Rotoiti Nature Recovery Project Annual Report 2011–12

Nelson Lakes Mainland Island, Nelson Lakes National Park

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Cover: Western weka (*Gallirallus australis australis*) pair with chick, Nelson Lakes Mainland Island. *Photo: DOC.*

Published by Nelson/Marlborough Conservancy, Department of Conservation, Private Bag 5, Nelson.

Occasional Publication No. 91
ISSN 0113-3853 (print), 1178-4113 (web)
ISBN 978–0–478–14983–8 (print), 978–0–478–14984–5 (web)

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Biodiversity restoration objectives

Restore and maintain populations of kākā, mistletoe, *Pittosporum patulum* and a *Powelliphanta* sp. snail

Ongoing mustelid trapping in the Mainland Island kept the mustelid tracking indices below 4% during 2011–12, whilst tracking at the non-treatment site at Lake Rotoroa exceeded 22%.

Possum control continued in the southern part of the Mainland Island, with re-invasion of possums from Travers Valley being problematic. Cat control resulted in an increased number of cats being trapped, possibly partly due to low rabbit numbers this year.

The kākā encounter rate increased by 49% over the previous year, maybe in response to a limited beech mast event. Kea nest protection initiated at three sites was only successful at one site where predator control had been in place for several years. Weka were monitored at Lake Rotoiti with some banding carried out. One pair produced six clutches in 12 months. Monitoring of mistletoe, *Pittosporum patulum* and *Powelliphanta* snails did not take place this year.

Establish and maintain populations of great spotted kiwi and other native species

Two kiwi pairs were known to have nested during 2011–12, with at least one chick successfully fledging. The use of IR cameras improved the monitoring of nests and provided new nesting information for great spotted kiwi.

Learning objectives

Test the effectiveness of rodent control tools in a beech forest system

Two rodent control operations were carried out during 2011–12. One (in spring) was effective at reducing rat tracking indices to below 4%, but another operation (in autumn) failed, possibly because an alternative food source (beech seed) was available. This operation was intended to reduce the rat population before a likely beech seed mast event.

South Island robin nesting success was used as an outcome measure for rat control. Nesting success was 100%, with five nests fledging chicks. Robin monitoring recorded a small increase in robin density in the survey area.

Test the effectiveness of wasp control tools

In addition to trailling different bait station configurations, the RNRP investigated measurement of biological off-take by wasps. Paired bait stations had a slightly higher success rate for reducing flight counts at wasp nests. Monitoring of honeydew droplets showed the most promise for measuring biological off-take by wasps and appears to be an efficacious monitoring method.

Test the effectiveness of different translocation methods

Four great spotted kiwi eggs were transferred to Willowbank, Christchurch, during RNRP's penultimate trip to Gouland Downs, Kahurangi National Park, in late 2011. Only two of the eggs hatched and these chicks were hand-reared for release later in 2012. One juvenile great spotted kiwi, sourced from the Stockton Plateau on the West Coast, was released successfully into the Mainland Island in early 2012.

Determine long-term trends in bird abundance and forest health in response to ongoing management

Five-minute bird counts were undertaken at Lakehead, on the St Arnaud Range track, and at the Lake Rotoroa non-treatment site.

An alpine tussock seed fall transect was re-measured in 2011.

Systematically record observations of previously unreported native and non-native organisms in RNRP

One white heron was recorded in 2011–12.

Facilitate research to improve our understanding of the ecology and management of beech forest and alpine systems

Research was carried out by students on three fronts during 2011–12:

- An assessment of pellet counts for monitoring hares was carried out by Jenny Long (University of Otago) in Cupola Basin.
- Research on audio-lures for possums was run by Matt Kavermann (Lincoln University) at Lakes Rotoiti and Rotoroa.
- An investigation of home range size and habitat use by great spotted kiwi was initiated by Peter Jahn (Edinburgh Napier University) in May 2012.

Analyse and report on the effectiveness of management techniques and ensure that knowledge gained is transferred to the appropriate audiences to maximise conservation gain

The 2010–11 report was published in late 2011 (Harper et al. 2011). A student research paper on hare pellet counts was also produced (Long 2012). Staff participated in and gave talks at a kiwi hui and a sanctuaries workshop.

Community objectives

Increase public knowledge, understanding and support for mainland islands and ecological restoration nationally through education, experience and participation

Education and experience

- *Revive Rotoiti* newsletter—this key advocacy publication is produced twice a year and highlights the work being done in the RNRP.
- RNRP Walks and Talks—visiting school and community groups are provided with an RNRP introductory walk or talk.
- Nelson Lakes Visitor Centre—displays outline the RNRP project and a noticeboard is being developed to showcase recent events. Visitor Centre staff also assist with RNRP advocacy.

Participation (volunteer assistance)

- Friends of Rotoiti (FOR)—this local conservation volunteer group continues their pest control to support and enhance the work being done within the RNRP.
- RNRP volunteers—individual volunteers work with the RNRP staff throughout the year, as well as groups such as Trainee Rangers and Pacific Discovery.

1. Introduction

The Rotoiti Nature Recovery Project (RNRP) is a 'Mainland Island' project established in 1996 to enable the recovery of a representative portion of an alpine honeydew beech (*Nothofagus* spp.) forest ecosystem at Lake Rotoiti in Nelson Lakes National Park.

The project began with infrastructure development and baseline monitoring across 825 ha of forest on the western St Arnaud Range (Nelson Lakes Mainland Island). Comprehensive pest control began in 1997. The project was established with control/treatment sites so responses to management techniques at Lake Rotoiti could be compared with the control (non-treatment) site at nearby Lake Rotoroa. The first annual report covered the 1997–98 business year.

South Island kākā (*Nestor meridionalis meridionalis*) have been a key focus from the beginning of the project. The Department of Conservation's (DOC's) Science and Research Unit (now Science and Technical) staff put considerable effort into radio-tracking kākā and monitoring nesting success in response to mustelid control. Kākā nesting success improved considerably and adult female mortality declined as a result of predator control when compared with non-treatment sites (Moorhouse et al. 2003).

In 2001–02, the extent of mustelid (stoats (*Mustela erminea*), ferrets (*Mustela furo*) and weasels (*Mustela nivalis*)) trapping was increased considerably and now more than 5000 ha on the western St Arnaud Range and southern Big Bush is under sustained predator control as part of the Mainland Island. Trapping is also carried out by a local volunteer group, Friends of Rotoiti (FOR), in adjacent areas, encompassing an additional 5000 ha.

Management of great spotted kiwi (*Apteryx haastii*) began in 2004 with the introduction of adult individuals from Gouland Downs in Kahurangi National Park. Additional introductions including chicks raised under the Operation Nest Egg™ (ONE) programme have ensured the successful establishment of a population. Some limited breeding has taken place over the past 7 years, and seven wild-raised kiwi chicks are known to have fledged, despite their vulnerability to mustelid predation. The ONE operation is being wound down, with the final four eggs removed from adults at Gouland Downs in late 2011. Two chicks from these eggs were due to be released into the Mainland Island in September 2012.

Kea (*Nestor notabilis*) nest protection was initiated in spring 2011 at three nest sites, but was established too late in the season for two nests, which failed due to possum (*Trichosurus vulpecula*) interference. The one nest near a possum control line within the Mainland Island successfully fledged chicks. Weka (*Gallirallus australis*) monitoring has continued during 2011–12, although transmitters have been removed from all birds. All new weka and juveniles encountered have been banded.

The RNRP has been a leader in large-scale control of introduced wasps (*Vespula* spp.) Under an experimental use arrangement, historically with Landcare Research and more recently with the Nelson-based company Entecol, the RNRP has been used as a trial site. Experiments have been undertaken with various toxins, X-stinguish™ in particular. Spacing of bait stations was again the focus of research in 2011–12, and effective reduction of wasp activity was achieved at much lower bait station density than previously used. Further trials of different bait station densities will continue over the next few years.

Rodent control has had a chequered history in the Core Area of the RNRP. Initial control of rodents (rats in particular) with brodifacoum and 1080 between 1997 and 2000 was effective. After a DOC review of the use of brodifacoum, a switch to snap-trapping at a density of 1 trap/ha proved ineffective at controlling rat populations. The first rat control operation in more than 4 years was run in the spring of 2010, over 600 ha of the Core Area using diphacinone in bait stations. Rat tracking in the Core Area declined from 50% to < 4% within 6 weeks after the start of

the poison operation. The continued use of five-minute bird counts and robin (*Petroica australis*) monitoring provides a response measure for rodent control. On the basis of the first successful poisoning operation, the area under rat control was extended to approximately 900 ha on the eastern shores of Lake Rotoiti.

