SCIENCE & RESEARCH
INTERNAL REPORT N0.114

PREDATOR TRAPPING IN THE EGLINTON VALLEY, FIORDLAND 1990-1991

by

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Published by Head Office,
Department of Conservation,
P O Box 10-420,
Wellington
New Zealand

ISSN 0114-2798
ISBN 0-478-01338-8

Keywords: predators, Eglinton Valley, trap design, yellowheads, mustelids, NZMS 260/E42

CONTENTS

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The effect of bait type, tunnel design and trap position.

by

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ABSTRACT

The effectiveness of trapping stoats using different bait types, tunnel designs and trap positions was investigated during a stoat population irruption in the Eglinton Valley, Fiordland. Broken eggs were significantly more effective stoat baits than synthetic lures based on the anal sac secretions of mustelids. Tunnels with partially camouflaged traps were no more effective than those with wooden bases and visible traps, which are faster and easier to check in the field. More stoats were caught at the edges of our trapping grid. The method outlined significantly reduced the rate of predation on breeding yellowheads.

1. INTRODUCTION

Since mammalian predators were introduced to New Zealand many bird species have become extinct or reduced to small populations on predator free islands (Mills & Williams 1979). Some forest bird species, however, have declined more slowly. Yellowheads (*Mohoua ochrocephala*), kaka (*Nestor meridionalis*) and kakariki (*Cyanoramphus* spp.) have declined since Europeans arrived in New Zealand. Irregular but severe predation by stoats (*Mustela erminea*) has been implicated in the decline of these species (Elliott & O'Donnell 1988). To prevent further declines of these vulnerable bird species, methods for effective localised predator control need to be developed to protect the remaining populations.

Methods for controlling stoats have been reviewed and tested by King (1980, 1981), King and Edgar (1977) and King & McMillan (1982). King (1984) concluded that stoat control is probably only worthwhile in the most sensitive areas, during the nesting season and only for a few endangered species. Such control has been attempted in New Zealand but its effectiveness has not been assessed.

A heavy beech seedfall in autumn 1990 in the Eglinton Valley, Fiordland and a predicted stoat plague in the following summer (see King 1983) provided an opportunity to assess the effectiveness of stoat trapping (O'Donnell *et. al.* in press). As part of this study the effects of bait type, tunnel design and trap position on stoat capture rates were investigated - this report documents these parts of the study.

2. STUDY AREA

The study area was located in the Eglinton Valley in Fiordland National Park (168°01'E, 44°58'S). The Valley is glaciated with steep sides and a flat floor which is 0.5-1.0 km wide.

Yellowhead and kakariki breeding was monitored in two study blocks. Stoats were trapped in only one area and the other acted as a control (O'Donnell *et. al.* 1991). The trapped area was located at Deer Flat (50 ha) and the untrapped area at Knobs Flat (40 ha), 1 km further up-valley. Both areas were on outwash fans on the valley floor at c.380m a.s.l. (Figure 1). The areas had similar forest types and topography. The forest is dominated by red and silver beech (*Nothofagus fusca, N. menziesii*) with the forest composition ranging from pure stands of silver beech c.20 m tall along the forest margin to tall stands of red beech up to c.40 m further into the forest. Mountain beech (*N. solandri* var *cliffortioides*) occurs occasionally in the canopy. Under the canopy the forest is generally open with few understorey plants and a moss ground cover. The most common understorey plants are mountain toatoa (*Phyllocladus alpinus*) and broadleaf (*Griselinia littoralis*).

3. METHODS

3.1 Trap layout

Traps were laid out on a grid with 56 wooden tunnels spaced at 100 m intervals (Figure 1). Each tunnel contained two Fenn traps.

