Rotoiti Nature Recovery Project

Annual Report 1997-1998

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Cover Photograph: An aerial view of Lake Rotoiti and St Arnaud, showing the project area.

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Executive Summary

This reports documents the second year of the Rotoiti Nature Recovery Project (from 1 July 1997 to 30 June 1998 – based on the Department's financial year) which was the first season of comprehensive pest control. It also includes a brief summary of the establishment of the project in the 1996/97 year.

The year has been an exciting one for all involved with the project as we have started to make a difference, echoing the title of the Department's Strategic Business Plan 'Restoring the Dawn Chorus'. An increase in bird numbers, particularly robins and kaka, is the most obvious evidence of the benefits of our pest control, through reduced pressure from introduced predators. A chorus of bellbirds now greets the visitor on arrival. The positive effects on plants through removing most possums from the block, and on insects through removing predators and competitors may be less obvious, but the signs are already there. We have also made significant progress with project advocacy, enjoying the support of the St Arnaud community, and of groups and individuals further afield.

KEY RESULTS

Possum Control – Vegetation Response

A reduction in possum numbers by an estimated 96.9% was achieved by a bait station operation using 1080. The reduction achieved over the full year after ongoing brodifacoum use was 84.6%. Such signifiant reductions are considered very likely to lead to measurable changes in palatable plant species. Analyses of vegetation surveys are currently being undertaken, but already there are signs that mistletoes are enjoying considerable growth and fuchsia seedlings have appeared in one vegetation plot.

Rodent Control – Vegetation and Bird Response

Rat numbers were very low in the forest at the start of the year and continued that way during our bait station poisoning operation.

Mouse numbers were also very low initially and reached a peak of 4% 'tracking tunnel activity index' during the year. Comparing this with a trapping index of 10% from Mt Misery in the winter indicates our control was keeping numbers down, for tracking tunnels are considered as sensitive an indicator as traps.

Research carried out on a sample of robins recorded a very high nesting success of 90% compared to previous South Island studies (eg. 13.3% at Kaikoura). This we would attribute to the success of our rat control among other factors. Quarterly five-minute bird counts are being used to monitor the response of other species.

Predator Control – Bird Response

Seven stoats were caught in 2096 trap-nights of ring Fenn trapping around kaka nests (all at the one nest). A full network of traps was established at the end of the year.

One feral cat was caught in a short period of live trapping and little cat sign seen on the block.

A large number of hedgehogs have been caught in traps set for predators.

A Science & Research team carried out a study of kaka here recording all four nests on the block being successful rearing a total of nine young. This compares with only two young produced from 20 nesting attempts over an 11 year period at nearby Big Bush where Landcare Research studied birds from the 1980s but no significant predator control was carried out. No nesting female kaka were lost in our area compared to four out of seven during the Big Bush study. This suggests our predator control was very effective.

Wasp Control – Invertebrate Response

The wasp control programme was the largest ever attempted in New Zealand. Wasp activity was reduced in c.300ha of the lower part of the block by 79% in a bait station operation using 'Finitron'™. A significant response was recorded in the output of honeydew by the beech scale insect, an important food source for native fauna. Honeydew remained above target levels in the treated area and fell below that due to wasps in the non-treatment area. Malaise trap samples have been collected to examine the impacts on other invertebrates and analysis of these has started based on advice produced under contract by Landcare Research.

Deer Control Assessment

Three deer were shot in a brief operation to assess the effectiveness of ground hunting here.

Land Snail Monitoring

Sample plots have been established for a new population of *Powelliphanta rossiana patrickensis* located at and above tree-line. A high proportion of intact shells suggested this population to be doing well, particularly in areas of tall tussock.

Vegetation and Plant Monitoring

A sample of tagged and measured individual endangered plants (3 species of mistletoes and *Pittosporum patulum*)has been established to monitor their response to herbivore control. Vegetation plots (20mx 20m), foliar browse index lines and one deer exclosure have been set up for long-term monitoring of vegetation changes. Beech seed is sampled annually at three sites. Almost no seed fell in 1996/97 and a small quantity in 1997/98.

Toxin Monitoring

Monitoring of lake water and trout has detected no toxins reaching the lake system.

Advocacy and Education

Considerable effort has been put in to establishing a project profile and generating community support. Three public events have been held, a project launch by Sir David Attenborough, an Open Day and Barn Dance a year later, and a ministerial launch of the project's wasp control and the Department's Strategic Business Plan. A project logo and slogan have been developed with the help of the local primary school and a twice-yearly newsletter established. A Visitor Services Concept plan was contracted to establish a programme of track and interpretation material for visitors. Work was undertaken with Rotoiti Lodge Outdoor Education Centre to develop biology projects for 6-formers in the project area.

Experimental Work

It has been identified that Mainland Islands like Rotoiti should be sites where techniques are developed, tested or refined for application at other sites. It is thus appropriate to emphasise activities of this type as follows:

- Mustelid trapping programme set up as part of a national trial of two trap cover designs and use of real or artificial eggs. Insufficient animals caught yet to determine most effective system and trial continuing, but both designs and egg types have caught stoats.
- Established the importance of providing access from ground to Philproof bait stations if they are to be used for mouse control.
- Demonstrated that a wasp control technique developed for small areas could be applied to a larger one.
- Refined an anaesthesia technique for live-trapping of mustelids.
- Assisted in first cross-fostering of kea in the wild.
- Conducted a trial of distance sampling as a bird counting methodology (using bellbirds).

1. Introduction

The Rotoiti Nature Recovery Project is the title given to a mainland island project based on beech forests containing honeydew, one of six projects funded within a national programme focussed on different habitats. The project area covers 825ha on the slopes of the St Arnaud Range, Nelson Lakes National Park, bordered to the east by Lake Rotoiti and to the north-east by St Arnaud village and farmland (Figure 1). The site was chosen as representative of a habitat type that occupies about 1 million hectares or 15% of New Zealand's indigenous forests (J. Beggs, unpubl. Data) particularly in the northern South Island, at a location accessible to visitors. It is crossed by three popular walking tracks adjacent to St Arnaud, the main gateway into the National Park. A more detailed description of the site is available in the project's Strategic Plan (Butler, 1998).

Fig. 1

The project began in the spring of 1996 and the first season was spent establishing the site, building infrastructure and undertaking some baseline monitoring (summarised in the 1996/97 Annual Summary – Appendix 1). Initiatives were also taken then to establish the project's identity and profile with the local community and wider public. The 1997/98 year is thus the first in which comprehensive pest control has been undertaken.

This report presents its results within the project's three objectives (below). Readers are referred to the Strategic Plan (ibid) for the thinking behind these objectives and their translation into a long-term programme of scientifically-based activities. That plan identifies a 5-year timeframe for the initial stage of the project culminating in a review before the 2001/2002 year in which its future direction will be assessed. This report contains few detailed analyses of results. This is partly due to the main focus being put on getting the project up and running and on data collection. It also recognises the fact that it will take several seasons of data analysed together to demonstrate the responses of some of the native flora and fauna. Data has been collected in as scientific a way as possible and it will require equally rigorous analysis and the application of statistical tests in the future.

2. Project Goal and Objectives

Goal

Restoration of a beech forest community with emphasis on the honeydew cycle.

A restoration goal such as this has been expressed evocatively as 'restoring the *mauri* (health and life force) of the forest ecosystem' (Shaw & Shaw, 1996).

Objectives

- To reduce wasp, rodent, stoat, feral cat, possum and deer populations to sufficiently low levels to allow the recovery of the indigenous ecosystem components (especially kaka, yellow-crowned parakeet, tui, bellbird, robin, long-tailed bat, and mistletoe) and ecosystem processes (especially the honeydew cycle).
- To re-introduce recently-depleted species, such as yellowhead (mohua), kiwi and kokako (S.I. sub-species if possible), once the beech forest ecosystem is sufficiently restored.
- To advocate for indigenous species conservation and long-term pest control, by providing an accessible example of a functioning honeydew beech forest ecosystem, so a large number of people can experience a beech forest in as near-to-pristine condition as possible.

3. Results - Pest Control and Monitoring

3.1 BRUSHTAIL POSSUM (*TRICHOSURUS VULPECULA*) CONTROL AND MONITORING

Objectives

To reduce possum numbers and hold them continuously at a low level such that:

- preferred browse species (see 4.3 Plant Monitoring) show increased growth/ productivity and further plants re-establish;

- impacts on invertebrates, particularly land-snails (see 4.2.3 Land Snail Monitoring), are reduced to a level that is insignificant compared to other mortality factors;
- impacts on birds through nest predation are reduced to a level that is insignificant compared to other mortality factors (see 4.1 Bird Monitoring);
- impacts on other forest biodiversity, e.g. fungi, are reduced to levels that are insignificant compared to other factors (no monitoring of these impacts currently in place).

Performance Target

Residual index using trap catch methodology (Warburton 1997) of 5%.

Methods

In 1996/97 a grid system was set up over the whole block using Philproof bait stations. Stations were spaced every 100m x 100m over the lower parts of the block, at 100m x 150m on the higher areas (above 900m a.s.l.), and at 150m x 150m at the top of the forest (for c450m – 3 lines - below the bush-line at c1400m)(Figure 2). Possum numbers were assessed in September using ground-set Victor 1 ½ leg-hold traps set along ten random lines as in the standard methodology (ibid). Then in October all bait stations were pre-fed with non-toxic Waimate RS 5 cereal pellets over 2-3 weeks followed by one feed of toxic 1080, 0.15% W/W lured with cinnamon at 5% with 1000g per station. Possum numbers were measured again by trapping inside the block and in a non-treatment area further south along Lake Rotoiti after the 1080 operation.

Talon 20WP™ was then loaded into the stations and replaced every 4-6 weeks from December 1997 onwards. During the Talon operation the block was split into the northern boundary, southern boundary and a core and stations loaded with different amounts - initially 250g per station increased to 500g on the northern boundary but leaving 250g in the rest. Amounts were then reduced to 250g on that boundary and 125g in the rest for the winter months, the latter mainly for rodent control. Possum numbers were measured again in May to represent the end of the 1997/98 season.

Results

The possum monitoring results are shown on Table 1. The trap-catch figures indicate that possum numbers were reduced by 96.9% by the 1080 operation but then increased very slightly over the season.

TABLE 1 – RESULTS OF POSSUM TRAPPING

DATE	TRAP NIGHTS	NO. OF POSSUMS CAUGHT	POSSUMS CAUGHT AS % OF TRAP NIGHTS
Treatment Area:			
September 1997 (before 1080)	599.5	39	6.5
November 1997 (after 1080)	599.5	1	0.2
May 1998 (after Talon)	381	4	1.0
Non Treatment:			
November 1997	199	16	8.0
May 1998	298.5	24	8.0

The pattern of uptake of non-toxic bait and Talon has been quite consistent, always higher on the northern boundary than in the core or southern boundary (Figures 3-4). The only exception was the initial take of 1080 itself which was higher in the core of the block.

The 1080 operation was closely monitored by the office of the Medical Officer of Health who imposed a significant number of conditions due to the proximity of the control area to a village. Their detailed report recorded that the programme had been well planned and implemented with satisfactory compliance with the conditions (Cameron 1997).

A detailed account of the season's possum operation is currently being drafted for publication (Pryde, in prep.).

Non-Target Impacts

A single non-target impact was detected, the apparent death of a female kea from 1080. A female was found dead close to her nest in the block during the period of 1080 application. Analysis by Landcare Research showed levels of 1080 in her liver rather less than found in birds of several species found dead but potentially enough to have caused her death. The bird's mate has lived within the block throughout the poisoning period so that it is hoped that this was an isolated incident peculiar to this individual. The loss of the female did provide an opportunity to test the cross-fostering of her chicks to another nest which proved successful (Kemp, in prep.). Detailed monitoring of kea continues in association with an MSc study with many birds locally carrying transmitters so that their nesting can be recorded (ibid). A silvereye found dead on the block during poisoning was also tested and carried no poison. No poison was detected in monitoring of water and fish in the lake (see Section 4.4).

Post-mortems of stoats and ferrets trapped on the block have shown some of these to have picked up Talon through secondary poisoning (see Section 3.3). This is a beneficial impact of the use of this toxin which enhances our ability to control predators.

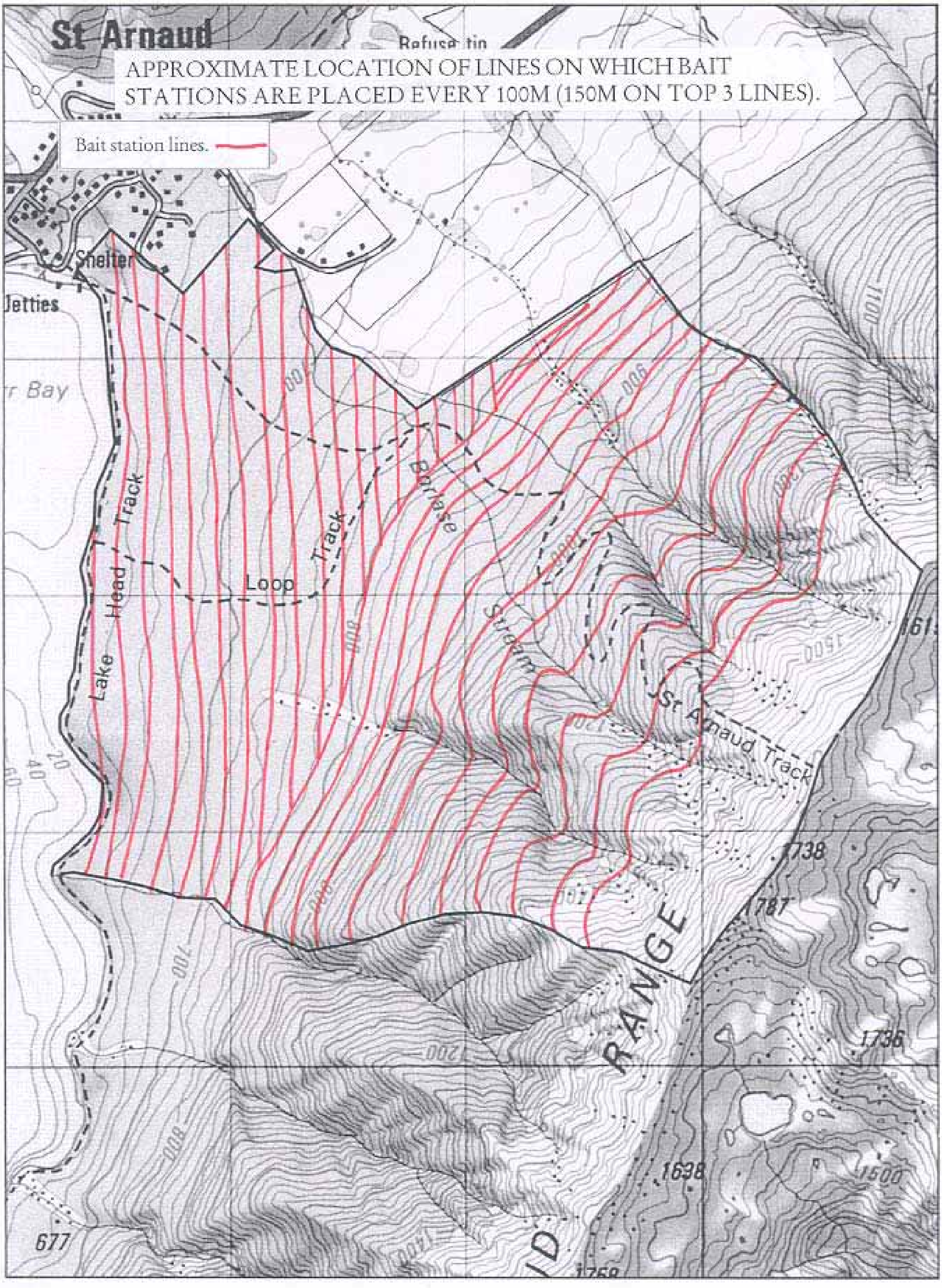
Several rats and a single weka were caught in the traps set to monitor the possums. The weka was a complete surprise as none had been detected in the vicinity of St Arnaud for several years. Since this one was caught, two or three further birds have been heard in the area If this continues the monitoring will change to use 'weka-safe' boards or ramps (as Thomson et al., 1996).