Feral cats (*Felis cattus*) were targeted in and around the RNRP during 2011–12 using cage traps, with a large amount of effort put in by trappers. Autumn was found to be the most effective time to cage trap; however, a less labour-intensive weka-proof cat trap is required. Trapping of possums, using Sentinel™ traps, has continued at a high level, targeting areas where fresh sign is found. Other pest species under management include ungulates, pigs (*Sus scrofa*) and hedgehogs (*Erinaceous europaeus*) using a mixture of methods.

Browse-sensitive native plant species that are monitored to gauge their responses to pest control include three species of beech mistletoe, the critically threatened understory plant *Pittosporum patulum* and *Griselinea littoralis*. Beech seedfall and *Chionochloa* tussock flowering are also monitored as 'ecological drivers' of rodent and subsequent mustelid population increases, and 20 × 20 m vegetation plots are monitored to determine the trends and responses of native vegetation to multiple species pest control.

Invertebrate monitoring has included *Powelliphanta* spp. snails, as well as beech scale insects and honeydew production because of their importance as 'ecological drivers' in the honeydew beech forest ecosystem.

In addition to the core work undertaken by RNRP staff, several students conduct research in the Mainland Island each year, which adds to our understanding of the functioning of the alpine beech forest ecosystem and improves pest control. In 2011–12, Jenny Long carried out work on faecal pellet counts to estimate hare (*Lepus europaeus*) abundance, Matt Kavermann investigated the use of audio lures for improving possum control and Petr Jahn radio-tracked great spotted kiwi (*Apteryx haastii*) to analyse home range and habitat use. Some time and money from the RNRP budget were used to support these projects.

The involvement of the local and wider community in the RNRP is essential for the success of the project and there is a strong theme of advocacy and participation. Hundreds of days of work in support of the Project have been carried out over the past 13 years by volunteers, including FOR, trainee rangers, Conservation Corp crews and the Over-50s tramping club. RNRP staff members have also given time for other DOC and community initiatives and attended workshops and conferences to transfer knowledge to the wider community. Advocacy has included presentations to many school and community groups, guided walks, displays in the Nelson Lakes Visitor Centre, information panels within the Mainland Island and various printed media. Many events and achievements from the RNRP have also been picked up by local and national media, including its listing as one of the Top 25 Ecological Restoration Sites in Australasia.

Although day-to-day work on the Mainland Island progresses in response to yearly or multi-yearly ecosystem cycles, no operation of this scale can operate without a vision and objectives to provide guidance in the medium term. Therefore, the publication of the Rotoiti Nature Recovery Project Strategic Plan for 2008–13 (Brown & Gasson 2008) has provided the planning framework and goals for the operation for the next four to 4–5 years and has highlighted the three major themes running through the project, namely:

1. Research, learning and knowledge transfer to a burgeoning number of ecological research projects nationwide.
2. Protecting and restoring biodiversity for its intrinsic value.
3. Advocating the value of ecological restoration to the public.

It is essential these themes remain the core values for ongoing restoration work within the RNRP for the future. A Technical Advisory Group and external advisors contribute an essential role in overseeing and guiding these themes.

2. Biodiversity restoration objectives

2.1 Restore and maintain populations of kākā, *Pittosporum patulum* and a *Powelliphanta* sp.

2.1.1 Introduction

The proposed RNRP Strategic Plan 2008–2013 identifies six threatened species that will be actively maintained for their biodiversity values. These populations and their New Zealand Threat Classification System rankings are:

- South Island kākā *Nestor meridionalis meridionalis*, Category 2, Nationally endangered
- The beech mistletoes *Peraxilla colensoi*, *P. tetrapetala* and *Alepis flavida*, all Category 4, Declining.
- The heteroblastic tree *Pittosporum patulum*, Category 2, Nationally endangered.
- The carnivorous land snail *Powelliphanta* 'Nelson Lakes', Category 7, Range restricted.

The RNRP contains some further threatened species that may benefit from pest control. The above populations were specifically identified in the Strategic Plan 2008–2013 because a considerable amount of work has already been invested into monitoring and managing them through the preceding decade.

The kākā is an endemic forest parrot which is threatened by predation. Stoats are the main predator of kākā, but all three introduced mustelids (stoats, ferrets and weasels) are targeted by mustelid control. Mustelid trapping has been shown to protect the local kākā population (Moorhouse et al. 2003), and mustelid control will continue for the foreseeable future. An upgrade from Fenn MkVI traps to DOC 200 and DOC 250 traps commenced in 2007 and was completed in late 2009. Feral cat control, although localised to date, may protect fledging kākā chicks that spend up to 3 days on the ground between emerging from their nest holes and flying. A more intensive cat control project is now in place. Other native bird species are likely to benefit from predator control, particularly great spotted kiwi and New Zealand falcon (*Falco novaeseelandiae*), both of which nest on the ground.

The beech mistletoes, *Pittosporum patulum* and snail *Powelliphanta* 'Nelson Lakes' are all threatened as a result of predation by the introduced brushtail possum. Possum numbers have been reduced and suppressed within the Mainland Island through a sustained poisoning and trapping project. As with mustelid control, possum control is considered to be effective, and will continue for the foreseeable future in order to protect biodiversity values.

In addition to being threatened by possums, *P. patulum* and *Powelliphanta* 'Nelson Lakes' populations may be threatened by red deer (*Cervus elaphus scoticus*). Detrimental browsing of juvenile *P. patulum* plants has been attributed to red deer. Red deer may deleteriously impact *Powelliphanta* habitat through concentrated browsing and trampling in the mountain beech/tussock ecotone that is favoured by both deer and *Powelliphanta* 'Nelson Lakes'. Deer control is currently not part of the RNRP pest control programme, but has been supplemented by the initiation of limited access to the Mainland Island for recreational hunters in May 2010, principally through local NZ Deerstalkers' Association branch members in a volunteer capacity. Hunters are allocated one of four blocks within the area and all animals shot are recorded. Another probable problem species for high montane and alpine species are hares, as they are likely to degrade habitat.

2.1.2 Mustelid (stoat, ferret and weasel) control and monitoring

RNRP mustelid control

Methods

Mustelids are trapped over approximately 5000 ha to the east and north of Lake Rotoiti. The goal of this trapping is to suppress stoat tracking below 5%, allowing successful kākā breeding. The 24 traplines have a total of 907 mustelid traps: 815 DOC 200 traps (441 stainless steel / 372 combination) and 92 DOC 250 traps (Fig. 1). Stoat traps are spaced 100 m apart. All traps are single set, baited with hen eggs and enclosed within wooden boxes. The box design is 'best practice' length for use in weka and kiwi areas. During the summer and autumn when stoat numbers are high and juveniles are dispersing, trap lines are checked fortnightly. Intervals between trap checks are extended to up to 6 weeks over the winter and early spring when few stoats are present.

