Rotoiti Nature Recovery Project
Annual Report July 2002 – June 2003

ST ARNAUD'S MAINLAND ISLAND, NELSON LAKES NATIONAL PARK

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Executive Summary

This report documents the seventh year of the Rotoiti Nature Recovery Project (RNRP) from 1 July 2002 to 30 June 2003 (based on the Department's financial year) which was the sixth season of comprehensive pest control. Good progress was made in advancing all three of the projects primary objectives.

KEY RESULTS

Possum Control – Vegetation Response

Possum numbers were maintained at very low levels in the treatment area for the sixth year in a row with no browse observed on the sensitive plant species monitored. Wax chew sticks for result monitoring show a reasonable correlation with residual trap catch indices. Pressure on surrounding populations has been applied via Animal Health Board operations.

Rodent Control

A significant reduction in rat activity was achieved compared to non-treatment areas. Tracking tunnel indices were above target levels each quarter, suggesting further work is needed to determine if trapping can cost-effectively reduce numbers to the same levels achieved previously by poisoning. Both effectively targeting mice and removing the negative influence of mice upon targeted rat control remain areas of concern for this programme.

Mustelid Control

This was the first full year of mustelid trapping over the expanded control area of 5000 hectares. A low to moderate mustelid year was experienced based upon capture records. This was also the first year that an independent measure (tracking tunnel index) of stoat activity was available. It showed that stoat activity was significantly lower in the project area due to trapping.

Wasp Control –Invertebrate Response

An expanded area of wasp control (1100ha) was successfully treated. Wasp numbers were reduced below the ecological damage threshold for a limited period of time only; however a population difference between sites was demonstrated over a period of ten weeks. This was the last season that the toxin Fipronil was available to us. The response of native invertebrates is still difficult to determine.

Response of Native Fauna

Kaka did not breed this year as there was negligible seeding of beech trees. Several kaka transmitters failed before expected impacting on the monitoring of this species.

The number of territories held by robins in the study area was less than in previous years, suggesting rodent control and/or mustelid control was not as effective this year.

Bird counts suggested that the increases in some species seen in the earlier years had tailed off. More data is needed to determine if this might be due to higher rat numbers, reduced mustelid trapping density, populations approaching carrying capacity or other factors.

The first repeat monitoring of the *Powelliphanta* snail population high up in the core area suggested this was stable or increasing slightly.

Reintroductions

After extensive consultation within and outside the Department it was decided to defer the tieke transfer. Following endorsement in principle from the Kiwi Recovery Group the initial planning towards a great-spotted kiwi transfer was begun.

Advocacy and Education

The visitor centre display on the RNRP was completely redesigned and a new pamphlet has been produced. One edition of Revive Rotoiti was printed and distributed to 520 recipients. Talks and or/tutorial walks were given to schools and several tertiary classes almost every week of the school year.

Volunteers and Friends of Rotoiti

An enormous amount of work was carried out by volunteers this year totalling 376 days. They ranged from nine individuals, Friends of Rotoiti, two local Conservation Corps groups and Nelson Marlborough Institute of Technology Trainee Rangers class. The Friends now have over 30 members including groups such as 50+ tramping club and Forest and Bird making up a 'member' each.

Skill Sharing

Numerous requests for information and advice were received from internal and external sources across a variety of pest control and monitoring programmes. Staff also attended the Mainland Island Hui at Lewis Pass where valuable information transfer occurred. The Project team were also invited to be involved in national projects run by both the Department and Landcare Research and these opportunities were taken up.

Research

Rotoiti Nature Recovery Project scholarships were awarded to two Canterbury University students carrying out bellbird and beech scale insect research within the Project area. Other students from Victoria, Canterbury, Waikato and Otago also took advantage of the area throughout the year. Landcare continued their wasp research and brodifacoum involvement and stoat carcasses were sent to Science and Research as part of their national diet analysis.

1. Introduction

The Rotoiti Nature Recovery Project is the title given to the mainland island project. It is based on beech forest containing honeydew, and is one of six such projects funded within a national programme focussed on different habitats. The project area was extended in 2002 from the original 825ha on the slopes of the St Arnaud Range, Nelson Lakes National Park, to take in further forest in the Park to the north and south and part of Big Bush Conservation Area. Figure 1 shows that different parts of the extended area are targeted for different pests and that some of the trapping is conducted by the recently-formed Friends of Rotoiti community group. The overall site was chosen as representative of a habitat type that occupies about 1 million hectares or 15% of New Zealand's indigenous forests (Beggs 2001) 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 original project area is available in the project's Strategic Plan (Butler, 1998). (Internal document staao-10245).

The same two non-treatment sites were used as in previous years at Lakehead (Figure 2), situated at the head of Lake Rotoiti c.5km from the treatment area covering similar aspect and altitudinal range, and Rotoroa or Mt Misery (Figure 3), situated at Lake Rotoroa 18km to the west of Lake Rotoiti, which extends to lower altitude.

This report presents its results within the project's three objectives (2.0 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. More detail on methodologies or past results can be found in the project's 1998-2001 Triennial Report (Butler, 2003) and 2001-02 Annual Report (Butler et al. 2003).

2. Project Goal and Objectives

Goal

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

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 show increased growth/productivity and further plants re-establish (see section 4.5 Plant and Vegetation Monitoring)
- impacts on invertebrates, particularly land-snails 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 is currently in place).

Performance Targets

Result - residual index using trap catch methodology (Warburton 1997) of < 2% all years.

Outcome – see section 4.5 Plant and Vegetation Monitoring.

Methods

Control

Three types of control methods have been applied this year, poisoning using Feretox and trapping using two different traps. Where and when they have been applied has depended on kill results and on observations of possum activity.

Northern Boundary

Feratox™ pellets in Ferafeed were placed in plastic bags according to possum sign along the Borlase farm boundary, in areas where animals were caught in previous years. Any damaged bags were replaced as needed.

Pincushion and Tincan Ridges

No possum control was carried out in these areas.

Snail Ridge

Feratox™ pellets in Ferafeed were placed in plastic bags at established marked stations.

Totara Ridge

Feratox™ pellets in Ferafeed were placed in plastic bags at established marked stations and Victor leg holds were placed for one three night session on raised sets.

Trap-catch Monitoring

Annual monitoring of possum numbers was undertaken in April 2003 in the treatment area and non-treatment site at Lakehead using the standard method of Warburton (1997) (Version 4.0). Raised sets were used. The methodology was unchanged from that used in 2001-02.

Chew Stick Monitoring

Possum interference with wax chew sticks (designed by Pest Control Research as precursor to Wax-Tag™) was measured on four occasions. The objectives of this monitoring were to:

- Identify seasonal patterns in possum activity;
- Identify 'hot spots' of possum activity;
- Calibrate a potentially low-cost possum monitoring method with the national standard (leg hold trapping to NPCA protocol) at low possum densities;
- Observe the difference in interference rate between one night and three night exposure.

Monitoring was undertaken concurrently with rodent and mustelid tracking tunnel surveys in the possum treated area (RNRP core) at quarterly intervals (February, May, August, November) using the same sites. Chew sticks were set for one night with the rodent monitor, and then replaced if chewed and run a further three nights with the mustelid monitor. It is acknowledged this gives a total of four night's exposure; however the checking after the first night allows each group to be analysed independently. All marked chew sticks were analysed and bite marks attributed to possum, rodent, bird etc. Unmarked chew sticks were recycled and re-used at subsequent monitors.

Results

Control

Kills of Buffer Operation

Northern boundary	BMI Kill Trapping	12 possums recovered
Snail Ridge	Feratox	0 possums recovered
Totara Ridge	Feratox	4 possums recovered

Non-target Kills

No non-target kills were recorded.

Trap-catch Monitoring

Possum trap-catch monitoring was undertaken during the week of 7 – 10 April 2003 with fine weather throughout. All lines were set on a bearing of 110 degrees magnetic.

RNRP Results

2 possums / 600 trap nights = 0.33% RTC (Standard Error = 0.22).

Non-treatment Area Results

10 possums / 300 trap nights = 3.33% RTC (Standard Error = 2.72).

Chew Stick Monitoring

TABLE 1. POSSUM CHEW STICK RESULTS

	% STICKS CHEWED (+/- S.D.)			
	August	December	February	May
One night	1 (1)	1 (1)	0 (0)	5 (3)
Three nights	Not run	Not run	1 (1)	1 (1)

There are some unresolved issues of independence between sample units. It is entirely possible for a single possum to chew more than one consecutive station, for example the May monitor yielded five chews (5%) but at two sites (at one site two consecutive stations, at the other three of four consecutive stations). A protocol for use of wax chew sticks as a result monitoring tool is under development. An advantage of this method is that it can be undertaken at little extra cost to the field programme as the lines are being worked for other purposes (tracking tunnels) and there appears to be a reasonable correlation between trap catch (0.33%) and chew sticks (0-5%).

Ground Operations Surrounding the Project Area

Three Animal Health Board (AHB) possum control operations were conducted this year in areas to the north and west of the project area. The principle contractor was Southern Pest Management and the operational details were as follows:

Tophouse Operation (Figure 4)

Subcontractor: Target Pest Contracting

Hand-laid toxins: 1080 (north of 3 km line), Feratox and trapping.

Upper Motueka Operation (Figure 5)

Subcontractor: Stratford Pest Control

Hand-laid toxins: 1080 (north of Beebys walking track), Feratox, cyanide paste, and trapping.

Rainbow/Upper Wairau Operation (Figure 6)

Subcontractor: Marlborough District Council

During 2002-2003, a maintenance control operation using trapping and Feratox, was carried out on the areas not treated during the 2001-2002 1080 aerial operation.

Discussion

These results continue the pattern of significantly reduced possum numbers in the treatment area. There is evidently continuing pressure from possums along the farm boundaries and effort there has been increased to prevent an increase in numbers penetrating the core area. The projects control efforts will have been assisted to some extent by the Animal Health Board's continued possum ground-based maintenance control in the Tophouse, Upper Motueka, and Rainbow/Upper Wairau areas.

The trap-catch results in the non-treatment area were the lowest (3.33%) since the project began. It seems likely that this indicates possum numbers have been reduced there due to project activities, particularly stoat trapping (section 3.3) which kills significant numbers of possums as a by-catch.

The continuing benefits of possum control are also evident in the health of mistletoes and other palatable plants (section 4.5).

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 section 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.

Performance Measures

Operational

- Grid spacing effectiveness will be examined at the end of the financial year, with indicative analyses done prior to Business Planning (April 2003).
- A review of the rat kill trapping programme will be undertaken by June 2003.
- Non-target captures will be analysed against trap tunnel entrance size by June 2003.
- Traps will be checked in accordance with prescribed frequency (see methods below).

Biological

- Rat tracking tunnel indices will be reduced to and maintained at less than 5%. If this reduction is unable to be achieved the shape of the Rotoiti tracking curve will be compared to the non-treatment areas before any move to contingencies is made.
- Robin nesting success at Rotoiti will be inferred to be significantly different from Rotoroa with the difference attributable to reduced rat predation from tracking tunnel results. Past relationships between robin nest failure and adult losses to tracking rates will drive this.

Methods

Control – targeted trapping

Control was undertaken in 2002-03 by trapping as in the previous year. There are 1,042 trap sites each consisting of one Victor Professional rat trap in a coreflute cover per hectare. Delivery spacing is 100 x 100m grid in the RNRP core area, and 200 x 50 m in Duckpond Stream catchment of Big Bush. Traps are baited with peanut butter and oats, and checked fortnightly from December to May and monthly for the remainder of the year.

Friends of Rotoiti (FOR) had their first full year of rat trapping following establishment of their trapping network throughout Black Hill, Black Valley, St Arnaud village and the peninsula in December 2001. The FOR trap grid aims to replicate that of the RNRP (one trap/ha at 200 x 50 m grid) but uses mostly walking tracks and roads to approximate this. Only two tracks have been cut for FOR trapping. All trap tunnels used by the FOR are white, and all have a larger entrance than RNRP of 60 x 60mm. (Figure 7)

Data management

An Access database for capture of rat trapping information was established at the inception of this programme in 2000. Subsequent use had shown this to be cumbersome for both data entry and extraction. It was re-modelled with the support of Graeme Elliott (DOC Scientist, Biodiversity Recovery Unit) this year.

Non-targeted trapping

Rodents are captured as non-target species during both possum and mustelid control.

Monitoring

Tracking tunnels networks for rodents existed at Rotoiti and Rotoroa prior to this year (nine and five lines respectively, each consisting of 20 tunnels at 50m intervals).

Following previous disturbance from possums some tunnels had been replaced (or established new) with tunnels 1m in length, allowing the tray to be inserted 23 cm (> 1 possum front leg length) into tunnel. Tunnels are constructed of galvanised steel or coreflute. The weight of the steel is intended to resist being tumbled on steep terrain, particularly where soil does not allow pegging. All tunnels for rodent monitoring are centrally-baited with peanut butter, as opposed to end-baited as per the Department's Standard Operating Procedure (SOP), to retain continuity with the methodology previously used at this site. Tracking media are ferric nitrate and tannic acid treated papers.

New mustelid tracking lines were established this year which also provide rodent information. See Table 11 and maps in Section 3.3 for detail of network (mustelid section).

Tracking surveys are run quarterly (August, November, February and May).

Results

Trapping effort

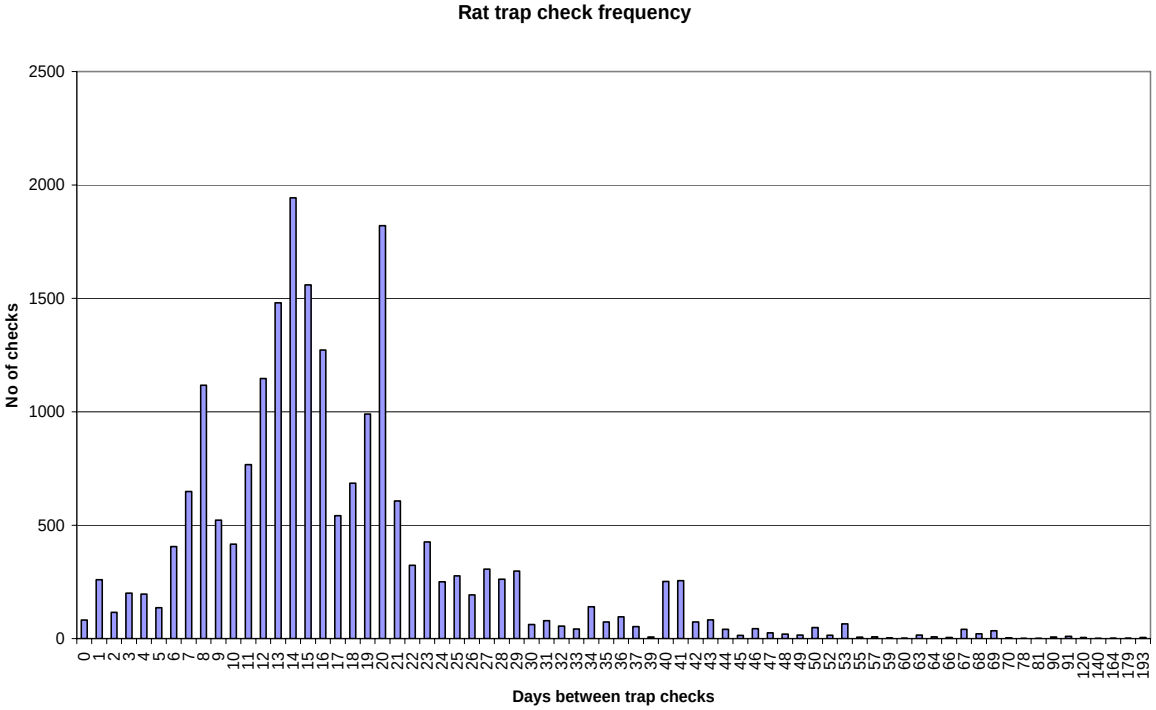
The prescribed operational performance measure was for fortnightly servicing of all traps from December to May and monthly for the remainder of the year. An exception was made for the higher altitude 'H' and 'G' lines which were to be serviced as required, based upon activity rates on the immediately lower altitude lines. Excluding 'H' and 'G' it is clear that this checking regime has not been met consistently. The upper end of the checking range in Table 2 below shows that some traps exceeded the maximum trap check frequency (monthly) by a factor of nearly three. Most data fits to a normal curve around the mean (+/- 1 standard deviation).

TABLE 2. TRAP CHECK FREQUENCY

	EXPOSURE (TRAP NIGHTS BETWEEN CHECKS)			
Site	Range	Median	Mean	Std. Deviation
All traps	1 – 193	15	17.3	10.7
All traps*	1 – 81	15	17	9.5
RNRP core*	1 – 81	14	17.03	10.2
Big Bush	1 – 78	16	18	8.8

*Excludes high altitude 'H' and 'G' lines.

GRAPH 1.



One cause of loss of trap checks was an incidence of vandalism in the Big Bush rat control area where one line (c.20 traps) was removed, including all tunnels and markers. This was partially restored and vandalism repeated. After inquiries involving police the line was restored again and remained intact for the remainder of the season. A total of 48 staff hours were incurred in investigation and restoration.

Targeted Trapping

Slightly higher numbers of rats were caught in the core area in rat traps this year compared with the last, but greater numbers of mice probably reflecting the beech seedfall in autumn 2002. This is expressed in Table 3 below as a ratio.

TABLE 3. TOTAL CAPTURES FROM RNRP CORE RAT TRAPS BY YEAR

	Rat	Mice	Stoat	Weasel	Total
2000/01 *	2174	4093	18	14	6299
2001/02	708	341	4	5	1058
2002/03	925	1210	1	2	2138
Ratio 2000/1:2001/2	3.1:1	12:1	4.5:1	2.8:1	
Ratio 2001/2:2002/3	0.8:1	0.3:1	4:1	2.5:1	

* Not a full year (traps opened August)

TABLE 4. TOTAL CAPTURE FROM BIG BUSH RAT TRAPS BY YEAR

	Rat	Mice	Stoat	Weasel	Total
2001/02*	241	855	1	0	1097
2002/03	240	851	1	0	1092
Ratio 2001/02: 2002/03	1:1	1:1	1:1		

* Not a full year (traps opened October)

Rat capture peaks over the year were July, February-March and then June. Rat captures initially exceeded mouse captures at the beginning of the year (July), but were overtaken by mice in September which continued until they became equal again at June 2003.

Trap covers in the core area are alternately black and white. Captures by cover colour were similar to last year with no preference by any species for either colour. Colour choice has now been tested in both high and low pest years and is shown to have no significant effect upon trap efficacy.

TABLE 5. RAT TRAP CAPTURES BY COLOUR COVER

	Mice		Rat		Stoat		Weasel		Total	
	Black	White	Black	White	Black	White	Black	White	Black	White
2000/01	1988 (48.6%)	2105 (51.4%)	1131 (52.0%)	1043 (48.0%)	8 (44.4%)	10 (55.6%)	7 (50%)	7 (50%)	3134 (49.8%)	3165 (50.2%)
2001/02	176 (51.6%)	165 (48.3%)	385 (54.4%)	323 (45.6%)	2 (50%)	2 (50%)	3 (60%)	2 (40%)	566 (53.5%)	492 (46.5%)
2002/03	583 (48.2%)	627 (51.8%)	474 (51.2%)	451 (48.8%)	1 (100%)	0 (0%)	1 (50%)	1 (50%)	1059 (49.5%)	1079 (50.5%)
Total to June 2003	2747 (48.7%)	2897 (51.3%)	1990 (52.3%)	1817 (47.7%)	11 47.8%)	12 (52.2%)	11 (52.4%)	10 (47.6%)	4759 (50.1%)	4736 (49.9%)

Cover colour preference by sex of trapped animal was examined, but is confounded by the high proportion (c.50%) of unsexed animals due to decomposition in the trap, or skill level/willingness of volunteers to sex. Mice were unsexed as they are considered non-targets.

Captures By Site

All rat traps are assigned to one of four major 'trap sites' - RNRP (core, perimeter north and perimeter south) and Big Bush. Results presented in Table 6 for RNRP includes all three RNRP sub-sites.

TABLE 6. RAT CAPTURES BY SITE

	Big Bush	Core	Perimeter N.	Perimeter S.
% of traps	31.9	42.0	17.6	8.5
% all captures	33.8	38.5	19.6	8.1
Ratio % of all captures: % of traps	1.060	0.917	1.114	0.953
% of mouse captures	41.3	33.9	17.9	6.9
Ratio % of mouse captures: % of traps	1.295	0.807	1.017	0.812
% of rat captures	20.6	46.7	22.7	10.0
Ratio % of rat captures: % of traps	0.646	1.112	1.290	1.176

If all traps have an equal probability of capture then the ratio of captures to traps would equal one. Good 'fits' to this model are all sites for all species. At a species level Big Bush falls short for rats and exceeds for mice; 'core' and 'perimeter south' fall short for mice; and 'perimeter north' exceeds for rats.

This data should be matched against trap effort to ensure that probability of check for all traps is equal to one. Given the variance of trap check frequency it is unlikely that this is true.

This analysis, when corrected and checked for statistical significance can provide guidance to priority areas for rat trapping effort, including augmentation by additional traps or trap checks.

Non-target Captures

One rifleman was caught (trap TD7, 12 February 2003), and one silvereye (DRF7, 18 July 2002). There were no other bird captures. One stoat (trap GB15, 29 January 2003) and two weasels (traps HH7, 9 January 2003 and CL2, 2 April 2003). Mustelid captures are less than previous years (32 in 2000-01, and 9 in 2001-02).

Grid Space Efficacy

No data is presented as this experiment is confounded by lack of adherence to prescribed trap checking frequency regime. Trap check efficiency is greater with the 200 x 50 m grid space in Big Bush with more traps checked per trapper hour.