Discussion

These results are considered to represent a very successful control operation that has almost removed possums from the block. Staff do not now encounter possum sign except on the northern boundary and we anticipate that we should soon be able to demonstrate a response in the vegetation (see Section 4.3).

1080 proved a very cost-effective poison for the initial knockdown of possums and the apparent loss of a female kea will have been outweighed by the benefits to other species. The bait stations were placed closer together than probably needed for effective possum control as they were also targeting ship rats and mice. The ongoing Talon operation has now been refined to focus on these rodents (see Section 3.2). The continuing activity of possums at the northern boundary, thought to represent the presence of higher numbers associated with the farmland, is to be tackled by a 'Feratox'™ cyanide operation which will be able to specifically target these animals.

Fig 2



APPROXIMATE LOCATION OF LINES ON WHICH BAIT STATIONS ARE PLACED EVERY 100M (150M ON TOP 3 LINES).
Bait station lines.
St Arnaud
Shelter
Jetties
Lake Head Track
Loop Track
Borlase Stream
St Arnaud Track
RANGE
1738
1787
1736
1638
1500
677

Fig 2

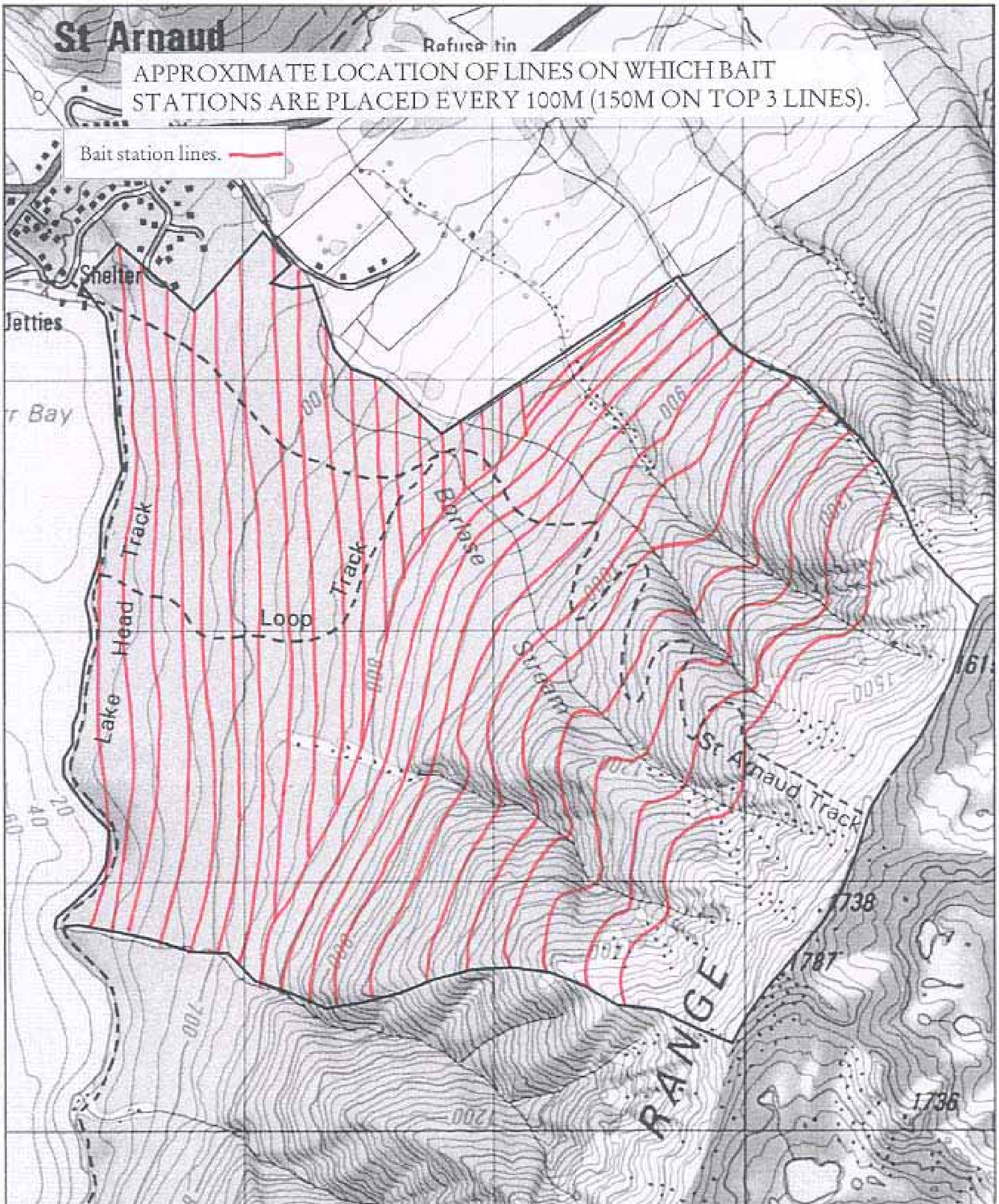
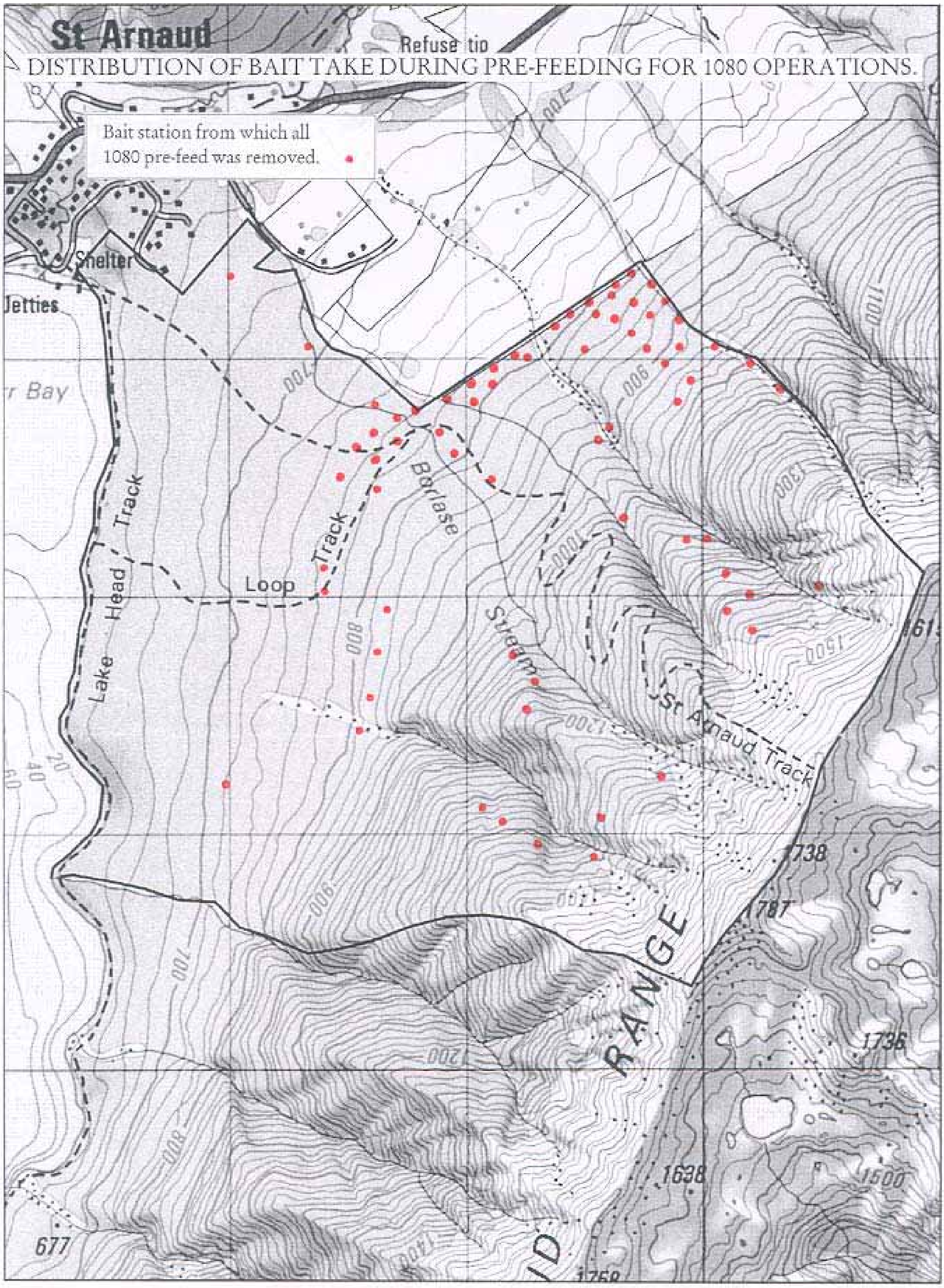

APPROXIMATE LOCATION OF LINES ON WHICH BAIT STATIONS ARE PLACED EVERY 100M (150M ON TOP 3 LINES).
Bait station lines.
St Arnaud
Refuse tip
Shelter
Jetties
Lake Head Track
Loop Track
Borlase
Stream
St Arnaud Track
RANGE
1738
1787
1736
1638
1500
677
1768

Fig 3


St Arnaud
Refuse tip
DISTRIBUTION OF BAIT TAKE DURING PRE-FEEDING FOR 1080 OPERATIONS.
Bait station from which all
1080 pre-feed was removed.
Shelter
Jetties
Bay
Lake Head Track
Loop Track
Borlase
Stream
St Arnaud Track
RANGE
1738
1787
1736
1638
1600
677
1768

This site had never been subject to significant possum control before, beyond a small-scale operation adjacent to the southern boundary where an area has been treated for c.4 years to protect lakeside rata. Thus possums numbers on the block prior to the operation can perhaps be considered the natural level for these forests. The trap-catch indices of between 6.5 and 8% are similar to those recorded in beech forest at Mt Stokes in the Marlborough Sounds (5.3% on Scott's boards – T. Stein, pers. comm.). These are a good deal lower than those for other mainland islands in mixed podocarp forests, e.g. Trounson Kauri Park 34.4%(1997), Boundary Stream 27% (1996), Northern Te Urewera 27% (1996) reflecting the lower densities of possums found in beech forests generally.

3.2 RODENT CONTROL AND MONITORING

3.2.1 *Ship Rats (Rattus rattus)*

Objectives

- To reduce rat numbers to levels at which:
  - predation of nesting birds (see 4.1 bird monitoring)
  - predation of ground dwelling invertebrates
  - inhibition of plant regeneration (through eating of fruit, seed) is insignificant alongside other mortality factors affecting these groups.
- To monitor the interaction between rats, mice and their predators to aid control of all species in future years.
- To investigate the role of rats in secondary poisoning by linking to ongoing research on this issue.

Performance Target

Post-control tracking tunnel or trap catch index of 5%.

Methods

Control was undertaken alongside that of possums with the bait station operation using 1080 followed by Talon also targeted at rats. Monitoring was carried out by a combination of snap-trapping as other South Island sites and tracking tunnels (using chemicals rather than food colouring) set according to standard protocols (King et al., 1994).

Results

Rat activity has been minimal in the block throughout the year. The population has clearly been at a low point in its cycle due to the absence of significant seeding of beech since 1995 (Wilson et al., 1998), and as initial pre-1080 trapping was not able to detect any animals it was not thought worthwhile to develop a comprehensive monitoring programme. Three sessions of snap-trapping were carried out in the project area and no rats caught (May 1997 - 45 trap nights, October 1997 - 60 trap nights, May 1998 - 80 trap nights). Tracking tunnels were run in May 1998 (100 tunnel nights) and no rat tracks recorded.

The low numbers of rats is also apparent in their capture as non-targets during trapping. One was caught in Fenn traps set around kaka nests between December and February in 2100 trap-nights, none during possum trap-catch monitoring in the project area (600 trap-nights with Victor traps) and one in the Lakehead non-treatment area (300 trap-nights).

Discussion

The performance target of 5% (tunnel index) which has been associated with benefits to kokako at North Island sites was clearly inappropriate this season. Indeed rats were in such low numbers that they could not be detected with any current monitoring techniques, making impractical any target except keeping them below detectable levels. There was light seeding of beech in April/June 1998 (Section 4.3.6) which one would have expected to be followed by some response in rat numbers – (a response in mouse numbers was seen – Section 3.2.2) – so one could conclude that the bait station operation was effective in preventing this response. Unfortunately logistical constraints meant that no non-treatment rodent information was obtained this year. However the same picture of very low rodent numbers was evident from other South Island beech forest sites, e.g. no mice caught in 3 seasons of index trapping at the Hurunui Mainland Island (rats absent there) since the 1995/96 beech mast year.

We are fairly confident that our bait station operation will achieve effective rat control given that the same bait stations that we have on a 100m x 100m grid have proven effective at other sites on a 150m x 150m grid. Our closer grid is aimed at mouse control – see below.

The season showed how difficult it is to pre-determine performance targets for rat control. It will also take several seasons of work before we can determine what the targets should be to achieve a benefit in beech forests. Intensive monitoring of robin nesting success (Section 4.1.3) is one way we are looking at this but we will need data for a range of rat densities before we can suggest a target from this.

3.2.2 Mice (Mus musculus)

Objectives

- To reduce mouse numbers to consistently low levels to reduce their impact on invertebrates and native plants (seed predation)
- To prevent the dramatic increases in number associated with beech mast years

A further and possibly conflicting objective under consideration is to maintain mice in the area in sufficient numbers and carrying sufficient dosage of poison to control mustelids and feral cats through secondary poisoning. This issue is currently subject to research at several sites and information to allow use of rodent populations in this way is not yet available.

Performance Target

No target could be set for 1997/98 as there are no other studies to base one on as there are with rats.

Methods

Control was undertaken alongside that of possums with the bait station operation using 1080 followed by Talon also targeted at mice. However one refinement was made to the bait stations following research done the previous season (see Appendix 1). Experiments carried out on an island near Nelson showed that the addition of sticks between the base of stations and the ground increased the take of bait by mice significantly (Taylor et al., 1998). Thus short lengths of rough cut 10mm x 10mm timber were slotted into holes at the base of each station. Monitoring was carried out by a combination of snap-trapping and tracking tunnels as for rats.

Results

Mice have also been at a low point in their population cycle. The monitoring results in the treatment area were as follows:

SNAP-TRAPPING

DATE	CAPTURES	TRAP NIGHTS	INDEX
May 97	0	45	0%
Oct 97	0	60	0%
May 98	1	80	1.25%

TRACKING TUNNELS

DATE	TUNNELS WITH TRACKS	TUNNEL NIGHTS	INDEX
29 May 98	4	100	4%
4 August 98	0	100	0%
31 August 98	3	100	3%

Some data was also obtained from the non-treatment area at Mt Misery on Lake Rotoroa by a Conservation Corps group supervised by Landcare Research. They set rat and mouse traps on the transect line regularly monitored by Landcare until 1995 (Wilson et al., 1998) with the following results:

DATE	CAPTURES	TRAP NIGHTS	INDEX
12-14 August 1998	22	219	10%

Discussion

These results confirm the picture of low rodent numbers through most of the year as discussed earlier. By May 1998 a small increase in mouse numbers in the treatment area is indicated by both trapping and tracking tunnels results, however this did not continue through to higher numbers in August. The relatively large numbers (10% index) caught in the non-treatment area at Rotoroa at this time suggests that the poisoning may have been having an effect of dampening population growth in the treatment area. The small increase in mice this autumn ties in with the partial seeding of beech that occurred.