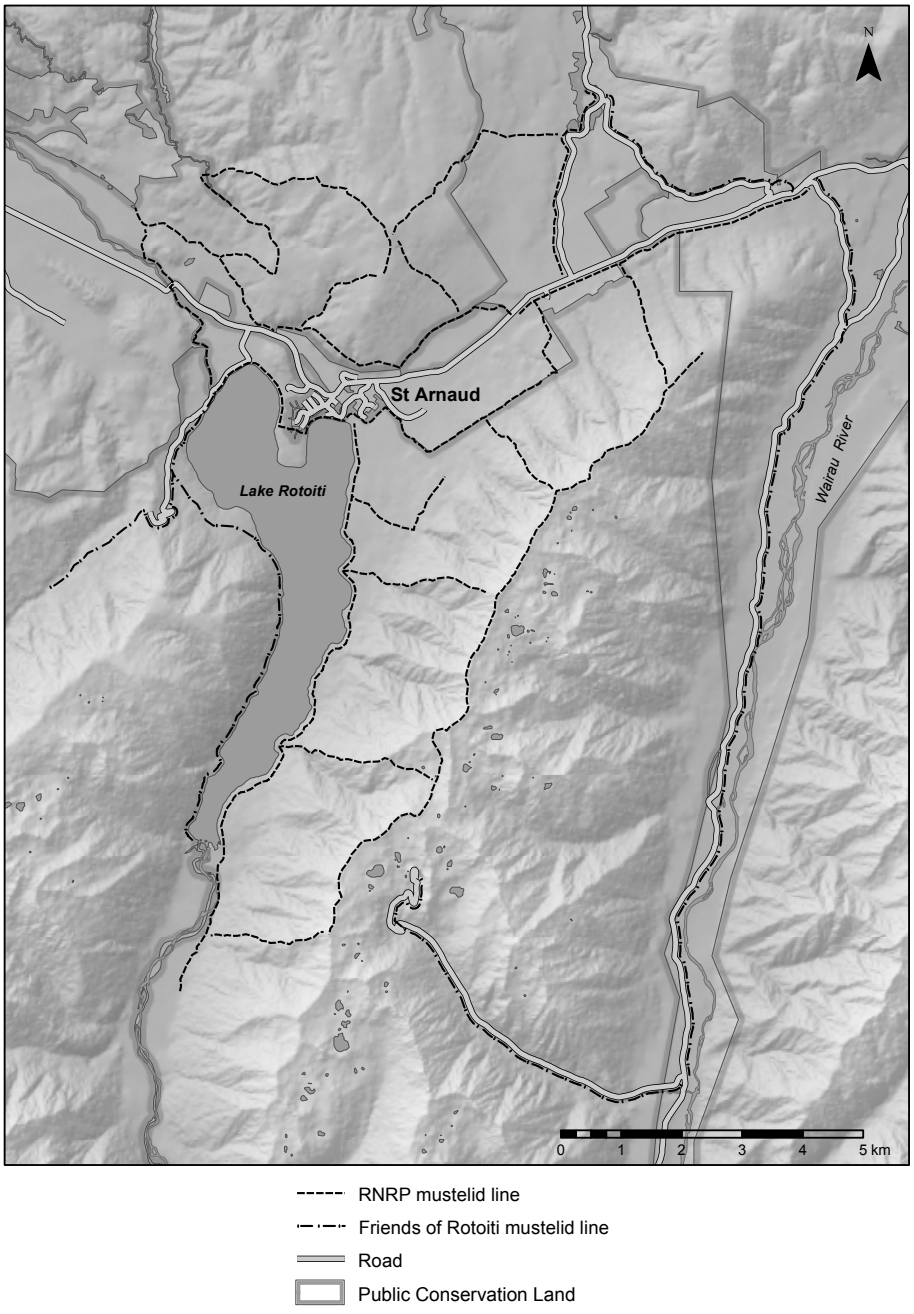

Figure 1. Location of RNRP and FOR traplines in June 2012.

Results

During 2011–12, 164 stoats, 8 weasels and 4 ferrets were captured (Fig. 2). The number of stoats caught was identical to last year, weasel captures were well down and ferret captures had increased. Two of the ferrets captured were caught in DOC 200 traps.

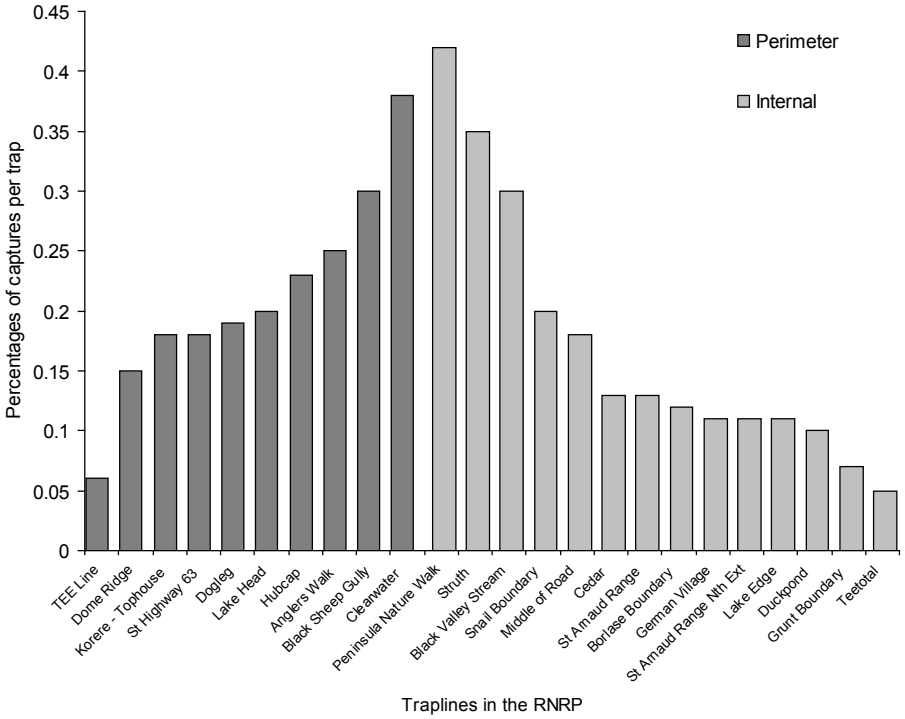

Figure 2. Proportion (%) of stoats captured by individual traplines during 2011–12.

The Peninsula Nature Walk trapline caught the most stoats (16 captures) and TEE line the least (1 capture). There is generally little obvious pattern in the rate of captures on traplines over past years, but there are a few lines that tend to catch more or fewer stoats than other lines. For example, during the last 3 years, Black Valley Stream has always been one of the top three lines for capture rates in the internal trap lines, whilst Teetotal has been in the bottom three. For external lines, Black Sheep Gully has been one of the top two years out of three and the TEE line has consistently been in the bottom three for all of the past 3 years.

Non-target species caught during 2011–12 were:

- Rats 460
- Hedgehogs 161
- Rabbits (*Oryctolagus cuniculus*) 92
- Mice (*Mus musculus*) 8
- Cats 17
- Birds 6 (1 tūī (*Prosthemadera novaeseelandiae*), 2 finches, 1 house sparrow (*Passer domesticus*), 1 starling (*Sturnus vulgaris*), 1 thrush (*Turdus philomelos*)

Captures of rats and hedgehogs were similar to last year (2010–11). Feral cat captures were significantly higher than last year (see section 2.1.3.). Locations of FOR traplines and stoat, weasel and ferret captures on them in 2011–12 are shown on Figs 3–7.

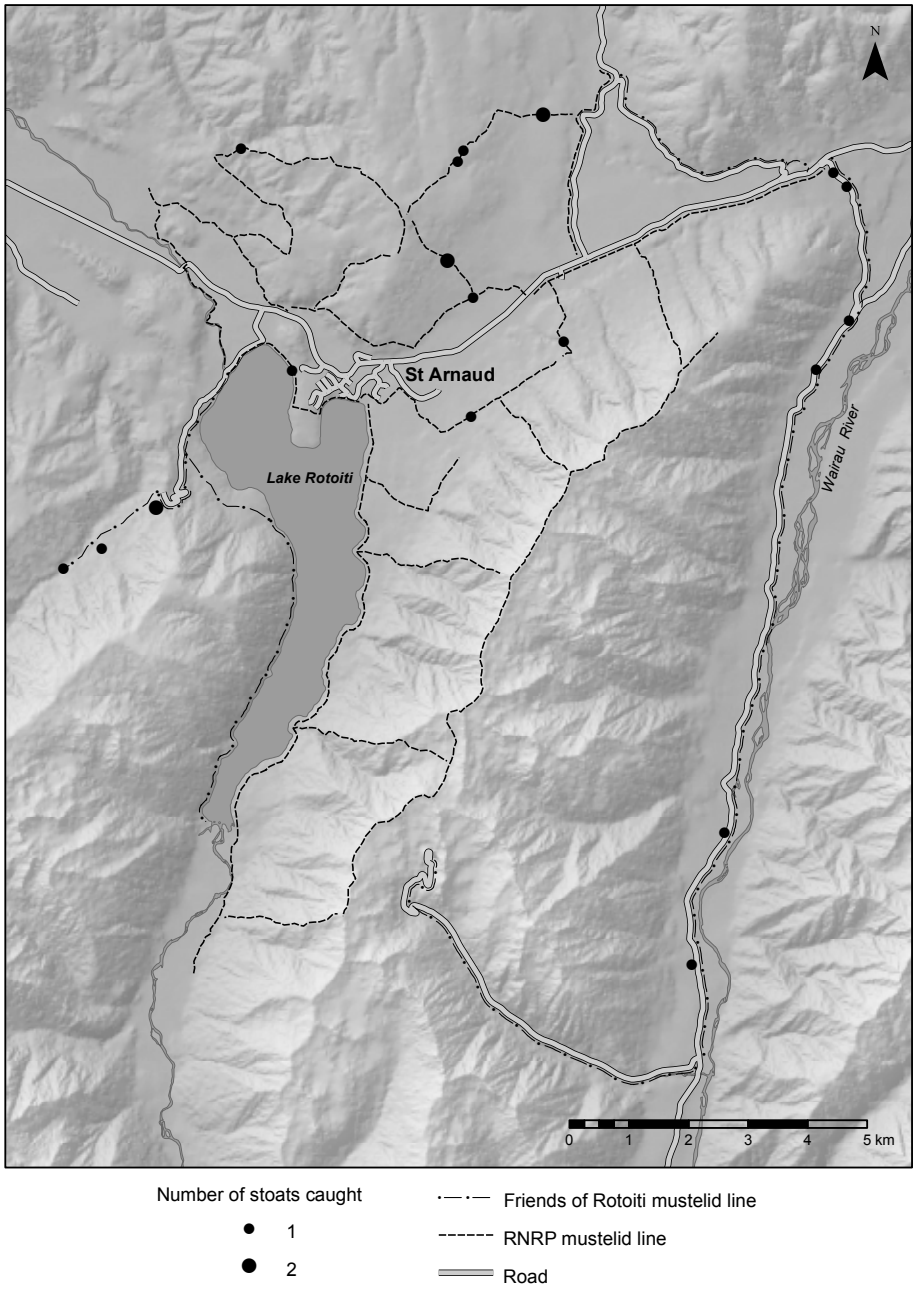

Figure 3. Map showing stoat captures on RNRP and FOR traplines for July–August 2011 and June 2012.