Friends of Rotoiti Trapping

TABLE 7. FRIENDS OF ROTOITI RAT TRAP CAPTURES

	Rat	Mouse	Hedgehog	Stoat	Ferret	Weasel
2001/02*	74	102	12	1		
2002/03	151	951	11	2	1	1

* December 2001 to June 2002

Friends of Rotoiti Non-target Captures

2002-03 yielded 15 mammalian non target captures (11 hedgehogs, 4 mustelids), 8 birds (2 blackbird, 1 chaffinch, 3 house sparrows, and 2 silvereyes) and one whistling tree frog.

Non-targeted trapping

279 rats were caught in RNRP Fenn traps for mustelid control. 32 rats were caught in Friends of Rotoiti Fenn traps.

Tracking Tunnel Monitoring:

Rodent tracking results:

Five rodent tracking tunnel surveys were undertaken this year (July, August, December, February and May), with the first excluding the Rotoroa site.

GRAPH 2.

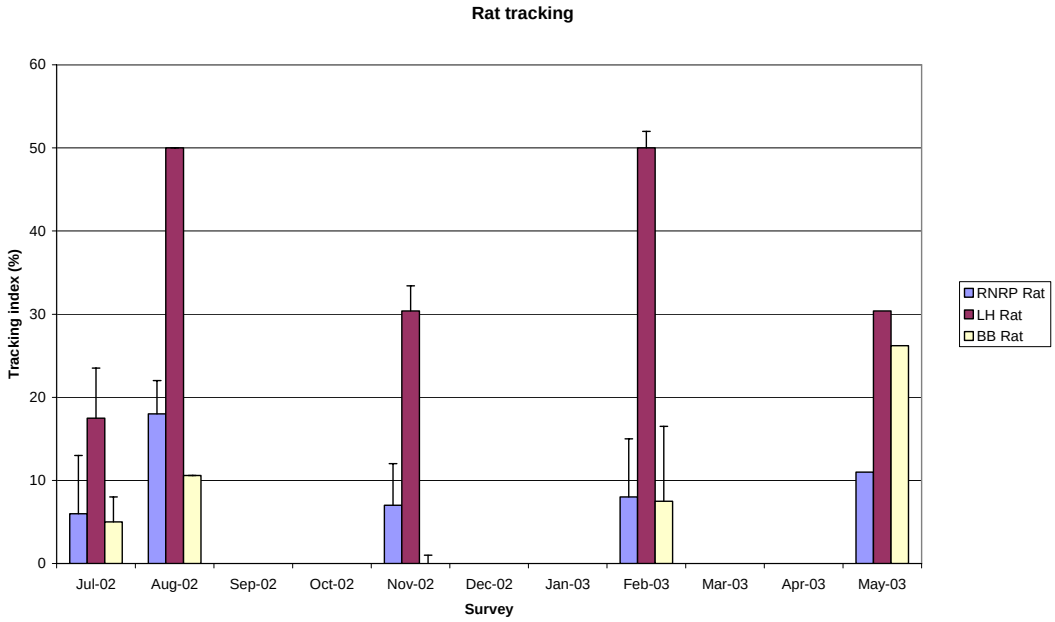


TABLE 8. 2002-03 RAT TRACKING RESULTS

Date	RNRP	Big Bush	Lakehead	Rotoroa
July 02	6%	5%	17.5%	
August 02	18%	10.6%	50%	7.1%
December 02	7%	0	30.4%	3.2%
February 03	8%	7.5%	50%	- *
May 03	11%	26.2%	30.4%	0%

*No monitor due to poor weather.

A further two surveys (October and April) were undertaken on the 'Loop' line in the RNRP core as a quick index in response to concerns regarding high trap occupancy rates and a high incidence of scavenged animals in traps from control trapping programme. Results for these were:

- October - rat 20%, mouse 0%;
- April – rat 5%, mouse 35%.

Rodents were tracked when tracking tunnel surveys were run targeting mustelids. This data is not presented as it represents a 'by-catch'.

Discussion

The inability to meet the operational performance targets for trap check frequency is a major limitation to testing any of the hypotheses. This precluded any effective review of rat trapping being undertaken, and precluded an analysis of relative efficacy of trap grid spacing.

Although tracking indices show that the 5% target was not met figures from both treatment areas are better than those at the Lakehead non treatment site. Thus, a rat control effect was achieved.

Insufficient trap entrance data is available for analysis of non target capture against this measure. This operational performance measure was not met.

The 2002 beech seed fall was similar to 1999 with comparable amounts of seed falling dominated by Nothofagus menziesii. There was no major rodent plague resulting from this event, although rat captures were elevated from the previous year. Rat tracking rates at Lakehead did not reach the same levels as the 1999-2000 year.

The 2003 seed fall is comparable with that of 2001, and was not expected to generate a rodent irruption. Track rates for the last quarter of this are comparable with the same quarter for the 2001-02 year. A detailed analysis of the relationships between rodent tracking and seed fall can be found in Butler (2003).

Rodents appeared to be almost absent from the Rotoroa non treatment area for this period. Similar magnitude seed fall events to Rotoiti occurred there in both 2002 and 2003. Data from this site has not been used for analysis; rather the focus has been placed upon the local non treatment site of Lakehead. It must be acknowledged that this site is now encompassed within the expanded mustelid control regime.

These findings, together with the fact that the rat index in the treatment area has been consistently above our target level of 5%, has led to plans to enhance the rat trapping programme in 2003-04 by reducing the spacing between traps along lines to 50m by adding extra traps.

The potential positive outcomes of rat control are discussed under bird monitoring (section 4.1).

3.2.2 Mice (Mus musculus)

Since July 2000 mice have not been targeted for any control but they have been caught as a significant by-catch during rat trapping. It is noted that although mice were targeted prior to August 2000 via brodifacoum poisoning it was shown to be ineffective at reaching target indices (Butler, 2003; Ecosystems Consultants, 2000). Monitoring was carried out using tracking tunnels as for rats.

Results

TABLE 9. MOUSE TRACKING RESULTS

Date	RNRP	Big Bush	Lakehead	Rotoroa
July 2002	1%	2.5%	0%	
August 2002	1%	10%	2.5%	0%
December 2002	1%	2.5%	5.1%	0%
February 2003	18%	30.7%	0	- *
May 2003	26%	52.3%	6.9%	3.4%

*No monitor due to poor weather.

GRAPH 3.

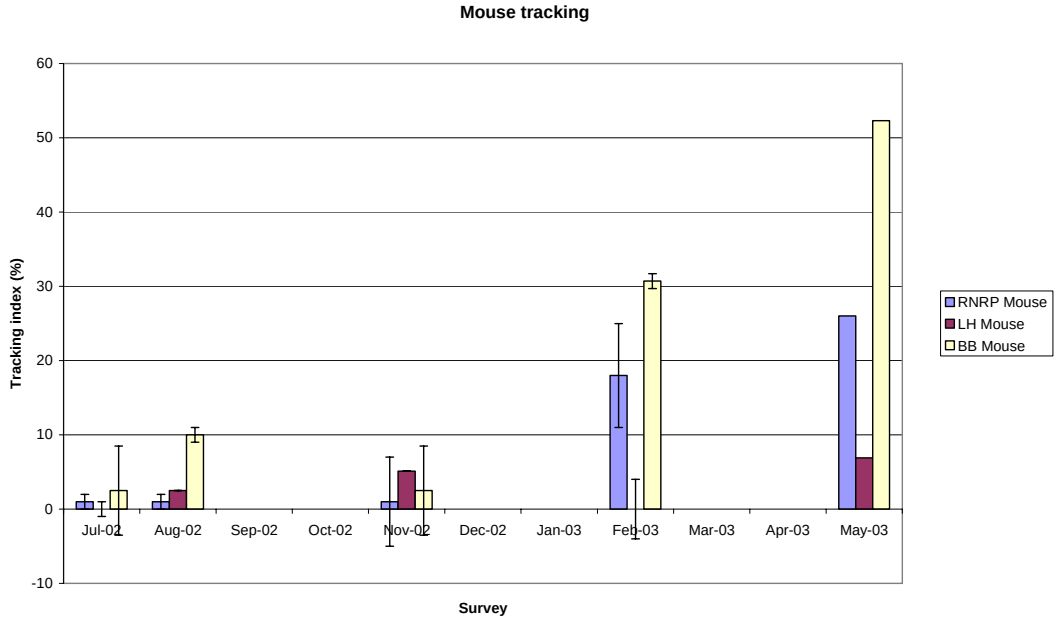


Table 3 placed these results in a longer-term context for the core area and Lakehead.

Rat traps caught 1165 mice as by-catch from the rat traps. A further two mice were caught in Fenn traps. Mouse capture rates in rat traps increased from September through to end of March, with a decline to April and a further (less dramatic) increase again in May.

Discussion

From tracking tunnel results mice were in low numbers throughout this period, until February 2003 where they became more apparent in indices in the treated areas. This coincides with the peak of mouse captures in rat traps. The steady increase in mouse captures from September to February is not well reflected in the tracking indices. Mouse tracking indices remained low at the Lakehead non treatment site throughout. It would appear that there was a population increase response to the 2002 seedfall for mice as evidenced by rat trap captures. It appears that the negligible seedfall of 2003 was unable to sustain the rate of increase in mouse numbers at the peak levels reached in rat traps in February/March, which coincides with the onset of seedfall. This same pattern is not reflected by the tracking index 'snapshots' of February and May, which continued to increase.

Although mouse captures were increased from last year they did not present the same 'clogging effect' upon the rat traps as they did in the 2000-01 year. The mouse to rat ratio was similar to that year, with 1.88 mice per rat in 2000-01 and 1.77 mice per rat in 2002-03. This differs from 2001-02 where a ratio of 0.48 mice per rat was experienced. The principal difference between 2000-01 and 2002-03 with respect to clogging is the magnitude of the rodent population, with the former being 3.3 times greater for mice and 2.3 times greater for rats, with an effect of increased competition for traps.

Both effectively targeting mice and removing the negative influence of mice upon targeted rat control remain areas of concern for this programme.

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

Objectives

To maintain mustelid numbers long term within the RNRP at a level that allows local recovery of populations of resident birds (particularly kaka) and re-introduction of species vulnerable to mustelid predation (e.g. mohua, tieke and kiwi).

To achieve this objective involves:

- completing an extensive 5000ha trapping regime (established during spring 2001, but requiring establishment of one 1km and one 5.5km length of trapline along boundary roads as buffer lines to complete the network)
- testing the effectiveness of the 5000ha trapping regime (cf. the 825ha intensive trapping operation involving a higher density of traps, operating from July 1998 to August 2001)
- developing a target mustelid tracking index related to kaka nesting success during monitoring of thirty nesting attempts within the RNRP.

To provide technical advice and support to the Friends of Rotoiti mustelid trapping programme during the period 1 July 2002 to 30 June 2003.

To support national research projects by making information/carcasses available in the period 1 July 2002 to 30 June 2003.

Performance Targets

Operational

Establish extensions as soon as practicable once traps arrive from supplier.

Check and maintain all Fenn sets and manage carcasses as described in the 2002-2003 Operational Plan and the RNRP Operational Field Manual.

Liaise with and support the Friends of Rotoiti community trapping group and national mustelid research project leaders as required.

Result

No result targets have been set. Mustelids were monitored for the first time this year using tracking tunnels in accordance with the National Tracking Tunnel SOP. Over the next few years tracking tunnel indices for mustelids will be correlated with kaka nesting success to guide development of a target tracking index for future operations.

Outcome

Maintain an increasing kaka population in the RNRP (see the 2002-2003 RNRP Operational Plan (internal document staao-8154) and Moorhouse, unpublished report, for further detail).

Increase in numbers and/or range of bird species recorded in 5-minute bird counts, compared with historical data and non-treatment areas.

Control Methods

Stoats are the primary target for mustelid control; ferrets and weasels are caught as well but may not be optimally targeted by this system. Control consists of a trapping system of single Mark VI Fenn™ traps set in wooden see-through tunnels baited with white fresh hen eggs (see RNRP Operational Field Manual for tunnel design). Traps are spaced at 100m intervals along traplines. (Figure 9)

Trapline configuration in the project area consists of perimeter trapping of contiguous 800ha blocks, covering approximately 5000ha. In November 2002 a further 67 trap sets were placed on boundary roads to complete the buffer network. A total of 893 trap sets were then operated. Maintenance of the oldest traps was initiated, with all traps from below bushline in the old Core network removed, wire-brushed to remove rust, waxed with National™ paraffin wax and replaced in the field.

Trapline configuration in the buffer zone, managed by the Friends of Rotoiti volunteer group, consists of a 25km line (the 'Rainbow Valley' line) following the Wairau valley road from the SH63 turnoff to the top of the Rainbow Valley skifield, and a 3.5km line (the 'Mt Robert Road' line) following the road from the Buller river intake to the top Mt Robert carpark.

The Rainbow Valley line was established in January 2002 with the placment of 222 traps from the Wairau Valley – SH 63 junction to the top of the Rainbow Valley skifield road. This line was extended in January 2003 when a further 21 traps were placed up the skifield to the top of the St Arnaud Range. A total of 243 trap sets were operated on this line in the 2002-2003 year. The section of trapline up the Rainbow Valley skifield (21 traps) is removed with the first snowfall each year, about early May, and then all traps from the gate at the bottom to the top of the skifield road (48 traps) are removed, generally from early June until the end of September. This prevents loss of traps due to skifield management. The Mt Robert Road Fenn line was established in January 2003, a total of 24 Fenn traps were operated on this line in the 2002-2003 year. Trap spacing on the Mt Robert Road and Rainbow Valley lines is constrained by landscape; in some areas road verges are too steep to accommodate trap sets and so traps are placed as close to 100m spacings as possible.

All traps were checked according to the following regime unless weather, eg. snowfall, prevented this:

- once a month during July – September and May – June
- once a fortnight during October – November and March – April
- once a week during December – February.

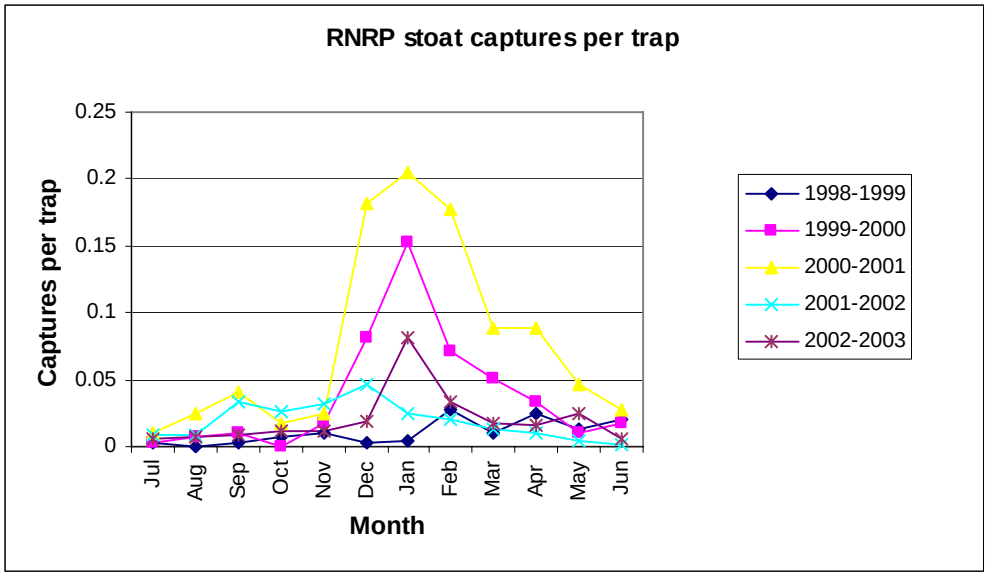
All fresh carcasses were retained and sent to researchers requiring carcasses for their work (further detail in section 6, Research). Liaison with the Friends of Rotoiti trapping group continued throughout the 2002-2003 financial year.

Results

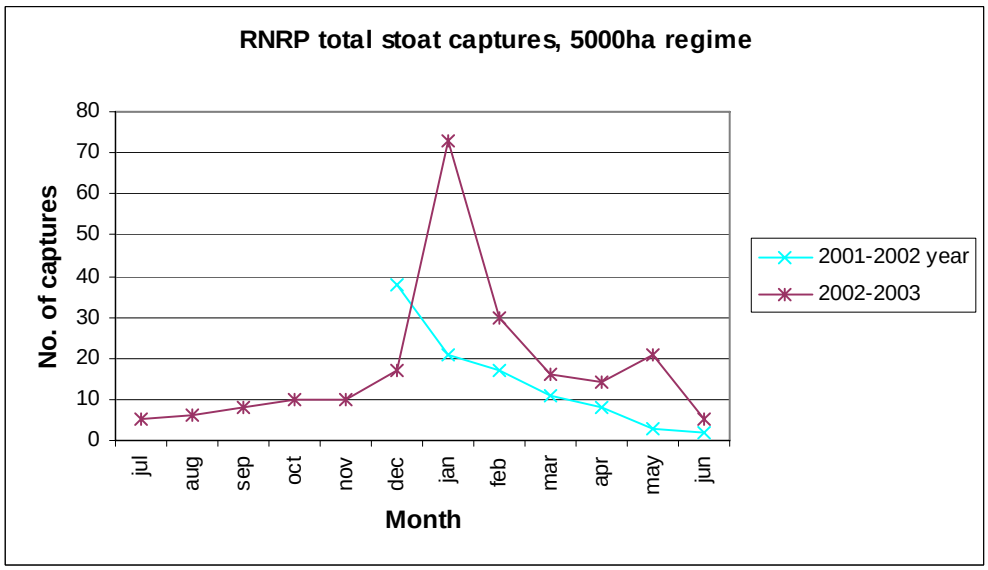
Fenn trapping captures – RNRP project area

Graph 4 presents stoat captures per trap for all traps (excluding the Friends of Rotoiti programme) that have been in place from the outset, allowing comparison of annual patterns. Graph 5 presents stoat captures per month for the 5000ha project area, from the outset of this regime (note that number of traps increases from 831 traps in December 2001 to 893 traps in November 2002, when the final lines were established).

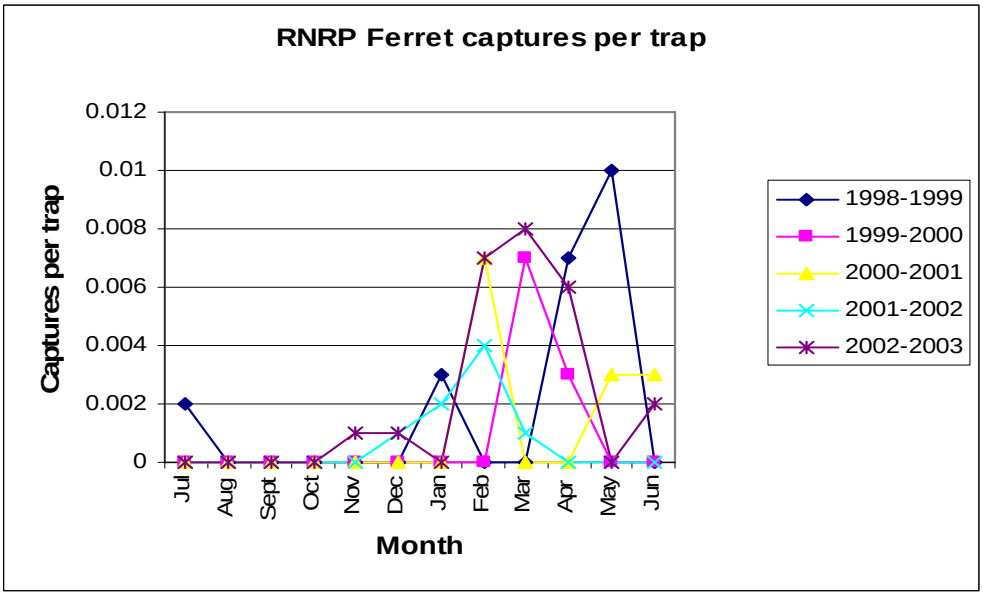
GRAPH 4.



GRAPH 5.

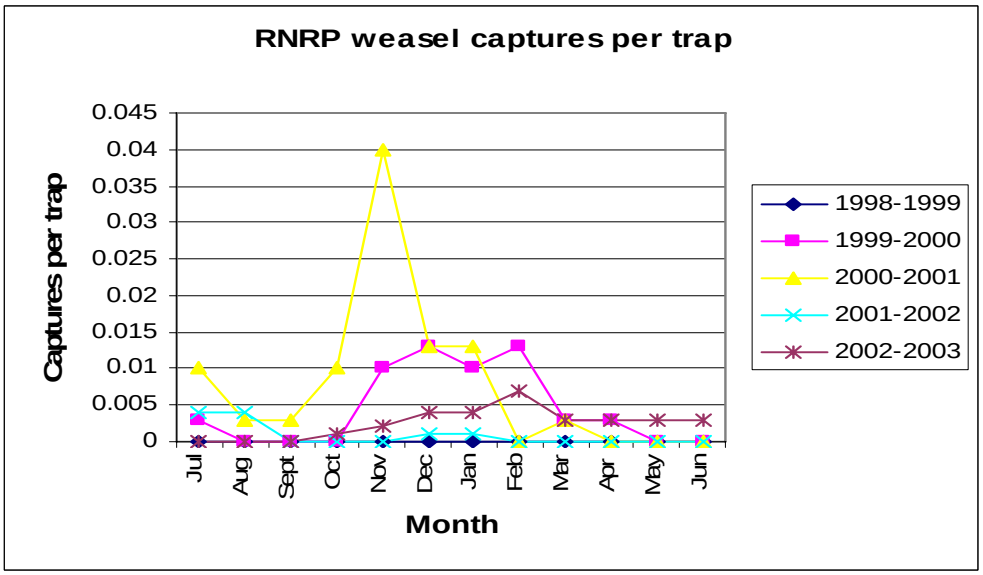


GRAPH 6.