3.2 Trapping tunnels

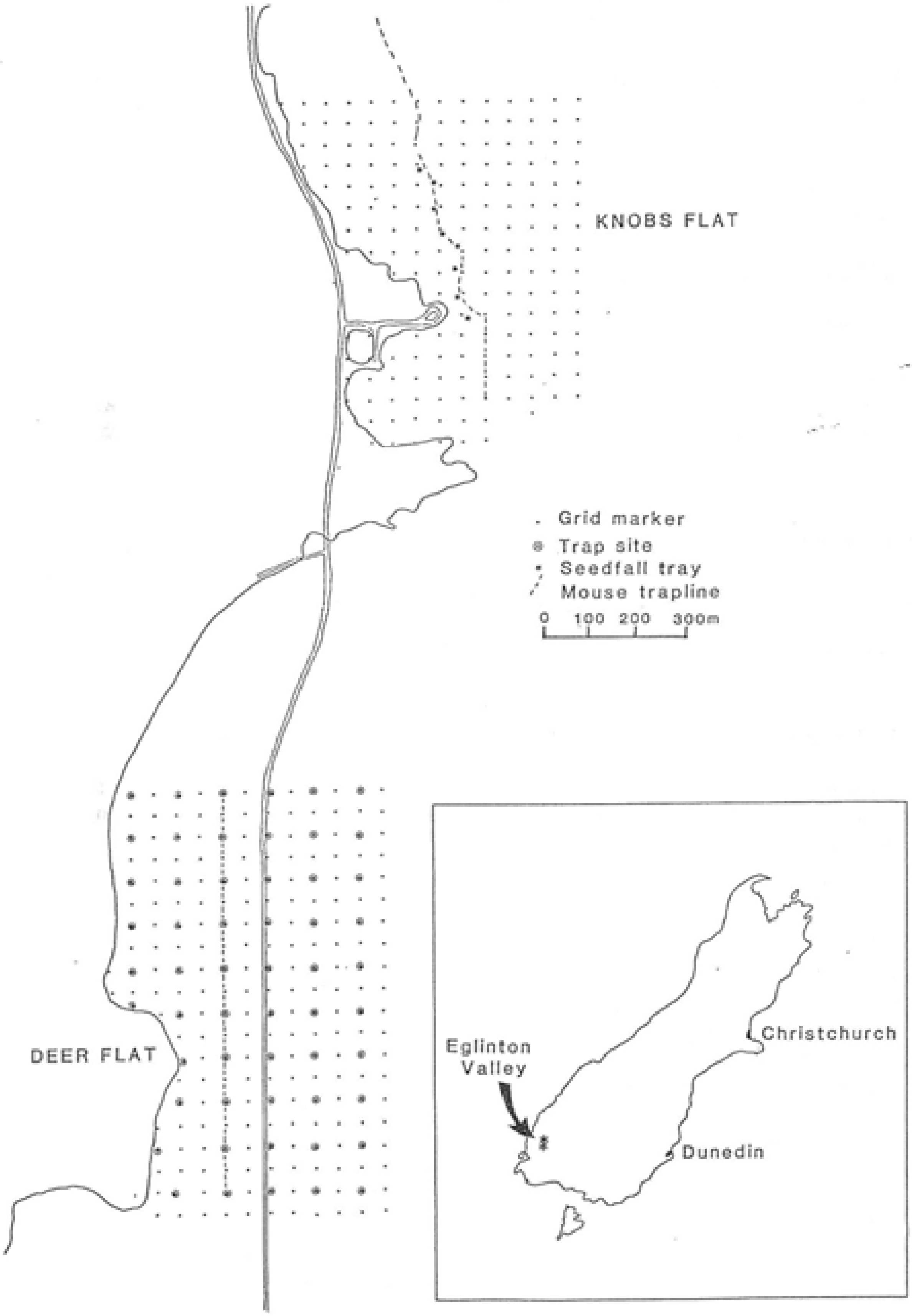
Each trapping tunnel was 600 mm long with a square cross-section of 150 x 150 mm. Two wire bars were placed horizontally 50mm apart across the ends of the tunnel to prevent target species entering the traps. The Fenn traps were set near the centre of the tunnel with the bait between them. Two types of tunnels were tested. In one, the traps were set in depressions in the ground. The other type of tunnel had a wooden base with the traps completely visible. The two tunnel types were placed alternately along the grid.

3.3 Baits

Phillipson (1990) determined that eggs were significantly more successful at attracting stoats than cat food (the bait used in King's trials) and fresh meat. We compared eggs with synthetic scent lures derived from anal sac secretions (Clapperton *et al.* 1989). Two different bait combinations were used. Half the traps had the synthetic lure 2-propylthietane (Clapperton 1991) plus a whole egg. The second treatment was two eggs, one whole and one punctured. These two bait treatments were placed in alternate bands across the grid (Appendix 1).

Traps were checked at regular intervals and baits replaced as often as necessary. As summer temperatures increased the cracked eggs dried out or became fly-blown and had

Figure 1: Location of Eglinton study areas and layout of trapping grid.



to be replaced frequently. This was done by cracking the whole egg and putting a new whole egg in the tunnel. Synthetic lures were replaced at 5-6 week intervals.