All of the traplines, with some minor exceptions, are now up to RNRP track marking standard, with all tracks and trap positions marked with coloured plastic triangles rather than flagging tape as has been the case until now. Minimal ongoing re-cutting and remarking is now required to maintain the traplines. Field time lost due to losing the track or missing a trapbox has been reduced, and there is less risk of volunteers losing the track while checking traplines.

Salted rabbit was used on the lower traplines in January to increase stoat captures at a time when stoat numbers are traditionally high. It was run as a trial with odd-numbered trapboxes on DOC 200-only lines being baited with salted rabbit and egg, while even-numbered trapboxes only had eggs. Trapboxes baited with salted rabbit caught twice as many stoats (18 captures) as trapboxes baited with egg alone (nine captures). This supports findings from other trials (e.g. Otanewainuku Kiwi Trust) that salted rabbit is much better than eggs alone at luring stoats into trapboxes. Fresh rabbit may be even better, but its short shelf life makes its use impractical, especially in summer.

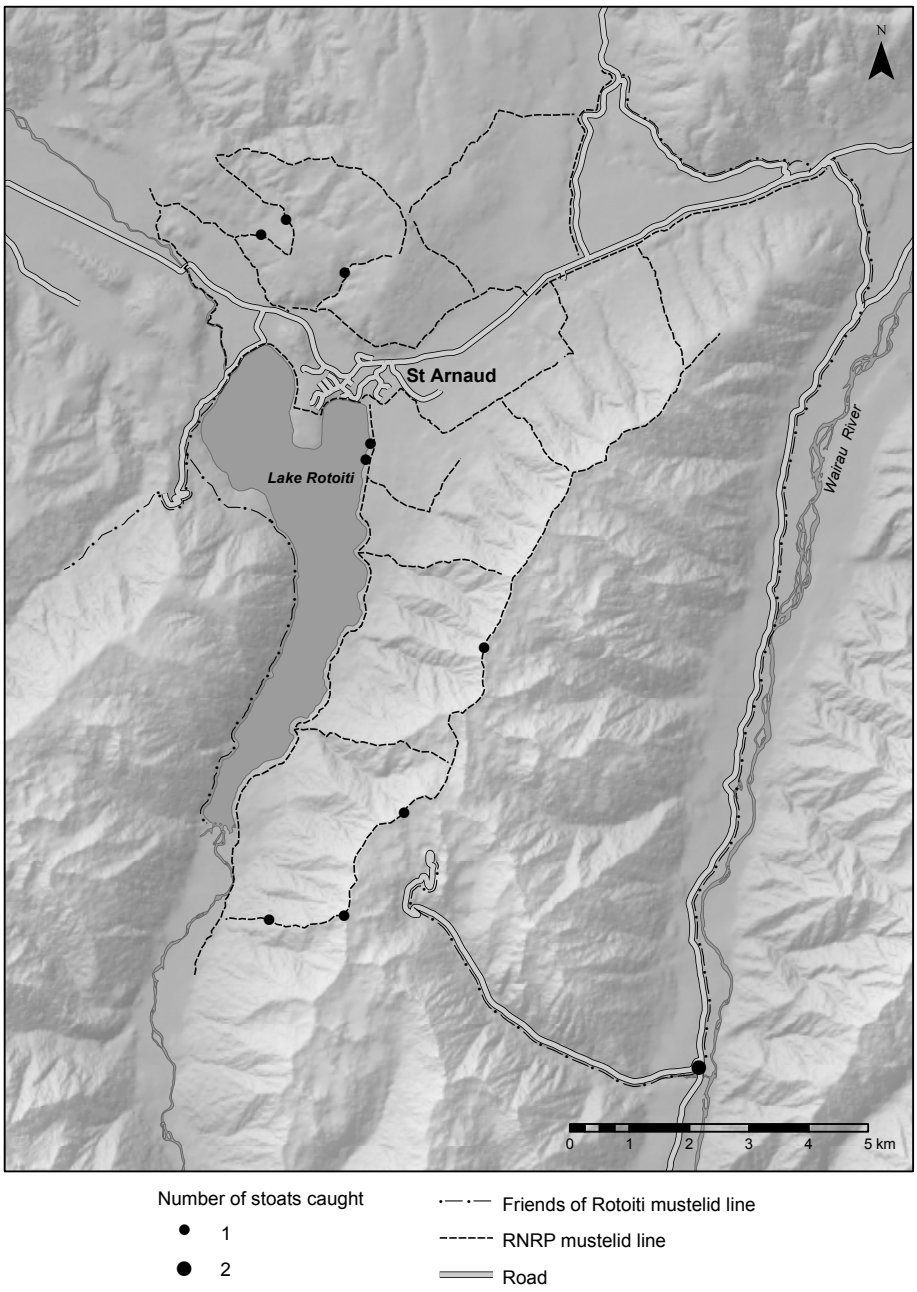

Figure 4. Map showing stoat captures on RNRP and FOR traplines for September–November 2011.

'Muscattract', a new mustelid and cat lure developed by Connovation, was trialled on the stoat lines in March–April 2012. Odd-numbered trapboxes on lines containing only DOC 200s had a squirt of 'Muscattract' applied to a tree trunk or similar within 1.5 m of the trap entrance. The scent was re-applied at the next trap check. Stoat captures for the two trap checks post-spraying were compared. There were no differences in capture rates between treated and untreated traps, with six stoats being captured in both cases. This suggests that using 'Muscattract' in this manner will not increase stoat capture rates, but a much larger sampling effort would be required to have confidence in these results. It may be worthwhile repeating this trial using 'Muscattract' applied in the trapbox to see if this has any benefits.