Ferret captures per trap for all years, allowing comparison of annual patterns. Peak captures occur late summer to early autumn.

GRAPH 7.



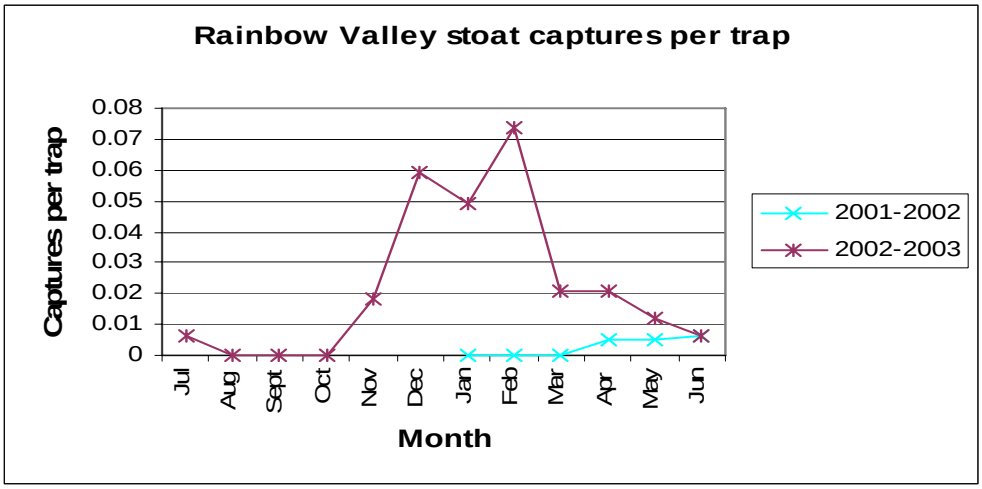
Weasel captures per trap for all years, allowing comparison of annual patterns. Capture numbers start to increase from November and decrease from February.

Non-target captures for the 2002-03 financial year were as follows:

11 cats, 279 rats, 207 hedgehogs, 32 possums, 50 rabbits, 2 song thrushes, 1 tui and 2 mice.

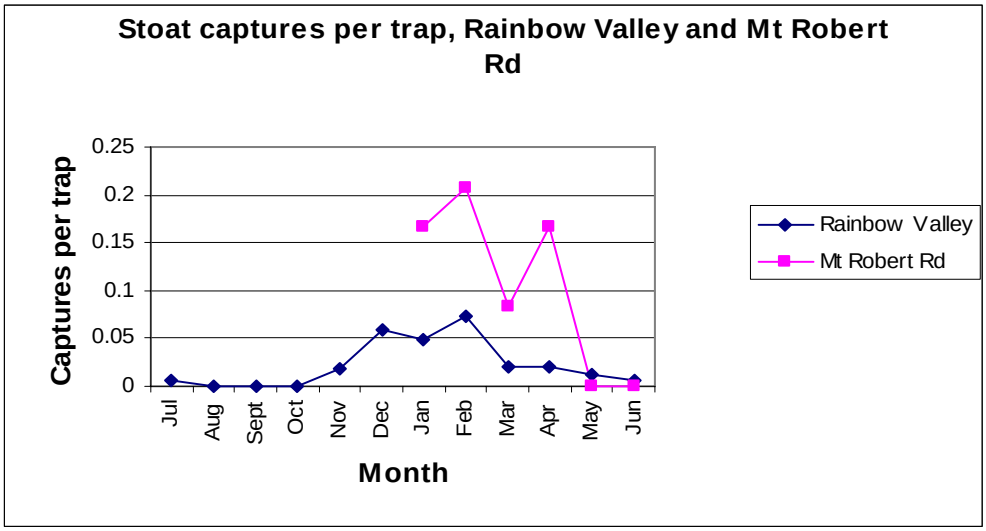
Fenn trapping captures – Friends of Rotoiti, RNRP project area buffer:

GRAPH 8.



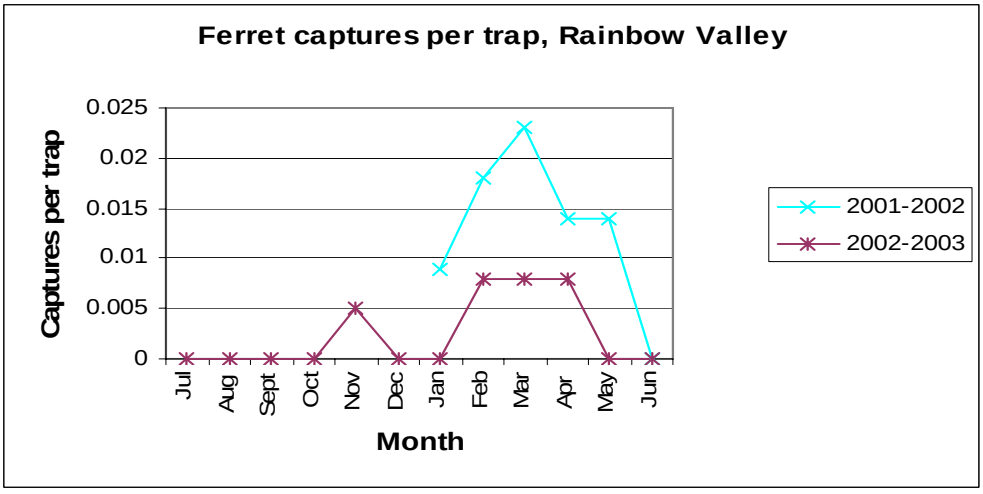
Stoat captures per trap for the Friends of Rotoiti Rainbow Valley Fenn trap line. Peak captures occur over summer, with increases starting in November.

GRAPH 9.



Stoat captures per trap for the Friends of Rotoiti Rainbow Valley and Mt Robert Road Fenn traplines for 2002-03 to allow comparison.

GRAPH 10.



Ferret captures for the Rainbow Valley Fenn line for the 2002-2003 financial year. One male ferret was caught on the Mt Robert Road line in February 2003, in the same trap that catches the majority of stoats caught on that line.

One weasel was caught in March 2003 on the Rainbow Valley Fenn line.

TABLE 10. FRIENDS OF ROTOITI FENN TRAP NON-TARGET CAPTURES

Species	Rainbow Valley			Mt Robert Road
	20012002	2002-2003	2001-2002	2002-2003
Hedgehog	61	102	n/a	0
Possum	7	14	n/a	1
Rabbit	1	11	n/a	0
Rat	5	32	n/a	0

By-catch in rat trapping operation

One stoat was caught in a rat trap in the old Core area on 29 January 2003, 700m from the closest Fenn trap line. One stoat was caught in a rat trap in Duckpond Stream on 10 June 2003, 450m from the closest Fenn trap line. Two weasels were caught in rat traps in the old Core area on 9 January 2003 and 2 April 2003 respectively, one at 1050m and one at 50m from the closest Fenn trap line.

Discussion

Tracking tunnel monitoring and correlation of result and outcome monitoring are discussed following Mustelid Monitoring, at the end of this section.

Capture trends and beech mast response

Stoats

All trapping operations showed a typical summer peak in stoat captures, tailing off slowly to typical low winter captures. There has been a continuing strong relationship between beech mast events and stoat captures, with more animals caught in response to heavier beech seeding (see section 4.5.4 for yearly beech seedfall results).

The Mt Robert Road Fenn trap line generally caught far more animals per trap than any other line during the 2002-2003 summer. 80% of stoats captured on this line were caught in the same trap (total captures = 15). There has only been one year of data from this line so whether this trend continues will need to be monitored.

Captures per trap were similar for the RNRP project area and Rainbow Valley Fenn trap lines, but captures on the latter peaked for a longer period than in the former. An uncharacteristic dip was observed on the Rainbow Valley line in January. The longer peak is possibly due to the lesser trapping intensity and thus more animals remaining in the system in this area.

Ferrets

Very low numbers of ferrets were caught in the RNRP project area during the first three years of operation, and capture numbers show little response to differing intensities of beech mast events. In all areas ferret captures peak later than observed for stoats and weasels. Since the extension the pattern of capture numbers in the RNRP project area suggests a response to beech mast events, with numbers caught in 2002-2003 higher than the 2001-2002 year. In contrast, capture numbers on the Rainbow Valley Fenn line were higher in the 2001-2002 year, possibly reflecting a knockdown of resident animals in the first year of trapping. More data is required to establish capture trends and their relationship to beech masting events.

Weasels

Capture numbers show a strong response to beech masting events, with a summer peak that occurs over a slightly longer period than observed for stoats.

By-catch in rat traps

The low by-catch of mustelids in rat traps probably means few numbers of mustelids inside the rat trapping core areas (cf. 18 stoats and 13 weasels caught in rat traps in the 2000-2001 year following a large beech mast). More data is required to establish whether this is because of the Fenn trapping or because mustelid numbers were generally low this year. The two animals caught in rat traps this year were caught during the peak time for mustelid captures.

Maintenance

The recently waxed traps continued to catch well, but were difficult to set as the brass tag and hook mechanism became slippery. Removing the brass tags prior to waxing might help reduce this problem.

Animal Health Board (AHB) operations

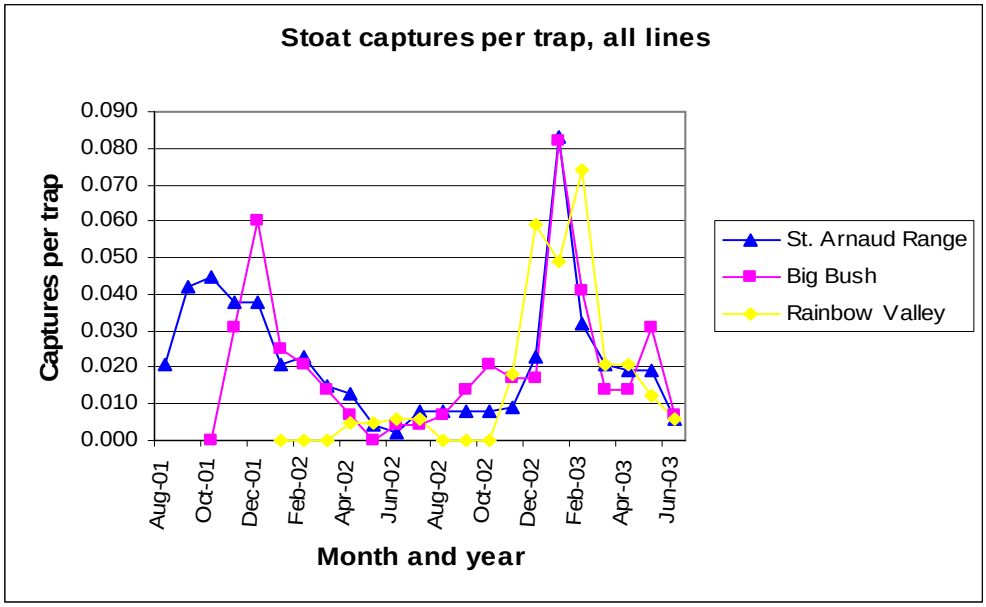
Section 3.1 (Brushtail Possum Control and Monitoring), details AHB operations to control possums and mustelids, to minimise the spread of TB in the Big Bush, Richmond and North St Arnaud ranges. A buffer zone of 3km exists adjacent to the RNRP project area, where 1080 and other toxins with secondary poisoning potential are prohibited for use by the AHB. The aim is to minimise impact on surrounding stoat populations through secondary poisoning, allowing testing of a trapping-only system for predator control.

An unknown number of mustelids were killed in the Tophouse and Upper Motueka operations. Eight ferrets were killed in the Rainbow/Upper Wairau operation.

It is possible that AHB control could have impacted stoat populations enough to directly affect RNRP trapping operations. If this effect was strong one would expect stoat captures per trap on the St Arnaud Range lines to be higher than those on the Big Bush lines, due to the far smaller proportion of lines adjacent to AHB operations on the St Arnaud Range. Graph 11 shows similar rates of capture between Big Bush and the St Arnaud range. This suggests that AHB operations are not impacting surrounding stoat populations enough to show up in our Fenn trapping results in these areas. Captures

on the Rainbow Valley line are unlikely to have been impacted by AHB operations as the only mustelids caught during AHB activities were ferrets. Trends will have to be followed over a few years, however at this stage it looks like we can be reasonably confident about drawing conclusions about a 'Fenn-trapping only' mustelid control regime.

GRAPH 11.



Stoat captures per trap for the Big Bush, St Arnaud range and Rainbow Valley areas.

Recommendations

- The Fenn trapping regime should continue without modification until enough kaka nesting attempts have been observed to determine the effectiveness of the trapping regime (c. 30 attempts).
- Continue to collect mustelid tracking indices for correlation with Fenn capture rates and kaka nesting success.
- Establish better systems for AHB operators to report their results from the area.
- A large amount of data has been collected over the years, and the opportunity exists for detailed temporal and spatial analysis of capture trends, which should be pursued.

Monitoring

Objectives

- To obtain quarterly relative activity indices for mustelids at treatment and non-treatment sites as result monitoring to test hypothesis in 3.3.1.

- To contribute to national tracking tunnel survey (DOC Science and Research Unit investigation 3647).
- To correlate mustelid result monitoring (relative activity indices) to outcome monitoring (kaka nesting success), to allow setting of performance targets for mustelid control.

Performance measures

- Establish two networks of tracking tunnels at treatment and non-treatment sites for mustelids.
- Run tracking surveys quarterly (August, November, February and May) each year.
- Forward data to national survey coordinator.

Method

Tracking tunnel networks for rodents existed at Rotoiti and Rotoroa prior to this year (nine and five lines respectively). These were augmented with additional lines to meet the SOP (Gillies and Williams, 2002). Existing lines consisted of 20 tunnels at 50m intervals. New lines were installed prior to the December survey. In implementing the requirements of the SOP it was apparent that the existing network would not comply perfectly. It was resolved that the existing network would be manipulated to fit as closely as possible the requirements of the SOP without compromising the ability to link to historical data from these sites. Twenty tunnel lines for rodent monitoring were retained and then halved for mustelid monitoring. Selection of the sub-sample for mustelid monitoring was subjective so as to ensure as near as possible 1km between the closest points of the lines to provide independence between samples. In some cases (RNRP core, Rotoroa A and B lines) the 1km was not achieved, but in all cases 900m was exceeded.

Figure 8 and Figure 9 show tracking tunnel lines for the RNRP; Figure 10 shows tracking tunnel lines at Rotoroa.

TABLE 11. TRACKING TUNNEL NETWORK

Site			Rodent		Mustelid		Rodent tunnels/line	Tunnel length		Tunnel material	
	Subsite	Line	Treat	Non treat	Treat	Non treatment		Std.	Long	Galv. Steel	Core flute
Rotoiti	Core	Loop	✓		✓		20	✓			✓
		Snail	✓		✓		20	✓			✓
		Rata	✓		✓		20	✓			✓
		Grunt	✓		✓		20	✓			✓
		Perc.	✓		✓		20	✓			✓
	Big Bush	IR	✓		✓		20		✓	✓ †	✓ †
		DR	✓		✓		20		✓	✓ †	✓†
	Lake Head	F		✓	✓		20		✓	✓	
		"G"		✓	✓		20		✓	✓	
	Wider	U		✓	✓		10		✓	✓	
		V		✓	✓		10		✓	✓	
		W		✓	✓		10		✓	✓	
		X		✓	✓		10	✓			✓
		Y		✓	✓		10		✓	✓	
		Z		✓	✓		10		✓	✓	
	Sub Total		7	8	15	0	6 x 10, 9 x 20	6	9	9*	8*
Rotoroa	Misery	A		✓		✓	20		✓	✓	
		B		✓		✓	20		✓	✓	
		C		✓		✓	20		✓	✓	
		D		✓		✓	20		✓	✓	
		L		✓			10	✓			✓
	D'Urville	E		✓		✓	20		✓	✓	
		M		✓		✓	10	✓			✓

TABLE 11. TRACKING TUNNEL NETWORK (CONTINUED)

Rotoroa	East	H		✓		✓	10	✓			✓
		I		✓		✓	10	✓			✓
		J		✓		✓	10	✓			✓
		K		✓		✓	10	✓			✓
	Sub Total		0	11	0	11	6 x 10, 5 x 20	6	5	5	6
All sites	Total		7	19	15	11	12 x 10, 14 x 20	12	14	14*	14*

Notes for table:

† Alternate tunnels galvanised and coreflute

* Includes 2 x ½ lines each treatment as per †

Results

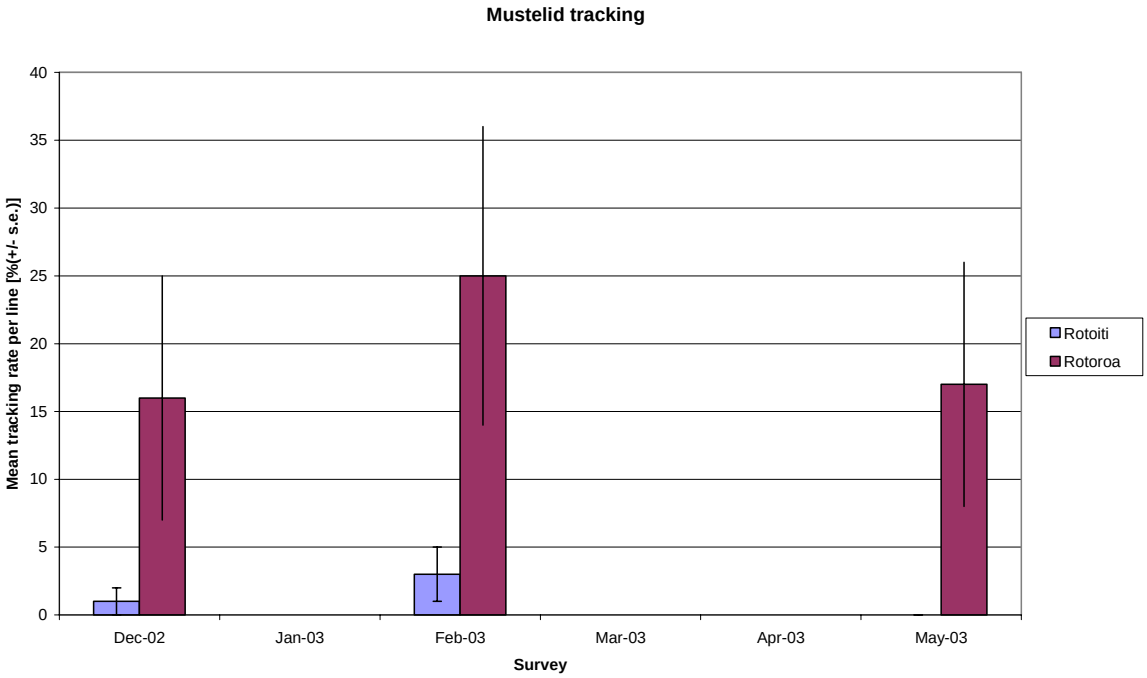
Mustelid tracking surveys were achieved for the last three quarters of the year following establishment of the network. The May survey at Rotoiti was split into two sub-surveys to cater for staff shortages.

Mustelid tracks were not assigned to species as this was considered unreliable due to overlap in parameters.

TABLE 12. MUSTELID TRACKING INDICES 2002/03

		Dec	Feb	May
Rotoiti (treatment)	Lines tracked (%) n=15	7	13	0
	Mean track rate /line (%(s.e.))	1 (1)	3 (2)	0 (0)
	Tunnels tracked (%) n=75	1	3	0
Rotoroa (non treatment)	Lines tracked (%) n=11	27	45	36
	Mean track rate /line (%(s.e.))	16 (9)	25 (11)	17 (9)
	Tunnels tracked (%) n=55	16	25	17

GRAPH 12.



Note for Graph: May Rotoiti value = 0

Discussion

Tracking tunnel monitor

This year for the first time the project had a measure of mustelid activity independent of the trapping results. It showed a clear difference in tracking activity between the sites for mustelids, suggesting that mustelid control is effective in reducing the number of mustelids inside the RNRP. No mustelids were detected at all in the treated area in May. On average the mean tracking rate per line in the treated area was 7% that of the untreated, and the average lines tracked 18% that of the untreated area. No hedgehogs were tracked at either site from mustelid surveys.

Correlation of result and outcome monitoring

Kaka did not breed in the 2002-2003 financial year so there was no opportunity for outcome monitoring of the mustelid control programme. To be 95% confident that predator control has been successful it is likely that a sample of at least 30 nesting attempts will have to be monitored (Moorhouse, unpublished report). To develop target tracking indices, tracking tunnel monitors will need to be undertaken until the target number of nesting attempts is reached, through several different beech mast intensities and thus different numbers of mustelids in the environment.

3.4 FERAL CAT CONTROL AND MONITORING

Objectives

- To maintain feral cat numbers long term within the RNRP Project area at a level that allows local recovery of resident bird populations and re-introduction of species vulnerable to cat predation (eg. tieke, kiwi).
- To reduce to zero the population of pet cats in St Arnaud in the long term, with the support of the local community.

Performance Target

Operational

Plan and establish an appropriate kill trapping regime by 31 December 2002.

Result

No result targets have been set, due to the absence of a good method to monitor cats. Stomachs are kept from all carcasses and contents will be sorted at some stage as an initial gauge of the impacts of cats. Captures in Fenn traps may act as an index of cat activity in the area.

Outcome

No loss, due to cats, of robins or kaka within the RNRP Project area that would compromise continued increase in populations of these species.

Methods

Twenty 'Steve Allan Conibear-style' kill traps were purchased in mid 2001, and a cover for the trap to reduce the chance of catching birds was trialled during 2002. Covers were made for remaining traps early in the 2002-2003 financial year.

Traps were located in areas of historical cat sign/sightings, and cat sign/sightings detected during the year (GPS references for trap locations are given in Appendix 1). Nineteen traps were set out in total, and 1 trap was retained in the office as an education tool.