The monitoring in the treatment area in May suggests that tracking tunnels may be a more sensitive index than snap-trapping but more paired samples are needed to confirm this. We will continue to liase with predator management staff in Science and Research on this issue as a national protocol is developed.

It is encouraging that our present bait station grid seems to have had an effect on mouse populations. However we will still undertake work in the 1998/99 year to compare the efficiency of a 100m x 100m grid of Philproof stations (with sticks) with more closely spaced grids and other designs of mouse bait stations.

This first year indicated some possible secondary poisoning of predators by Talon and it is likely that this was through mice given that few possums remained after the 1080 operation and rats have been in very low numbers. We hope to investigate this further in 1998/99. For we aim to pulse our poisoning so as to put out the minimum amount of Talon, which is likely to have the side effect of allowing a small increase in the mouse population providing animals which will act as vectors for Talon.

Research

A short piece of research was commissioned in 1996/97 (see Appendix 1) to investigate mouse access to bait stations, which led to the placing of sticks between station entrances and the ground.

3.3 MUSTELID (STOAT – *MUSTELA ERMINEA*, FERRET – *MUSTELA FURO*) CONTROL AND MONITORING

Objective

- To reduce mustelid numbers to a sufficiently low level that they have minimal negative impacts on the breeding success of resident birds (particularly kaka) and on bats, and that would allow the re-introduction of other species vulnerable to mustelid predation (e.g. yellowhead (mohua), kiwi).
- A further objective could be to maintain mustelid numbers at a level that would allow native fauna to recover to the density in this area that would have been present before the introduction of these mammals to New Zealand. However achievement of this objective is hard to measure as we have no way of determining those densities. Mustelid-free offshore islands could provide an indication but none of similar habitat is thought to exist.

Performance Target

No targets in terms of mustelid numbers could be determined initially. The main measure used to judge the effectiveness of control was the breeding success of kaka (Section 4.1.2).

Methods

The mustelid control work can be divided into three phases, following the appointment of a predator management co-ordinator in November 1997. The first phase involved ring-trapping using MkVI Fenn™ traps around kaka nests, which was designed as an interim measure to help protect the birds for a season before a full trapping system could be set up. The second phase was a brief period of live trapping and radio tracking. The third phase was the opening of traps within a complete system of trap lines around and within the block.

For the ring trapping, single Fenn traps were placed in single-entrance wooden tunnels (9mm H4 plywood) with a fresh egg (or occasionally a piece of fresh rabbit) for bait, 25 around each nest in a ring c.25 metres from the nest. The traps were put in place as soon as nests were located (early December) and left until several days after the chicks had fledged and left the vicinity of the nest (between late February and early March).

Live trapping was carried out using a combination of cage traps (Havahart™) and mesh tunnels designed by I. McFadden, Science & Research with rabbit meat as bait set around the edges of the farmland.

The wider Fenn trapping system involves lines around the perimeter of the block and extending beyond it for 1km in each direction and two lines within the block (Figure 5). Traps are spaced at 50 metre intervals along the north and south boundaries, except that at the lake edge the distance is reduced to 25 metres for the first 250 metres. Along the ridgeline and lakeshore the traps are spaced at 100 metre intervals. The two internal trap lines are set at 100 metre intervals. These distances should maximise the chance of catching females and invading stoats.

The introduction of this system in an area with limited prior mustelid control has been used as an opportunity to conduct a national trial of trap cover designs and baits. The wooden tunnels will be alternated with weld mesh cages of the same design (12.7mm). The following four baits will be placed in sequence: fresh white hen's egg, white plastic egg, fresh brown hen's egg and brown plastic egg. It is hoped that plastic eggs may be as effective as real eggs, if the predators are hunting by sight, as they are obviously longer lasting and easier to use.

Delays in the appointment of the co-ordinator and other constraints meant that only a single tracking tunnel monitor was carried out in the treatment area (in May 1998) – no mustelids detected – and none in non-treatment areas.

Results

1. *Fenn Trapping Around Kaka Nests*

25 single Mark VI Fenn traps placed in wooden tunnels around four kaka nests, 5/12/97 – 26/2/98.

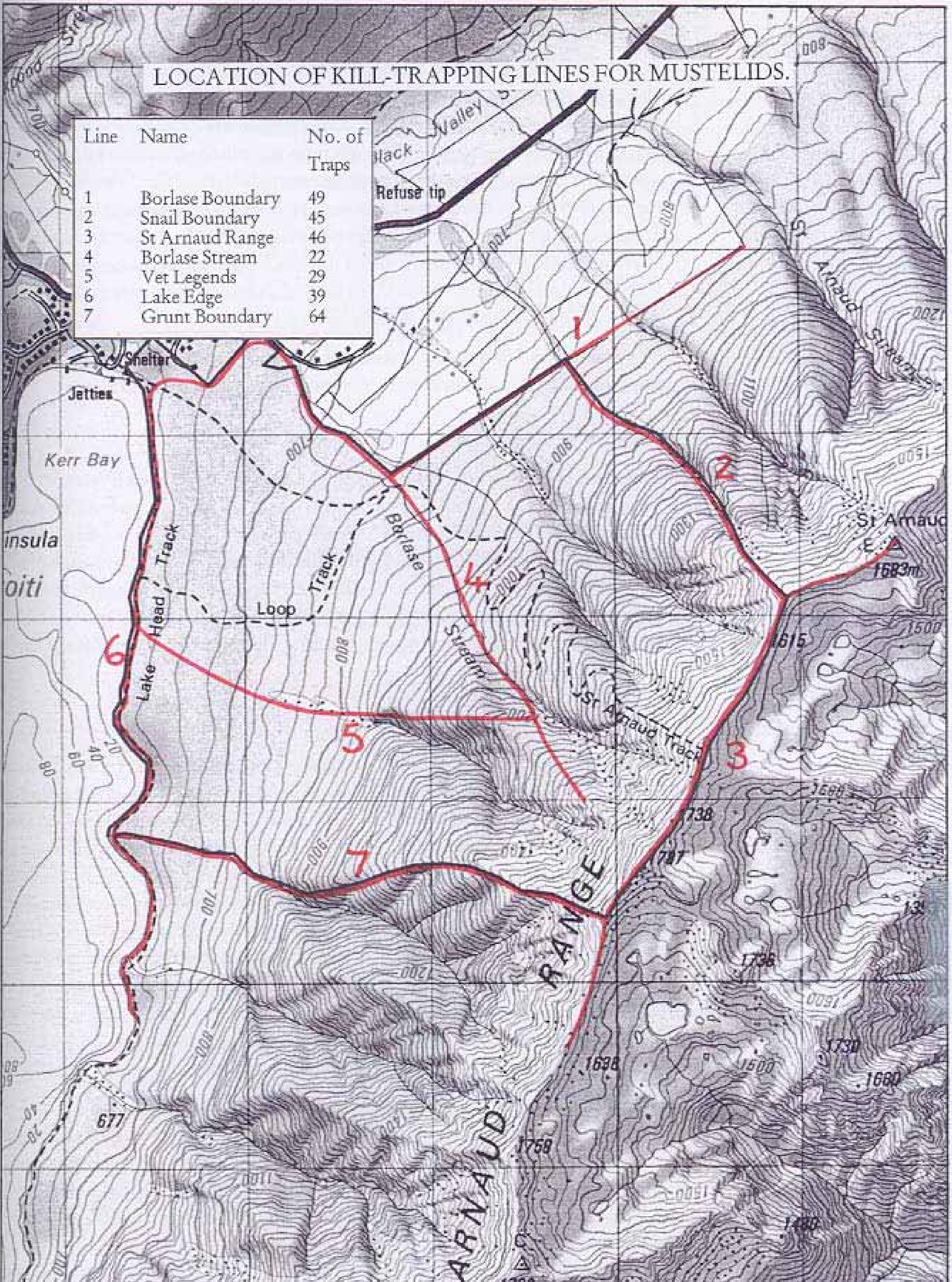
NEST	TRAP NIGHTS	CAPTURES
1	521	2 hedgehogs
2	525	0
3	525	1 hedgehog, 1 ship rat
4	525	7 stoats, 6 hedgehogs

2. *Live Trapping*

The live trapping work had 4 main aims:

(a) to gather information on mustelid movements around and within the recovery area to determine where trapping effort should be concentrated

Fig 5


LOCATION OF KILL-TRAPPING LINES FOR MUSTELIDS.
Line Name No. of Traps
1 Borlase Boundary 49
2 Snail Boundary 45
3 St Arnaud Range 46
4 Borlase Stream 22
5 Vet Legends 29
6 Lake Edge 39
7 Grunt Boundary 64
Refuse tip
Shelter
Jetties
Kerr Bay
Lake Head Track
Loop Track
Borlase Stream
St Arnaud Track
St Arnaud
1683m
1615
738
787
1736
1730
1680
1638
1758
1782m
677
ARNAUD RANGE
1
2
3
4
5
6
7

(b) to assess the effectiveness of the kill trap regime

(c) to assess the extent of secondary poisoning (through being able to obtain carcasses of animals that died)

(d) to help calibrate the tracking tunnel monitoring

Five weeks of trapping were undertaken this season in May/June and one male stoat and one female ferret caught. A modification of the usual anesthesia procedure was trialled with the assistance of two Australian veterinarians. This only allowed two ear tags to be put on the stoat which was not fully anaesthetised, however the technique was refined to work well on the ferret which received a transmitter. Its movements over the period 29 May to 2 July are summarised as follows: It was captured approximately 1.5km south of Kerr Bay along the edge of the lake within the project area and ranged over a wide area on the northern side of the area, most often in the farmland but also visiting the forest nearby. It was killed in a Fenn trap set at the edge of the farmland within three days of the trap line being opened.

The examination of anaesthesia techniques had a valuable side effect, bringing the Department's mustelid work better into line with regulations in this area.

3. *Fenn Trapping on Lines*

At the end of the year the full Fenn-trapping set-up was established (Figure 5). Traps were placed at 50 or 100m intervals within either wooden or mesh tunnels (same design – as used for ring trapping). Tunnel types were alternated in a trial with our Biodiversity Recovery Unit in Wellington to determine the relative effectiveness of each. Four baits were rotated in sequence: white hen's egg, white plastic egg, brown hen's egg, brown plastic egg to determine any preference which will depend on whether mustelids are largely hunting by sight or smell. The traps were opened at the start of 1998/99.

Discussion

The project has based its original control on Fenn trapping given some ongoing questions about the effectiveness of poisoned eggs. The trapping has caught more stoats and ferrets than originally anticipated at a time when mustelid numbers were believed relatively low, linked to low rodent numbers following years without significant beech seed. However it is difficult to separate its effect from that of secondary poisoning in controlling mustelids this season, and also difficult to separate the role it played in allowing kaka to breed successfully from the other protection measure taken, banding nest trees. Certainly, trapping several stoats in the vicinity of one kaka nest (see Section 4.1.2) almost certainly prevented that one being lost. The few days that elapsed between the start of trapping and the capture of the one ferret with a radio-transmitter also encourages the view that trapping provided significant protection to the block. The result should be much clearer in 1998/99 because the bands have been removed from the nest trees leaving trapping as the key technique for protecting the kaka.

It is considered that we enter the 1998/99 year with few if any resident mustelids on the block. The trapping lines that surround it are intended to intercept any dispersing animals before they enter it. Once they are in the block we hope that they will encounter one of the internal traps or pick up sufficient toxin from rodents to die from secondary poisoning before they locate a kaka nest.

The results have changed our views about ferrets. We had expected them to largely be restricted to the farmland or forest in that vicinity with the rabbits found there their main prey. It is now obvious that they can be found throughout the area from the lake edge to the top of the range and it appears they may be spending significant time in the forest. The MkVI Fenn traps are large enough to be effective for ferrets so we are not taking any additional measures to control them at this stage.

Discussion has recently been held with the Ministry of Agriculture to link our work into initiatives to prevent the spread of Tb into this area. Marlborough District Council staff are likely to be engaged in ferret surveys and control to the north of the national park in the Wairau Valley and there should be opportunities to share information and perhaps resources.

The initial radio-tracking work proved that this should be valuable in the future, particularly when there are more animals to catch. The location of the site with boat or vehicle access makes radio tracking effective without significant effort. We intend to trap outside the block in mid-summer in 1998/99.

3.4 FERAL CAT CONTROL AND MONITORING

Objectives

- To reduce feral cat numbers to a sufficiently low level that they have a minimal deleterious effect on the breeding success of resident birds and lizards and that would allow the re-introduction of other species vulnerable to cat predation (e.g. kiwi).
- In the longer term to reduce the population of pet cats at St Arnaud with support of the local community.
- To assess the benefits of cat control, balancing negative impacts on native fauna with positive impacts controlling rodents (and rabbits in farmland).

Performance Target

None could be determined in advance without a good method to monitor cats.

Methods

Our cat control has initially been based on live-trapping using cage traps baited with rabbit on the lower boundaries of the block and in the village (when feral cats have been sighted around houses), and by shooting at the rubbish dump at the northern end of the village. No significant effort has been put into monitoring given the lack of a suitable technique. The trapping gives some indication of cat activity, but otherwise we have been relying on seeing sign or cats in the forest.

It is considered that advocacy and education to try and reduce the number of cats kept as pets in the village and brought here by bach owners, and to have these neutered, will be the most effective way of reducing the threat of cat predation in the long term. Initial initiatives in this area with Lake Rotoiti School are covered briefly in Section 5.3.

Results

Live-traps were run along the boundary with the farmland and the village through to the lake from 2/10/97 through to 31/10/97 covering before and during the 1080 operation. This was partly aimed at catching and returning any pet cats that might otherwise have been exposed to a secondary poisoning risk. Only a single cat, a feral one, was caught in c.90 trap nights (5 hedgehogs were also caught so effective trap-nights are slightly less).

One cat was also caught in a small wire trap set for live capture of stoats along the lake edge (traps set between 27 April and 5 June 1998).

Shooting feral cats at the dump had been carried out on an ad-hoc basis by Departmental staff prior to the start of this project. Records of kills have been kept since December 1997 and in that time 16 animals have been killed.

Discussion

There have been no indications of significant cat activity in the block this year. Whether this will be true in years of higher rodent numbers remains to be seen. A surprisingly large number of cats are regular killed at the rubbish dump suggesting that this is a continual reservoir of feral animals just across the farmland from the block. It seems unlikely that there is a self-sustaining wild population there given the numbers removed and either people are dumping unwanted animals or losing pets or their offspring. The Tasman District Council are planning to close or move this dump which should help the situation, but control will continue till then.

Experience elsewhere suggests that any resident feral cats on the block would have probably died from secondary poisoning during our bait station poison operation through 1080 (as Gillies 1997) or Talon (Alterio 1998).

Difficulties of detecting cats in the forest mean that it is possible that more are present than thought. Certainly it was Trounson Kauri Park's experience that they could trap large numbers of cats when they were rarely seeing them. The close monitoring of robin survival is an alternative way that we are assessing their possible impacts (see Section 4.1.3). We will also set up trapping lines from time to time as resources allow.