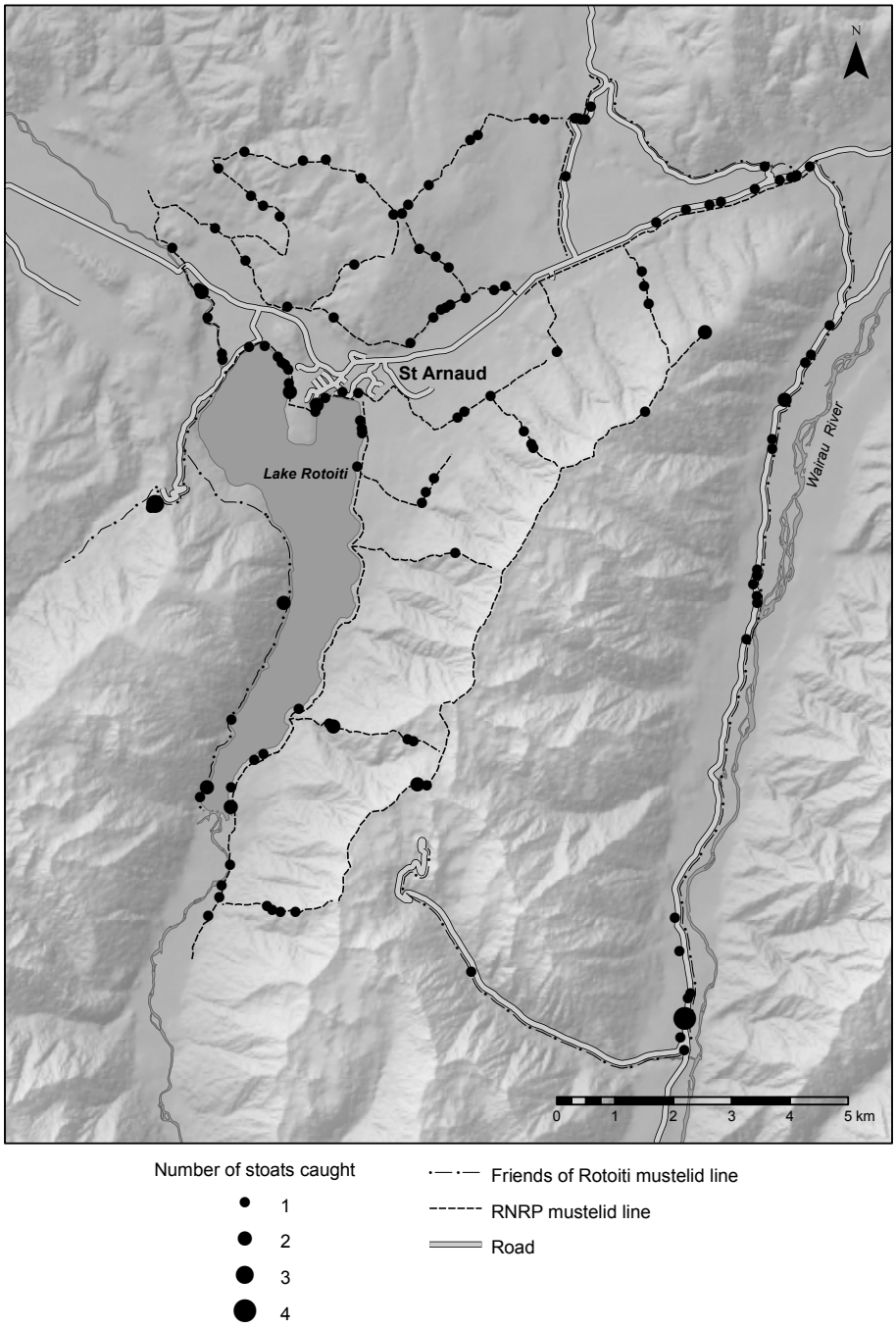

Figure 5. Map showing stoat captures on RNRP and FOR traplines for December 2011 – February 2012.

Friends of Rotoiti mustelid control

Methods

Mustelid trapping lines have been maintained as a buffer to the Mainland Island, with a total of 388 DOC 200 and DOC 250 traps in operation.

- *Rainbow Valley Line*—153 DOC 200s and DOC 250s.
- *Seasonal Rainbow Ski-field Line*—68 DOC 200s. These traps were put out in November 2011 and removed for the winter in May 2012 (this timing is always dependent on when the snow falls at the beginning of the season, and when the ski-field closes at the end of the season).
- *Mt Robert Line*—17 DOC 200s
- *Whisky Falls Line*—82 DOC 200s (1 additional trap set out in May 2012)

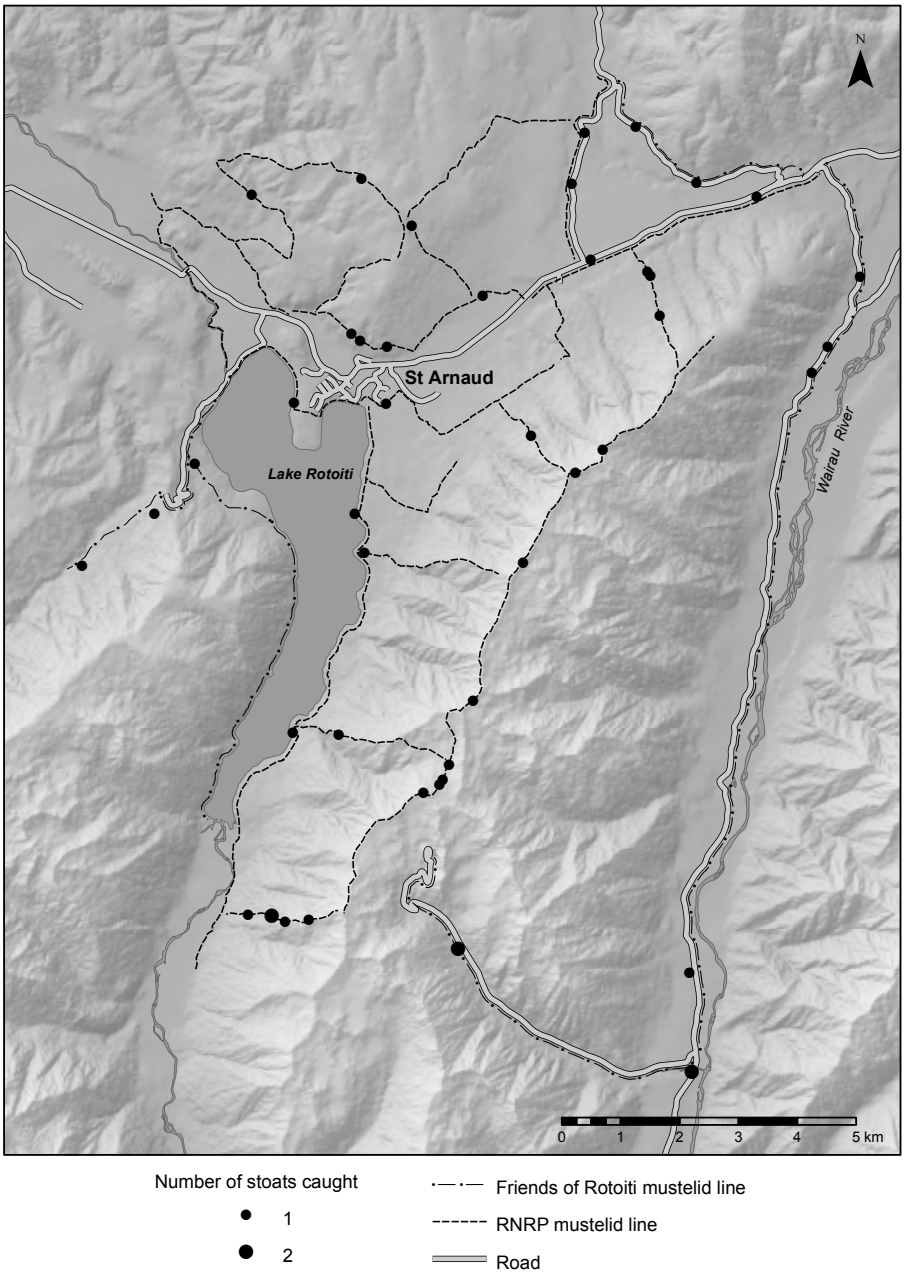

Figure 6. Map showing stoat captures on RNRP and FOR traplines for March–May 2012.

- *Tophouse Road Line*—43 DOC 200s
- *Speargrass Line*—25 DOC 200s (3 additional traps set out in May 2012)

Trap check frequency differs from the RNRP schedule, with checks occurring weekly or fortnightly in the warmer months from October to April and monthly through the remaining colder months of the year. Bait is changed every 8 weeks, with polymer baits (from Trappers Cyanide) replacing fresh eggs as the bait used in all mustelid traps from early 2011. Results of trapping are shown below (Table 1 and Fig. 8).