Table 1: Combinations of tunnel and bait type treatments tested.

	Egg	Lure	Totals
Base	15	13	28
No base	16	12	28
Totals	31	25	56

3.4 Analysis

The effects of tunnel and bait type and trap position were examined using Maximum Likelihood Estimation, a test similar to Analysis of Variance but appropriate for data with a Poisson distribution. Statistical tests presented in tables 2, 3, & 5 are maximum likelihood tests for sequentially adding each effect to the model.

4. RESULTS

The traps were set from 12/10/90 until 14/3/91, a period of 152 days (16,119 trap nights). Animals caught during that period were 62 stoats, 4 rats (*Rattus rattus*), 1 mouse, 4 possums (*Trichosaurus vulpecula*) and 1 robin (*Petroica australis*) (Appendix 1). The analysis of data is concerned only with the stoats caught as these were the primary target of the trapping.

4.1 Age and sex ratios of trapped animals.

Sixty two stoats were caught comprising 3 adult males, 44 juvenile males, 2 adult females and 13 juvenile females. Thus 76% were males and 24% females, and 8% adults and 92% juveniles.

4.2 Capture rate

The capture rate of stoats over time is shown in Figure 2. One stoat, an adult male was caught nine days after the traps were first set but the next animal, a juvenile, was not caught until another 42 days had elapsed. This coincided with the young of the year becoming independant in early December. Most stoats were caught over a 6-8 week period, from early December through to late January. During February only two further animals were caught but 11 more stoats were caught in March.

All of the adults were caught during the first half of trapping (Figure 3). Once the young animals became independent, juvenile males comprised the bulk of animals caught with juvenile females scattered throughout the whole trapping period. Of the eleven stoats caught in March six were females.

Overall the capture rate of stoats was 0.385 animals per 100 trap nights. The rate

Figure 2: Capture of stoats through the trapping period.