3.5 WASP (*VESPULA* SPP.) CONTROL AND MONITORING

Common wasps (*Vespula vulgaris*) build up to high densities in these forests in summer when they depress the levels of honeydew which is a significant food source for native fauna, and take large numbers of native invertebrates.

Objectives

General objectives are:

- to reduce the take of honeydew;
- to reduce predation on native invertebrates and bird nestlings (Moller, 1990) so that the impacts of wasps are insignificant alongside other mortality factors affecting these groups;
- to improve the public's experience visiting the beech forest in late summer.

Performance Targets

Four possible measures of wasp control performance developed from studies by Landcare Research, Nelson were identified in the Strategic Plan (Butler, 1998).

To reduce wasp numbers to:

- avoid reduction of honeydew standing crop by more than 94% of peak value - i.e. keep above 2500 J m^{-2} (Moller et al., 1996). About a 92% reduction in wasps may be needed to achieve this to protect the birds that use honeydew;
- to ensure that honeydew anal filaments are not visited more frequently than every 3 hours by wasps (Moller et al. 1996a);
- to minimise the time that the energy level of honeydew falls below 1.4 joules/drop, the point at which it ceases to be energetically profitable for kaka to feed on honeydew (Beggs & Wilson, 1991), or to prevent this fall;
- to reduce wasp densities to 2 nests/ha or reduce nest size by equivalent amount (Thomas et al., 1989). (An 83% reduction of wasp density would be necessary to achieve this in their study).

This season we focussed on the first measure in our analysis of the honeydew response though also collected data that allows assessment of the fourth as well.

Methods

1. *Wasp Control*

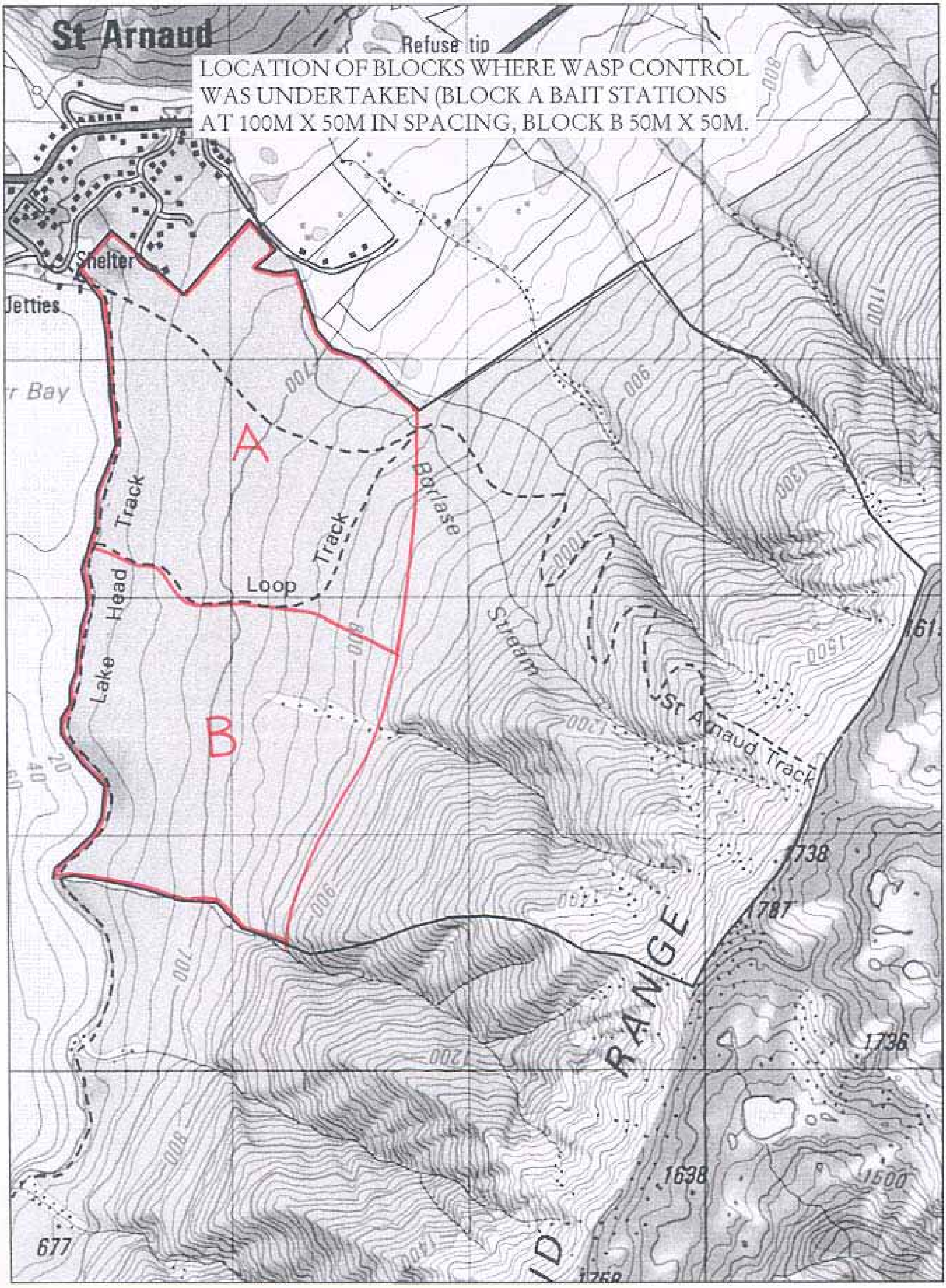
Control was undertaken using a toxin applied in bait stations in February based on previous research by Landcare Research, Nelson. The lower third of the block (the area with abundant honeydew) was divided into two areas with bait stations spaced at 100 x 50m in one (Block A) and 50 x 50m in the other (Block B) to determine which was the more effective (Figure 6). The aim was to extend the previous work which was based on a 30m x 50m grid (Beggs et al., 19??), recognising that the wider the stations could be spread and still achieve a result the more cost-effective the operation. We planned to time the poisoning according to a protocol developed by Landcare Research, placing non-toxic bait in a sample of stations daily until the numbers of wasps on each after they had been left one hour exceeded five. This point was never reached this season due to low wasp numbers, and poisoning was carried out on 8th February.

The poison applied was 'Finitron'™, a sardine-based bait with sulfluramid as the toxin, which is formulated as frozen tubes from which it is applied with a caulking gun. The wasps take the poison back to the nest where it slows their energy system and kills them within a few days. The poison was placed into 1027 stations made from modified 1L plastic milk containers, kindly donated by Nelson Milk Ltd and screwed to trees to facilitate later removal. It took six people two days to cover the block.

Loadings were as follows, to achieve an equivalent of 320g/ha of 1% sulfluramid as used by Landcare Research (0.5% not 1% was available in 1997/98):

Block A	145ha	359 stations (2.3/ha)	278g of 0.5% bait applied.
Block B	136ha	668 stations (4.9/ha)	130g of 0.5% bait applied.

Fig 6


LOCATION OF BLOCKS WHERE WASP CONTROL WAS UNDERTAKEN (BLOCK A BAIT STATIONS AT 100M X 50M IN SPACING, BLOCK B 50M X 50M.
St Arnaud
Refuse tip
Shelter
Jetties
A
B
Lake Head Track
Loop Track
Borlase Stream
St Arnaud Track
RANGE
1738
1787
1736
1638
677

2. *Wasp Monitoring*

Monitoring of wasp nests was carried out using a strip transect methodology developed by Landcare. This involves three people walking slowly line abreast covering a 10m width, locating all nests within the strip and recording the traffic rate (wasps in and out per minute) at each. Transects were typically 500m in length and were set up in the Blocks A and B of the treatment area and in a non-treatment area c1km to the south along the shore of Lake Rotoiti.

Wasp activity was also measured by the numbers caught in malaise traps, the primary tool for measuring changes in the invertebrates preyed on by wasps (Section 4.2.1). Wasp impacts were also measured through changes in honeydew available (Section 4.2.4). For both the malaise trapping and honeydew work the non-treatment area was at the Howard Saddle on the shore of Lake Rotoroa.

TABLE 2: RESULTS OF STRIP TRANSECTS: NEST NUMBERS

	100 X 50 M STATION SPACING	50 X 50 M STATION SPACING	TOTAL TREATMENT AREA	NON-TREATMENT AREA
Sampled Area (m^2)	22780	18000	40780	6000
Total Nest Numbers				
Pre (27 January - 11 February)	30	36	66	33
Post 1 (19-26 February)	29	36	65	33
Post 2 (13 March - 24 March)	15	22	37	31
Nests/Ha				
Pre Poisoning Sample (27 January -11 February)	13.17	20.00	16.18	55.00
Post Poisoning Sample 1 (19-26 February)	12.73	20.00	15.94	55.00
Post Poisoning Sample 2 (13 March - 24 March)	6.58	12.22	9.07	51.67
% Reduction				
Pre Poisoning & Post Poisoning 1	3.3%	0.0%	1.5%	0.0%
Post Poisoning 1 & Post Poisoning 2	48.3%	38.9%	43.1%	6.1%
Pre Poisoning & Post Poisoning 2	50.0%	38.9%	43.9%	6.1%

TABLE 3: RESULTS OF STRIP TRANSECTS: WORKER NUMBERS

	100 X 50 M STATION SPACING	50 X 50 M STATION SPACING	TOTAL TREATMENT AREA	NON-TREATMENT AREA
Sampled Area (m^2)	22780	18000	40780	6000
Worker Wasps/Ha				
Pre (27 January - 11 February)	6978	9252	7982	19803
Post 1 (19-26 February)	5357	7514	6309	21415
Post 2 (13 March - 24 March)	1798	1558	1692	8974
% Reduction: Worker Wasps/Ha				
Pre Poisoning Sample (27 January - 11 February)	23.2%	18.8%	21.0%	-8.1%
Post Poisoning Sample 1: (19-26 February)	66.4%	79.3%	73.2%	58.1%
Post Poisoning Sample 2: (13 March - 24 March)	74.2%	83.2%	78.8%	54.7%