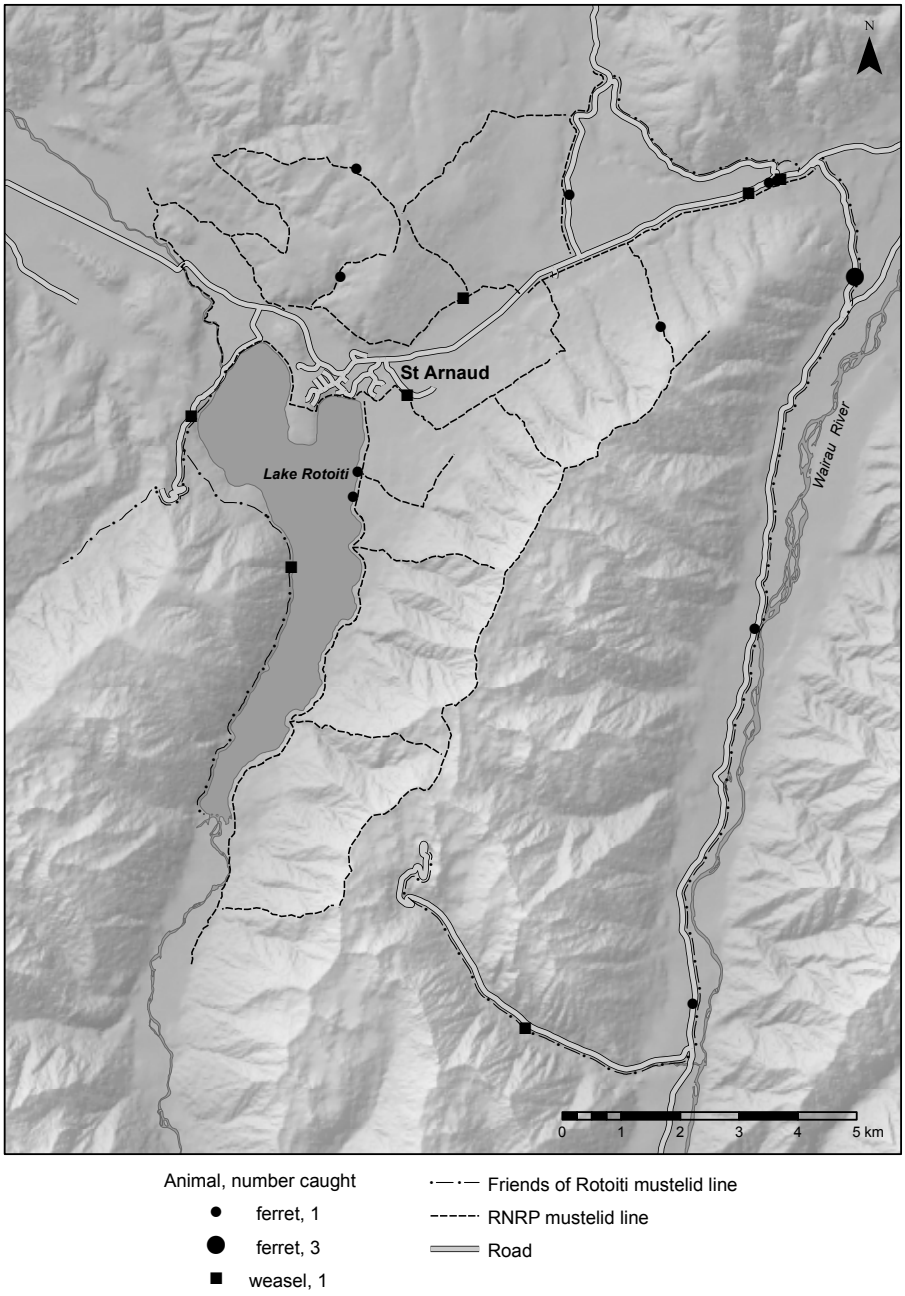

Figure 7. Map showing weasel and ferret captures on RNRP and FOR traplines for 2011–12.

Results

Mustelid captures on FOR traplines in 2011–12 sare shown in Table 1.

The following captures were non-target species caught as 'by-catch' in the Friends of Rotoiti mustelid traps:

- Hedgehogs 64
- Possums 10
- Rats 213
- Rabbits 16
- Cats 4
- Mice 4
- Birds 4 (2 tūī, 2 thrushes)

No weka were caught in the mustelid traps this year.

Stoat captures per trap per line on FOR traplines in 2011–12 are shown on Fig. 8. (Note: no stoats were captured on the Mt Robert line during 2011–12).

Table 1. Mustelid captures on FOR traplines in 2011–12.

MONTH	STOAT	WEASEL	FERRET
July 2011	7	1	1
August 2011	1	0	2
September 2011	1	1	0
October 2011	1	0	0
November 2011	3	0	0
December 2011	24	1	0
January 2012	10	0	0
February 2012	3	0	1
March 2012	6	0	2
April 2012	3	0	0
May 2012	2	0	0
June 2012	0	0	0
Total	61	3	6

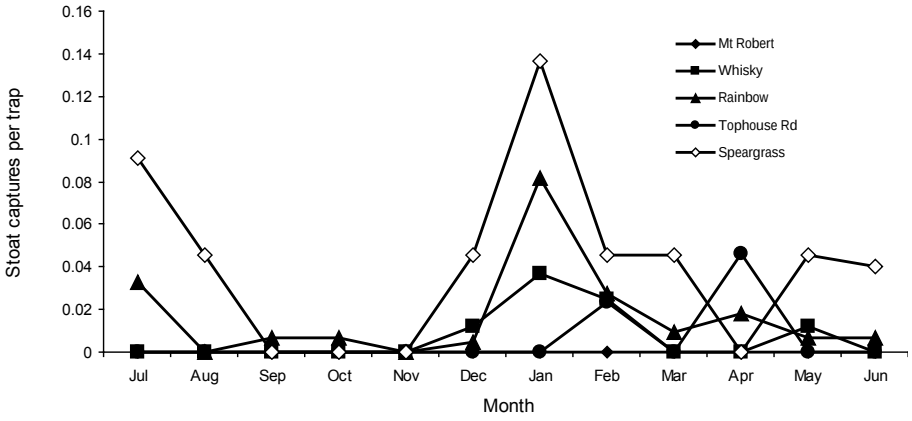

Figure 8. Stoat captures per trap per line on FOR traplines in 2011–12.

RNRP mustelid population monitoring

Introduction

Mustelid monitoring is used to compare mustelid tracking rates between the Rotoiti treatment site (trapping) and the Rotoroa non-treatment site (no trapping). The Rotoiti site includes the Core Area, Lakehead and Big Bush lines.

Methods

Mustelid monitoring is carried out using standard coreflute tracking tunnels with Black Trakka™ inked cards and rabbit meat bait set to the best practice method described by Gillies & Williams (2004). Refer to the 'RNRP Field Manual 09–10' for further details.

Results

Tracking Tunnels were set for mustelids in November 2011 and February 2012 (Fig. 9). Mustelid tracking at the Rotoiti site remained below the 5% mean tracking rate per line recommended by Greene et al. (2004) to protect kākā populations.

Detailed tracking tunnel descriptions, results and graphs are found in the Excel document 'RNRP Tracking Calculator 2011–12' (DOCDM – 761754).

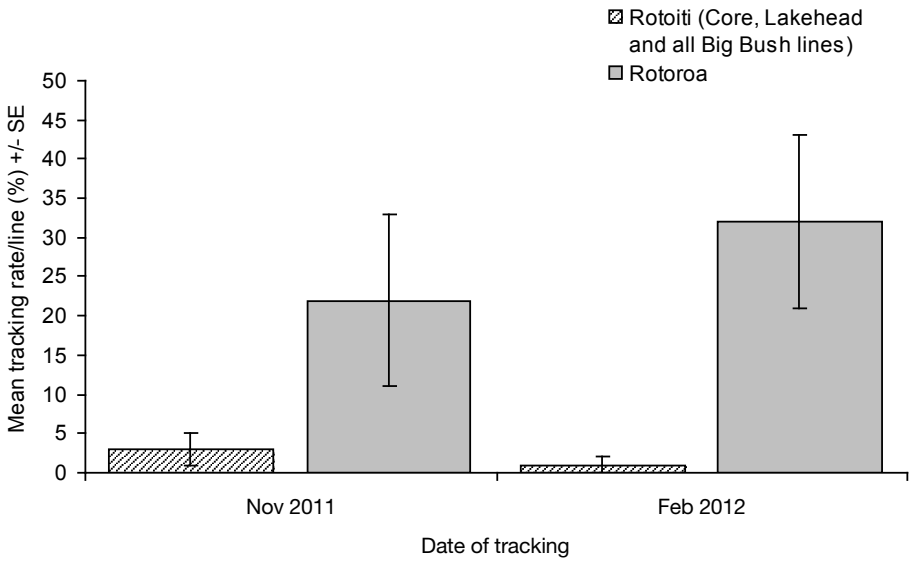

Figure 9. Mustelid tracking rates recorded by the RNRP in 2011–12.

Discussion

During 2011–12, mustelid tracking rates were again below 5% within the Mainland Island, highlighting the ability of the form of trapping programme being used to maintain pressure on an invasive predator population. Ongoing adjustments and trials of trap types, trap arrangements and bait types will only increase the ability of predator control programmes to maintain predators at low numbers on the mainland, and possibly eradicate them on islands.

The existing DOC 200 traplines will be shut down in September 2012, with the establishment of the A24 self-resetting trap trial. The DOC 250 traps will operate as usual, with salted rabbit presented in them in January and April 2013 to attract ferrets and small feral cats.

2.1.3 Feral cat control

Methods

In 2011–12, Havahart™ cage traps were again used to control feral cats in and around the RNRP mainland island area. Trapping was undertaken in areas with high cat presence (sightings, scats) and in areas with a history of cat captures. Trapping was undertaken in Autumn, as this is the most successful time to catch feral cats. Cage traps were baited with fish frames or, occasionally, fresh rabbit meat. Traps were usually baited and left open for a few days prior to setting to allow cats to get used to them. Trapped cats were shot with a .22 rifle.

Muscattract™, a scent lure produced by Connovation, was trialled to see if it improved captures. Every second cage had Muscattract™ applied to the base of a tree within 1.5 m of the cage trap to bring feral cats into the area.

In addition to the targeted cage trapping, the DOC 200/250 traps on the stoat trap lines continued to catch juvenile cats. In addition to the normal hen's egg baits, from mid April to mid May 2012, the DOC 250 traps were also baited with salted rabbit.

Results

In total, 25 feral cats were removed from the RNRP during 2011–12 by all methods. This is nine more cats than last year (Fig. 10). Eight cats were caught using cage traps, a decrease of two from last year. Cage traps were run for a total of 271 trap-nights, a return of 1 cat per 34 trap nights. Of the eight cats captured in cage traps, five were caught in cages with 'Muscattract' lure.