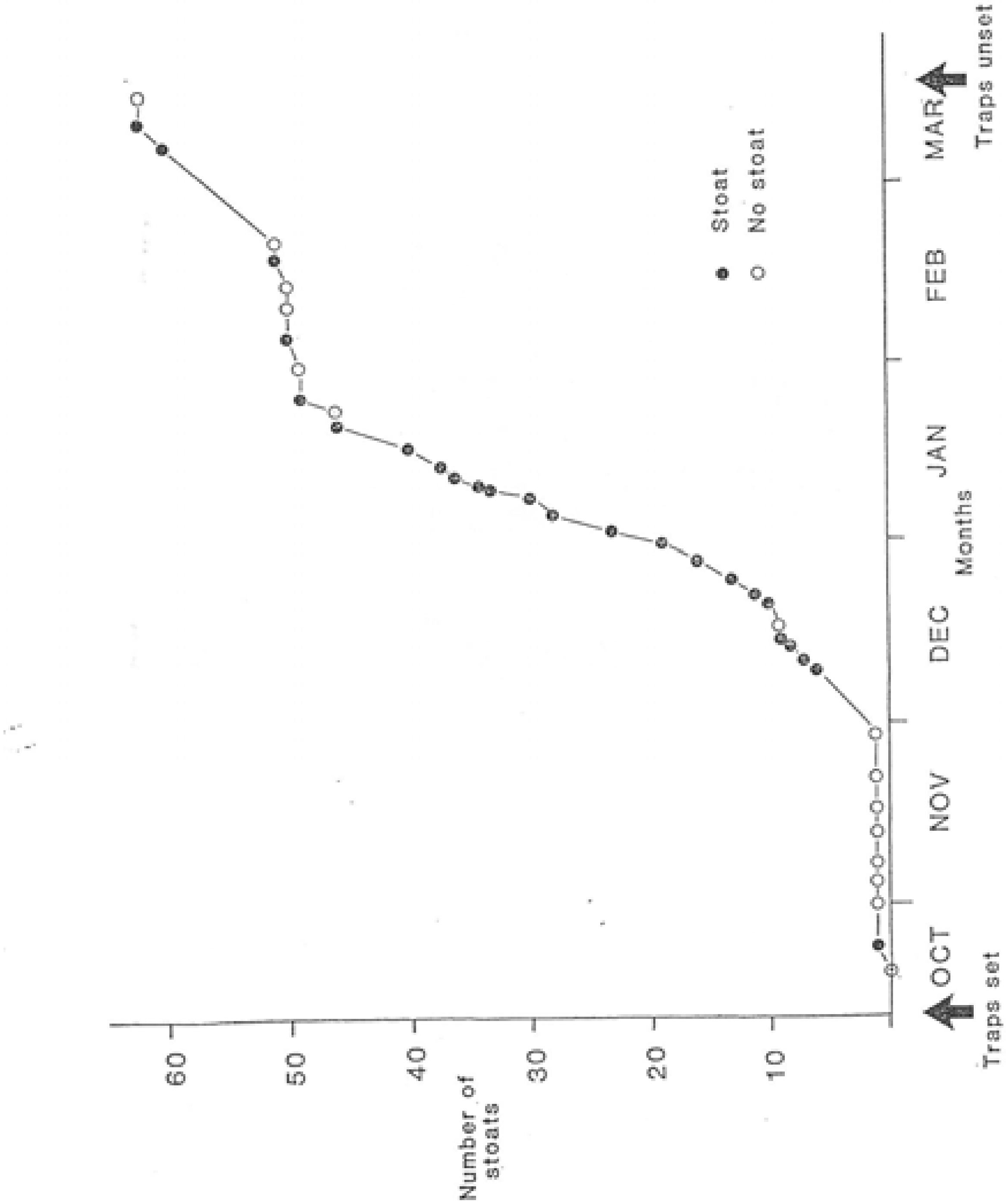
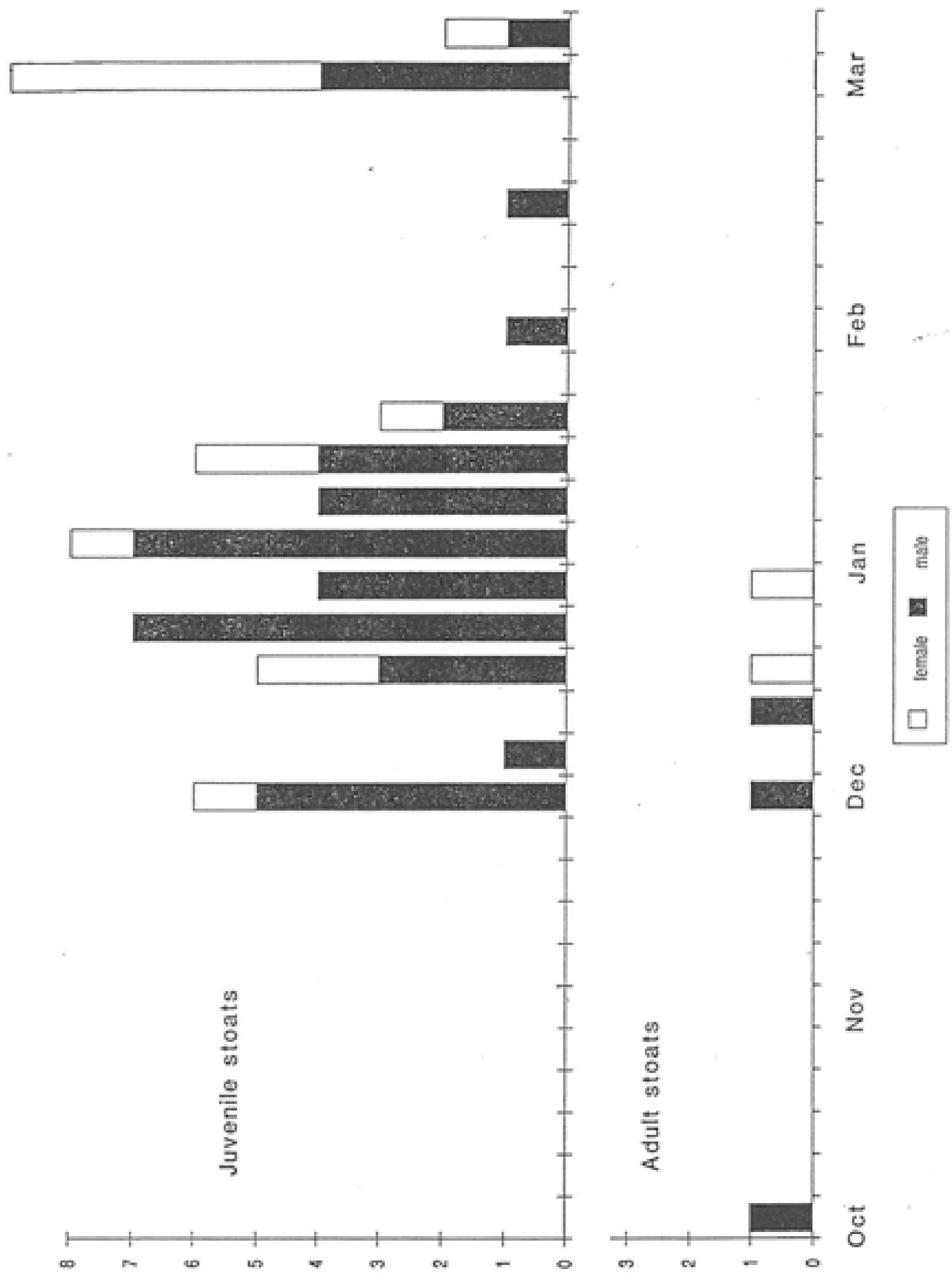