FIGURE 6: CHANGES IN WASP NEST DENSITY FROM STRIP TRANSECTS

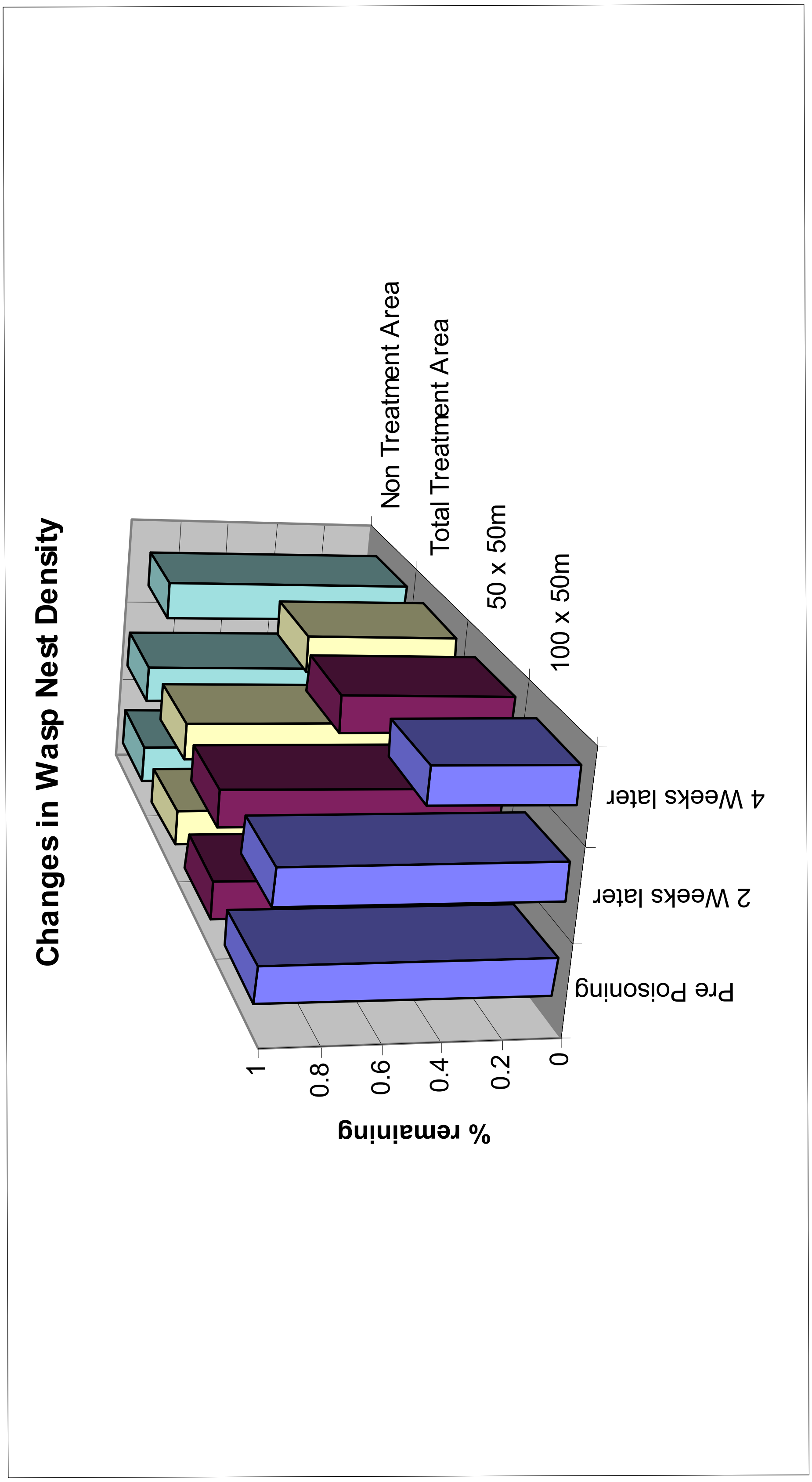


TABLE 4: NUMBERS OF WASPS COUNTED IN MALAISE TRAPS

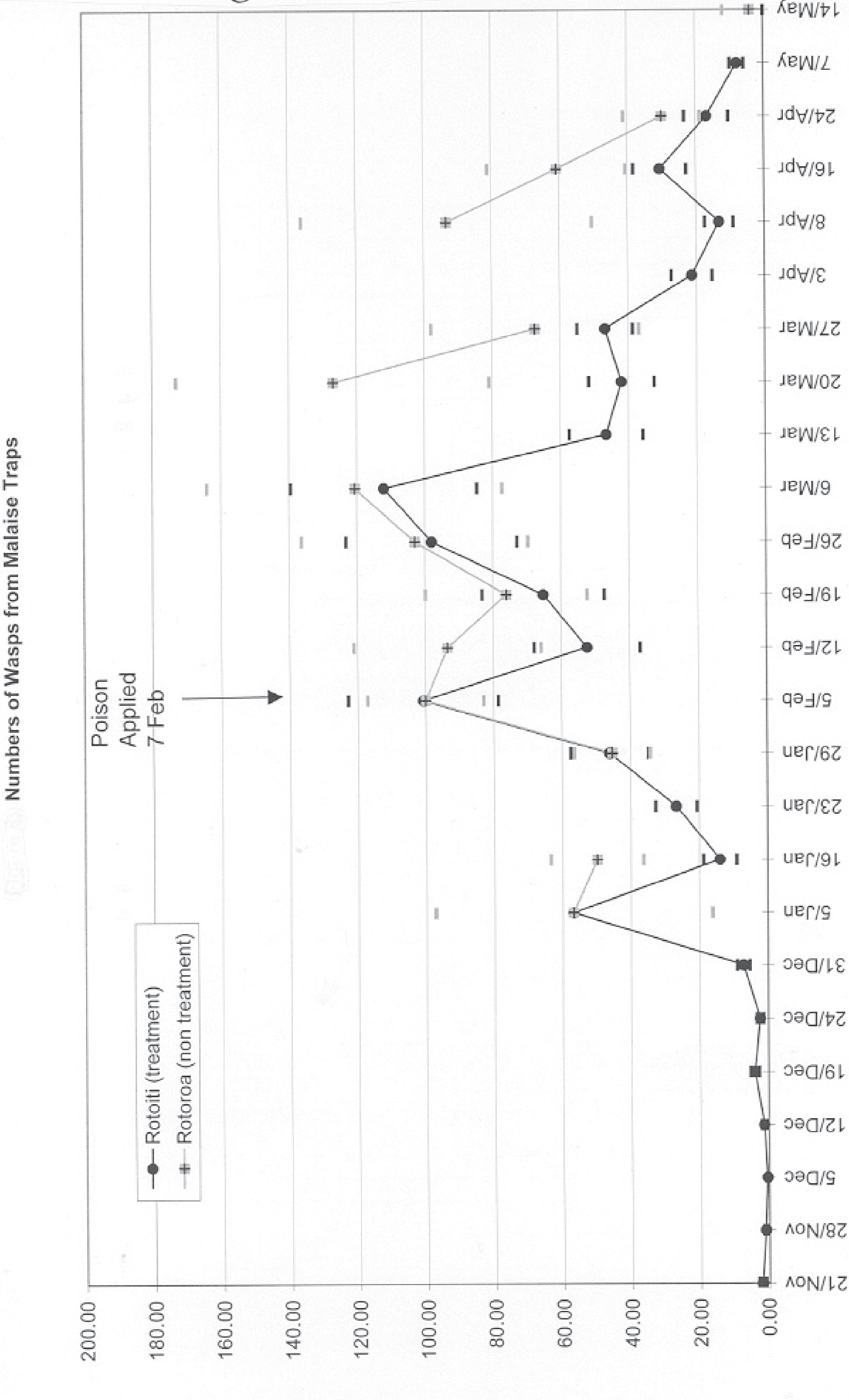
SURVEY DATE	MEAN NUMBER	SD	95%CI
Rotoiti Treatment Area			
21 November	2.0	0	0.9799805
28 November	1.0	1.21354	0.5320282
5 December	0.5	0.686333	0.3007926
12 December	1.3	1.625455	0.7123731
19 December	3.9	2.778363	1.2492793
24 December	2.4	2.233713	0.9789484
31 December	7.2	4.162489	1.8242551
5 January	56.8	41.3874	40.558844
16 January	13.9	10.81395	4.8624485
23 January	26.7	13.7851	6.0414659
29 January	46.1	25.88126	11.342736
5 February	100.7	47.83181	22.096732
12 February	52.5	35.4304	15.527749
19 February	65.3	40.90409	17.926653
26 February	98.1	57.4653	25.184777
6 March	112.1	61.1278	27.485866
13 March	46.5	23.97074	10.778346
20 March	42.0	21.86676	9.5833405
27 March	46.8	18.56107	8.1345842
3 April	21.3	13.60292	5.9616248
8 April	13.2	9.30698	4.1848456
16 April	30.5	17.62922	7.7261939
24 April	16.8	14.7277	6.4545727
7 May	7.8	4.55313	2.0472963
Rotoroa Non-Treatment			
5 January	56.8	41.387397	40.558844
15 January	49.8	21.857112	13.546909
22 January	41.6	14.462211	8.9635934
29 January	45.3	17.882642	11.083556
5 February	100.0	27.604347	17.109012
13 February	93.5	44.482831	27.570197
20 February	76.1	38.35637	23.773052
27 February	103.0	53.828947	33.362865
5 March	120.6	70.087564	43.43986
17 March	126.9	70.502561	46.060759
26 March	67.3	49.24553	30.52209
9 April	93.3	69.108691	42.83316
17 April	60.8	32.733944	20.288306
22 April	29.9	17.984252	11.146534
1 May	29.9	17.961378	11.734534
14 May	4.0	8	7.8398443

Results: (Tables and figures from P. McArthur)

The strip plot results in Table 2 and Figure 7 show an overall 43.9% reduction of nests in the treatment area compared to a 6.1% reduction presumed to have occurred naturally over the same period in the non-treatment area. Traffic counts within the strip plots showed an average reduction in overall wasp activity of 78.8% compared to a reduction of 54.7% in the non-treatment area (Table 3)(Figure 7).

The malaise trap results are shown in Table 4 and Figure 8.

Fig. 8



Numbers of Wasps from Malaise Traps
Rotoiti (treatment)
Rotoroa (non treatment)
Poison Applied 7 Feb
200.00
180.00
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
21/Nov
28/Nov
5/Dec
12/Dec
19/Dec
24/Dec
31/Dec
5/Jan
16/Jan
23/Jan
29/Jan
5/Feb
12/Feb
19/Feb
26/Feb
6/Mar
13/Mar
20/Mar
27/Mar
3/Apr
8/Apr
16/Apr
24/Apr
7/May
14/May

The results of a 74% reduction in the density of wasps and a 41% reduction in the density of nests are equivalent to killing c. 1.7 million wasps and 2,300 nests (calculation from figures of Landcare Research, Nelson).

Discussion

The wasp poisoning proved a major logistical exercise as expected. Considerable effort was required to mark lines between the 100m-spaced possum bait station lines in half the area to achieve the 50m x 50m spacing. This was followed by the erection of the 1027 stations and then the applying of the poison itself (involving six people over two days). Shortages of Finitron due to the company awaiting a full registration of the product also meant that a day had to be spent mixing bait ourselves to achieve sufficient, an unpleasant task. Finally we had to bring some unused bait back in from the field which had not been anticipated.

Wasp numbers were lower than in previous seasons (Landcare Research, Nelson unpubl. data from this area and bait trials further south). This had two consequences results. Firstly it meant that a single application of poison was sufficient, i.e. wasp numbers never recovered from this enough to make a second application appropriate. Secondly it is probably the main reason that not all the bait was taken from the stations as the worker wasps may still have been encountering plenty of their natural food supply that they had not depleted, making the bait less attractive to them.

The significant kill of wasps did allow us to achieve the target of our main performance measure, maintaining honeydew levels above 2500 joules/m^2 in the treatment area all season whereas they dropped below this at the non-treatment area at Rotoroa for a five-week period of high wasp numbers. However the kill was not sufficient to reduce nest density to 2 per hectare as identified in the other performance measure. The 78.8% reduction in overall wasp worker activity (strip transects) was less than the 80-90% sought to achieve this. It should also be noted that wasp activity declined naturally at both non-treatment areas over the same period, e.g. by 54.7% (strip transects) further up Lake Rotoiti (discussed below).

A further issue with the bait may also have contributed to reduce the kill. Finitron was only available as a bait containing 0.5% of the active ingredient, sulfluramide, rather than the 1% used in previous trials by Landcare Research. We endeavoured to compensate for this by placing twice as much bait so as to achieve the same amount of toxin/hectare as they used. However the fact that some of this (as much as half at times) was left in the stations meant that not enough toxin apparently reached some nests. This is suggested by the fact that we reduced wasp numbers by more than three-quarters but only completely killed off less than half of the nests.

There was an apparent delay of approximately two weeks between the poison being applied and having an effect as can be seen by both strip transect data – little change between figures 'pre-poisoning' and 'post-poisoning 1' on Tables 2 and 3 – and malaise trap data (Table 4) (Figure 8). This is a further period in which wasps will be having a negative impact. A quicker result would be desirable.

The benefits of the wasp control to honeydew production have already been mentioned. We have yet to complete analyses of the invertebrate samples collected in our malaise traps (Section 4.2.1), but initial results suggest that it will be hard to detect any significant effects. We did not have the means to collect quantitative data on the beneficial effects of the control on people using the area, however a number of positive comments were received. The St Arnaud Community Associations control of wasps in the village (see below) will also have contributed significantly to ensuring that there was no wasp 'nuisance' in the popular Kerr Bay area by the lake.

The changes in wasp numbers in the non-treatment sites c 1km up Lake Rotoiti (where strip transects were done)(Tables 2 & 3) and at Lake Rotoroa (malaise trapping)are interesting. At the former there was a small reduction in nest numbers over the monitoring period (6.1% Table 2), but a greater than 50% reduction in wasp numbers (Table 3). There was initial speculation that this was due to our poisoning. However in a season of low densities the non-treatment area was considered far enough away for this not to be the case (J. Beggs, pers. comm.). (In a season of higher densities wasps might forage further in their efforts to obtain food). More significantly a similar effect was observed at the same time at Lake Rotoroa in the malaise trap samples, c.f. mean of 127 wasps caught on 17 March and 67 on 26 March. These results suggests that many nests reduced in the number of workers present over this period when in other years they would still be building to a peak. Analysis of detailed weather data at Rotoiti may help explain this though there is no recording station at Rotoroa. Interpreting results should be easier in 1998/99 as both nest transects and malaise trapping will be undertaken in the same area at Rotoroa.

Our results were similar for the two spacings, 50m x 50m and 50m x 100m. The latter seemed to kill more wasps but fewer nests but the differences were not statistically significant. The fact that each achieved less than an ideal result was considered largely due to the season and toxin concentrations rather than due to expanding on the 30m x 50m grid used previously. It was thus intended to repeat the use of both spacings in 1998/99.

St Arnaud Community Association's Wasp Control Programme

A significant wasp control programme was run in the St Arnaud village area by a group of Community Association volunteers co-ordinated by Colin Clarke, funded by a grant from the Trustbank Community Trust. This aimed to reduce the summer infestation to enhance the enjoyment of the area by community embers and tourists as well as supporting our project's efforts in the adjacent area. Nests were located by systematic visual searching and destroyed by applying the poison Permex^{TM} (active ingredient: permethrin) directly to the hole. The programme killed over 900 nests which together with a few destroyed by departmental staff meant that over a thousand were removed from land to the west of the Recovery Project's area.

Several attempts were also made to use Finitron but this proved less effective than previously, as we found, due to few wasps taking the bait.

This was an excellent example of a community initiative, with some departmental encouragement, that complemented our programme to achieve a successful outcome over a large area than either of us could have managed alone. The group has also secured funding from the Lottery Commission for 1998/99.

3.6 DEER (*CERVUS ELAPHUS*) CONTROL AND MONITORING

Objective

- To control deer numbers so that they have minimal impact on the forest ecosystem.

Performance Target

This first season was aimed at assessing deer impacts and trialling shooting as a control method here.

Methods

Shooting was carried out above tree-line in summer. The time required to monitor the numbers of deer themselves was not considered justified given the low numbers in the area, but sightings were recorded along with person-days in the block as a gross measure of activity . Impacts were to be assessed through monitoring browse on susceptible species particularly broadleaf, through 20x20m vegetation plots and 20x20m deer-fenced exclosures (see Section 4.3).

Results

Only a single hunting session was carried out following delays in achieving engineering sign-off for the newly installed bivvy near tree-line. Three deer were shot in 17.5 hours hunting in the tussock basins and one forested gully, one stag and a hind and fawn. Livers from each were taken for toxin analysis (see Section 4.4).

Only four deer were seen by staff working in the block during the year (total person-days in block recorded but not yet tallied up).

One 20m x 20m deer exclosure has been constructed to date (paired with an unfenced 20m x 20m plot), situated close to the St Arnaud Range track and the farmland.

Discussion

The year's observations have confirmed the view that there are few deer resident in the area. However the few animals passing through may still be having an impact on selected plants that are already reduced in numbers or condition by a long history of ungulate presence. Further seasons of vegetation monitoring are needed before any such conclusions can be drawn. A further exclosure will be placed in the block and one or two in non-treatment areas once a vegetation survey is completed in the 1998/99 summer.

3.7 CHAMOIS (*RUPICAPRA RUPICAPRA*) CONTROL AND MONITORING

We undertook no specific activities targeting chamois. No animals were seen in the block but a pair of tracks was noted above tree-line. Very few animals are considered resident in this part of the park.

3.8 HEDGEHOG CONTROL AND MONITORING

Hedgehogs were not identified as a pest in the project area in initial planning. However significant numbers have been caught in live traps and Fenn traps as follows:

DATES	TRAPPING CAUGHT	NO. HEDGEHOGS
2-31 October 1997 December1997 - February 1998	Cage trapping for cats Ring Fenn-trapping of kaka nests	5 in 90 trap nights 9 in 2096 trap nights

Stomachs have been collected from most animals for diet analysis and a Canterbury University student is due to look at these as part of an MSc project.

Hedgehogs have been found to use the tracking tunnels placed for rodents so this would be one way of monitoring their activity.

Detailed studies of hedgehogs are taking place at two other mainland island sites, Trounson Kauri Park and Boundary Stream, and their results will be assessed to determine whether a specific control programme needs to be initiated here.

3.9 HARE AND RABBIT CONTROL AND MONITORING

As planned, no activities were undertaken in the first year. We are considering erecting hare exclosures above tree-line in 1998/99. It is not clear whether the rabbit disease RCD has reached the St Arnaud area though it is present nearby in Marlborough. Rabbit numbers have been relatively low but we have not encountered the number of carcasses we would have expected if RCD had been active.

3.10 WEED CONTROL AND MONITORING

Further weeds have been documented in the block including one sizeable rowan, and limited pulling of seedlings has occurred. More comprehensive control is planned following the recruitment of a staff member with expertise in this area, however this will never need to be a major activity for this project.

4. Monitoring of Native Species and Systems

The results of monitoring the native flora and fauna are presented here, by groups or species. Performance targets could rarely be determined from existing knowledge. Performance is thus generally measured by assessing whether there has been positive change in numbers or productivity, either compared to a base level before pest control started or compared with a non-treatment area where no control is taking place.

4.1 BIRD MONITORING

Objectives

- Programme objective: to increase bird numbers through the reduction of predation and competition by pest species.

- Monitoring objective: to document changes in bird populations and determine those that relate to pest control programmes.

4.1.1 *Multi-Species Monitoring*

Objective

- To record changes in the full range of bird populations and identify which of these are likely to be due to pest control by comparison with a non-treatment area.

Methods

Two transects have been established to carry out 5-minute bird counts using standard procedures as the main tool for monitoring a range of species. One follows the St Arnaud Range track with 21 stations, and the other a similar but shorter altitudinal transect in the Lakehead non-treatment area with 14 stations. Counts have been done quarterly using two observers over three days.

Distance sampling methods (Buckland et al., 1993) were used to obtain some further data on tui and bellbirds in the summer in the lower parts of the treatment area and in the Howard Saddle non-treatment area. This was to tie in to honeydew monitoring at these sites.

Results

The data has been logged on the project's database but no analyses yet carried out.

Discussion

Undertaking the bird counts has proved relatively straightforward though one session was disrupted by a Search & Rescue followed by bad weather. It is considered that the counts should document population changes in those species that are relatively abundant; i.e. those of which 1 to 3 individuals are generally heard or seen per count. These are bellbird, grey warbler, tomtit, rifleman, tui (lower levels), brown creeper (higher levels), chaffinch, song thrush, blackbird. (Note: at low levels there can be six or seven bellbirds a count and the technique loses sensitivity for this species at that point, i.e. it becomes difficult to determine if an eighth bird is present.) Changes in the numbers of silvereyes (and finches out of the breeding season)will be harder to document because of their habit of moving around in large flocks which leads to high variability between counts. The counts will generally be ineffective as measures of change for rarer birds so specific programmes are being developed for them (e.g. kaka, falcon, robin, parakeets).