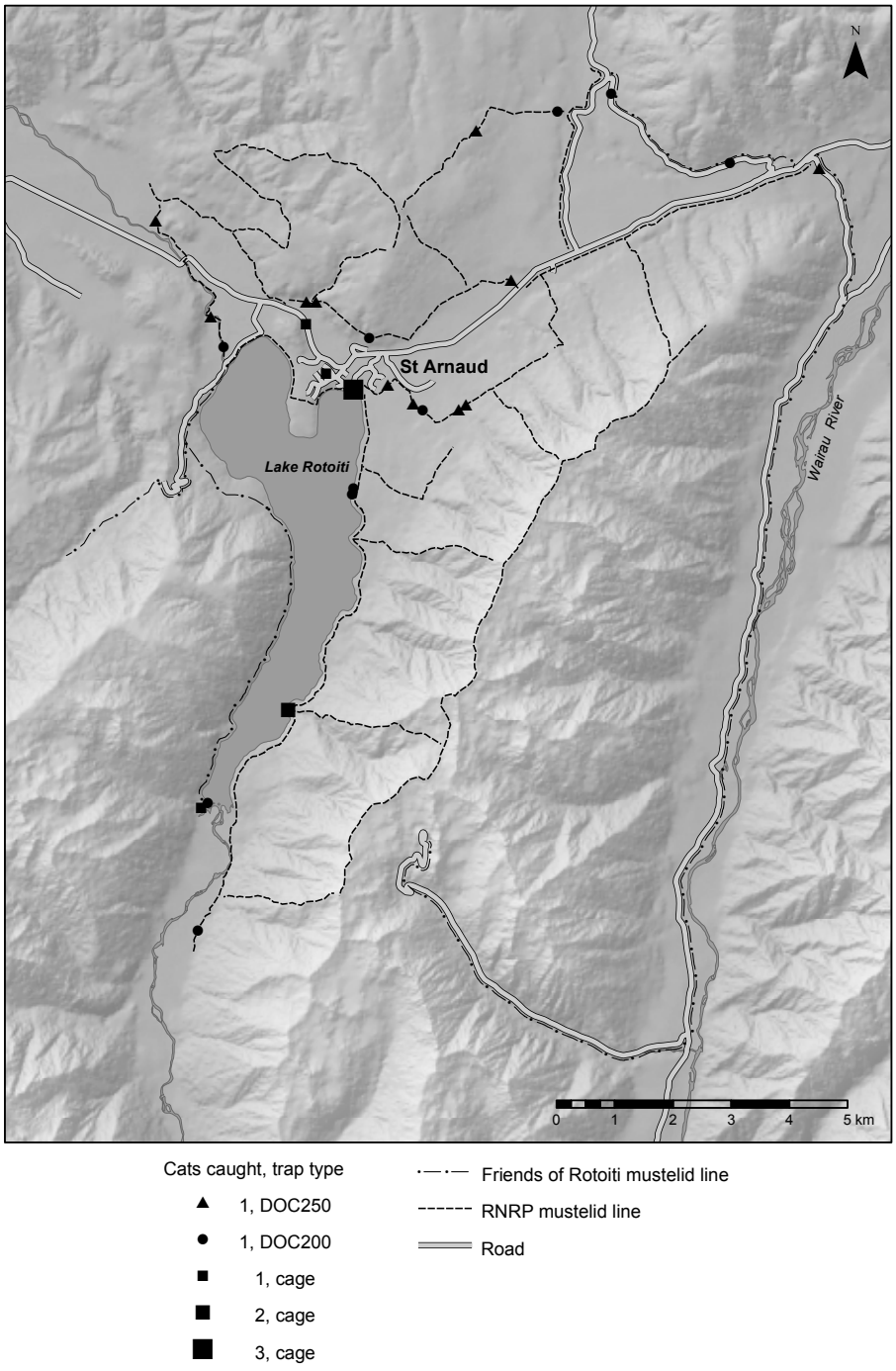

Figure 10. Map of RNRP cat captures in 2011–12.

The DOC series stoat traps caught 17 cats, significantly more than were captured last year. The majority were caught in DOC 250s (10 captures), and of these captures, nine occurred when salted rabbit was used in conjunction with egg as bait.

Discussion

Cage trapping effort was halved in 2011–12 with only a 20% decline in captures. The effort expended for each capture was 59% less than that expended last year, meaning the cage trapping was undertaken more efficiently.

The apparent increase in cat captures in cages lured with Muscattract™ suggests that this lure may improve capture rates. However, a larger or longer-term trial would be needed to confirm these results.

The DOC250 traps baited with salted rabbit appeared to substantially increase feral cat captures. While the traps are designed to trap ferrets, the larger entrance hole size will allow easier access to cats than the DOC 200 trapboxes. Baiting DOC 250s with salted rabbit in autumn will be continued next year.

In addition to catching feral cats using cage traps and DOC 250s, we plan to set up raised set kill traps to increase our trapping effort in 2012–13.

2.1.4 Possum control and monitoring

RNRP possum control and monitoring

Introduction and methods

Kill trapping was maintained on the Snail, Grunt, MOR and Lakehead mustelid trap lines. Trap lines were also maintained south of the Core Area within the new rat grid, with two lines following contours in each of the X, Y and Z rat blocks between Grunt and Lakehead. An additional trap line was also established on the existing Clearwater mustelid trap line.

All traps used were Sentinel kill traps. Traps were baited with 'Smooth in a tube' possum lure and 'Possum Dough' which were applied on alternate traps along each line. Traps were also blazed with flour and icing sugar as additional lures.

No monitoring of possum densities was undertaken during 2011–12, but this is scheduled to be done in 2012–13.

Results

One hundred and twenty possums were caught in 2011–12. As in previous years, trap lines situated to the south of the Core Area caught the most possums, with traps situated near Lakehead recording the highest number of captures. This is due to the fact that no possum control exists south of the Mainland Island, so there is likely to be a continuing high rate of re-invasion in this area.

Discussion

The number of possums caught in 2011–12 was consistent with the numbers caught in the previous few years (149 in 2010–11 and 101 in 2009–10; (Fig. 11). The overall increase in captures over the past few years is due to increased trapping effort and the fact that some areas had very little history of possum control.

In the past, the RNRP has benefitted from Animal Health Board (AHB) possum control operations adjacent to the north of the project area. These operations have minimised the number of possums moving south and thus kept possum numbers extremely low in the north of the Mainland Island. However, this effort has now been reduced, as no TB has been detected in the possum population for some time. This reduction in effort could result in a slow increase in numbers of possums detected in the northern Mainland Island, including Big Bush. As possums are known predators of nesting kākā and their eggs and chicks (Moorhouse et al. 2003), and there is a significant amount of kākā activity in Big Bush in particular (see section 2.1.6), a possum control programme in the northern RNRP should now be implemented. In the interim, possum control on the current trap-lines will serve as a surrogate possum population monitoring tool and guide further responses to likely increased possum numbers.

Friends of Rotoiti possum control

Introduction and methods

FOR started possum trapping in 2005 to minimise possum interference with stoat traps. During 2011–12 they had 51 Sentinel traps in operation, including traps deployed on the Speargrass and Mt Robert lines. The lures used during 2011–12 were Ferafeed (Connovation Ltd), Possum Dough (Trappers Cyanide Ltd) and, towards the end of the year, a new paste from Goodnature Ltd