Traps were generally checked in conjunction with other work, mainly Fenn trapping and rodent trapping. The checking and re-baiting periods are uneven for each trap.

No active advocacy work was done to discourage St Arnaud residents from keeping pet cats, however discussions were held with owners on a casual basis when the opportunity arose. Several cage traps were loaned to St Arnaud residents to capture wild cats seen on their properties. Public notice was given through the community newsletter when the kill trap regime was established. One new pet cat is known to have been brought to the township with the arrival of a new couple to the area.

Results

All 19 cat traps were out in the field by the end of November 2002. A total of 5397 trap nights (uncorrected) were run. Six cats were caught in these traps, on the following dates:

- July 2002
- 20 September 2002
- 1 November 2002
- 15 April 2003
- 1 May 2003
- 6 June 2003

One stoat and one possum were caught in cat traps on 9 January 2003 and 30 April 2003 respectively.

Eleven cats were caught in Fenn traps during the 2002-2003 year.

TABLE 13. CAT CAPTURES PER TRAP IN FENNS

Month	1998/99	1999/00	2000/01	2001/02	2002/03
July	0	0	0	0	0
Aug	0	0	0	0	0
Sept	0	0	0	0.004	0.001
Oct	0	0	0	0.002	0
Nov	0	0.003	0	0	0
Dec	0	0	0.003	0.004	0
Jan	0	0	0.013	0.001	0.001
Feb	0	0	0.01	0.001	0
Mar	0	0	0	0	0
Apr	0.003	0	0.03	0.001	0.004
May	0.01	0.003	0	0	0.004
Jun	0	0	0	0.001	0.001
Total captures	n=4	n=2	n=17	n=8	n=11

An unknown number of cats were caught by landowners in the St Arnaud Village.

No losses of robins were detected during the year that could be positively attributed to cats, however one falcon nestling was apparently killed by a cat (section 4.1.4 Falcon Monitoring).

Discussion

Cat control is not a high priority for work in the RNRP. Captures in Fenns over the years suggest numbers in the area are generally low, although a rise in numbers was observed during the 2000-2001 year, probably a response to the enormous beech mast in 2000. More importantly, monitoring of native species has not shown cats to be endangering the continued survival of native species in this area. One fledgling kaka (1999), and one nestling falcon (2003) may have been killed by cats. It is probable that current monitoring would not detect cat impacts, because species targeted are not significant components of cat diet. Casual observation of cat scats indicates lizards and weta are possibly more important (James McConchie, pers. comm.).

Roger, a predator dog continued training to locate cats this year with Dave Seelye, DOC, Murchison Field Base. Roger is a Border Terrier – Fox Terrier cross bred by Scott Theobold of Northland, and is part of the National Predator Dog programme. Once Roger is fully trained and certified he will be used in control and monitoring of cats in the RNRP area. This will be especially important when cat-sensitive species such as kiwi are reintroduced. This year Roger underwent training and aversion work in the Black Valley Stream and Anglers Walk areas. By 30 June 2002 Roger had attained his Interim Certificate, having passed obedience standards but still requiring training in aversion.

Recommendations

- Continue cat targeted trapping as the current best tool available for cat control requiring minimum input, relative to the threat cats pose for this area.
- Support Dave Seelye and Roger as required.
- Support the advocacy team to establish a programme to encourage responsible ownership of pet cats resident in St Arnaud, and discourage acquisition of new cats by St Arnaud residents.

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 were:

- 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

The performance measure was based on the Ecological Damage Threshold (EDT) (Beggs & Rees, 1999) used in the previous two years, to maintain wasp activity levels below 2.7 captures per malaise trap per day.

Methods

Wasp Control

Control was undertaken using the toxin Fipronil in a chicken-based bait (0.1%), applied in KK bait stations under an experimental use permit held by Landcare Research who were developing the formulation with Bayer (formerly Aventiss Australia). The experimental use permit has subsequently expired.

Experimental work by Landcare Research showed a poisoning effect at least 400m beyond the operational boundary in the 2000 season. The 2003 operation covered the same area as the 2002 one (lower slopes RNRP core, Duckpond stream, Brunner Peninsula, and St Arnaud Village) giving a total area of c.1,100ha. (Figure 11)

Bait stations were spaced throughout on a grid of 200 x 50 m which has been shown to be the optimum to maximize effectiveness while minimizing resources required. The grid was established using lines cut in the Big Bush and RNRP core areas, whereas in the village and Peninsula areas roads, tracks and other existing features were used to approximate this.

Poisoning was carried out on the 16 January in accordance with the Wasp Poisoning Decision Maker flowchart prepared by Landcare Research (local document ref: staao-8221). 40g of bait was applied per KK bait station giving a loading of 0.04 kg/ha. Any remaining bait was removed on the 22 January. Eight person days of labour was required to put the bait out, with slightly less required for removal.

An Assessment of Environmental Effect (AEE) for Control of Common Wasps was prepared in December 2002. (Internal document staao-8223)

Wasp monitoring

Malaise traps are used for result monitoring of wasp activity. Twenty traps at the Rotoiti treatment site and ten and six respectively at Lakehead and Rotoroa non-treatment sites are open from November to May and samples collected weekly (non-treatment) and fortnightly (treatment). Wasps are counted and removed and the remainder of the sample stored in 70% ethanol. These samples are also used for outcome monitoring as covered in section 4.2.

Nest monitoring did not utilise the strip plots of previous seasons. Data related to wasp activity pre and post poisoning was collected from a sample of nests encountered in the course of other work.

Results

Bait take

The quantity of bait applied was halved from the previous year's operation in response to the large amounts unconsumed then. This season the majority of bait stations still had unconsumed bait at the time of removal. The unconsumed quantity varied between stations from full to empty, but most had at least one quarter to one third remaining.

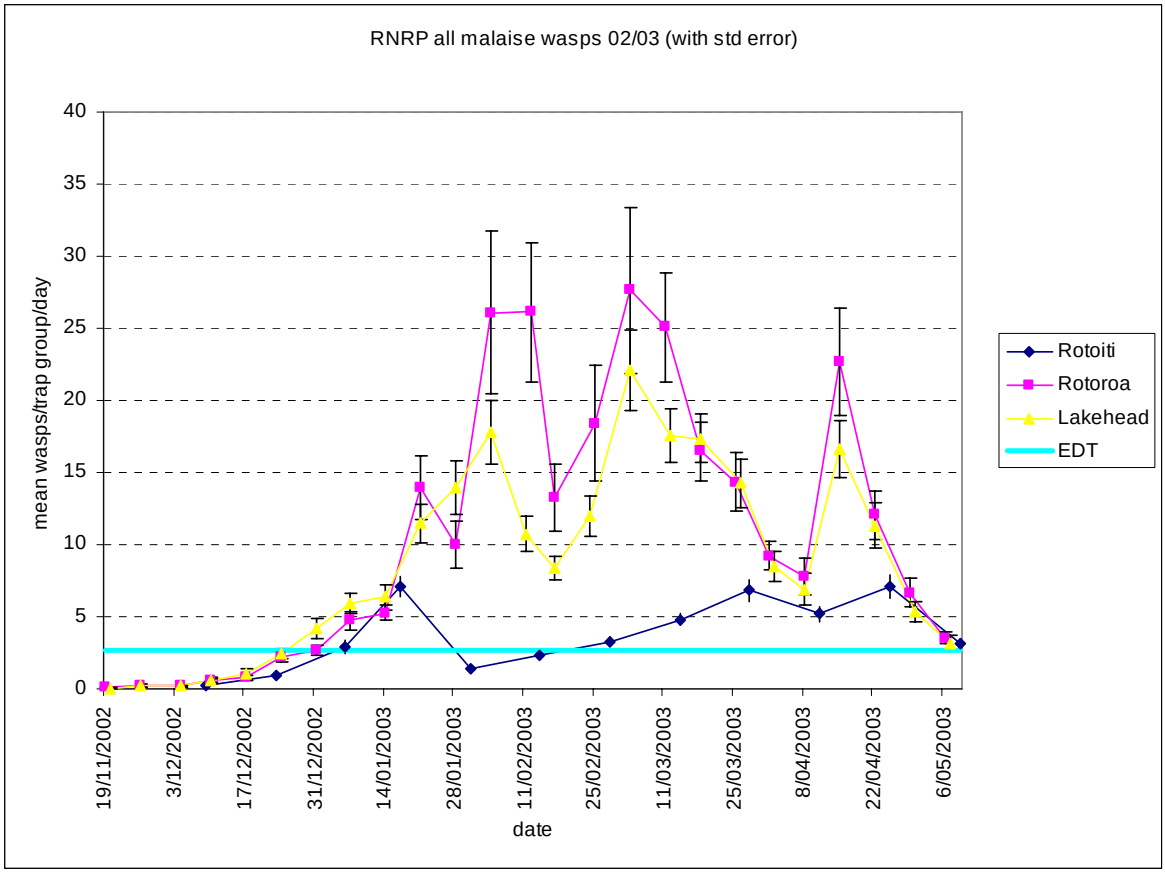
Individual nest results

Strip plot transects were not undertaken this year, as a robust link between malaise traps and nest activity has been demonstrated in previous seasons. A small number of nests incidentally encountered in course of other work were monitored as a 'reality check' to the malaise traps. This showed an approximately 90% kill uniformly across the control area.

Malaise trapping

GRAPH 13. COUNTS OF WASPS CAUGHT IN MALAISE TRAPS, 2002/03

(± 1 standard error)



It should be noted that while wasp numbers were reduced below the Ecological Damage Threshold following poisoning, they breached this point again approximately one month later. It was recommended by the RNRP Technical Advisory Group that a repeat application of toxin be considered. Several tests of the feasibility of such action were undertaken during late February to late March using the non-toxic bait protocol to assess interest in protein. All showed there was insufficient interest in these baits to trigger a poisoning operation, with results between 0.1 – 0.3 wasps/bait with the trigger being > 1 (as per Wasp Poisoning Decision Maker).

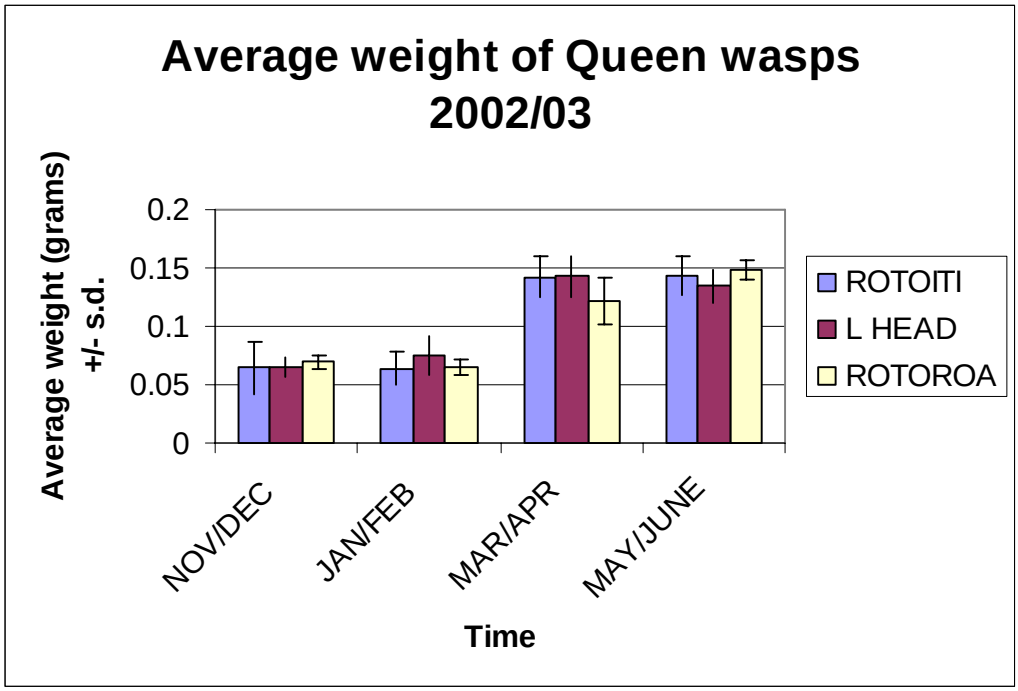
Spatial analysis shows that there was no obvious pattern in which malaise traps yielded wasp indices greater than the EDT. Thus the increase in wasps following the initial reduction from the poison operation can not be easily attributed to either an edge effect or recovery of any resident population.

Overall the malaise trapping data show a difference in wasp populations between treated and non-treated sites shortly after poisoning until the end of March, a period of about six weeks. Wasp abundance was at least three times greater at the non-treatment sites during February and March (Standish, 2003).

Queen wasps

Queen wasps were separated and kept from malaise samples from all sites. These were later assessed for 'quality' (by dry weight) to test the hypothesis 'that reduced wasp competition resulting from poisoning will allow a higher quality of queen in the RNRP'. There was no significant difference between sites.

GRAPH 14.



Caterpillar experiment

The predation of free living caterpillars is an indicator of predation pressure exerted upon invertebrates by wasps (Beggs & Rees 1999). This experiment was not undertaken as the onset of 'go for poisoning' took us somewhat by surprise and did not allow for this to be undertaken prior to wasp control.

Honeydew

The honeydew resource was not monitored this year as a clear link between wasp reduction and honeydew recovery has been demonstrated from previous operations. Honeydew quality was to be inferred from wasp reduction.

Non target impacts

Invertebrates found dead at bait stations were collected and forwarded to Ian Millar, TSO (Invertebrates), Nelson/Marlborough Conservancy for identification. Those identifiable were:

Blowflies (Calliphoridae); lacewings (Neuroptera); '*Necrophilus' prolongatus* (Agyrtidae); large, small and very small rove beetles (Staphylinidae); and a carabid beetle (Carabidae). None of these animals are communal or colonial species. Most are carrion feeders and are either attracted to the protein bait or to dead flies and other invertebrates stuck on the bait. The beetles are mostly ground dwellers and are unlikely to have significant contact with the elevated bait stations. Those collected this year did not differ from those collected and identified last season.

No vertebrates were observed feeding on baits or found dead following the operation.

Discussion

The 2002-03 season may be described as reasonably good for wasps, with indices peaking at > 25 wasps/trap/day at Rotoroa, a figure greater than 1998-99 (peak 19 wasps/trap/day) and less than 2000-01 seasons (peak 35 wasps/trap/day).

The poisoning programme was deemed successful with wasp numbers reduced below the EDT. Examining the time period over which the population curves are different this can be considered one of the more successful wasp control seasons. However, the limited period for which suppression of wasp numbers below the EDT was maintained is of concern. Although a population difference was demonstrated between treated and untreated sites for ten weeks, the ecological benefit to the control area for the latter half of that period where the EDT was breached is uncertain. Mechanisms for enhancing the longevity of control effect should be investigated, as should the benefits of reduced wasp activity that still exceed the EDT.

Despite there still being unconsumed bait remaining in stations at the time of removal it is unlikely that there will be any further future reduction in the quantity applied per station. It is considered that the risk of missing the opportunity to provide foraging wasps with toxin due to some bait stations being cleaned out is unacceptable, and that the cost of overprovision is negligible when compared with the potential need for and cost of re-treatment. It is also uncertain that any repeat application would be successful, as worker wasps required for delivery of toxin to nest will be reduced following initial poisoning.

That there was no detectable difference in queen quality between sites was unsurprising as these animals disperse over great distances, thus the point of origin for any queen caught in a malaise trap need not coincide with the site trapped. This hypothesis may only be testable by trapping queens as they emerge from nests within the treated and untreated areas, or by digging up those nests. Studies of worker wasp foraging effort may also shed light on colony quality, and the effects of reduced competition for those target animals unaffected by control.

As the non-target kills included no communal or colonial invertebrates, we are confident that this operation poses no significant threat to native invertebrates at a population or community level.

Statistical advice was sought to guide further honeydew monitoring to provide a 'reality check' that reductions in wasp activity as shown by malaise trapping do indeed translate to restored availability of this resource. Previous honeydew monitoring had proven to be very labour intensive, and it was considered undesirable to invest significant resources in an area already proven. Advice received was that the data from honeydew monitoring have great variance and in fact the full monitoring programme was probably necessary to adequately test that target levels were attained over time. It was suggested that sampling ten trees at Rotoiti at times of expected peak response (following imposition of wasp control) would be sufficient to answer the alternative question " Is the honeydew energy level more like that of wasp controlled Rotoiti than non treated Rotoroa from previous seasons?" The full sample of forty trees would be more than adequate, whilst ten trees would be marginal but still worth doing (Westbrooke, pers. comm).

Consultation

Following consultation support for this operation was given by iwi of Te Tau Ihu, Tasman District Council, Fish and Game, local school, local outdoor education centre, Medical Officer of Health, and local branches of National Beekeepers Association. The local community was notified, or consulted directly where known concerns existed, or access across land was required. One individual had unresolved concerns following this process.

At the request of the local school to maximise benefit of control, standard Medical Officer of Health conditions as per DOC Assessment of Environmental Effect for avoiding such facilities were waived.

Recognising that although this toxin is beyond the jurisdiction of the Medical Officer of Health as it is not a vertebrate or controlled pesticide, the proximity of the operation to a residential population raises some questions about public safety. Also this is a relatively unusual pest control activity and it was considered desirable to gather information to provide guidance to other wasp control practitioners and authorities with which they will need to work (e.g. MOH). At the request of the Rotoiti Nature Recovery Project an audit of public safety was undertaken by the Nelson Marlborough Public Health Service. This concluded that the operation appeared to be well managed and undertaken; there was low public health risk; and there was appropriate notification, signage and information available (Molloy, 2003).

St Arnaud Community Association (SACA)'s Wasp Control Programme

The SACA did not undertake any poison baiting of wasps this year. Several individuals did undertake individual nest destruction using Permex ™ (a pyrethroid powder) killing 65 nests. This compares with 90 nests treated last season for similar effort, and 150 in 2000-01.

3.6 DEER (*CERVUS ELAPHUS*) AND CHAMOIS (*RUPICAPRA RUPICAPRA*) CONTROL AND MONITORING

Objective

The target of hunting is red deer but any chamois encountered are to be shot too. Hunting is primarily focussed upon gathering stomach samples to assess diet to guide outcome monitoring relating to deer impacts.

Performance Target

No biological outcome or result performance measures exist for this activity. A performance measure for a fixed effort of forty hours ground hunting with a dog is to be achieved.

Methods

A combination of aerial hunting (one hour) in summer and ground hunting in both winter and summer was planned. Winter ground hunting was not achieved and the summer ground hunting employed contract hunters with dogs.

For all animals shot their age category, sex, associates, location and habitat were recorded; livers were removed for toxin assay by Landcare Research as part of Brodifacoum profiling investigation and stomachs were removed for diet analysis.

Results

Sightings/incidental encounters

Only sightings of animals are reported on here. Incidental records of pellets, prints, and feed sign are recorded in field diaries. These are treated as an unreliable index as not all observers will record sign, multiple recording of same sign can not be discounted, and assignation of sign to species can not be guaranteed.

Deer

Four encounters relating to five deer were recorded. Two were unconfirmed as deer (one possibly chamois (unlikely due to habitat), the other 'a large animal'), one related to a kill of a 'spiker' on the boundary by a neighbour. Liver and stomach samples of this animal were collected.

Chamois

Four encounters relating to six animals recorded. One of these was unconfirmed (probably a deer). All sightings except the unconfirmed one were on the St Arnaud Range. The unconfirmed encounter was in Big Bush.

Hunting

Aerial

No aerial hunting was undertaken this year due to the poor results achieved for the effort made in past years.

Ground

Late winter/spring ground hunting used D. Barker and his dog for approximately 24 hunting hours in late August and mid September. Low altitude to mid slope bush areas were targeted. No kills were made but at least one animal was present.

Discussion

Aerial hunting has returned very few animals for effort expended and will be discontinued. Ground-based hunting with a dog has shown no yield thus far. Comments from hunters suggest that conditions (particularly wind) must be optimal to have any hope of encountering animals at the low levels they appear to be at. Both hunters encountered animal sign of varying age and believe the area to be utilised by deer at low levels. They felt unable to comment upon the residence or transience of animals using this area.

3.7 PIG (*SUS SCROFA*) CONTROL & MONITORING

No pig control work was planned this year. However some targeted hunting was undertaken as there was an expansion of the previous range occupied by pigs and they were considered to be the cause of disturbance to Fenn trap tunnels towards the top of the bush on the St Arnaud Range.

Results

Sightings/incidental encounters

Only sightings of animals are reported on here. Incidental records of pellets, prints, and feed sign are recorded in field diaries. These are treated as an unreliable index as not all observers will record sign, multiple recording of same sign can not be discounted, and assignation of sign to species can not be guaranteed. Seven encounters relating to eight animals were recorded. All encounters were to the north of core area

Ground hunting

Two sessions of hunting with dogs were undertaken by staff in July and September. Each session involved approximately sixteen hunter hours. The first targeted the area around the 'Hubcap' Fenn line resulting in two kills, the second the northern end of Rainbow station resulting in one confirmed and one possible kill. Permission to operate on several neighbouring properties for the purposes of pig control was obtained.

Discussion

Pigs appear to be well established in the Wairau Valley (Rainbow station area) and the southern end of Richmond Ranges. This makes any eradication of pigs from the local area challenging. History suggests that pigs make only occasional incursions into the recovery area. Thus further control will be reactive and focus upon new sightings/sign/trap disturbance as they occur. The use of pig traps should be investigated.

3.8 HEDGEHOG CONTROL AND MONITORING

Fenn traps caught 161 hedgehogs in the year, most between October and April. Friends of Rotoiti caught an additional 77 on their lines, most of them (63) in the Rainbow Valley.

No hedgehog prints were recorded incidentally through the rodent tracking tunnel programme at any site.