4.1.2 *Kaka (Nestor meridionalis) Monitoring*

Objective

- To document kaka nesting success as a measure of the effectiveness of stoat control:

Methods

Between November 1996 and April 1997 12 kaka were captured and radio-tagged within the project area. By following these birds four nests were located between November and December. Given that the project's full stoat trapping grid was not in place, it was decided that it was important to protect these nests as much as possible to ensure the females survived to allow the objective to be achieved the following year. Nests were protected as follows:

After locating a nest, a band of sheet aluminium 60 cm wide was placed around the base of the nest-tree in order to prevent mammalian predators climbing the trunk to reach the nest cavity. The same was done to adjacent trees which could afford access to the nest via their canopies. Some saplings were felled which might have allowed predators to by-pass these barriers. The position of two nests allowed an additional aluminium band to be placed above the nest entrance in an attempt to completely isolate the nest from climbing predators. A ring of 25 Mk IV Fenn traps was placed around each nest-tree at a radius of 25 m and baited with hens' eggs or rabbit meat.

Results

All four nests were successful producing a total of 12 young. There was no predation of females or nestlings but three fledglings were killed by predators. All carcasses had been dismembered to some degree; heads were missing from all, one had had a wing and leg removed and part of another was found cached underground in a manner typical of stoats. Kaka fledglings are vulnerable to mammalian predators because they are incapable of flight for several days after leaving the nest and spend the majority of this time on the ground (Moorhouse & Greene 1995). One of the preyed-on fledglings was probably killed on the ground before it was able to fly but the other two were killed a month after fledging, long after they were capable of flight and perching in the canopy.

Seven stoats were caught in Fenn traps between 10 December 1997 and 17 February 1998, all in the vicinity of a single nest-tree. The livers of six of these were tested for brodifacoum. Three contained sub-lethal levels of brodifacoum while it was undetectable in the other three livers. This suggests that at least some stoats were killed by secondary poisoning over the period in which these animals were caught.

Discussion

The nesting success recorded was significantly higher than in previous studies in these forests. Landcare Research studied a population of kaka at nearby Big Bush for 11 years from the 1980s, but did not carry out significant predator control. They recorded only two successful nests from 20 attempts over 11 years, producing a total of four young (Wilson et al., 1998), ie. 0.2 young fledged per nest compared to our 3.0 young. It is not possible to determine whether trapping, banding of trees, or secondary poisoning from our bait station operation were the keys to the increased breeding success at Rotoiti.

The fact that seven stoats were trapped in the vicinity of one nest site, and three fledglings were killed, presumably by stoats, indicates that stoats were present in the environment while nesting was in progress.

We are unsure why flying fledglings should be more vulnerable to predators than adults. Our observations indicate that, apart from their first few days out of the nest, fledglings, like adults, spend virtually all their time in the canopy. The only fledgling capable of flight that was seen on the ground was one that appeared to have lost its parents for several days. One aspect of fledgling behaviour that could predispose them to predation is their frequent and distinctive calling (Moorhouse & Greene 1995) which could allow predators to locate them more easily than adults. Fledglings are also likely to be more naive than adults and consequently may not attempt to escape from predators.

An interesting aspect of our results was the absence of desertion of the clutch, which was the most common cause of nest failure recorded by Wilson *et al.* (1998). However, since we only observed four nests, all within a single breeding season, this could have been due to chance. Wilson *et al.* (1998) suggested that females had insufficient food to sustain incubation. On one occasion, they observed an incubating female leave the nest for over an hour which suggests that she was receiving insufficient food from her mate and therefore had to forage for herself (J. R. Beggs pers. comm.).

4.1.3 *Robin (Petroica australis) Monitoring*

Objectives

- Use robins as a cost-effective measure of the success of predator control.
- Use robins in the village to advocate the control of predators there, particularly cats
- Use robins in the village to encourage community participation in the project

Methods

The techniques to monitor robins in this way are well documented (Powlesland, 1997). In the 1997/98 season robin monitoring was carried out as part of an MSc study by a Canterbury University student, Amanda Byrne.

Results (Byrne, A. unpubl. data)

The robin research started slightly late in the season (20 October) after some birds had fledged their first chicks. A total of six pairs were located in the block, confined to the area below c.800m a.s.l., and 4 pairs in the village (one of which also used part of the block). The outcome of ten nesting attempts of birds in or using the block was known. One of these failed (10%) and the average number of chicks produced per attempt was 1.7 (range 0-3). The average number of chicks produced per pair in the season was 2.83 (range 0-7) with three producing three clutches.

One young banded on the block was located in the autumn at the head of Lake Rotoiti c. 6km away, an interesting long-distance dispersal.

Discussion

The nesting success observed in this study was greater than that found in previous South Island studies where pest control was not undertaken, e.g. Kowhai Bush where only 13.3% of nests were successful and 68.9% were lost to predators (Moors, 1981).

One of the banded birds in the village provided an excellent advocacy message for it was observed being killed by the schoolteacher's cat, following a session at the school discussing the impacts of cats. This will be followed up in further discussions with the school pupils when they become involved in robin monitoring fieldwork in 1998/99.

4.1.4 *Kea Monitoring and Research*

The fate of the one pair nesting in the block at c. 900m a.s.l. was monitored in the course of a regional study being carried out by an MSc student, Josh Kemp of Otago University. The female was located dead a few metres from the nest in December at a time chicks were present. Analysis of the carcass indicated possible poisoning by 1080 (see Section 3.1 – non-target impacts). In a first operation of its kind, the four chicks were transferred to another nest at the head of Lake Rotoiti once it was obvious that the surviving male was not going to feed them. The 'foster parents' had lost their chick c24 hours earlier and accepted the new brood readily. Two survived to fledge. (Kemp, in prep). The male bird of the original pair continues to be present in the block at times.

Other nests being monitored along the St Arnaud Range had mixed nesting success but the majority reared young.

4.1.5 Other Bird Species

For other uncommon species we have established a system of recording all sightings using the nearest bait station as a means to locate them. Data was obtained as follows:

A single pair of falcons was observed in the block and they nested successfully, rearing two or three chicks. Data was passed to the co-ordinator of the national falcon survey.

Yellow-crowned parakeets were observed in small numbers, largely confined to the northern end of the block towards the farmland.

Single pigeons were seen on two occasions on the edge of the lake.

One morepork nest was found on the block but its fate could not be monitored.

4.2 INVERTEBRATE MONITORING

4.2.1 Flying Insects

Objectives

There is insufficient knowledge on which to base specific objectives at this stage and much research is needed. Our initial interest was to monitor the impact of wasps and document the benefits of their control so our aim was to do the following:

- Collect malaise trap samples that can be later analysed by different species or groups.
- Liase with Landcare Research, Nelson and other entomologists to identify indicator species/groups (sensitive to wasp numbers) for analysis.
- Record changes in biomass of flying insects in treatment and non-treatment areas.

Methods

Twenty malaise traps were set up in the lower part of the project area, 10 located randomly in each of the two wasp poisoning blocks. A further 10 traps were placed at the Howard non-treatment site, 5 in an area at c. 500 m a.s.l. where Landcare Research had trapped for several seasons and 5 higher up c 650m in forest visually more similar to that at Rotoiti. Traps were set out in November at Rotoiti and January at the Howard and emptied weekly until mid-May. The trap sets were based on advice from Landcare facing a uniform direction and avoiding dead trees. Insects were collected and held in 75% alcohol.

Landcare Research were then contracted to provide advice on which insect groups should be counted in addition to wasps, that might be indicators of the benefits of wasp control. Based on their analyses of wasp diet and malaise trap samples, they prepared an identification guide covering three target groups: crane-flies (Tipulidae), bristle-flies (Tachinidae) and geometrid moths (Geometridae) (Toft and Dugdale, 1998). A training session was provided and initial sorting commenced.

Results

The numbers of wasps collected was presented in Section 3.5. Preliminary results are available for the other invertebrates but not all samples have yet been sorted and analysed. G. Sandlant analysed 30% of the 480 Rotoiti samples and 45% of the 160 Rotoroa ones using the groups identified by Toft and Dugdale (ibid.). He was unable to demonstrate any changes clearly attributable to wasp control (Appendix 4). The reasons for this were either the seasonal variability of numbers, natural differences in numbers between Rotoiti and Rotoroa, or the fact that they would logically take more than one season to be apparent due to the life cycle of a particular group. D. Jones is currently examining the same samples for beetles, but her results are not yet available.

Discussion

The malaise trapping set-up was based on Landcare work that suggested that ten traps was sufficient to provide a good measure of wasp numbers in an area (J. Beggs, pers. comm.). It remains to be seen how much variability there is between traps in numbers of other invertebrates, to determine whether this sample size gives an accurate picture for them. Preliminary results suggest that several seasons will be need before any patterns show up. More effective wasp control than we achieved this year will also obviously help to magnify any effect.

The current trapping regime is however about all that can be coped with logistically alongside other work. Analysing all the samples collected for insects other than wasps is probably too time-consuming and it is likely that we will only sub-sample for these. However all samples will be stored as a potential resource for other researchers.

4.2.2 Ground Invertebrates

Objective

- In the first year our objective was to collect limited data through malaise trapping and keep the issue of more specific surveys for ground invertebrates under review. Preliminary analysis of malaise trapping samples has shown that these include several weta species including two that have yet to be formally described (P. Johns, pers. comm.).

4.2.3 Land Snails (Powelliphanta rossiana patrickensi 'St Arnaud')

A small population of snails was located (in 1997) in tussock and mountain beech forest at tree line at the northern end of the block. Monitoring of this population is ongoing.

Objective

- Document changes in large land-snail populations as pest control proceeds.

Methods

The standard monitoring protocol (Walker, 1993) is being applied with the marking of permanent plots and the recording and measuring in them of all live and dead snails at intervals of several years. A few individual snails were collected for analysis to determine their taxonomic status. A search has been carried out for shells outside the original area.

Results

The initial plots were placed in 1996/97 (results in Appendix 1) and no further ones were completed this year. Morphological analyses of the snails collected suggest they represent a distinct taxon though chemical analyses have yet to be undertaken to confirm its relationship to other taxa. Searches have extended the area over which snails have been found to include the top of the beech forest adjacent to the original site.

4.2.4 *Beech Scale Insects (Ultracoelostoma spp.) and Honeydew Monitoring*

Objectives

- To document changes in honeydew levels associated with reduced numbers of wasps following their control.
- The honeydew produced by beech scale insects is an important resource for native fauna and taken in large quantities by wasps in summer. It is predicted that an increase in the honeydew resource should occur as a result of wasp control.

Methods

Honeydew was sampled using a standard protocol developed by Landcare Research. A 50 x 5 cm quadrat is placed on the north side of selected honeydew trees, 1.5 m from the ground. The numbers of threads, both with and without drops, are counted within the quadrat. Volume is measured by uptake into capillary tubes and sugar concentration obtained using a refractometer. It is then possible to calculate available honeydew expressed as energy (J/ m^2).

Honeydew sampling was to be undertaken once a week, at both the treatment site and Rotoroa non-treatment site, however this was not always possible as there was a requirement to allow at least two days after rain, preferably three. The samples were taken between 0800 and 1100 hours and monitoring started in December at Rotoiti and early January at Rotoroa and continued through to May. Reduced sampling using fewer trees was continued at Rotoiti over winter.

Results

TABLE 5: HONEYDEW ENERGY LEVELS - ROTOITI (TREATMENT AREA) (AS J/M^2)

	11 DEC	9 JAN	19 JAN	6 FEB	12 FEB	27 FEB	4 MAR	18 MAR	24 MAR	9 APR	17 APR	22 APR	5 MAY
Mean	10745	6386	6416	4874	4672	4162	10322	4019	12223	7901	20873	11781	531
SD	6766	5556	7995	7589	5839	6337	11908	4779	14965	12225	28857	14868	553
95% C.I	2965	1906	2480	2352	1819	1949	3690	1481	4638	3759	9095	4635	171

TABLE 6: HONEYDEW ENERGY LEVELS - ROTOROA (NON-TREATMENT AREA)

	15 JAN	22 JAN	7 FEB	13 FEB	27 FEB	5 MAR	17 MAR	26 MAR	9 APR	17 APR	22 APR	6 MAY
Mean	7124	2632	1186	1183	1927	3693	3491	2454	3528	2532	3615	2152
SD	5024	1176	949	891	2045	2812	4299	2481	2004	1892	3561	2112
95% C.I	3251	729	595	570	1253	1743	2784	1538	1088	1173	2207	1304

Discussion

The data showed that honeydew levels dropped off at both sites initially, then increased dramatically at Rotoiti after wasp control (Figure 9). The level stayed low at Rotoroa confirming this as a management effect. One of our targets was to keep energy in the honeydew above 2500 joules, which Landcare Research showed to be a level that birds could feed on productively. The level never went below this target at Rotoiti where we poisoned wasps but did at Rotoroa for a five- week period. Honeydew concentrations were affected significantly by weather which is thought to explain some of the fluctuations later in the season.

4.3 PLANT AND VEGETATION MONITORING

4.3.1 *Mistletoes*

Objectives

- Monitor the health of selected plants within the treatment and non-treatment areas, to test the hypothesis that the apparent decline is the result of possum browse.
- Record the anticipated recovery of the mistletoe population with sustained possum control.

Use mistletoes to monitor possum presence/impact within the treatment area.

Methods

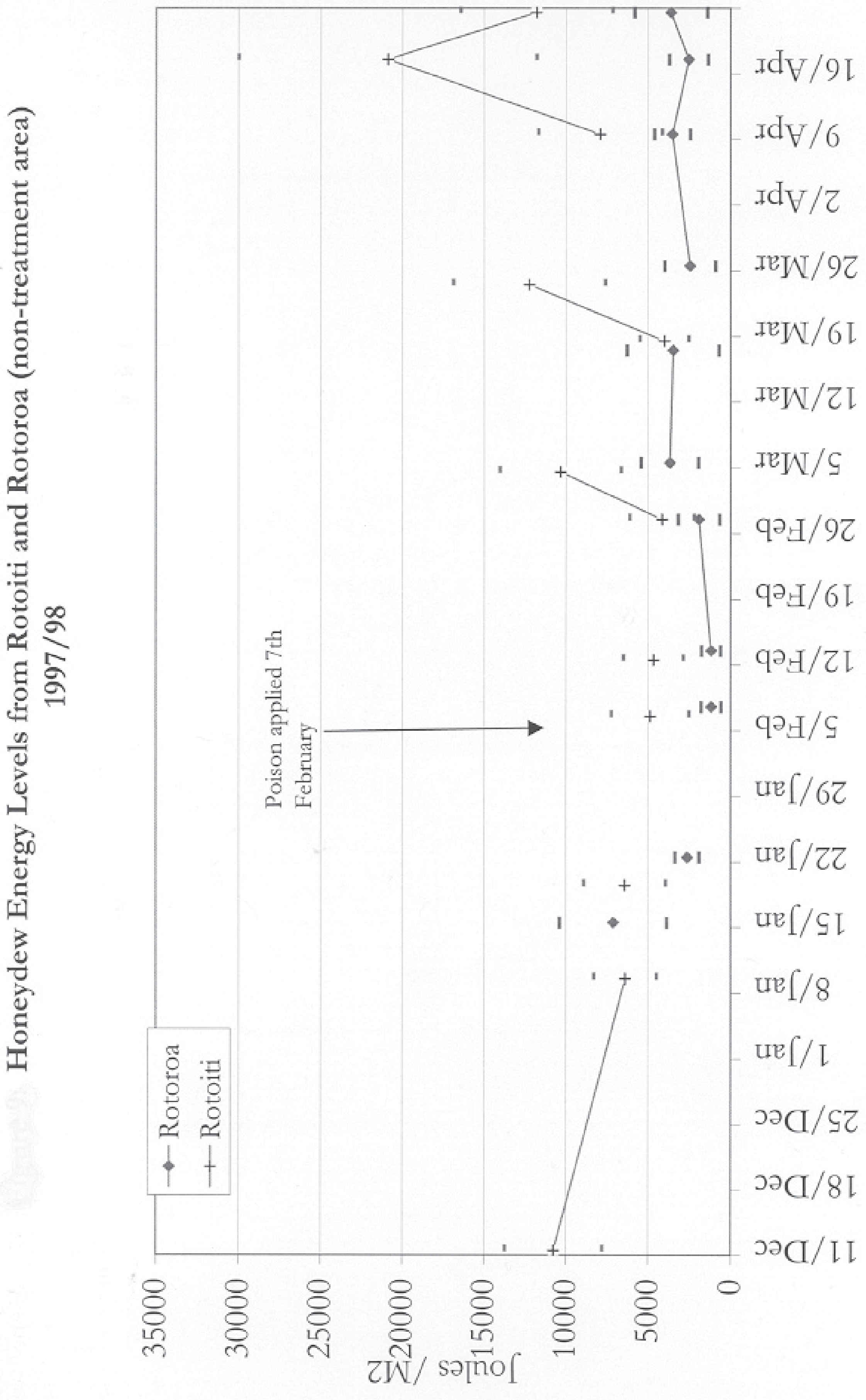
Plants have been located in the course of other work, rather than specific surveys (planned for 1998/99). All plants found to date have been tagged and a standard set of data collected from each, including measurements and amounts of browse. Such recording will continue on an annual basis with all new plants to be tagged until a suitable sample (30+) is obtained for each species.