Figure 3: Capture rate of adult and juvenile stoats. Juvenile stoats become independent from their mothers in early December.



increased from 0.05 and 0.0 in October and November to 0.54 and 0.97 animal per 100 trap nights in December and January. Capture rate fell markedly in February to 0.08 per 100 trap nights but increased to 0.51 in March when trapping ceased.

4.3 Tunnel type

Traps set in tunnels without bases caught 32 stoats while those set in tunnels with bases caught 30 stoats. The difference was not significant (Table 2).

Table 2: Capture of stoats in tunnels with or without bases.

	Base	No base	P=
Male	22	25	0.400 N.S.
Female	8	7	0.483 N.S.
Totals	30	32	0.729 N.S.

4.4 Bait type

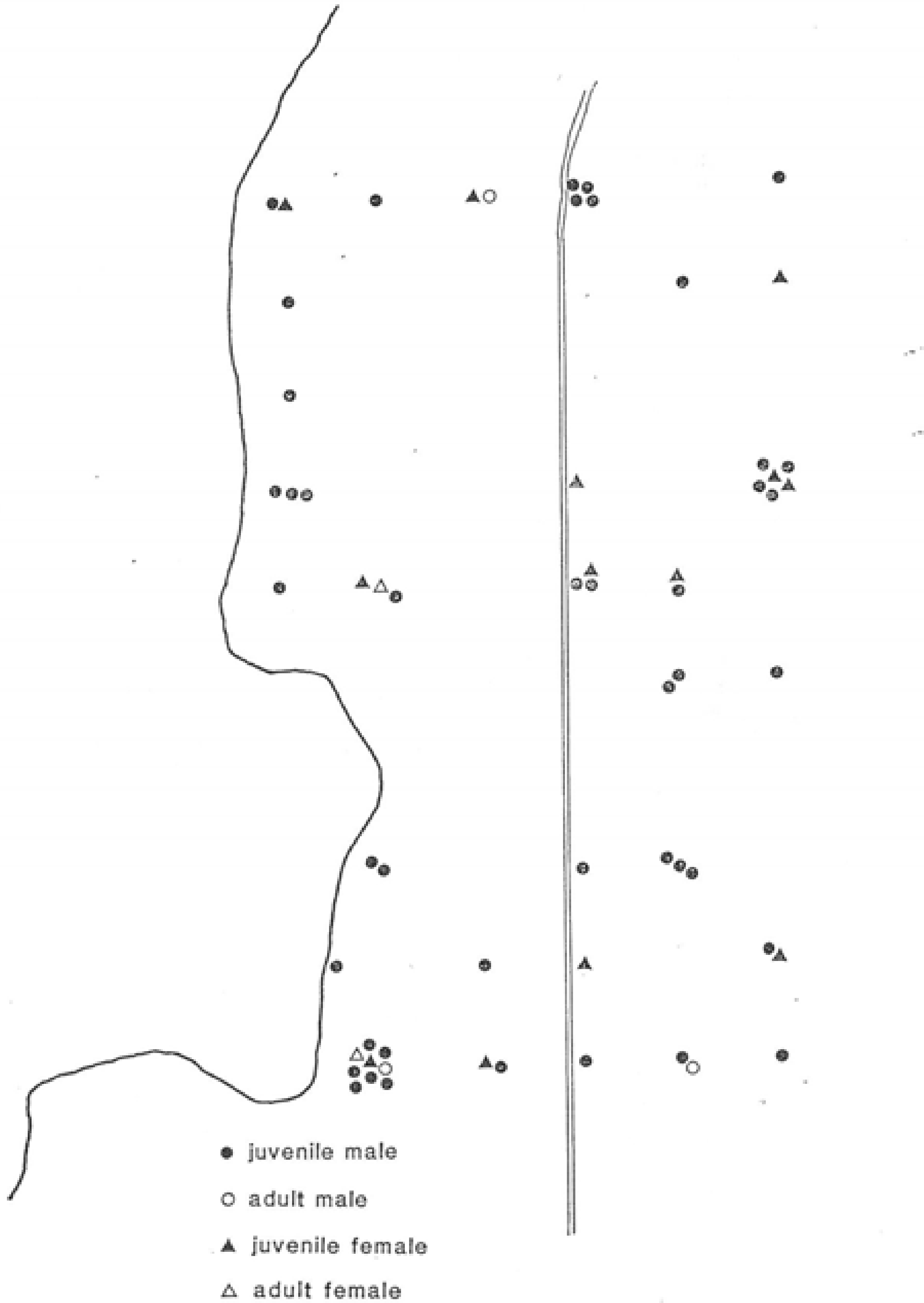
Traps baited with two eggs caught 43 (69%) of the 62 eggs whilst those baited with the synthetic lure plus an unbroken egg caught 19 (31%) (Table 3). However, one lure-baited trap (Trap 50) caught 9 (50%) of these animals (Figure 4). This was probably due to its position: it was situated on a sweeping bend of the Eglinton River where stoats would be funnelled past the site. It may also have been close to a den as it caught an adult female and seven juvenile stoats. Despite trap 50, stoats appeared to have a significant preference for traps baited with only eggs (Table 3).