3.9 HARE AND RABBIT CONTROL AND MONITORING

No planned hare or rabbit control was undertaken. Chris Berg, a BSc (Hons) student from University of Canterbury is studying the foraging behaviour of hares, in particular their food and habitat preferences with respect to plant secondary metabolites. Fieldwork includes faecal pellet analysis, plant collection and analysis, and indicator plant inspection.

3.10 WEED CONTROL AND MONITORING

Weed control within the mainland island falls under the Area Office weed programmes. Weed sightings are reported by RNRP staff, and small incidental encounters of weeds are often treated manually at the time of encounter (e.g. rowan, cotoneaster and douglas fir).

4. Results - Monitoring of Native Species and Systems

The results of monitoring 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 Bird Monitoring – 5-minute Counts

Objectives

To document changes in bird populations and determine those that relate to pest control programmes.

Methods

Five-minute counts were undertaken on the same transect lines within the project area ('St Arnaud') and at Lakehead ('Lakehead') as in previous years. Five-minute counts were also conducted in the Rotoroa non-treatment site ('Rotoroa'). The Rotoroa transect follows the old Mt Misery track from lake edge to bushline. Counts were done to a standard technique based on Dawson & Bull (1975).

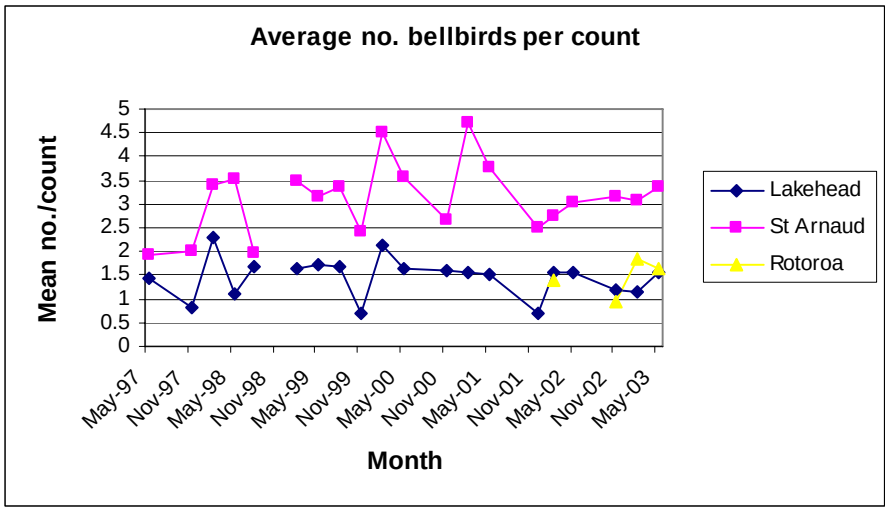
This is the second season of Fenn trapping around the Lakehead bird count line, and the second season of DoC bird counts at Rotoroa. A nine year database of bird counts exists from Landcare Research studies at Rotoroa, conducted during the 1970s and 1980s (Pete Wilson, pers. comm.). DoC bird counts at Rotoroa are conducted at the same count sites as those used by Landcare Research.

Results

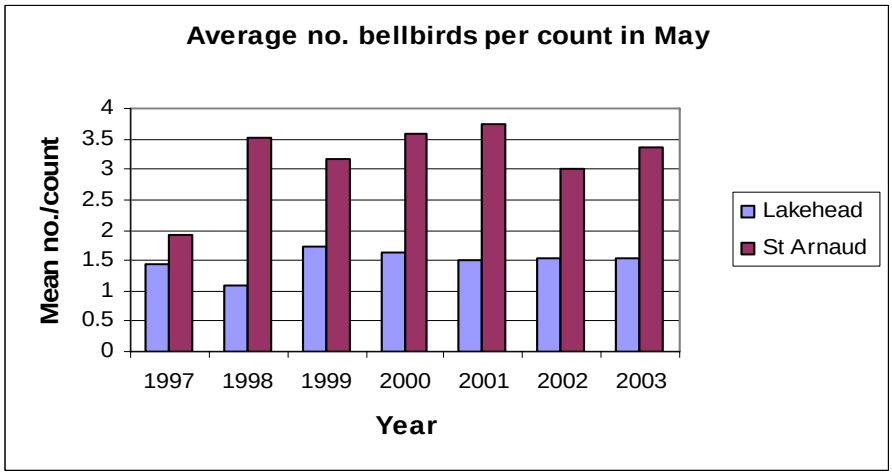
Graphs 15 to 31 summarise the results for a range of native and introduced species at the St Arnaud, Lake head and Rotoroa sites. No counts were done at Rotoroa during May 2002, and no counts were done at the Rotoiti sites in November 1998.

The graphs cover bellbirds, brown creeper, and rifleman (all counts and May), fantail, yellow crowned parakeet, tui, grey warbler, silvereye, blackbird, chaffinch, song thrush (all counts) and tomtit (all counts, May and February).

GRAPH 15. BELLBIRD

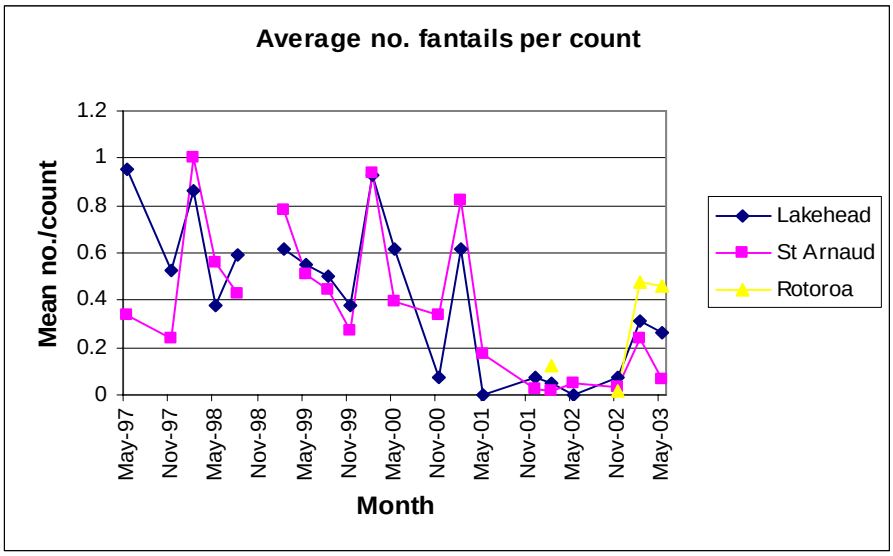


GRAPH 16. BELLBIRD, MAY



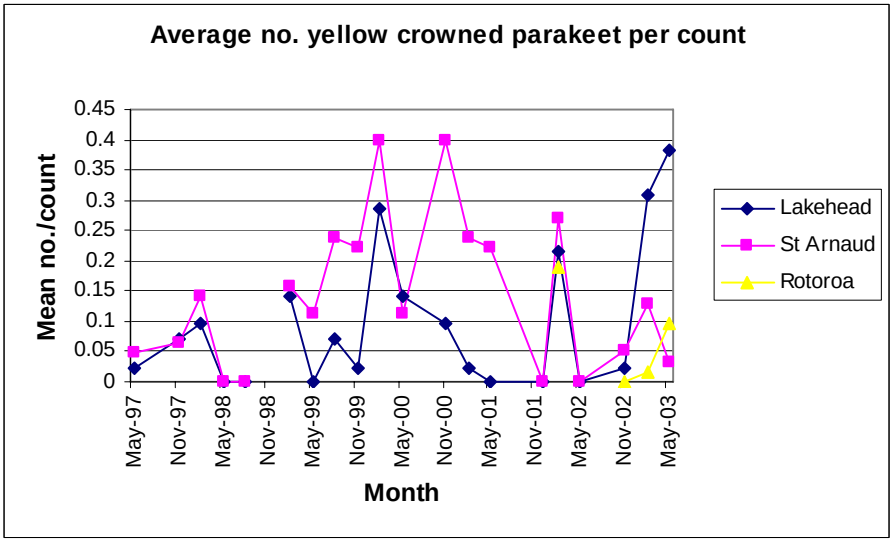
The trend in bellbird numbers at St Arnaud is stable, possibly increasing, and at Lakehead stable but at a much lower level. There is an obvious reduction in the seasonal fluctuation of numbers recorded in 2002 and 2003.

GRAPH 17. FANTAILS



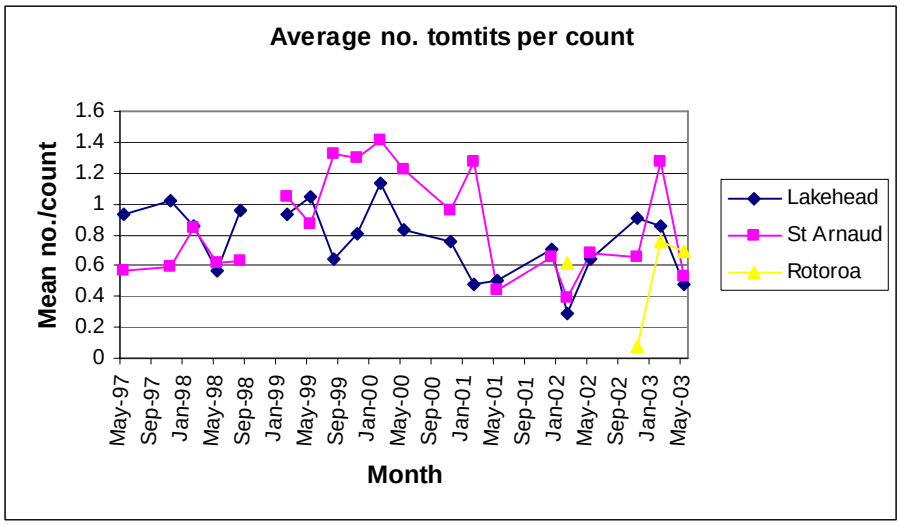
Similar trends in fantail numbers are apparent in the RNRP and at Lakehead, with little difference in numbers recorded at both sites. Numbers at Rotoroa look like they might follow a similar trend. There has been a small increase since the dramatic decline (discussed in 2001-2002 annual report) in numbers in 2001-2002, but numbers are not back to former levels.

GRAPH 18. YELLOW CROWNED PARAKEET

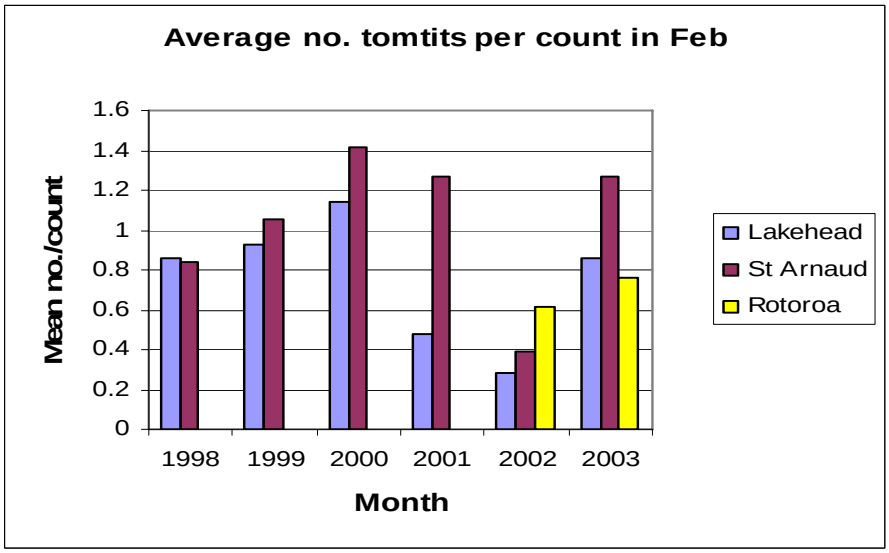


After apparent gains at St Arnaud in early years, parakeet numbers recorded seem to have declined back to levels similar to those at the start of the project, with a rise (seen at all sites) in February 2002 being only temporary. Numbers heard in February at Lakehead have increased to higher levels than at St Arnaud in recent years.

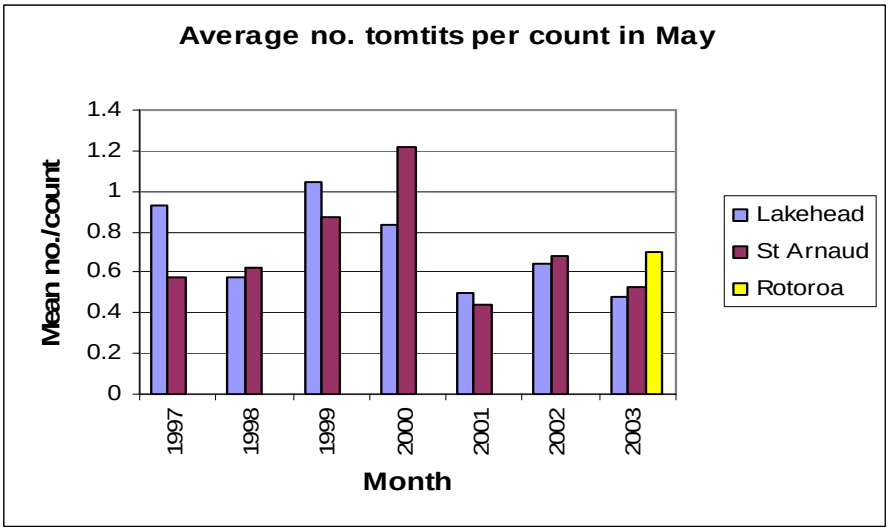
GRAPH 19. TOMTITS



GRAPH 20. TOMTITS, FEBRUARY

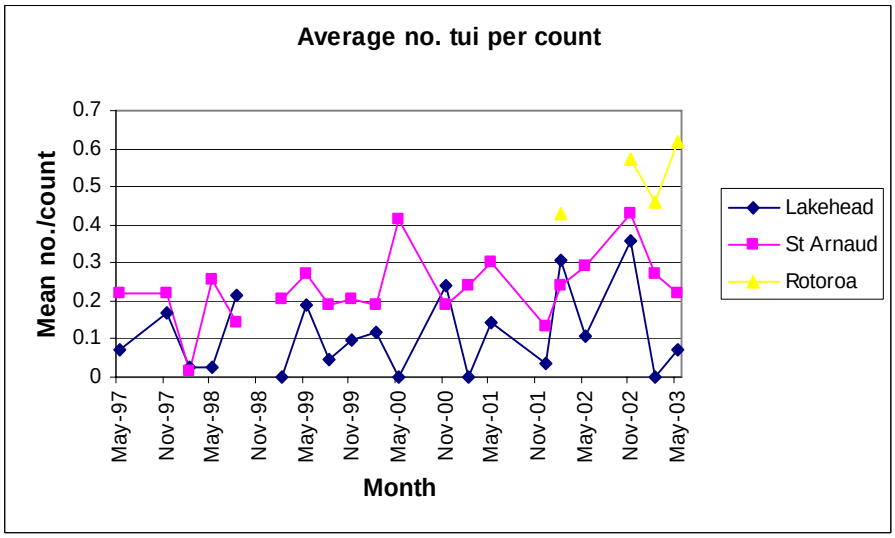


GRAPH 21. TOMTITS, MAY



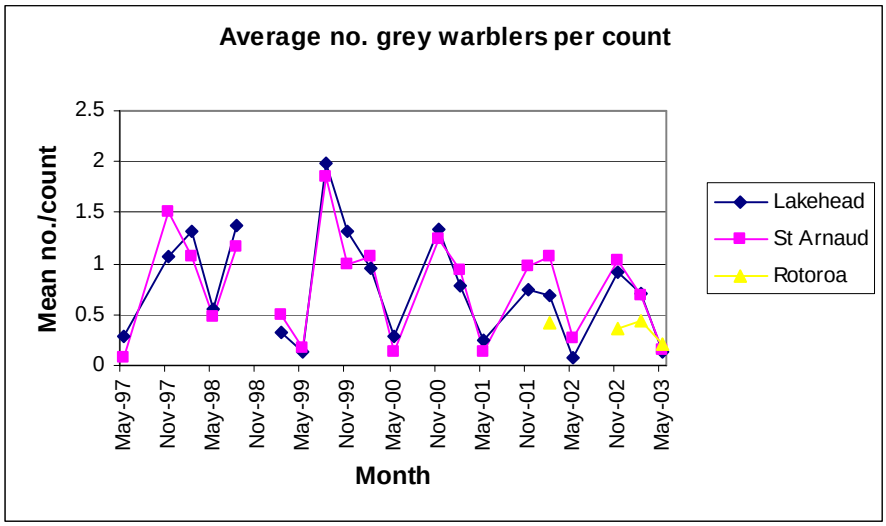
Numbers of tomtits recorded at St Arnaud have dropped in recent years to match that of Lakehead, and are now similar to those detected at the start of the project.

GRAPH 22. TUI



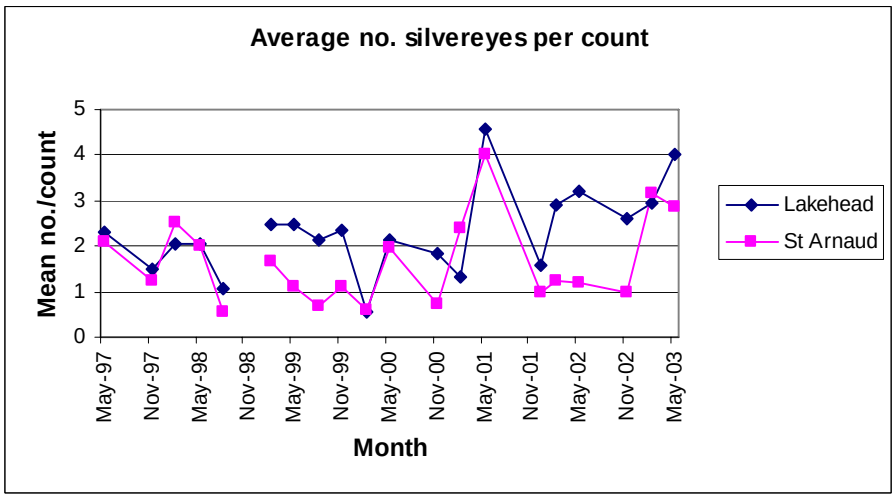
A relatively stable trend in tui numbers is apparent at both the Lake Rotoiti sites, with no tui detected in some months at Lakehead.

GRAPH 23. GREY WARBLER



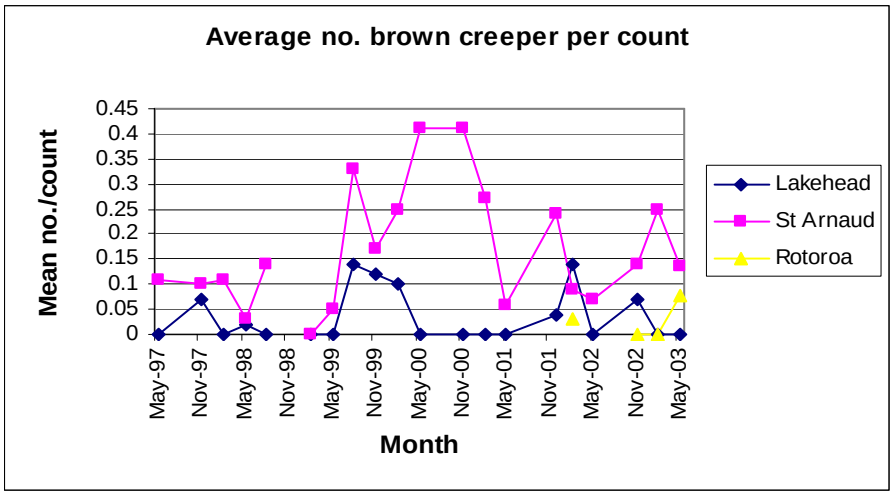
Similar trends in grey warbler numbers are apparent at St Arnaud and Lakehead, with little difference in numbers heard at either.

GRAPH 24. SILVEREYE

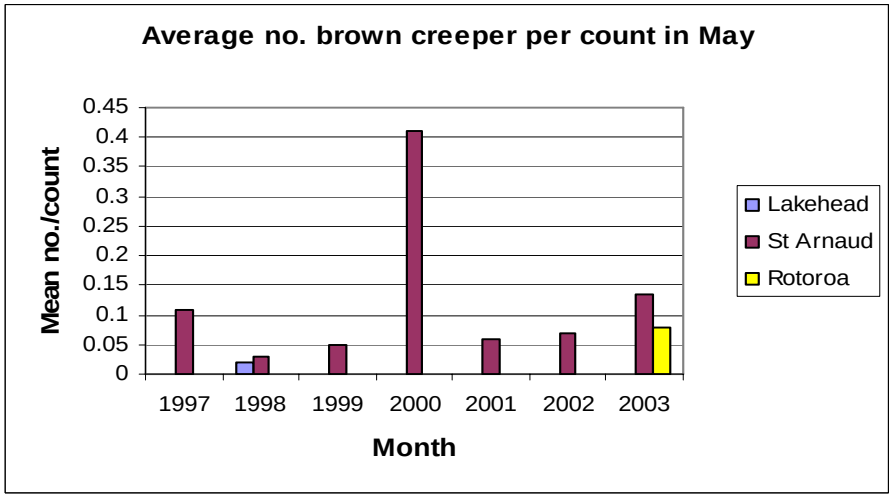


Silvereye numbers fluctuate similarly at both the Lake Rotoiti sites, with higher numbers detected at Lakehead in some years. Too many silvereyes are heard at Rotoroa to count, and this data has not been analysed.