Results

Peraxilla tetrapetala

Twenty-five plants have been reported and surveyed from the lake edge, almost to the alpine zone. Most are established on trunks ranging from 1m off the ground to the canopy, typically on *Nothofagus solandri* however *Nothofagus fusca* is also a popular host. Plant size ranges from dormant haustoria (no branches or leaves) to large cylindrical clumps surrounding a metre or more of the host. Visual observations suggest that possum browse

Fig. 9



Honeydew Energy Levels from Rotoiti and Rotoroa (non-treatment area)
1997/98
Rotoroa
Rotoiti
Poison applied 7th February
Joules /M2
35000
30000
25000
20000
15000
10000
5000
0
11/Dec
18/Dec
25/Dec
1/Jan
8/Jan
15/Jan
22/Jan
29/Jan
5/Feb
12/Feb
19/Feb
26/Feb
5/Mar
12/Mar
19/Mar
26/Mar
2/Apr
9/Apr
16/Apr

was widespread 4 – 6 years ago and that possum browse has been largely absent in the intervening years. However several plants suffered heavy attack in the months prior to the first treatment of the block with 1080 in October 1987.

Peraxilla colensoi

Seven plants have been reported and surveyed, all between the lake and the toe slopes of the St Arnaud Range. Five of these appear to be juveniles i.e. non-flowering (by size), and of the remaining two, one was totally defoliated (presumably possums) during the winter of 1987 and the other is attached to a heavy branch that has died back to near the trunk where the mistletoe is attached.

Alepis flavida

Only two plants have so far been found. As this is the most common mistletoe in nearby Kerr Bay and generally widespread in the Park, this is probably due to the difficulty of seeing them rather than a real scarcity. *Alepis* generally attach to branches, often in the outer foliage and have sparse foliage similar in colour to beech when viewed from beneath. One plant in Kerr Bay (not monitored) is established on a *Coprosma* 'tayloriae' shrub, indicating that there is potential to find this less fussy mistletoe on hosts other than beech.

Non-Treatment Sampling

As yet no non-treatment work has been undertaken, although a number of mistletoes are known in the Lakehead area and the opportunity exists to pick-up monitoring of a population previously studied by Landcare Research on Mt. Misery.

4.3.2 *Pittosporum patulum*

Pittosporum patulum is an endangered species subject to browse by deer and possums.

Objectives

- To use *Pittosporum patulum* to monitor possum presence/impact within the treatment area and to document improved growth and survival of seedlings in response to possum control.

Methods

As for mistletoes, though details of measurements taken differ.

Results

20 plants have been found within the project site. All are juveniles, ranging from 550 to c3000mm in height, and appear healthy. The plants are mainly above 800m a.s.l in mountain beech forest.

4.3.3 *Foliar Browse Index*

Objectives

- Foliar browse analyses are used to detect responses to herbivore control in relatively abundant, browse-sensitive plants.

Methods

A standard methodology developed by Landcare Research was used (Payton et al., 1997).

Results

Six transect lines have been surveyed to date and cedar, broadleaf, *P. simplex*, pohaka, lancewood and rata recorded, with the presence of wineberry and fuchsia also noted. Detailed computer analyses have yet to be undertaken but cedar appears to have the most die-back.

4.3.4 Vegetation Plots

Eleven standard 20m x 20m recce plots have been established in the treatment area, eight of which have been re-surveyed so far this autumn. The results have yet to be analysed. Three plots are established in non-treatment areas.

4.3.5 Deer Exclosure

One 20m x 20m exclosure fenced to exclude deer and domestic stock has been established in the block near to the farmland boundary, paired with a 20m x 20m recce plot.

4.3.6 Beech Seeding

Beech seed was collected from the project area and nearby Big Bush forest (continuing the sampling of seed trays established there by Landcare Research) – see Appendix ? for methodology). Preliminary analyses recorded the average number of seeds per tray as 12.9 from the project area and 12.7 from Big Bush. This represents an increase over the previous year which averaged no more than 2 seeds a tray, but is still not a major seedfall. Counting the number of seeds that are viable remains to be done to compare figures with those from 20+ years of sampling at Mt Misery and 5+ at Big Bush.

4.4 TOXIN MONITORING

Toxin monitoring falls into two areas: Firstly, monitoring the lake system (water and trout) to ensure no detectable level of toxin reaching it, and secondly monitoring non-target impacts: on deer (as part of a national system), on predators to assess the extent of secondary poisoning, and on native fauna.

4.4.1 Monitoring Lake System

Objective

- To detect any toxins entering the lake system and thus possibly available for uptake by people.

It was considered that there was really not a remote possibility of significant toxin entering the lake from a bait station operation. However to be able to prove this to the public (particularly in the case of 1080) it was felt worthwhile to sample water by the intake that supplies some of St Arnaud village. Trout are the other item extracted by people from the lake so these were also sampled. This may be most significant in mast years when trout are said to feed on mice and could possibly obtain toxin by this route.

Methods

Water was extracted directly from beside the water intake buoys at West Bay and Kerr Bay and samples frozen and sent to Landcare Research in Lincoln for analysis. Trout were gill netted in Kerr Bay by Nelson Marlborough Fish and Game and sections of muscle frozen and sent to Landcare.

Results

No 1080 or Talon was detected in any samples.

Discussion

The results found were as expected. Monitoring of water has now been discontinued for two reasons: the Kerr Bay intake, which was the closest to the mainland island, has been closed and the toxin now in use, brodifacoum is insoluble. It would re-start if this situation changed. It is intended to begin to test freshwater mussels at the mouths of streams running off the block as a means of examining possible accumulation of the insoluble brodifacoum over time.

4.4.2 *Non-Target Monitoring*

Results

The livers of the three deer shot in the block were tested for brodifacoum and none detected.

The livers of 6 trapped stoats and one silvereye found dead were tested for brodifacoum. Three of the stoats and one silvereye had no detectable levels, but the other three stoats contained 0.03, 0.03 and 0.27 microgrammes/g. of brodifacoum.

A female kea found dead at a nest in the block contained 0.46 microgrammes/g. of 1080.

Discussion

The two-week 1080 operation was associated with the death of a kea but no other birds were found dead on the block during or immediately following it. Negligible spill of poison was noted and all unused bait was removed at the end of the 2-week period so minimal non-target deaths would have been expected.

It is not certain that the level of 1080 found in the kea, 0.46 microgrammes/g. in a sample of muscle, was enough to have killed it as the LD50 for two birds tested ducks and weka are much higher at 5.0 and 8.0 respectively (Department of Conservation, 1997). However it seems likely that the female kea fed directly on poison in a station to achieve the level she had. Her mate remained in the block throughout the period with no apparent ill-effects so is assumed not to have done so. This difference in feeding behaviour may relate to the fact that the female would have been restricting her activity to the area of the nest as she was brooding and feeding chicks, while a bait station was less than 50m away.

Dead kea with residues of 1080 have been found dead after an aerial 1080 operation using unscreened carrot bait (Spurr & Powlesland, 1997), however this is the first time that individually marked kea have been monitored during a bait station operation using cereal-based bait. It will thus be important to further monitor the survival of kea during bait station operations to determine if this was a one-off event. It may also be wise not to run operations at a time that birds are expected to be looking after chicks. As with other species the loss of one or two individuals may be acceptable, for the population as a whole should show increased productivity as a result of reduced predation and/or enhanced food supplies.

Only a single intact bird (a silvereye) was found dead over the balance of the year (i.e. not the result of predation) with Talon in the bait stations and it tested negative, leading to the view that this operation had minimal non-target impacts on birds. The stoat results show that some animals had picked up the poison, almost certainly through feeding on poisoned rodents as very few possums remained after the 1080 operation to possibly pick up Talon. One of the stoats might have picked up enough Talon to have killed it if it had not been caught in a trap. Other stoats may well have died from the Talon operation and not been picked up in traps, to judge from the results of other studies.

5. Advocacy and Education

Objectives

The project's third overall objective is "*To advocate for indigenous species conservation and long-term pest control, by providing an accessible example of a functioning honeydew beech forest ecosystem, so a large number of people can experience a beech forest in as near-to-pristine condition as possible*". The advocacy and education programme under development aims is working towards this, and has identified five aims as follows:

- Develop a high public profile for the project, enhancing opportunities for its key message to be put across.
- Develop and seek opportunities to express the key message that the conservation of indigenous species requires the control of pests. The use of poisons, shooting and traps are currently the only practical options for this control.
- Develop opportunities to involve the St Arnaud and wider community in the project.
- Extend the work of the project into the St Arnaud area through the involvement of its community.
- Develop opportunities for schools to contribute to the project and achieve education outcomes at the same time.

5.1 DEVELOPING AND MAINTAINING PROJECT PROFILE

Development of the high profile began with the project launch in February 1997 (see Appendix 1) and continued with two activities in 1997/98.

1. *Launch of Wasp Control Programme and Strategic Business Plan – 21 January 1998 – Kerr Bay, Lake Rotoiti.*

   The project site was chosen by the Minister of Conservation to launch 'Restoring the Dawn Chorus', the Department's Strategic Business Plan 1998-2002, and our wasp control programme. Speeches by Hugh Logan, Director-General of Conservation, Nick Smith, Minister of Conservation and Dave Butler, Rotoiti Nature Recovery Project Co-ordinator before a small group of invited associates of the Department were followed by refreshments and the Minister donning a protective suit to apply the first wasp bait to a station. Good coverage was obtained in print media and radio.

2. *First Anniversary and Open Day – 19 April 1998 – Kerr Bay, Lake Rotoiti.*

The key objective of the event was to introduce the first year's results to the community in an atmosphere of fun and celebration.

The programme for the day consisted of:

1200 – 1300 hr:	Introduction and speeches by:
	Neil Clifton (Regional Conservator)
	Alan Saunders (National Mainland Island co-ordinator)
	Kerry Marshall (Mayor for Tasman)
	Nick Smith (Minister of Conservation)
	Presentation of a first anniversary cake, cut by a former chief Ranger of the Park, George Lyon together with the Minister.
	Presentation to the Minister of a large quilt made by Lake Rotoiti School pupils.
1300 – 1400 hr:	BBQ.
	Viewing displays showing the project's results.
	Games for children (project teeshirts as prizes) – 'name the robin', 'guess the number of wasps in the jar', 'project bingo', 'Revive Rotoiti quiz'.
1400 – 1500 hr:	Presentation of results by staff using a 12m painted 'Results Banner'.
1500 – 1600 hr:	Guided walks by staff.
1900 – 2400 hr:	Dance at the school hall with folk music and a caller.

The day was well attended in fine, sunny weather. It obtained good coverage in local media and positive feedback focussed particularly on the banner and the fact that the actual staff doing the project work presented their results with this. It was noted that most of the attendees in the afternoon were from the wider Nelson/Marlborough community whereas the St Arnaud community turned out in force for the dance (over 150 people in a small Community Hall).

5.2 COMMUNITY LIAISON

Revive Rotoiti Newsletter

The first two editions of our 4-page A4 newsletter 'Revive Rotoiti' were produced, one in August 1997 and the other in January 1998 (Appendix 2). Each is sent to an address list of over 400 including local St Arnaud residents and bach owners, individual and group 'associates' of the Nelson/Marlborough Conservancy, media and other offices of the Department. Positive feedback has been received after each issue and the media have often followed up stories based on what they have read. Newsletters or photocopies of them have been available at a display in the National Park Visitors Centre and about 50 a month are taken.

Meetings

The AGM of the St Arnaud Community Association was attended.

Groups given talks on the project during the year included:

Marlborough Forest & Bird (20 people)
Tasman Forest & Bird (15 people)
Nelson Luncheon Club (60 people)
Carleton College (US) students
Victoria University students
Canterbury University students

Groups given guided walks round the project site were:

Local Government Association (partners attending national meeting)
Japanese Girl Guides (sister city visit to Nelson)
Tasman & Marlborough Forest & Bird

5.3 MEDIA LIAISON

Significant coverage in local media, particularly the Nelson Mail, Marlborough Express, Leader (free community newspaper) and Fifeshire Radio, was obtained through the use of press releases and visits by journalists to the site. The main themes developed through the year were creating a possum-free future, kaka breeding and stoat control, and the country's largest wasp control operation. Filming at a kaka nest was conducted by a UK team with Tim Flannery for a section on mainland islands in a documentary based on his 'Future Eaters' book.

5.4 EDUCATION PROGRAMMES

We have worked with Lake Rotoiti School, a primary school taking children to Form 2, and Rotoiti Lodge, an outdoor education centre visited by all the secondary schools in the region.

The objective for Lake Rotoiti School was largely to build up a relationship between the children and the project to further build community support over the long term. Following on from their involvement in the launch of the project and the development of a logo and slogan in 1996/97, we undertook two activities this year. Firstly we focussed on the cat issue, spending time discussing the impacts of cats in the classroom and then asking the children to conduct a survey of cat ownership in the village. Secondly we involved the school in the project's anniversary event through the production of a quilt which was unveiled by the Minister of Conservation and now hangs in the Visitor Centre.

For Rotoiti Lodge we worked on the modification of field exercises undertaken by 6^{th} form biology classes through the involvement of a US volunteer. An exercise on the beech scale insect was altered to transfer the recording sites to the Rotoiti Nature Recovery Project area and to change the recording to provide data on honeydew abundance in a form that we can utilise. An exercise that used the St Arnaud Range track within the project area to look at altitudinal zonation and two others looking at freshwater systems were also re-drafted. A slide show was prepared that will be copied so that teachers can provide their own introduction to the project. While this was in production, DOC staff provided talks on the project to at least eight school groups visiting the lodge.

For the latter there is significant potential to develop education programmes that benefit the project's monitoring objectives. The Lodge currently works with 6-form biology students on forest description, honeydew monitoring, and niche separation in streams, and we have helped make changes to these programmes to fit the project (with the assistance of a US-based volunteer).