Table 3. Number of stoats caught using egg and synthetic lures.

	ALL TRAPS
Egg	43
Lure	19
Total	62
P=	0.012*

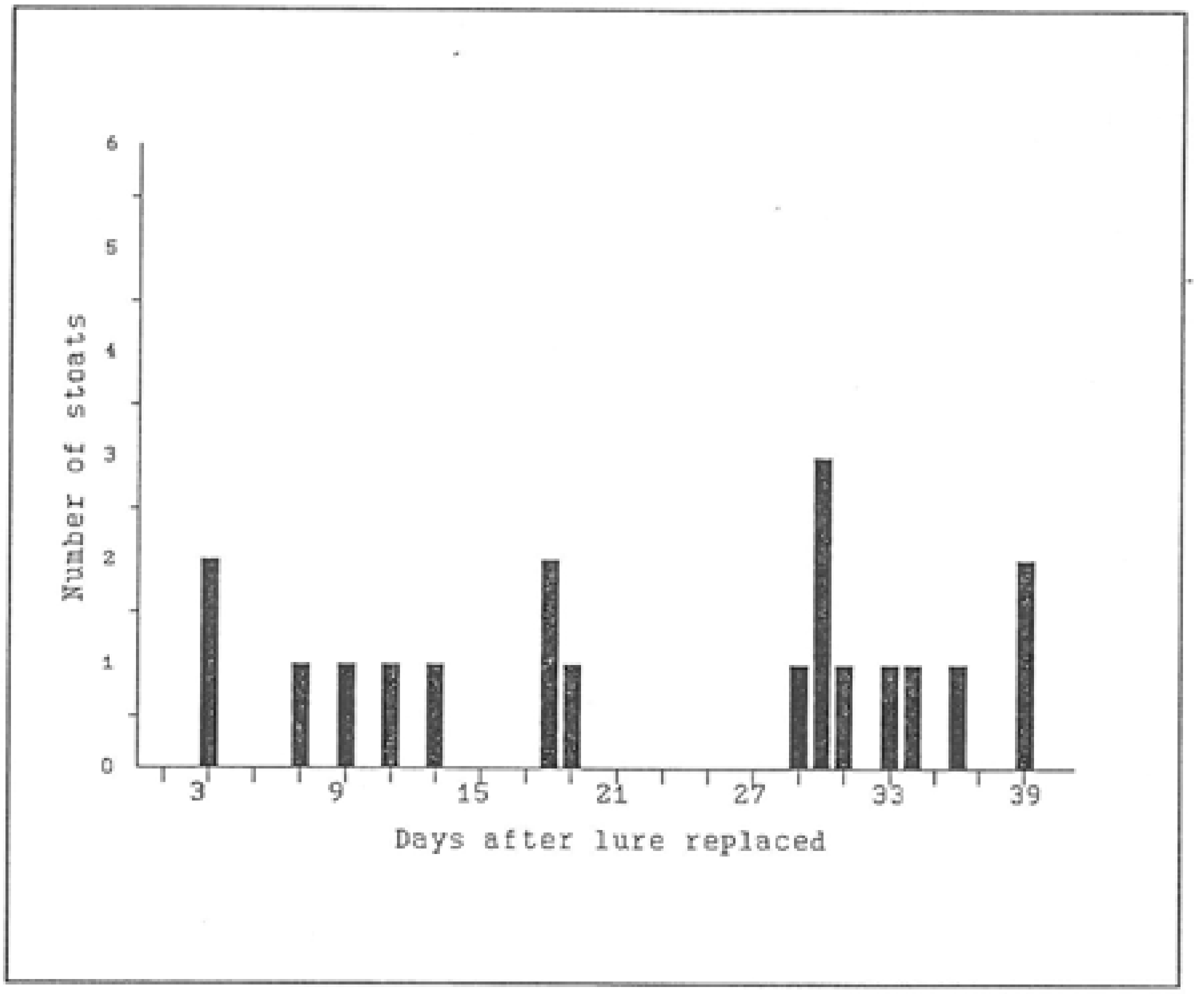
Synthetic lures do not appear to attract stoats and may have actively deterred them from entering tunnels. Stoats were caught between 3 and 39 days (average 23 days) after the lures were replaced but few animals were caught immediately after lure replacement