GRAPH 25. BROWN CREEPER

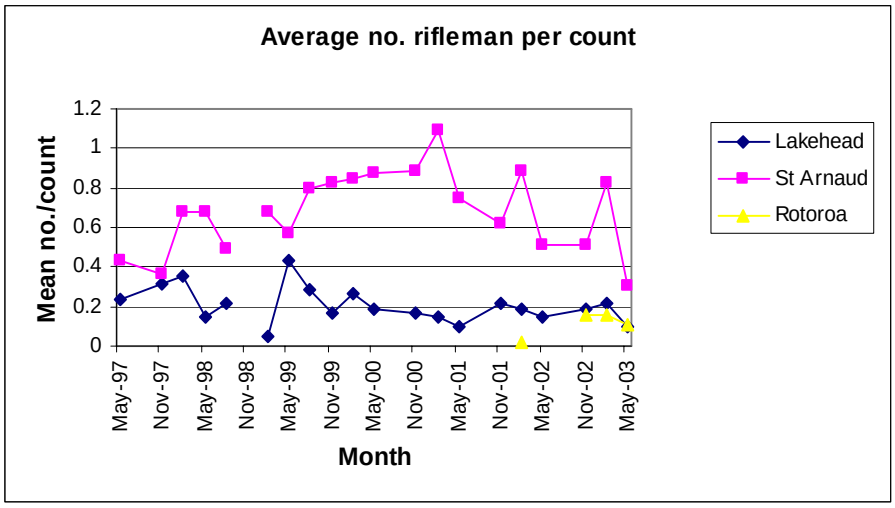


GRAPH 26. BROWN CREEPER, MAY

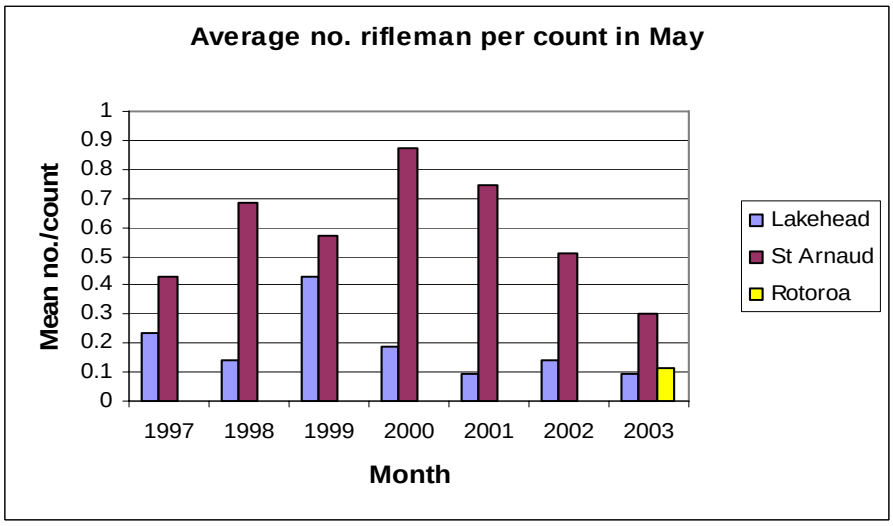


May counts of brown creeper are relatively similar from year to year, except in 2000 when numbers rose. No brown creeper have been detected in some months at Lakehead.

GRAPH 27. RIFLEMAN

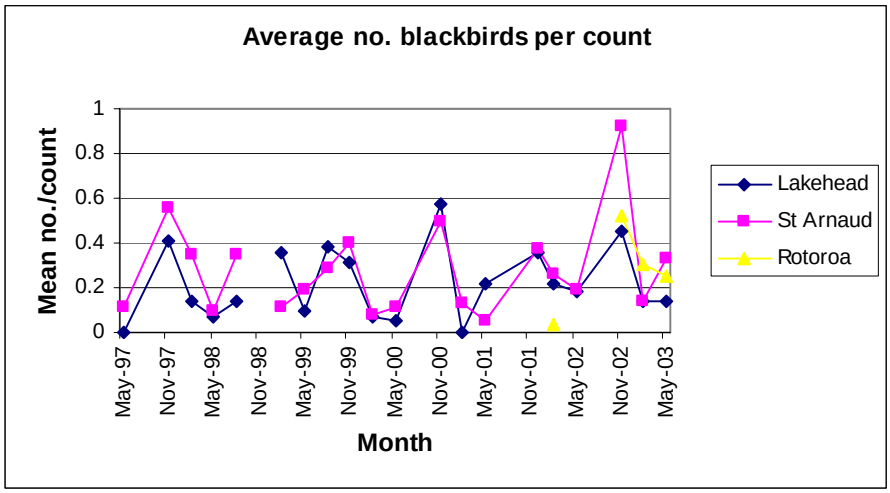


GRAPH 28. RIFLEMAN, MAY



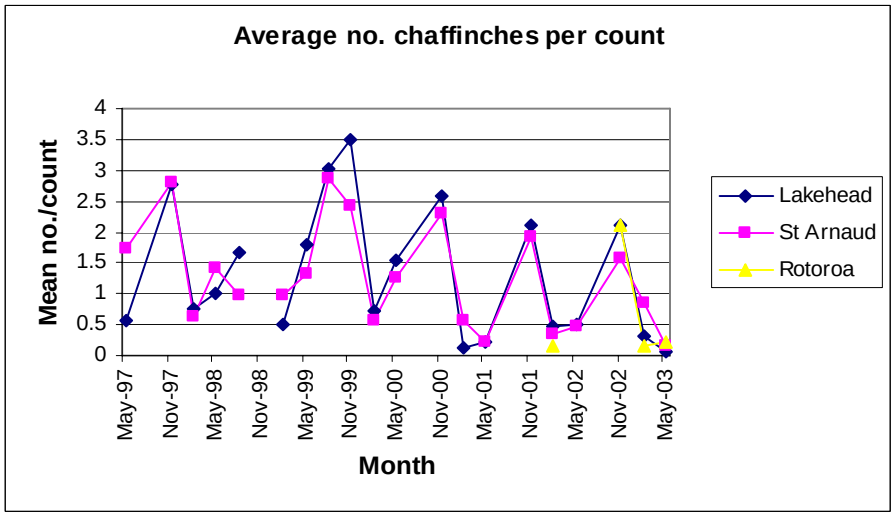
A general decline in rifleman numbers has occurred at St Arnaud after a period of increase (1997-2000). Numbers recorded at Lakehead are consistently low.

GRAPH 29. BLACKBIRD



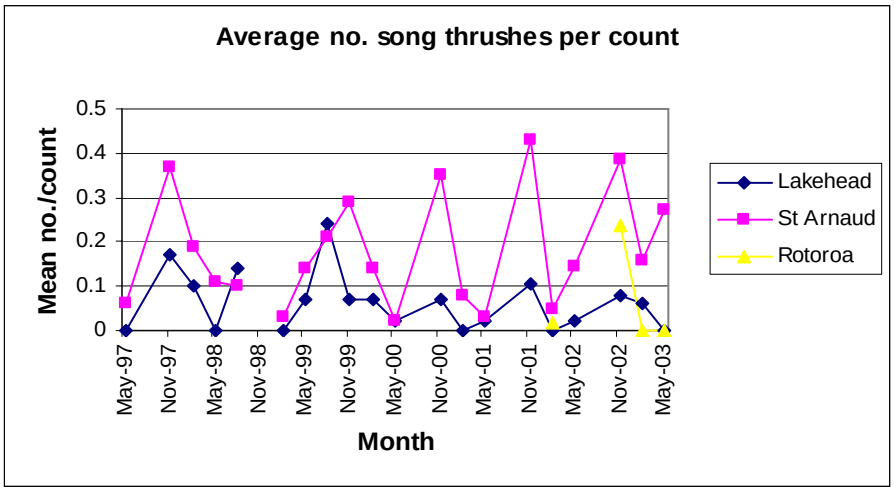
Similar trends in blackbird abundance are apparent at St Arnaud and Lakehead, with little difference in numbers recorded at both sites.

GRAPH 30. CHAFFINCH



Similar trends in chaffinch abundance are apparent at St Arnaud and Lakehead, with little difference in numbers recorded at both sites.

GRAPH 31. SONG THRUSH



Song thrush numbers recorded fluctuate by season, more dramatically at St Arnaud, with none detected some months at Lakehead.

Other species detected in 5-minute bird counts, but in numbers too low to analyse are:

- Long-tailed cuckoo
- Shining cuckoo
- Goldfinch
- Hedge Sparrow
- Kaka
- Kea
- NZ falcon
- NZ pigeon
- NZ pipit
- Paradise shelduck
- Redpoll
- Skylark

St Arnaud site only:

- Greenfinch
- NZ harrier
- Spur-winged plover

Rotoroa only:

- Kingfisher

South Island robins are also detected in the 5-minute bird counts, but this data is not analysed as their tendency to investigate people (especially in the RNRP project area where they are habituated to feed on mealworms offered by an observer) biases the data.

Discussion

The data has only been subject to simple analysis comparing trends in mean counts. There are several factors that influence numbers and activity that could be taken into account to provide a more detailed picture and sufficient counts have probably now been undertaken to examine some of these. One obvious factor is altitude. Averaging species that are only present higher up, such as brown creeper, across count stations at all altitudes is not an ideal representation. Another factor which may bias results is that the number of bellbirds heard in the lower part of the St Arnaud transect now dominate birdsong, making smaller birds (eg silvereye, tomtit) harder to hear. Looking for any different patterns in birds seen, not heard, would be one way of examining this issue. The smaller number of counts at Lakehead (14 compared to 21 at both St Arnaud and Rotoroa), resulting from the shorter distance to the top of the bushline there, means that comparing averages can be slightly misleading unless standard errors are also presented.

In general, May counts have been used to compare trends from year to year, as these are thought to represent most accurately numbers of birds recruited into the local populations following breeding. They are thus not influenced so much by breeding behaviour or differences in breeding season (eg: longer breeding/late breeding, etc), with the possible exception of yellow-crowned parakeets which are capable of breeding all winter during a beech mast.

More analysis thus needs to be done on the data to establish the significance of trends observed.

This year's results are similar to last year's for some key species that were clearly benefiting from the project in the past. Increasing trends were apparent at St Arnaud for bellbird, rifleman, tomtit and parakeets between 1997-2000-01. Such trends have now either flattened off, in the case of bellbirds, or partly reversed.

Bellbirds

The most noticeable feature of bellbird counts since December 2001 is the absence of February peaks in abundance at St Arnaud shown previously. It is possible that this is due to reduced breeding attempts or nesting success. Changes in rat or stoat abundance are implicated (see details below).

Rat tracking indices increased dramatically in the RNRP during the October 2000 to June 2001 period (peaking at 34.4% in November 2000, 35.4% in March 2001 and 41% in June 2001, see 2001-2002 Annual Report (Butler 2003) for more detail). Since June 2001 indices have ranged between 5 and 22.3%.

Mustelid control changed in the old RNRP 825ha core area (where the St Arnaud bird count transect runs) in July 2001 with the removal of two lines running through the centre of the core area, effectively changing the trapping configuration from perimeter trapping of three contiguous 300ha (approximately) blocks to perimeter trapping of one 800ha block. Since November 2001 Fenn trapping has been extended (see mustelid control section 3.3).

Bellbird counts continued to rise in the presence of high rat indices to their highest peak in February 2001. The peak rat index of 41% did not occur until June 2001, after bellbird breeding had finished. If high rat numbers account for reduced breeding success, a lag was experienced, possibly because bellbird numbers had to decrease below a threshold before a difference became detectable. The disappearance of February peaks coincides with changes in the Fenn trapping regime, and it is possible that reduced Fenn trapping intensity, which reduced kaka nesting success in 2001-2002 (see RNRP 2001-2002 annual report), also impacted bellbird breeding success.

The continued increasing trend, or at worst, stable trend (indicated by May counts) in numbers recorded suggests that bellbirds are still responding positively to control programmes at St Arnaud, and may have reached carrying capacity. Ceisha Poirot, University of Canterbury, MSc, undertook the first year of a two year study investigating bellbird nesting success and time budgets this season, and may shed light on this issue.

Other species

Pest control appeared to benefit tomtits and rifleman early on, but since May 2000 numbers have decreased. Tomtits appear to respond to beech seeding, however the exact dynamics of this response are not understood. The declining trend for these species in recent years in the RNRP, relative to the Lakehead site, coincides with an increase in rat tracking indices to 34.4% in November 2000. It is possible that predation by rats is the cause of observed declines.

A similar picture is seen for yellow-crowned parakeets. From 1997-2000 there was an apparent increase in numbers recorded in the treatment area but this has not been sustained. However sample sizes are much smaller than this species than many others so it is harder to identify significant trends.

Brown creeper appear stable, except for the May 2000 count. Flocking behaviour may have biased May 2000 data, when two relatively large groups were detected on the 22nd. The most obvious trend for brown creeper is the regular absence of this species at Lakehead. Only once has this species been absent from the RNRP counts, in February 1999, suggesting some benefit to brown creeper from pest control.

The most obvious trend in tui counts is that this species has not become a major component of the system in the presence of pest control. Some impact of pest control is suggested by their detection at all times of year at St Arnaud, with birds still apparently disappearing periodically at Lakehead.

No benefit from predator control is apparent for fantails, grey warblers, blackbirds and chaffinches at levels instigated in the RNRP.

Song thrush counts show an obvious increase in conspicuousness of this species during the breeding season. The fact that this species is regularly absent from Lakehead, but never in the RNRP, suggests they fare better in the RNRP, possibly due to some non-management related factor (eg: aspect).

Recommendations:

- Further analysis of data is required to fully interpret the results. The need for altitudinal analyses is especially important for species such as brown creeper and rifleman, which are generally found higher up. Analysis of other species above the noisy bellbird zone would be interesting to see if trends change as a result. Confidence intervals will be important.
- As much information as possible on biology/ecology and intra-specific interactions of species detected needs to be incorporated into the analysis.
- A detailed look at possible relationships between birdcounts, rodent tracking indices (and, in future, mustelid tracking indices) and the change in Fenn trapping intensity needs to be undertaken.
- Rotoroa counts need to continue, these will be especially important when pest control work is initiated at this site (see RNRP Strategic Plan 2004, staao-9591 for long-term project goals). Continued counts at all sites are important to establish trends.
- Future analysis of Lakehead accounts needs to identify any effects from extending stoat control to cover this area in 2001-02.
- Research initiatives targeting specific species need to be encouraged, to augment understanding of trends observed for these species (eg Ceisha Poirot's work).

4.1.2 Kaka (Nestor meridionalis) Monitoring

Objective

To test the effectiveness of predator control methods for protecting kaka in the St Arnaud area.

Methods

Documentation of nesting success by locating nest sites, monitoring the outcome of all nesting attempts and determining causes of nest failure, as in previous years. A sample of 15 transmittered females of breeding age was monitored.

Survival and dispersal of 9 juvenile birds, transmittered and fledged in the 2001-2002 season, was monitored to add data to a kaka population model to assist interpretation of nesting success results.

Results

Kaka did not breed in the 2002-2003 financial year.

Table 14 details survival and location records for the nine juvenile birds monitored this year. 'Core' denotes the old 825ha block.

TABLE 14. JUVENILE KAKA LOCATION (AS OF 30 JUNE 2003)

Tx #	Sex	Date last signal	Location
01	F	31/10/02	Wairau Valley, Chinaman Stream
07	M	23/06/03	Big Bush
08	M	23/06/03	Big Bush
12	F	19/11/02	Big Bush (also spends time in Wairau Valley, Chinaman Stream)
23	M	19/11/02	Big Bush
28	M	13/05/02	North core (also spends time in Wairau Valley, Chinaman Stream)
32	F	29/12/02	Big Bush[1]
39	F	23/06/03	Big Bush
	M	16/06/03	Big Bush

[1] Tx dropped, weak link broken, found 14 January 2003 in Big Bush GR N29 577 357.

Four of the eight (50%) juvenile birds monitored were still in the RNRP project area at the end of the 2002-2003 financial year (female 32 has been omitted from the statistics as her transmitter fell off before the end of the financial year).

Transmitters on some of the birds failed this year, earlier than expected (estimated life = 66 months, actual life 35-44 months). Table 15 details the status of all transmitters of birds of known location as of 30 June 2003 with the dates that the last reliable signal was recorded. Some transmitters continued to transmit 'clunks' occasionally after the dates given here. 'Core' denotes the old 825ha block.

TABLE 15. TRANSMITTER LIFE OF KAKA OF KNOWN LOCATION (AS OF 30 JUNE 2003)

Adult birds

Tx #	Sex	Tx type	Life (months)	Prior use (months)	Date on	Last signal	Location
00	F	20ppm	51	-	8/03/99	1/07/03	Core
04	F	20ppm 12/12	39	-	18/12/99	4/04/03	Core
21	F	20ppm 12/12	35	-	27/01/00	30/12/02	Core
79	F	20ppm 12/12	44	-	9/01/00	22/09/03	Core
76	F	20ppm 12/12	37	-	1/04/00	12/05/03	Nth core
05	F	20ppm 12/12	39	-	1/02/00	12/05/03	Core
09	F	20ppm 12/12		-	23/01/01	working	Whisky Falls
24	F	20ppm 12/12		-	1/05/01	working	Speargrass
20	F	20ppm 12/12		-	23/01/01	working	Nth core
45	F	20ppm 12/12		-	19/02/01	working	Big bush
48	F	20ppm 12/12		-	13/12/00	working	Big bush
92	F	20ppm 12/12		-	14/12/00	working	Big bush
49	F	20ppm 12/12		-	26/02/01	working	Big bush
86	F	20ppm 12/12		0.5	14/12/00	working	Big bush
88	F	20ppm 12/12		-	19/01/01	working	Big bush
59	M	20ppm	46.5	16.5	22/02/00	20/08/02	Nth core
73	M	20ppm		-	1/02/00	working	Big bush
97	M	20ppm	56	-	2/03/99	10/11/03	Core

Juvenile birds (produced 2001-2002 season)

Tx #	Sex	Tx type	Life (months)	Prior use	Date on	Last signal	Location
39	F	20ppm 12/12		-	5/03/02	working	Big bush
08	M	20ppm 12/12		-	5/03/02	working	Big bush
74	M	20ppm 12/12		-	22/04/02	working	Big bush

Discussion

No more work could be done on testing the benefit of predator control regimes for kaka this year.

Juveniles are considered to be settled within a home range when they breed for the first time (in the case of males, reaching breeding age is the measure). Once a bird disperses outside the transmitter range for detection from the Mt Robert carpark or top of the St Arnaud Range, they are lost to the study, thus final dispersal of 50% of fledglings produced in 2001-2002 is unknown.

Failure of transmitters on the six female kaka resident in the old core area is disappointing. There are no other transmittered female kaka resident in this area, and the available sample of birds for observations of nesting attempts has been reduced by 37%. Remaining transmittered females all carry the same type of transmitter as those that have failed, so it is reasonable to assume that these transmitters will have a similar life span.

Recommendations

Replace transmitters on all females carrying working transmitters during the next breeding season.

Mist-net new areas in the RNRP Project to increase the available sample of female birds.

4.1.3 Robin (Petroica australis) Monitoring

Objectives

- To test the effectiveness of predator control methods for protecting robins in the St Arnaud area.
- To support TSO staff tasked with completing a significance test and further detailed analysis on 1998-2000 data from treatment and non-treatment sites.

Methods

As in the 2001-2002 financial year, survey methods follow protocols set out by Powlesland (1997). The survey area was extended slightly this year to include the lower part of the Watertank block (Figure 12). All rat trapping lines in this area were used as transects. The survey was conducted four times at weekly intervals during September.

Nesting success of pairs in the survey area was also monitored this year, in response to results from the territory mapping.

Casual sightings of birds in the RNRP core area were recorded throughout the year. This information is not presented, but over time may be treated as a rough index of robin numbers in the RNRP.

Results

Territory mapping

A total of two pairs holding territories were detected in the survey area in 2002/03 (Table 16). Two single males and one female of uncertain breeding status (no positive observations of breeding activity made during the season) were also present in the area.

TABLE 16. NUMBERS OF ROBIN PAIRS HOLDING TERRITORIES IN SURVEY AREA.

Date	# of pairs
August 1998 - February 1999	5
August 1999 - February 2000	5
September 2000 - February 2001	6
September - October 2001*	6
September 2002	2

*Lower 5 lines in water tank block not surveyed in this year.

Note that numbers differ from those in the 2001-02 report, to include pairs present in the lower five lines of the water tank block; and that 2001-02 was the first time Powlesland's protocol was followed for territory mapping.

Nesting success

In total five male robins were monitored in the survey area to detect and record success of nesting attempts. One of these males turned up after the survey was completed. Another of these males was observed interacting with a female (discussed in Territory Mapping section), but no nesting was ever detected.

Of these birds, two were paired up and attempted to nest. One pair successfully fledged six chicks from three nests. The second pair had two failed nesting attempts, the second attempt terminated when the female disappeared.

Discussion

Territory mapping results are not encouraging. The robin population has taken a big dive from previous years, when nesting observations suggested they were doing well. Reduced nesting success and losses of adult female birds were apparent in 2000-2001 when rat tracking indices rose to 34% (Butler, 2003). The September 2002 survey follows two years of heightened rodent tracking indices, often above 20%, suggesting that rodent control by trapping is not benefiting robins as well as the brodifacoum regime. The apparently stable number of territories found during work in 2000-2001 and September 2002 is probably real. Despite different techniques used in 2000-2001, the amount of work done in the survey area in this year probably resulted in detection

of all robin pairs in that area (Nic Etheridge, pers. comm.). Thus it appears that robins showed a delayed response to heightened rat numbers, maybe because the population

was strong enough to cope during the first year. Another cause of population decline could be the reduced intensity of Fenn trapping in the core area from July 2001, presumed to be the cause of reduced kaka nesting success discussed in the 2001-2002 report.

This year's sample size of nesting observations and female mortality is too small to analyse with regard to the second biological performance measure for rodent control, however it is encouraging that some nests made it through.

No work was done by Technical Support Officers staff on further analysis of 1998-2000 data due to other commitments and this has been dropped from their work programmes.

