
95a	M	<1	04/02/97	600	26/02/97 (8)	1.86

11.2 Ferrets caught in diphacinone poison area

(a) Ferrets lost transmitters, died, or disappeared before diphacinone poison-baiting (12/03/97)

Ferret number	Sex	Age (years)	Date of capture	Capture weight (g)	Date lost transmitter, found dead, or disappeared	Fate where known
6a	F		12/02/97	700	26/02/97	lost transmitter
12a	F		12/02/97	670	18/02/97	lost transmitter
12b	F		21/02/97	710	27/02/97	killed by farmer
34	F		20/02/97	500*	28/02/97	moved out[3]
38	F		29/01/97	690	11/03/97	moved out[3]
40b	F	<1	28/02/97	760	05/03/97	moved out[1]
61c	F		05/03/97	605	12/03/97	lost contact[2]
72	M	<1	06/03/97	945	12/03/97	lost transmitter
84	F	<1	21/01/97	470	13/03/97	moved out[1]
86a	M		05/03/97	1320	11/03/97	lost transmitter

* estimate from recapture weight

1=later killed by farmer, 2=failed transmitter?, 3=still alive

(b) Ferrets found dead after diphacinone poison-baiting (12 /03/97)

Ferret number	Sex	Age (years)	Date of capture	Capture weight (g)	Date found dead (days after poison-baiting)	µg/g diphacinone in carcass*
1	F	<1	19/02/97	670	19/03/97 (6)	
4	M	<1	06/03/97	1025	25/03/97 (9-12)	
6b	F	<1	26/02/97	690	25/03/97 (9-12)	
9	F	<1	20/02/97	670	25/03/97 (9-12)	
12c	F	<1	28/02/97	610	19/03/97 (6)	
16	F	<1	29/01/97	700	01/04/97 (14-18)	
25	M	<1	27/02/97	1000	18/03/97 (5)	
30b	M	<1	12/03/97	1040	25/03/97 (9-12)	
42	F	<1	20/02/97	700	25/03/97 (9-12)	
44b	M	<1	05/03/97	750	19/03/97 (6)	
46	M	<1	06/03/97	1205	19/03/97 (6)	
50	M		20/02/97	990	19/03/97 (6)	
54	F	<1	27/02/97	650	25/03/97 (9-12)	
64	M		06/03/97	1145	19/03/97 (6)	
76	F	<1	20/02/97	640	25/03/97 (9-12)	
79b	F	<1	27/02/97	690	08/04/97 (25)?	
80a	F	<1	21/01/97	450	25/03/97 (9-12)	
80b	F	<1	26/02/97	710	01/04/97 (14-18)	
95b	F	<1	06/03/97	845	18/03/97 (5)	

* data to be supplied

11.3 Long-distance movements by ferrets caught on the Culverden flats

Ferret number	Sex	Age	Date of capture	Capture weight (g)	Date last relocated	Distance (km)	Direction
2	M		05/02/97	900	24/02/97	6.2	W
8	F	<1	14/02/97	720	22/04/97	5.8	NW
22	F		17/01/97	700	13/05/97	3.7	NE
26	F	<1	05/02/97	650	01/04/97	6.7	S
34	F		20/02/97	500*	13/05/97	9.0	SE
38	F	<1	29/01/97	690	13/05/97	4.3	E
40a	M	<1	13/02/97	760	28/02/97	12.5	SW
44b	M		05/02/97	850	22/02/97	8.3	W
56	F	<1	21/01/97	470	21/04/97	3.5	N
61b	F		12/02/97	510	27/02/97	4.3	W
79	M		05/02/97	950	24/02/97	6.5	W

* estimate from recapture weight