Figure 4: Location of stoats trapped on the Deer Flat Fenn trap grid. Trap 50 is located at the bottom left-hand corner.



when the scent was strongest (Figure 5). However capture rate did not vary significantly with increasing age of lures (tested at 10 day intervals 1-10, 11-20, 21-30 & 31-41 days after renewal, $G = 1.724$, $P = 0.632$).

Figure 5: Capture rate of stoats after renewal of synthetic lures.



4.5 Trap position

The distribution, age and sex of stoats caught on the trapping grid are shown in Figure 4 and Table 5. Overall, traps on the edge of the grid caught 71% of stoats compared with 29% in the grid interior. Traps positioned along the river edge of the grid and at the ends caught significantly more animals than expected. Numbers of animals caught at the back of the grid or along the road (which was in reality only a gap in the forest with no change of habitat type) did not differ from that expected.

Table 5: The effect of trap position on stoat capture rate.

Area	No Traps	No Stoats	Stoats/trap	P=
1 River Edge	10	20	2.0	0.003**
2 End (North)	6	10	1.7	-
3 End (South)	5	15	3.0	-
4 Ends (2+3)	11	25	2.3	0.000***
4 Back	10	12	1.2	N.S.
5 Road	10	11	1.1	N.S.
Interior	29	18 (29%)	0.6	
Total Edge	27	44 (71%)	1.6	

5. DISCUSSION

The high numbers of stoats, particularly juveniles, caught within the 50 ha study area confirmed that a population irruption similar to those noted by King (1983) had occurred. Trapping on this intensive scale increased the breeding success of yellowheads significantly (O'Donnell *et. al.* 1991) even though the trapping was unsuccessful at catching stoats before yellowheads began breeding. Few stoats were caught before December, the time when young left their den sites.

Similar numbers of adult male and female stoats were caught but considerably more juvenile males were caught than juvenile females. Comparisons with Kings (1980) trapping provides a possible explanation. King had long lines of traps, mostly placed more widely than ours, and over the same period of trapping she caught nearly equal numbers of males and females. Kings trapping design may have effectively sampled the stoat population in a large part of the Eglinton Valley, whereas ours may have caught all the resident stoats then acted as a sink for wandering juveniles. Such an explanation is consistent with the findings of Murphy and Dowding's (1991) radio telemetry study. Their estimates of home range indicate that our study area probably contained few adult stoats and they were resident. Murphy and Dowding's study, however, provided no evidence that juvenile males were more mobile than juvenile females, so a possible explanation for the skewed sex ratio of juveniles that we caught is that females are more trap shy.

Traps baited with only eggs appeared to be much more successful at attracting stoats than synthetic lures and stoats may have in fact avoided tunnels with a lure present. At present broken eggs are the most attractive bait known. They are also far more practical than other baits because they are easy to store and handle in the field. Egg baits and tunnels with wooden bases will substantially reduce the amount of time needed to set and service a trapline.