4.1.4 Falcon (Falco novaeseelandiae) Monitoring

Objective

To monitor nesting success of all pairs within the RNRP Project area as a contribution to ecosystem health monitoring and incorporation into the wider Area Office falcon monitoring programme.

Methods

Location of breeding territories is identified during other work undertaken in the RNRP Project area, indicated by the aggressive behaviour of adult birds. Location of nests is undertaken by ground searches following such observations. Nests are then observed at intervals throughout the season to determine outcome and identify predators.

Results

One falcon nest was found inside the Project area this season. This nest is at RF14, about 200m from the RG9 nest that was monitored over the previous two seasons, and is clearly within the same territory. For the second year running there was no nesting activity detected at the Borlase Boundary. There was activity detected in the Lakehead territory but no nesting sign was found which also reflects last years result. No nesting activity was detected at the Big Bush site that was monitored in 2001-2002.

The RF14 nest produced one chick from a clutch of three, but the chick failed to fledge. One newly-hatched chick and two eggs were seen in the nest on 2 December; however by the time the chick was due for banding on 24 December, one egg was missing and the other was unhatched, presumed infertile. Three sites within 150m of the nest were identified, where the bird appeared to have been plucked (down and/or partially sheathed primary feathers were located). This sign suggests a predator, most likely a cat, killed the nestling.

Discussion

This is the second year in a row that a chick has been killed by a predator just prior to fledging in the RNRP Project area. It seems that this period is a dangerous time for ground-reared falcon chicks; they are probably left alone for longer periods as the parents have to spend more time hunting to feed their growing brood.

Recommendation

Continue monitoring falcon nests found inside the RNRP Project area to complement other outcome monitoring tasks and augment the Area Office falcon monitoring programme. In time a picture of how falcon are responding to predator management in the RNRP Project area will be built up.

For more detail on the Area Office falcon monitoring programme see file: NHS-03-13-02. Also see spreadsheet of all attempts. (Internal document staao-7920.)

4.2 NON-WASP INVERTEBRATE MONITORING

Objectives

To document the beneficial impacts of the control of wasps on the populations of the native insects that make up their prey.

Methods

To assess response to invertebrates to wasp control insects belonging to ten indicator groups (A, B and C guild Tachinidae (bristle-flies), and seven Tipulidae (craneflies)) were separated, sorted and counted from a sub-sample of material collected in malaise traps by contract entomologist Rachel Standish (2003) following methodology of Sandlant (2003) and the key of Toft and Dugdale (1997). Biomass analyses for sub samples of malaise traps from this season and previous years were undertaken by Richard Toft, Landcare Research.

Results

Main findings include that the number of indicators caught at Rotoiti was greater than that caught at either non- treatment site at each sampling period. Overall there is no relationship between wasp activity in February immediately after poisoning at Rotoiti and the relative change in indictor activity prior to and after poisoning. The relative indicator activity at Rotoiti is similar to that at Rotoroa despite wasp activity being greatest at Rotoroa (Standish, 2003). (Internal document staao-9639).

For biomass analyses it was concluded that no response attributable to wasp removal could be detected (Toft, pers. comm.).

Discussion

Non-wasp invertebrates from the malaise traps show no clear response to wasp removal. It is proposed that a meta-analysis of these groups be undertaken over the five years that Fipronil toxin has been used at this site.

For both biomass analyses and measurement of abundance of indicator groups it was noted that this process is confounded by the fact that each sample period per site does not match perfectly, that although equal in time elapsed they are often offset by a day or more, a situation dictated by labour resource required for service. As weather is major determinant of invertebrate activity, a day's difference can be significant. In addition the micro sites sampled by malaise traps will vary substantially, which can be significant for many invertebrates (Ibid.). It can be concluded that we are asking too much from a sampling regime established for result monitoring of wasps, which are abundant, relatively homogenously distributed throughout the forest, and have large home ranges. Conversely outcome monitoring targets animals which may be less common, have tighter niche requirements, and small home ranges. The issue of outcome monitoring of non wasp invertebrates in response to wasp control should be addressed. In the interim it is intended to continue the current sampling regime as any patterns are likely to become clearer over time.

4.3 LIZARD SURVEY AND MONITORING

Objectives

- To identify lizard species and populations present in the RNRP Project area.
- To record changes in lizard populations in the Friends of Rotoiti rat-trapping area and identify cause of change.

Methods

39 pitfall traps, made out of 2 litre fruit tins, were established on the top of the St Arnaud Range, between GR N29 004 311 and 000 305. Traps were intended to target an area where a skink was observed basking on 20th February 2001. Traps were run for two days (the intention was to run them for four days, but weather conditions and other commitments prevented this). Rock rolling and early morning searches for basking animals (Whitaker, 1994) were undertaken during the time the pitfalls were run.

Two transects of 20 pitfall traps each were established in November 2002 to measure changes in lizard populations in the Friends of Rotoiti rat-trapping area. One transect runs along Ward Street in St Arnaud, and one along the Black Hill walk (Figure 7). Traps were run by Terra Dumont, a member of the Friends, for four consecutive days on three occasions (November-December 2002, February 2003 and March 2003).

All lizards caught in pitfalls were marked on the top of the head with xylene-free silver pen. Captures were measured (snout-vent length), and presence/absence of tail

regeneration and recaptures were noted. Daily temperature and rainfall data were collected for the monitoring period.

Results

No lizards were caught in the pitfalls on top of the St Arnaud Range. No lizards were detected in the early morning basking or rock-rolling searches. A number of large, unidentified, hairy spiders that drew blood with their bite were caught in the pitfalls overnight. Daytime temperature ranged from 14ºC to 18ºC, the sky became overcast from 4pm on the 12/02/03 and 9pm on 13/02/03 (cutting the basking search short). A cool breeze was present on both days but the ground remained warm to the touch. Traps were closed down when the weather forecast deteriorated.

TABLE 17. SUMMARY OF TOTAL LIZARD CAPTURES (RE-CAPTURES EXCLUDED) ON THE FRIENDS OF ROTOITI PITFALL TRAPPING TRANSECTS

Month	Max temp range ºC	Rainfall mm	Ward Street		Black Hill	
			O. nig. pol.[1]	O. lin.[2]	O. nig. pol.	O. lin.
December 2002	22 – 23.2	1.7 (on last day)	2	0	2	0
February 2003	20.8 – 25.5	0	26	0	9	4
March 2003	21.7 – 22.3	1.8 (on last day)	6	0	3	6

[1] *Oligosoma nigriplantare polychroma* Common skink

[2] *Oligosoma lineoocellatum* Speckled skink

One *Naultinus stellatus* (Nelson green gecko) was found well above bushline on the St Arnaud Range (N29, GR 982 277) during the course of Fenn trapping.

Discussion

Little can be concluded from work done on the St Arnaud Range. Weather conditions were not ideal and not enough time was spent surveying. Lizards are obviously present, but lack of regular sightings during other work means they are probably in such low numbers that they are difficult to detect.

The Friends of Rotoiti pitfall trapping provides the first set of data since a baseline study conducted by Glen Greaves (University of Otago, BSc) in 2001-2002.

Recommendations

Further work is required in all sites surveyed to establish trends.

Friends of Rotoiti pitfall trapping should continue on an annual basis as a useful programme for identifying lizard species present and measuring changes in population, and for education.

Lizard work should remain a low priority for RNRP staff, given that a useful monitor population has not been identified and to get significant results more hours than are available need to be invested to the work. If time allows, work should focus on identification of lizard species and populations in the RNRP area.

4.4 SNAIL MONITORING

Objective

To track changes in a population of *Powelliphanta sp*. extant in the RNRP at bushline on the St Arnaud range.

Methods

Powelliphanta 'striped St Arnaud' (species as yet undescribed) have been monitored in the RNRP since April 1997. Because search techniques modify snail habitat, monitoring is undertaken only once every 4 -5 years. This prevents long-term habitat modification that might endanger the snail population. March 2003 was the second time this population has been surveyed.

The method involves searching plots, as described in Walker (1993). Twelve 5x5m plots were established in 1997-1998 at bushline on the St Arnaud Range, N29 GR 005-324; 4 in the forest edge, four in tussock, four in the bush. All plots were searched by eight observers (maximum 4 in each plot) in March 2003.

Results

Live snails

TABLE 18. NUMBER OF LIVE *POWELLIPHANTA* SNAILS FOUND IN THE SEARCH PLOTS

Date	Tussock	Bush Edge	Bush
30/04/97	11[1]	2	-
21/04/99	10[1]	-	0[2]
26-27/03/03	19	9	0

1. 2 plots in this habitat surveyed in 1997 and 2 new plots established and surveyed 1999
2. 4 plots in this habitat established in 1999

- plots not searched

Empty shells

A total of 6 empty shells were found in 1997, 4 intact and 2 broken.

In 1999:

- 9 empty shells were found in the tussock (5 intact, 4 broken).

- 1 empty shell was found in the bush (intact).

In 2003:

- 6 empty shells were found in the tussock (4 intact, 2 broken).
- empty shells were found in the bush edge (3 intact, 2 broken).
- 0 empty shells were found in the bush.

Discussion

A small increase in the number of live snails found in the Tussock and Bush Edge plots has been detected, but the sample size is too small to draw any conclusions. A number of live snails of small shell diameter (< 15.0mm) were found in 2003, suggesting successful breeding has occurred. The majority of empty shells found are intact (64% in 2002-2003). This data suggests the RNRP *Powelliphanta* population is at least stable. Identification of sign of predation on empty shells recovered is awaited.

Recommendation

Monitoring continue to increase the sample size and establish trends.

4.5 PLANT AND VEGETATION MONITORING

4.5.1 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

Further plants continue to be located in the course of other work in the treatment area and non-treatment sites. All plants monitored have been tagged and a standard set of data collected from each, including measurements and an assessment of browse using the Foliar Browse Index methodology (Payton et al., 1997). This concurs with the internal document 'Best practice for survey and monitoring of Loranthaceous mistletoe' (Internal document wscco-22338). Such recording will continue on an annual basis with all new plants to be tagged and baseline measurements taken until a suitable sample (30+) is obtained for each species.

Results

No mistletoe monitoring was undertaken this year.

Additional plants were encountered in the course of other work, principally from one observer (Jimbo McConchie). Most plants would be described as previously undiscovered, or recovered. None could be described as recruited due to the location on the host plant and size of haustorium.

TABLE 19. NEW MISTLETOE PLANTS 2002/03 BY SITE AND SPECIES

	PER tet	PER col	ALE fla	Total
RNRP core	101	28	12	141
Fenn lines	16	10	4	30
Duckpond	15	0	4	19
Big Bush rat	7	0	0	7
Pincushion	1	0	0	1
Track tunnel lines Rotoiti	5	0	0	5
Track tunnel lines Rotoroa	14	10	4	28
Total	159	48	24	231

Note for table 19

- RNRP possum control covers sites:
- RNRP core
- Pincushion
- some of Track Tunnel Rotoiti
- Fenn lines.

Animal Health Board possum control encompasses:

- Duckpond
- Big Bush rat
- some of Track Tunnel Rotoiti
- Fenn lines

Non treated sites include:

- Track tunnels Rotoroa
- some of Track Tunnel Rotoiti
- Fenn lines

TABLE 20. NEW MISTLETOE PLANTS IN RNRP CORE BY YEAR

	PER tet	PER col	ALE fla	Total
2000/01	88	7	42	137
2001/02	36	13	5	54
2002/03	101	28	12	141
Total	225	48	59	332

Discussion

Although no browse monitoring was undertaken mistletoe appear to be in good health based upon anecdotal reports and evidenced by the conspicuousness of new plants.

Sufficient plants now exist across species and sites for a robust sampling regime at treated and non treated site as outlined in methods above.

The 'discovery' of plants at each site is a function of (any one or combination of) the health of the plants, the observer, and site exposure. It should not be treated as an index.

Plants continue to be found at sites previously visited (often repeatedly) of such a size that they can not be 'new', i.e they will have been visible to those who 'looked right' for a number of years. At other sites some plants have finally been 'found' after repeated searches for the source of dropped leaves found on the forest floor. Many more still of this category await a plant to attribute the fallen leaves to. Windy or drought conditions aid mistletoe discovery through presence of fallen leaves on the ground.

Mistletoe pollination studies

In January 2003 David Kelly and Jenny Ladley (University of Canterbury) and Alastair Robertson (Massey University) examined mistletoe (*Peraxilla tetrapetala*) pollination and fruit set at RNRP as part of ongoing studies relating these measures to predator control. RNRP was selected as mustelid and rodent control are established.

Method

Incidence of bird-opened flowers is measured by "% pink", the percent of all ripe flowers which are not yet opened. With good bird attention this should be low. Fruit set was examined across three treatments: 'bagged'- allows only self pollination and no bird pollination, natural - bird and insect visited; and hand-pollinated - a measure of maximum potential fruit set.

Results

Flower visitation was 5.0% pink.

Fruit set: Natural 32.0%. Hand pollinated 60.8%

Discussion

The % pink result is a very low value indicating good bird visitation. Similar values are found at few other monitored sites.

The natural fruit set was further form the hand pollinated fruit set than would be expected if good bird visitation was the rule as indicated by the % pink value. The fruit set values were not significantly different - either because of low sample numbers (low flowering year for *PER tet*) or pollination was not working well due to low flowering (few other plants from which to pick up pollen from). It is planned for this study to be replicated in January 2004. (Kelly, Ladley, and Robertson, 2003).

4.5.2 *Pittosporum patulum*

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

Objective

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. No work was undertaken in this programme this year.

4.5.3 Foliar Browse Index

Objective

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

Methods

A standard methodology developed by Landcare Research was used (Payton et al., 1997). Marked trees re-assessed annually. Sample sizes for some species are limited for various reasons: e.g. naturally scarce (*Podocarpus hallii* (POD hal), *Pseudopanax colensoi* (PSE col)); monitored for other programmes run by the Area Office (*Metrosideros umbellata*) (MET umb); and bad weather prevented monitoring *Libocedrus bidwillii* (LIB bid).

Griselinia littoralis (GRI lit) is monitored for ungulate outcome monitoring, with its canopy density a 'health' measure. All other species are used for possum outcome monitoring.

TABLE 21. VEGETATION MONITORING RESULTS

Species	Year	n	CFD	s.e.	B0	B0+1
Ela hoo	2002	21	45	3.2	100%	100%
GRI lit	2002	18	37	3.8	100%	100%
LIB bid	2002	6	57	9.5	100%	100%
MET umb	2002	0	-	-	-	-
PSE cra	2002	15	48	2.5	100%	100%
PSE col	2002	1	55	-	100%	100%
RAU sim	2002	13	41	3.1	100%	100%

Species codes not listed above:

Ela hoo – *Elaeocarpus hookerianus*; Pse cra – *Pseudopanax crassifolius*; Rau sim – *Raukawa simplex*.

GRI lit coppice browse. n=18. Plants browsed n=7 (38.9%). Browse range (% coppices browsed) 50-100%, mean = 67.5% (s.d.29.2%)

Discussion

A trend of no observed browse continues for all species indicating continuing success of the possum control operation. Most species have shown nil browse for several years, with the exception of *Raukawa simplex* and *Libocedrus bidwillii*. These plants are considered to be the only plants to be sensitive to browse at current possum densities. Mistletoe shows similar sensitivity.

The RNRP Technical Advisory Group recommended that FBI monitoring be discontinued for species other than *Raukawa simplex* unless possum densities change dramatically (e.g. > 2% RTC). Possum outcome monitoring for floral values will be provided mistletoe monitoring and *Rau sim* FBI.

Coppice browse on broadleaf indicates that deer are present in the treated area.

4.5.4 Beech Seeding

Objectives

The periodic seeding of beech is the primary determinant of the population cycles of rodents and mustelid, and for native invertebrates and birds such as kaka in this forest. Monitoring of beech seedfall allows the placement of each annual seed event, and subsequent response, in an historical context.

Method

20 x 0.28m² funnel shaped seed traps collect seed and litter fall from canopy between 1st March and 30th June at each Mt Misery (Rotoroa) and RNRP. Seed is separated from litter, sorted to species and tested for viability.

Results

Results are presented in Table 20 showing the total number of seeds collected per site by species and the proportion that were viable.

TABLE 22. BEECH SEEDFALL 2003 BY SITE AND SPECIES

	Nothofagus fusca		*N.menziesii*		*N.solandri*		All species		
	Total seed	% viable seed	Total seed	% viable seed	Total seed	% viable seed	Grand total viable seed	Viable seed/m²	Log10 viable seed/m²
RNRP	2	0	11	54.5	5	40	8	1.43	0.1549
Mt Misery	11	18.2	10	30	7	14.3	6	1.07	0.02996

GRAPH 32. BEECH SEEDFALL

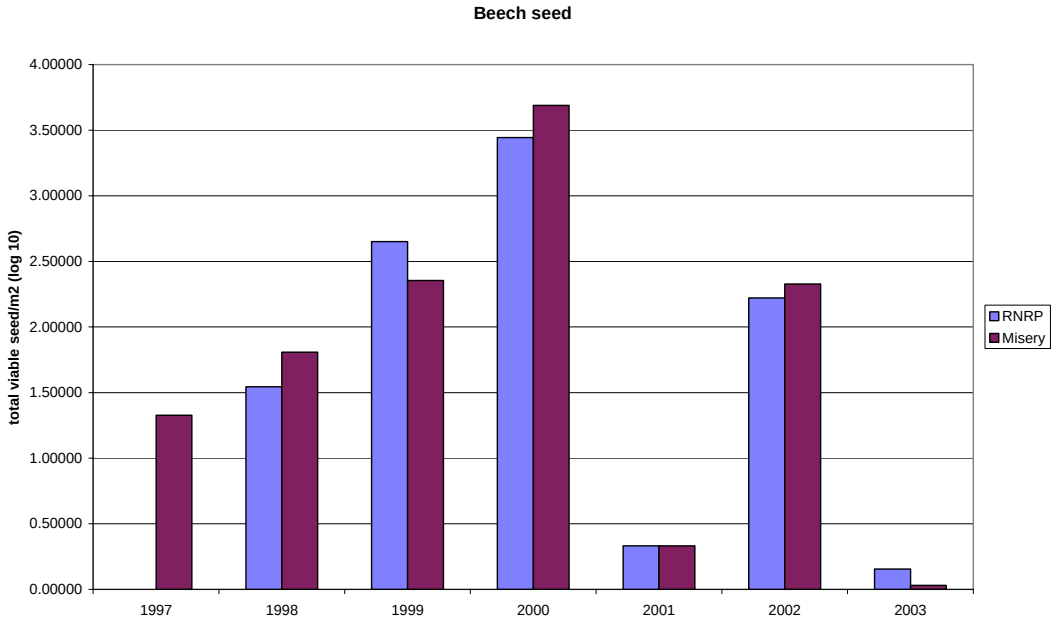


TABLE 23. BEECH SEED VIABILITY

		1997	1998	1999	2000	2001	2002	2003
Rotoiti	Total viable seed/m²	0.36	35	447.5	2778.9	2.14	166.4	1.43
	Log10 Total viable seed/m²	-0.447 *	1.544	2.651	3.444	0.331	2.221	0.155
Mt Misery	Total viable seed/m²			225.9	4883.0	2.143	212.7	1.071
	Log10 Total viable seed/m²	1.327	1.808	2.354	3.689	0.331	2.328	0.030

* Negative log value does not show on scale of graph above.

Discussion

2003 may be described as a non-seed year with very little viable seed falling, providing the ecosystem with negligible energetic input from this source.

4.5.5 Tussock Seeding

Objectives

Seeding of tussock is used as a good indication of the intensity of beech seeding that can be expected in the same year, although the relationship is not mathematically perfect.

Methods

Two species of tussock are monitored over a 1000m transect at Mt Misery (200 counts) and a 500m transect at RNRP (100 counts). (Internal document staao-1869)

Results

No tussock counts were undertaken this year.

5. Reintroductions

Tieke/Saddleback

Transfer of South Island saddleback/tieke from Motuara Island (Queen Charlotte Sound) to Rotoiti Nature Recovery Project was included in the 2001/02 business plan to occur during September 2001.

This did not occur as necessary approvals were not in place before birds commenced breeding on Motuara Island. It was deferred to February 2002.

For reasons listed below it was decided to further defer the transfer to spring of the next financial year.

- Expanded RNRP mustelid trapping network was not yet shown to work (as per kaka breeding outcome monitoring). 2001/02 results for RNRP core were not available until late March at earliest. The new regime was significantly different from that operative 1998 –2001, and thus previous results could not be extrapolated with any certainty.
- Imminent beech seedfall of moderate to large intensity would expose transferred birds to a rodent irruption.
- The rodent plague following the enormous 2000 seedfall was managed to benefit forest birds in the RNRP. However ship rats were not controlled as effectively as was hoped for (exceeded target tracking tunnel indices). Management of rodent irruption following 2002 seedfall would allow the project team to determine how effectively ship rats can be managed following seedfall events of 'normal' proportions.
- A poor (cool and wet) summer 2001-02 would likely result in no flowering of beech in spring 2002, and therefore no seedfall in autumn 2003. Thus a window of opportunity will exist to translocate tieke with an expectation of low rat densities. At best this could allow at least two tieke breeding seasons (including that of transfer) prior to exposure to rodent irruption.
- Greater lead time would allow greater preparation and would allow the project team to maximise the learning opportunities. A potential Masters of Science student has expressed interest in studying this translocation. A spring 2002 transfer would allow study of tieke interaction with RNRP tools on Motuara; optimal transmitter attachment; transmitter limitations; habitat matching; roost/nest box habituation; and post release dispersal and behaviour.
- Deferral allows the project team to undertake the translocation at the originally preferred time of spring. This maximises opportunities for breeding and acclimatisation before experiencing a Rotoiti winter.