5.5 VISITOR SERVICES

A contract was let in 1997/98 for the planning of visitor services associated with the project. The resulting plan proposes developments in four areas over three years: a new short walk in a loop from Kerr Bay, interpretation on this walk, interpretation in the Visitor Centre and a gateway to the project area (Tourism Resource Consultants 1998). Initial work on implementing this plan is set down for 1998/99.

A display unit based on a 'time machine' concept which was produced by a Conservancy staff member for the project launch in 1997 was placed in the Visitor Centre for the year. In addition a specific display was put up to advise the public of the bait station poisoning programme with stuffed possum, bait station and part of a Conservancy display on the impacts of possums.

5.6 VOLUNTEER INVOLVEMENT

In 1997/98 the project provided opportunities for four types of volunteers. Firstly we had four overseas volunteers able to spend significant periods with the project, Stacy Gaylord from the US for almost six months, Matthew Low and Kate McInnes from Australia for two months and Jamie Craig from the UK for three months. Stacy, Matthew and Kate worked on activities additional to our work plan, the former carrying out distance sampling of bellbirds and preparing educational material (see below) and the latter two developing an anaesthetising programme for live capture of mustelids. Jamie who was here as a work-based placement from University participated more in all project activities. Secondly we have provided shorter periods of work-based training for local people through the Abel Tasman Enterprise Trust (2 individuals - both of whom went on to short-term contract employment with the project), Greymouth Polytechnic (1 individual - now on a seasonal contract with recreation staff), and Nelson Polytechnic (2 individuals). Thirdly we have had three weekly visits from the Whenua-iti Conservation Corps based near Motueka. Fourthly we have had two short-term volunteers assisting for a week or so, though we have discouraged this as potentially counter-productive and only taken people recommended by other projects.

In summary, the involvement of volunteers has either allowed us to do extra work outside our budgeted work programme, or provided individuals with a unique training opportunity where they could experience a wide range of conservation activities at the one site.

There is a further group of volunteers that we were not been able to develop programmes for initially, namely local people (mostly retired) who are keen to give a hand occasionally. Opportunities will be developed in 1998/99, particularly tree planting associated with track construction/re-routing.

6. Research

The project provided some support (travel expenses and Departmental accommodation) to two research students. Amanda Baird, an MSc student from Canterbury University conducted the robin research mentioned earlier (Section 4.1.3). Rex Barthlomew, on a Practicum placement from Victoria University, developed a project database using Access software (Section 7.4).

Occasional field support was provided to Josh Kemp an MSc student from Otago University studying kea and to a Landcare Research team investigating baits for possible aerial application to control wasps (a DOC-funded contract). A Lincoln University student, Ben Thompson, wrote an evaluation of the project as a course assignment. A group of 3rd-Year Forestry students from Canterbury University conducted a brief study of the spatial patterning of honeydew within the forest. Victoria University Earth Science students also conducted a field trip to the site sampling soils and invertebrates.

Letters of support were provided to three applicants seeking FORST Grants for work that would have included the project area (two Landcare Research-related and one private consultant), but none of these received funding.

At the end of the year a request was sent out to all Universities seeking proposals for students to work with the project in 1998/99 and listing our research needs. The Rotoiti Research Scholarship of $1000 annually would be awarded to one of these students for the work that was judged most relevant to the project and also valuable nationally.

7. Project Management

7.1 BUDGET

The project obtained a budget of $208,400 from the Department's National Priority Pool in 1997/98. A rough breakdown of expenditure is given below. In addition it was very pleasing to receive donations totalling $10,330 including one of $10,000 placed in a Trust Fund for the Rotoiti Research Scholarship (see Section 6).

Salaries – permanent staff:	$76,100
Salaries – contract staff:	$62,400
Overheads:	$3,500
Consultants and scientific advice:	$19,100
Field Equipment::	$14,300
Field Supplies:	$21,000
Vehicles and travel:	$6,100
Office equipment and supplies:	$2,200
Printing:	$1,400
Training:	$500
Miscellaneous:	$1,800

7.2 STAFFING

The project team consisted of two full-time permanent staff (one recruited half way through the year), several contract staff (one on a 1-year contract and others for up to 6 months), and three other permanent staff within the Area Office who contributed almost a person-year between them. This team received considerable support from other staff in the Area Office and Nelson/Marlborough Conservancy Office and the national Mainland Island Technical Co-ordinator, and advice from scientists within and outside the Department.

Week by week project management was carried out with the oversight of a Working Group of Area and Conservancy Staff which met every two months or so. An annual review and planning input was provided by a Technical Advisory Group.

Appendix 3 names the members of the team and two groups.

7.3 HEALTH AND SAFETY

Specific sections were developed for the St Arnaud Area's Hazard Database covering the possum control, wasp control and mustelid trapping and live capture programmes. These identified hazards and means to eliminate or minimise them. All project staff working over the summer received training in the injecting of adrenaline to manage any anaphylaxis associated with wasp stings, but no problems occurred. Staff who were to use Talon for significant periods were given blood tests before they started handling the poison and again at the end of their contracts or the end of the year. Talon was placed into 250g ziplock plastic bags in the workshop under controlled conditions for safer loading of stations (rather than tipping into stations from larger containers in the field).

7.4 DATA MANAGEMENT

Data was typically collected into field notebooks or data sheets and initially transferred to spreadsheets in Excel. However in January a project database was established by a Victoria University student using Access. The data entered into this is all linked to sites, typically using the bait station grid, with forms for each survey and each data point within a survey (see Figure 11).

8. Postscript

It seems appropriate while documenting a year of achievement to record some constraints and areas for improvement.

Constraints:

- There were significant delays in the appointment of a predator co-ordinator due to this position being caught up in re-structuring. These delays meant that the planned predator trapping regime could not be in place for the kaka breeding season.

- Fitting a programme of regular monitoring requiring good weather into other demands of the Area Office can be difficult. One quarterly session of bird monitoring was lost when staff were called out to a search and rescue followed by two fires.
- The production of an information sign to introduce people to the block was cancelled due to delays in producing a national standard for such signs.

Challenges – areas for improvement:

- It is difficult to work plan far ahead, due to the complexity of the programme some elements of which require good weather and others which have to respond to changing patterns of pest numbers and distribution.
- We aimed to provide each team with a varied work programme including the repetitive (e.g. loading bait stations) and the more interesting (monitoring birds). This was managed reasonably well but also added to the work planning challenge.

9. Acknowledgements

This year's results represent a significant team effort. Twelve Departmental staff have worked on the project from time to time from the St Arnaud Area Office (Appendix 2) supported by others from the Nelson/Marlborough Conservancy, Regional and Central Offices, including the kaka team from Science & Research. These people have been joined by some wonderful volunteers (Section 5.5). All should be acknowledged for their efforts and enthusiasm.

Sir David Attenborough in his 1997 address at the project launch identified that a project like this succeeds "…*if it has the scientific knowledge, if it has the decisive backing financially and intellectually, and if it has the goodwill of the people who actually live here.*"

The exciting nature of the project and the openness of the Departmental team have lead to the involvement of many scientists and others from outside the Department, both as members of our Advisory Group (Appendix 2) and in other capacities. These people have helped ensure the knowledge and intellectual backing. The support on the financial side from staff up the Department's line has been unwavering and the interest taken in the project by the Director-General and the Minister of Conservation has been a major boost to project staff.

Finally we have enjoyed the goodwill and support of the people of the local area. The St Arnaud Community has participated in several activities, and we would like to acknowledge the contribution of Lake Rotoiti School and its teachers. The iwi, Ngati Apa, have lent their warm support. We would also like to single out Phillip and Fiona Borlase and thank them for allowing us access through their farm adjacent to the National Park.

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Appendix 1: Annual Summary 1996/97

INTRODUCTION

The 1996/97 year marked the start of this project. A full-time co-ordinator was appointed in October 1996 and a field programme began with the recruitment of contract staff and Taskforce Green workers in January 1997. This programme concentrated on the development of a track system and baseline monitoring work. This is a brief draft summary in lieu of an annual report given the absence of significant activity in many areas.

FIELD PROGRAMME

Track Development

A significant time has been put in to cutting management tracks across the hill, contouring using altimeters at higher levels and using compass bearings at lower levels. Higher tracks are c. 150m apart and lower tracks (below c950m a.s.l.) c. 100m apart. Tracks have been cut with minimal impact using a combination of chainsaws and slashers. Upper sections were done first due to the significant wasp hazard found in lower parts until late April.

Beech Seedfall

Twenty beech seedfall traps (metal funnels of DSIR design) were erected in the project area, at varying altitudes, 6 under largely mountain beech, 8 under silver beech and 6 under red beech. A further 24 traps set in nearby Big Bush by Landcare Research, Nelson were also run by project staff this year. Traps were emptied in April and June. April's sample produced very little seed (few traps had more than 4-5 seeds) and June's looks similar though it has not yet been analysed in detail.

Weather data has been analysed in an effort to predict the level of beech seeding expected in 1997/98. Higher than average temperatures in January to April have been found to be associated with heavy seeding the following year. However 1997's temperatures were generally lower than average so heavy seeding is not predicted by this measure. Looking at a contrary variable, beeches have not seeded significantly since 1995 so the trees should have built up enough reserves to do so again by now, if climatic conditions were favourable. Combining the two we would predict some seeding but not a heavy crop. The next indicator will be the level of flowering in the spring.

Vegetation Plots

Eight 20m x 20m vegetation plots have been established in the project area at different altitudes using the Recce description method of Allen & McLennan (1983). Three are situated around 620m a.s.l. in the strip of characteristic lake edge vegetation, one just slightly higher than this, and four between 1000m and 1300m. Further plots are planned at intermediate altitudes now that tracks have been completed there. Single plots have been established at the project's two non-treatment areas and the sites for others chosen. Computer software for analysis of all plot data has been obtained from Landcare Research.

Bird Counts

Standard 5-minute bird counts have been conducted in the project area and at both non-treatment areas.

Land Snail Monitoring

Finding a *Powelliphanta* shell near timberline in the project area was quite a surprise as none were known from this part of the St Arnaud Range. Better still was the discovery of a healthy population when plots were put in with the help of Kath Walker of the Conservancy Office. Thirteen live snails were found in six 5m x 5m plots, most deep under the sub-alpine tussock but some in vegetation under mountain beeches at tree-line. The snails are considered close to *Powelliphanta rossiana patrickensis* though they may be a new one and the results of genetic analysis are eagerly awaited.

Rodent Monitoring

Monitoring of mice and rats using snap traps set in tunnels has been carried out in the project area and the Howard non-treatment area. Despite c90 trap nights we have not managed to catch a single rodent - though a few traps were set off. An experiment using bait stations (see below) was transferred from the project area when insufficient mice were found there, reinforcing the idea that rodent populations were very low in the area this autumn. This is likely to tie in to the low availability of beech seed for the last two years.

Mouse Research

Research was undertaken by Conservancy staff and a private consultant to examine the question of whether a broadifacoum poisoning operation based on Philproof bait stations was likely to provide an effective method of mouse control. Four station 'designs' were used (with 20 stations of each), the first unmodified Philproofs at the standard height (c.30cm), the second Philproofs at standard height with sticks fixed to facilitate access, the third Philproof stations placed on the ground, and the fourth Novacoil stations on the ground. The experiment was initially set up in the project area. However only one Novacoil station showed signs of mouse activity - one animal being caught on video - so it was moved to a small island in Nelson Harbour.

The results were as follows: Using 100g as a maximum daily take, on average the full 100g was taken out of Philproofs and Novacoils on the ground, 40g from Philproofs with sticks and 0g from Philproofs without sticks.

Lack of mice also prevented testing of the effectiveness of different spacings of stations in the project area and the issue of possible exclusion of mice from bait stations by rats. (The island used had no rats or possums, only large numbers of mice).

ADVOCACY AND EDUCATION

Project Launch - 2nd February

A perfect summer's day on the shores of Lake Rotoiti began with a moving welcome by local iwi, responded to by Tutekawa Wyllie M.P on behalf of the visitors and followed with speeches from the Minister of Conservation, Dr Nick Smith, the Mayor of Tasman District, Kerry Marshall, and Sir David Attenborough who officially launched the project. Children of Lake Rotoiti School presented the Minister with their pledge and read poems and the poster produced for the competition were displayed. A large crowd of between 400-500 attended, some going on guided walks in the project area, and the event was covered by TVNZ News, National Radio and local media.

Activities at the Local Primary School:

1. Poster and slogan competition. Following a talk on the project by the co-ordinator, pupils were asked to draw posters depicting their idea of the project and come up with a logo and slogan for it. Small prizes were awarded across three age groups with the winning slogan being 'Revive Rotoiti' about a logo of a kaka.

2. Participation in project launch. Pupils were invited to write poems about the project and read them at the launch and the school also wrote its own pledge supporting the project which was presented to the Minister of Conservation.

3. Cat survey. After a morning's discussion about cats, looking at differences (and similarities) of pets and feral animals and the damage they can cause, the pupils participated in a survey to record pet and stray cats in St Arnaud village and look at the animals they were catching. Pupils approached this task very enthusiastically though the results have yet to be received. The cat survey results will be used to identify pets when we begin live trapping on the project boundaries shortly.

Public Meetings and Talks:

One public meeting was held in late 1996 in the St Arnaud Community Hall to introduce the project top a small turn-out. (Following this a Fact Sheet was sent to all Community Association members.) The Co-ordinator has given several talks to school groups visiting Rotoiti Lodge.

INFRASTRUCTURE

An office extension was built with space for two desks and associated work-benches and shelving. A separate poison store was added to the workshop.

Appendix 2: Personnel

Staff employed by the project in the course of the year:

David Butler	Paul McArthur
Darren Peters	Graeme Omlo
Nic Etheridge	Graeme Ure
Moira Pryde	Hannah Edmonds
Frank van Kampen	James Thorneycroft
Russell Frost	Mark King

Working Group Members:

Dave Butler, Don Bogie, Paul McArthur, Darren Peters – St Arnaud Area
Peter Gaze, Mike Hawes, Andrew Macalister – Nelson/Marlborough Conservancy

Advisory Group Members:

Jacqueline Beggs, Peter Wilson (Landcare Research, Nelson)
Eric Spurr (Landcare Research, Lincoln)
David Norton, School of Forestry, Canterbury University
Rowley Taylor, Nelson
Martin Heine, Nelson/Marlborough Conservancy

Working group members

Appendix 3: Revive Rotoiti Newsletter

Follows.

AN EXAMPLE OF A DATA SHEET FOR ONE TRAP ROUND

APPROXIMATE LOCATION OF LINES ON WHICH BAIT
STATIONS ARE PLACED EVERY 100M (150M ON TOP 3 LINES).

DISTRIBUTION OF BAIT TAKE DURING PRE-FEEDING FOR 1080 OPERATIONS.

DISTRIBUTION OF TAKE OF TALON BAIT (18/12/98-6/3/98).

LOCATION OF KILL-TRAPPING LINES FOR MUSTELIDS.

LOCATION OF BLOCKS WHERE WASP CONTROL
WAS UNDERTAKEN (BLOCK A BAIT STATIONS
AT 100M X 50M IN SPACING, BLOCK B 50M X 50M.

LEGEND

Line	Name	No. of Traps
1	Borlase Boundary	49
2	Snail Boundary	45
3	St Arnaud Range	46
4	Borlase Stream	22
5	Vet Legends	29
6	Lake Edge	39
7	Grunt Boundary	64

Bait station lines.

Bait station from which all 1080 pre-feed was removed.

Bait station from which all Talon was removed.