The relative roles of the scent and visual aspects of egg lures need further investigation. Future trials will assess these factors and whether a scent lure, derived from sulphide chemicals present in eggs, will attract stoats readily.

Most stoats caught (90%) were young of the year. Although we were able to largely prevent predation on breeding yellowheads by intensive trapping (O'Donnell *et al.* 1991), if female stoats could be caught before they produce independent young, the rate of stoat predation on forest birds may be even further reduced. Development of a bait that attracted female stoats before their young became independent could substantially reduce the effort required for effective stoat control.

Significantly more stoats than expected were caught along the front edge (river) and ends of the trapping grid. A C-shaped trap-line or a square of traps may provide effective protection for a bird population by catching dispersing animals before they enter an area, as long as animals resident near the trap-line are also caught.

6. FURTHER WORK

During next summer (1991/92) the trapping trials will be repeated in much the same format as last year to determine if trapping in a "non-stoat" year can also improve reproductive success in the yellowhead population.

In addition further trapping trials are planned. Areas which require further work include:

1. Tunnel design. Would a tunnel with different trap and bait sets or dimensions such as reduced entrance size prove to be more attractive to female stoats?

2. Bait development. Are there more effective and easily handled baits than eggs? Can synthetic egg lures be produced by isolating the scent chemicals from eggs? Could this be used in conjunction with poisoning operations? Are stoats attracted to eggs by scent or visually.

A greater understanding of some aspects of the ecology of stoats would assist in designing more effective control. For example, do adult male and female stoats behave differently? Do they have exclusive territories and what is their territory size? This may influence the area that an effective trapping operation needs to cover. Are the resident adults (males or females) the main arboreal predators? Do residents know their territories better and find birds nests more readily than dispersing animals? Do adult and juvenile stoats climb trees equally as well and as often? Is there any aspect of stoat behaviour that would enable us to kill stoats before they produce independent young?

7. ACKNOWLEDGEMENTS

Special thanks to Christine Tisdall who spent several months servicing traps and monitoring breeding birds, and to Dave Crouchley for tunnel design and construction.

Thanks also to Kay Clapperton for making the synthetic lures available; to Lynn Adams, Jenny Brown, John Davey, John Dowding, Donald Geddes, Jane Maxwell, Elaine Murphy, Heidi Lindsay Smith, Steve Thomas for servicing traps from time to time, the Nelson Conservation Corps for laying out the trapping grid, Elaine Murphy for aging and autopsy of stoats and comments on the text, Kim King for comments on the text and Jenny Brown for statistical advice. Thanks to the Knobs Flat residents who made us welcome and coped with being invaded and outnumbered by the "bird and stoat people" and their numerous visitors.

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Appendix I: Animals caught in Fenn traps 12/10/90 - 14/3/91.

S = stoat P = possum R = rat
M = mouse B = bird (robin)

Trap	Catch	Trap	Catch	Trap	Catch	Trap	Catch
1(BE)	4S,1P	15(BE)	3S	29(BE)	1S	43(BL)	-
2(NE)	-	16(NL)	-	30(NL)	1S	44(NE)	-
3(BE)	1S,1P	17(BE)	2S	31(BL)	2S	45(BE)	3S
4(NL)	1S	18(NE)	2S	32(NE)	1S	46(NL)	-
5(BL)	-	19(BE)	-	33(BE)	-	47(BL)	-
6(NE)	6S	20(NL)	-	34(NL)	-	48(NE)	2S
7(BE)	-	21(BL)	1S	35(BL)	-	49(BE)	1S,1R
8(NE)	1S	22(NL)	-	36(NE)	-	50(NL)	9S,1R
9(BL)	-	23(BL)	-	37(BE)	-	51(BL)	-
10(NE)	-	24(NE)	1S	38(NL)	1B	52(NE)	1S
11(BE)	2S,1P	25(BE)	3S,1M	39(BL)	-	53(BE)	3S
12(NL)	1S	26(NE)	-	40(NE)	2S	54(NL)	1S
13(BL)	2S	27(BL)	-	41(BE)	1S,1R	55(BL)	1S,1R
14(NE)	-	28(NE)	1S	42(NL)	-	56(NE)	2S

B = tunnel with bottom L = lure + egg bait
N = tunnel with no bottom E = two egg bait

Appendix II: Layout of Deer Flat trapping grid showing position of trap sites.