The above points were developed through observation of this seasons ecological and management activities at the RNRP and discussions with David Butler, Peter Gaze, Bill Cash and Tim Lovegrove (Auckland Regional Council).

Roroa/Great Spotted Kiwi

Following encouragement from Kiwi Recovery Group in 2001 to pursue a reintroduction of Great Spotted Kiwi to the RNRP, this year saw much informal discussion held with kiwi practitioners toward developing an operational plan which in turn would form the basis for a translocation proposal. This covered aspects such as possible source locations, translocation techniques, and minimum sample sizes.

Additionally Paul Gasson and his dog Huxley developed skills in aspects of kiwi handling and monitoring. Huxley achieved full certification as a wildlife dog through the national certification process.

6. 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 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.

6.1 DEVELOPING AND MAINTAINING PROJECT PROFILE

Spreading the Message

The site of the Rotoiti Nature Recovery Project is readily accessible to visitors. The Bellbird and Honeydew walks within the original core area at Kerr Bay offer all weather tracks with a series of detailed panels about many aspects of the project. Returning visitors often comment on the increased bird song and presence of native wildlife around the village and the tracks through the RNRP area.

The ever increasing number of 'mainland island' type projects outside the department's management (both on and off private land), provide testimony to the inspiration that the early departmentally-managed projects have provided. RNRP staff also provided technical support to several community groups involved in mainland restoration work such as the Friends of Flora group.

RNRP staff participated in the annual mainland island hui held in Lewis Pass at which individuals from a number of groups outside the Department were exposed to the work going on at Rotoiti.

A paper was invited for the 'Offshore and Mainland Islands' symposium of the 3rd International Wildlife Management Congress to be held in Christchurch, December

2003. An abstract for this was submitted and accepted (Maitland and Butler 2003). (Internal document staao-8837).

6.2 COMMUNITY LIAISON

Ongoing community support is vital to the long-term future of the project. We continue to aim to keep the community informed through regular (at least monthly) contributions to the local newsletter, and indirectly through the media, and offer opportunities for more in-depth contact through talking to groups, providing guided walks and opportunities for 'hands on' involvement through involvement with the Friends of Rotoiti (refer Section 6.5 Volunteer Involvement).

Revive Rotoiti Newsletter

Only one edition of Revive Rotoiti (Appendix 4) was published in the year (December 2002). The newsletters (including photocopies of back-issues) are available in the Nelson Lakes National Park Visitor Centre. The distribution list continues to grow steadily, totalling over 520.

Meetings

Project information has been supplied regularly to meetings of the St Arnaud Community Association, the Rotoiti District Community Council and community forums held by the Department in Nelson.

6.3 MEDIA LIAISON

The wasp control programme received television, radio, and print media coverage. This generated a large number of enquiries to the project for advice with managing this pest.

6.4 EDUCATION PROGRAMMES

Secondary and Tertiary Education

Groups given talks on the project in 2002/2003 included:

- Nelson Girls College
- Newlands College
- Marlborough Girls College
- Marlborough Boys College
- Waimea College
- Nayland College

- Motueka High School
- Queen Charlotte College
- Golden Bay School
- Collingwood School
- Nelson Marlborough Institute of Technology Trainee Ranger class
- Nelson Marlborough Institute of Technology Tourism class
- Massey University

A talk was given at Rotoiti Lodge nearly every week in term time. A total of 1055 student were given the talk at Rotoiti Lodge. Six staff were involved in this activity. The slide show has been replaced with a powerpoint based data show. This has already proven its worth in being able to present information in much more user friendly form with an ability to update and further develop the presentation as often as desired or necessary. The feedback from students and teachers has been very good. Most schools continue to run their programmes as they have for the past few years, but many senior biology classes are now having a tutorial-style guided walk instead of the traditional slide show.

Groups given guided walks round the project site were:

- Youth Nelson
- Waimea College
- Nayland College
- Nelson Girls College
- Bohally Intermediate
- Nayland College
- Inangahua School
- Wairau Valley School
- Mayfield Primary School
- Forest and Bird
- Blenheim Probus
- Collingwood School

Many senior biology classes staying at Rotoiti Lodge now choose to have guided "tutorial' type tour of the mainland island. This has increased the number of guided walks given. This is included in assessment for many of these classes. The total number of people given guided walks around the project in 2002-03 was 744.

Primary School Resource Kit

Many of the primary schools that visited in 2002-03 are using the resource kit to plan their trips. They are still requesting a staff member to give an introductory talk to their classes, but are otherwise largely self-guiding.

6.5 VOLUNTEER INVOLVEMENT

6.5.1 RNRP Volunteers

RNRP received 216 volunteer work days this year from the following:

- Nine individuals gave a total of 54 days work.
- Four visits by NMIT Trainee ranger Classes doing 42 days work in total.
- Five visits by New Zealand Conservation Corps (Whenua Iti and Omaka) produced 89 work days.
- Malika Vira-Sahwmy (Mauritian Wildlife Foundation) 31 days as part of international exchange with DOC.

(Note - This does not include the Friends of Rotoiti hours)

6.5.2 Friends of Rotoiti

The Friends of Rotoiti (FOR) community group was set up in 2001. Its objectives are to provide opportunities for the community to be involved in pest control, species monitoring and re-introductions and for individuals to receive training from the Department in best practice techniques in these areas. In this year there were two organised training days for all group members. All new members are trained by either staff or experienced volunteers on their first day. The group conducts rat trapping in the village, 'filling the gap' between the old core and the new rat control area at Duckpond Stream and also run a Fenn trap line up the Wairau Valley and from Six Mile road to the top of the Rainbow Skifield. In January 2003 a new Fenn line was put in from the Buller Bridge in West Bay to the Mt Robert car park. Predator control methods are identical to RNRP techniques, with the frequency of trap checking also the same where possible. Results in sections 3.2 and 3.3.

FOR had over 30 members at the end of 2002. The number is necessarily vague as some of the "members" are representatives of groups such as the 50+ tramping club, and Forest and Bird, may bring up to ten volunteers on a day.

The Friends of Rotoiti did 160 volunteer days of work over the 2002/03 period.

In 2002-03 Terra Dumont, a year 10 student at Garin College, took on lizard pit-fall monitoring in Ward Street and on Black Hill. Only two four-day monitors had happened by 30 June 2003, so a full report of result will wait until the 2003-04 report. Results in section 4.3.

Feedback from the group indicates that there is ongoing commitment to the project, and members have expressed great satisfaction in being able to make a positive, hands-on contribution to the RNRP.

6.6 VISITOR SERVICES

A major redevelopment of the RNRP display in the visitor centre happened over the year, with the new displays being opened in December 2002. The local community was invited to the opening and feedback on the displays has been very positive.

Janet Bathgate was contracted to do the design and production work, with most of the information and photos provided by RNRP staff. The new displays take up approximately one quarter of the visitor centre display area. The old "faces" panels have been upgraded and the information bought up to date. The new panels are on the impact and control of predators and on wasps and the honeydew cycle. Two "flip books" have removable pages and information in them can be upgraded and added to. A notice board with temporary information about trapping results etc is updated regularly.

A full colour brochure sized A3 to fold into a DL shape has been developed, once again with the assistance of Janet Bathgate. This is available from the visitor centre and provides a good range of information supported by maps and photographs on the RNRP project. (Appendix 5).

7. Research

Following is a list of projects funded or assisted by the Project to differing levels

Carl Wardhaugh, University of Canterbury MSc, awarded an RNRP Research Scholarship for 2002-2003 and logistical support for study on interactions between the sooty beech scale, host trees and introduced wasps (ongoing).

Ceisha Poirot, University of Canterbury MSc, awarded an RNRP Research Scholarship for 2002-2003 and logistical support for study on bellbird breeding success and time budgets (ongoing).

Chris Berg, University of Canterbury MSc Hons, logistical support for research on the impacts of hares (ongoing).

Dave Kelly and Jenny Ladley (University of Canterbury) and Alastair Robertson (Massey University), logistical support for National research on mistletoe flower opening and pollination in areas with and without predator control (ongoing).

Ed Abdool, University of Victoria, support for research on the relationship between Fenn trapping success rate and the surrounding micro-habitat, using the Friends of Rotoiti Wairau Valley trap line as a research site (ongoing).

Eric Spurr, Landcare Research, contribution of carcasses for profiling persistence of Brodifacoum in selected pest species (ongoing).

Fraser Maddigan and Elaine Murphy, Science and Research, DOC, contribution of carcasses for National stoat diet analysis (ongoing).

Graeme Sandlant and Rachel Standish, Landcare Research Nelson, contribution of malaise samples for analysis of indicator groups of invertebrates as a response to wasp control (ongoing).

Kim King, Robbie McDonald, University of Waikato, contribution of carcasses and funds in 2001-2002 for national stoat and weasel diet and predator disease research (ongoing).

Paul Banks, Nelson Institute of Technology Trainee Ranger Scheme, logistical support for a study on the effect of the common wasp on honeydew in beech forests, the influence of rainfall and temperature on wasp impacts on honeydew and the rate of wasp re-invasion following poisoning with Fipronil insecticide (complete).

Sarah Spalding, University of Otago, Wildlife Management Diploma, logistical support for survey on rodent control techniques used by landowners in St Arnaud, as contribution to Eric Spurr's work (ongoing).

The RNRP has also provided a research site for Landcare Research, Nelson and Lincoln, to undertake research into the impacts of mice and wasps on soil chemistry and soil microbes and invertebrates in a honeydew beech forest. Project infrastructure was set up this year, and data will be gathered over the next four years. This work is supervised by David Wardle.

8. Project Management

8.1 BUDGET

TABLE 24. BUSINESS PLAN BREAKDOWN BY MAIN TASKS

Activity	Staff Hours *	Operating Costs ($$)	Temporary Wage Costs ($$)
Predator management	1324	1700	13668
Wasp control	544	2500	4850
Management of rodents	368	2326	23100
Vegetation monitoring	380	505	4735
Native fauna monitoring	968	5630	10075
Small mammal monitoring	184	400	5730
Project management	1429	1500	1500
Reintroductions	680	1250	8491
Possum control	329	800	1560
Ungulate control & monitoring	240	2200	0
Research support	40	0	0
Advocacy	296	6103	600

* Does not include volunteer effort (3008 hours)

8.2 STAFFING

- Brian Paton, Programme Manager Biodiversity, 50% RNRP
- Matt Maitland, Project Supervisor
- Genevieve Taylor, A2 Ranger
- James McConchie, A1 Ranger
- Andrew Taylor, 2 year temporary A1 Ranger
- Jasmine Braidwood, 6 month A1 Ranger

- Brett Thompson, 6 month A1 Ranger
- Paul Banks, 6 month A1 Ranger

Others that contributed business-planned hours were

- Paul Gasson, Biodiversity A2 Ranger (assets)
- Graeme Omlo, Biodiversity A1 Ranger (threats)
- Dave Seelye, Biodiversity A2 Ranger
- John Wotherspoon, Programme Manager Community Relations
- Kimberley Parlane, Community Relations A2 Ranger
- David Butler Technical Support Officer from Conservancy

8.3 TECHNICAL ADVISORY GROUP

The RNRP Technical Advisory Group continue to contribute valuable input in providing advice to the area manager. The advisory group meet formally once a year, prior to business planning, to review the previous years' work and provide recommendations for the coming year. Technical Advisory Group members in 2003 were:

- Jacqueline Beggs, (Landcare Research, Nelson)
- Peter Wilson (Landcare Research, Nelson)
- Eric Spurr (Landcare Research, Lincoln)
- David Kelly, Canterbury University
- Graeme Elliot, Biodiversity Recovery Unit

There is also a standard invite to the National Technical Co-ordinator (Mainland Islands).

Pete Gaze, Mike Hawes and Martin Heine, technical support staff from Nelson/Marlborough Conservancy, also attend the annual meeting.

8.4 SKILLS SHARING

The following opportunities were taken advantage of:

Matt Maitland

- attended National Multi-Scaled Biodiversity Monitoring Programme (to support NHMS)
- provided technical information and review of Rodent Control section of Best Practice Predator Manual.

- attended 'islands, Islands, ISLANDS' Landcare Research/DOC collaborative workshop for brainstorming biodiversity futures.
- attended Beech Forest Working Group meeting.
- advice to many individuals, organisations, and DOC Area Offices for wasp control.

Genevieve Taylor

- Stephens Island frog monitoring.

Kimberley Parlane, John Wotherspoon, Matt Maitland, Genevieve Taylor and Jimbo McConchie

- support to Friends of Rotoiti.

Paul Gasson

- Kiwi egg candling course, Rotorua.

Opportunity for cat management skill sharing with Trounson Kauri Park not realised.

Although accurate records for information transfer are not kept, numerous requests are received from internal and external sources across a variety of pest control and monitoring programmes.

9. Acknowledgements

This year's results represent a significant team effort. Thirteen Departmental staff have worked on the project from time to time from the St Arnaud Area office, supported by others from the Nelson/Marlborough Conservancy, Regional and Central Offices. These people have been joined by some dedicated volunteers and in particular we would like to acknowledge the expanding effort of the Friends of Rotoiti. All should be acknowledged for their efforts and enthusiasm.

The very 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 Technical Advisory Group and in other capacities. These people have helped provide knowledge and intellectual backing.

The project has 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. Iwi from the Top of the South Island, particularly Ngati Apa, have also lent their support. It is also appropriate to single out Phillip and Fiona Borlase and thank them for their continued support and for providing access through their farm adjacent to the national park.

Comprehensive mainland restoration projects like this differ from many of the other projects the Department undertakes, in that there is never a break in the field programme. There is a requirement to keep a measure of pest control and monitoring going throughout the year, particularly in a season of beech seeding such as we faced recently. Acknowledgement must also be given to all those staff who toiled in the field during inclement weather, as the rewards have become plain for all to see.

Finally it was with much regret that we bade farewell to Dave Butler who resigned at the end of June 2003. It was Dave who was involved with the initial setting up of the recovery project and became the driving force that has seen it become the success it is today. When he moved back to Nelson as the Technical Support Officer his technical expertise was later very much valued by the Project staff. Fortunately we have been able to retain his services on the Technical Advisory Group and in this capacity he has been able to review this annual report.

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Appendices

Appendix 1. Cat Trap Locations

Trap code	Physical location code	Northing	Easting
LECT 1	LEF 56-57	2497510	5932605
LECT 2	LEF 68	2497292	5931525
LECT 3	LEF 75	2497398	5931016
LECT 4	LEF 92	2497279	5929587
KBCT 1	BBF 49	2497421	5933391
KBCT 2	BBF 49	2497368	5933359
DPCT 2	DPS 2	2496631	5934937
DPCT 4	DPS 4	2496693	5935026
DPCT 6	DPS 6	2496800	5935075
LHCT 1	LHF 7	2495256	5925725
CWCT 1	Coldwater hut	2494725	5926119
AWCT 1	AWF 21-22	2494511	5935376
MRCT 1	PNW 50	2495094	5933759
CNCT 1	CN 8	2498783	5932562
CMCT 1	CM 1	2498674	5932067
BZCT 1	BVS 36	2498838	5934854
HZCT 1	HBC 10	2502344	5935361
MBCT 1	MBF 34	2494714	5937703
SZCT 1	SBF 18	2500127	5933027

Appendix 2. Figures

Appendix 3. Tables and Graphs

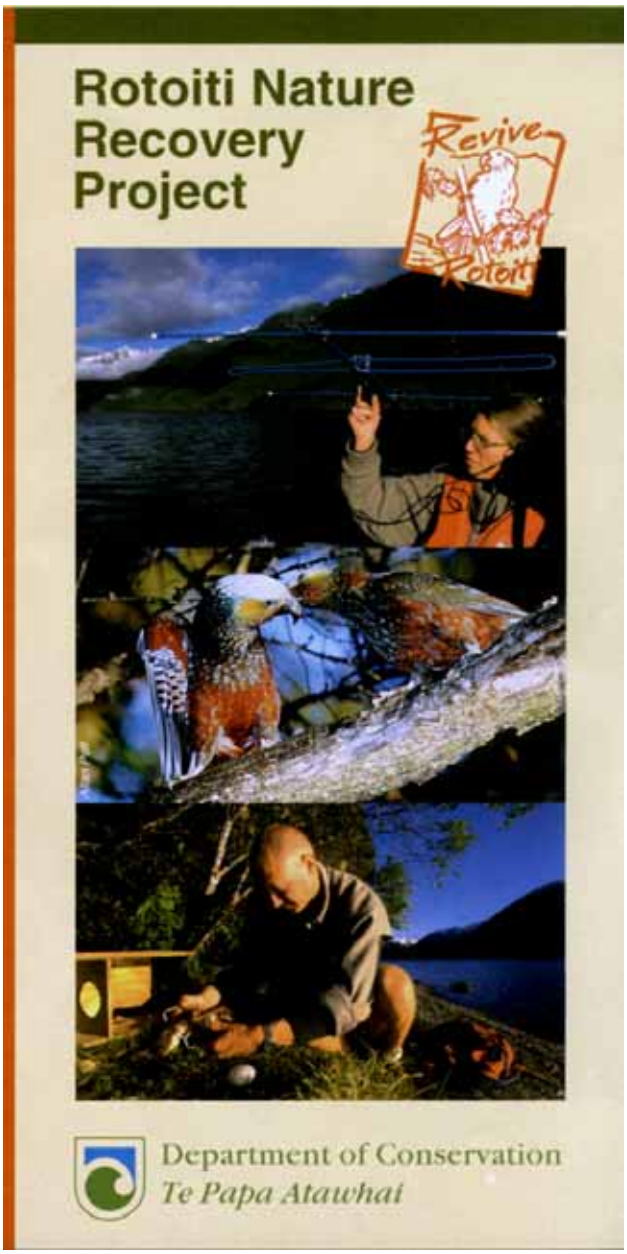
Tables

Graphs

Appendix 4. Revive Rotoiti Newsletter

Revive Rotoiti

Appendix 5. RNRP Brochure



Appendix 6. Operational Field Manual Contents

The Operational Field Manual is a folder that is available for field staff to reference in the Area Office. It contains hard copies of prescriptions and instructions for specific tasks. It is arranged in numerical order according to business plan task codes.

5525/001 Predator management

- Mustelid control and monitoring: an overview document
- Sketch of Fenn cover design
- Sketch of fenn trap set
- Fenn trapping data sheet masters

5525/002 Wasp control and monitoring

- Wasp Poison Decision Maker. Scanned version: dme:\\staao-8221
- Non-toxic wasp count protocol
- Wasp strip plot transect map RNRP
- Malaise collection and sorting methods at: dme:\\staao-5976
- Malaise/honeydew suppliers list
- Malaise trap location maps: RNRP, Misery, Lakehead
- Malaise trapping data sheet master
- Honeydew sampling protocol (refractometer method)
- Honeydew location map and instructions filter paper method
- Honeydew tree location map

5525/003 Rodent management

- Rat trap checking prescription at: dme:\\staao-6809
- Rat trapping data sheet master: dme:\\staao-5757
- RNRP core grid map S:\Camera|Mainland Island\maps\core grid.bmp
- Rat trap information sheet (includes photos of tunnels set): dme:\\staao-7222
- Rat trap cover cutting pattern sketch, scanned version: dme:\\staao-7352
- Snap trapping database instructions. Printed from screens from Citrix database St Arnaud Snap Trapping
- Rodent snap trapping for monitoring instructions RNRP and Rotoroa

- Cunningham and Moors rodent paper with identification features and protocol for calculating snap trap index
- Protocol for tissue sampling and testing for Vertebrate Pesticides. G.R.G. Wright, Landcare Research

5525/004 Vegetation monitoring

- RNRP vegetation monitoring synopsis
- Mistletoe monitoring protocol Kerr Bay and RNRP. See also: dme:\\wscco-22338
- Tussock counts protocol Misery and RNRP. See also: dme:\\staao-1869
- Beech seed collection and analysis instructions: dme:\\staao-6352
- Equipment list for two 20x20 plots

5525/005 Fauna fauna

- Lizard survey protocol and data sheet
- Robin monitoring protocol
- Snail monitoring protocol
- Kaka monitoring protocol

5525/006 Monitoring of small mammals

- Rodent monitoring documents with line locations and written instructions for setting tunnels, analysis results and suppliers. Requires updating but useful as guide
- TT (Tracking Tunnel) line locations (including treatment types, hazards, best combinations): dme:\\staao-9073
- Maps for tracking tunnel lines: Rotoroa A-D (with notes), Lakehead, Big Bush rat area, RNRP core
- Sketch diagram for galvanised 1m possum proof tracking tunnel
- TT ink and paper preparation (ferric/tannic method)
- TT field data sheets: dme:\\staao-9063
- TT rodent and mustelid data sheets Rotoiti and Rotoroa from dme:\\staao-8614
- TT excel calculator: instructions for and from dme:\\staao-8614
- TT rodent and mustelid synopsis sheets

- TT guide to prints: dme:\\hamro-20234
- TT protocol for SRU investigation sites dme:\\hamro-66179 Note – some variance from protocol noted on hard copy
- TT protocol for field from dme:\\hamro-66179 with variances

5525/007 RNRP management

- Etrex settings
- Maps
- Project codes and task managers dme:\\staao-6740
- Business planning calendar tables
- Iwi contact list
- Acetate map grids for estimating area
- Mainland Island Draft reporting guidelines dme:\\hwkco-18884
- Memorandum of Understanding – Borlase farm access dme:\\staao-9230

5525/009 Possum management

- NPCA trap catch protocol for field operatives
- Kill trap line and trap locations
- Kill trap data sheets: dme:\\staao-8725
- Wax tag spreadsheets: dme:\\staao-9067

5525/010 Ungulate management

- Deer, chamois, hare protocol, including stomach sampling: dme:\\staao-4224
- Hunter return sheet: dme:\\staao-6256

5525/011 Research support

- RNRP request for research proposals with research needs: dme:\\nelco-32119