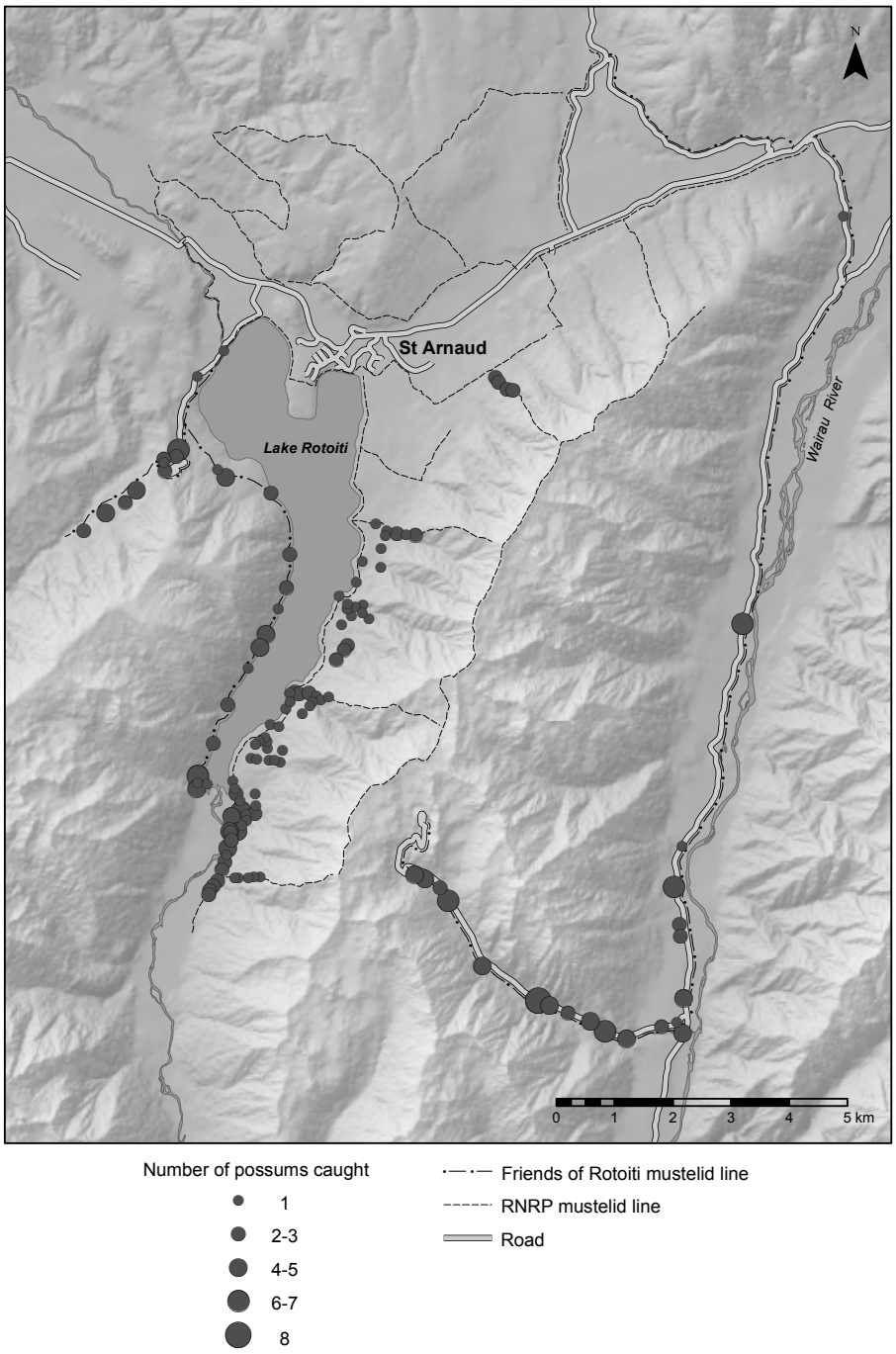

Figure 11. Map of RNRP and Friends of Rotoiti possum captures in 2011–12.

Results

The change in lures, in conjunction with more traps being put out, has contributed to higher numbers of captures in 2011–12. Trapping results are shown in Fig. 12.

2.1.5 Deer control and monitoring

Methods

Project staff report deer sign and sightings on the St Arnaud Range while carrying out other work within the project. These signs and sightings are recorded in the Excel document 'Predator and Ungulate Sign'. Sign and sightings are only recorded for the St Arnaud Range because this is where most of the vulnerable plant species in the RNRP are located.

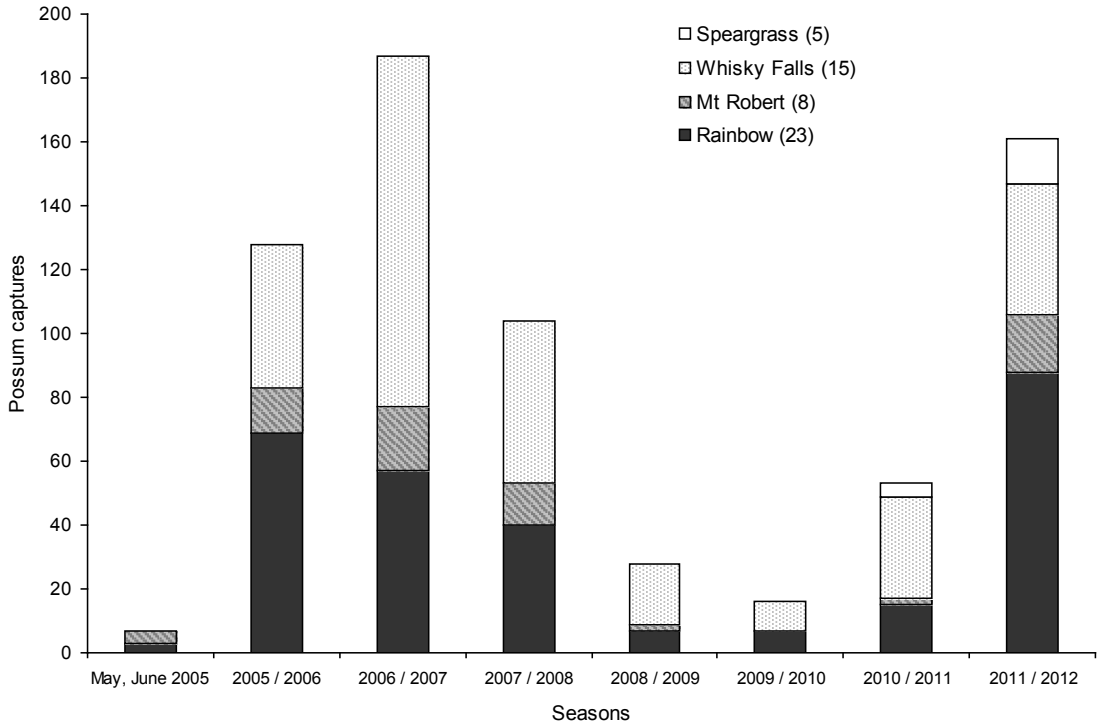

Figure 12. Friends of Rotoiti possum trapping results May 2005 – June 2012.

A system to allow (primarily) members of the local branch of the NZ Deerstalkers' Association access to the RNRP on a volunteer basis has been established. It allows hunters to book access to hunting blocks within the Mainland Island.

Results

Seven hinds, two stags and three chamois (*Rupicapra rupicapra*) were sighted within the Mainland Island during 2011–12.

There has been limited use of the hunting blocks since May 2010. No hunting was allowed during 6 months in spring and autumn 2011–12 because of two rat poisoning operations. There were nine hunting days during 2011–12 and two stags and one chamois were shot.

Discussion

Although numbers of ungulates within the Mainland Island appear to be low, or they have a very patchy distribution, their affect on native plants is likely to be biased toward particular preferred species like *Pittosporum patulum*. This means that numbers of browsers in the Mainland Island need to be kept low to reduce their impact on rare plant species in particular. It is planned to put more effort into ungulate control as there have been more sightings over the past 2 years, which may mean the population of deer and chamois in the Mainland Island is increasing.

2.1.6 Kākā (*Nestor meridionalis*) monitoring

Methods

The kākā encounter rate survey was continued during 2011–12 (from the beginning of October 2011 through to the end of April 2012). The survey is run in conjunction with the mustelid trapping programme during the regular trap checks on 19 of the 24 trap lines. The other 5 mustelid trap lines are excluded, as they do not traverse suitable kākā habitat.

Trapping staff record the date, the start and finish time in suitable habitat, any kākā seen or heard, the nearest trap box location and the time of any kākā encountered. No recording was done above the bush line.

Results

Ninety-two kākā were seen or heard over 227.6 hours in 2011–12, giving a rate of 0.404 encounters/hour. As in previous years, no kāka were encountered on the Anglers Walk trap line. No kākā were encountered on the Lake Head and the Teetotal Road trap lines (Table 2).

Discussion

The kākā encounter rate in 2011–12 was 48.5% higher than that recorded during 2010–11 (Fig. 13). It is not known whether this was due to their being more noticeable (more vocal, flying around etc.). Although no breeding attempts were observed, a small amount of beech flowering and seeding was noted that may have stimulated the kākā to breed. As in previous years, most encounters in 2011–12 were within large areas of continuous beech forest. This pattern is consistent with other years, during which most kākā encounters were in the Big Bush and on the lines within or bordering the main Core Area. The lines with the fewest or no encounters recorded all traverse through more marginal kākā habitat, like mānuka-dominated shrubland (Table 2 and Fig. 14).

2.1.7 Kea (*Nestor notabilis*) nest protection

Introduction

Kea are present in low numbers in Nelson Lakes National Park and there is evidence for their continuing slow decline (Steffens & Gasson 2009). The Kea Conservation Trust have run kea surveys in the Lake Rotoiti / Raglan Range area in recent years and this work supports evidence of a decline (J. Kemp, pers. comm.). Elliot (1999) found little evidence of predation after monitoring 36 nests over 5 years, but information from elsewhere suggests that possums and stoats kill kea nestlings and incubating adults fairly often. There is also evidence for lead poisoning in kea, from lead roofing nails and flashings removed from buildings (such as tramping huts and skifield facilities) in the alpine zone.

Table 2. Kākā encounter rate on RNRP trap lines (October 2011 – April 2012).

TRAP LINE	HOURS SURVEYED	KĀKĀ SEEN	KĀKĀ HEARD	ENCOUNTER RATE PER HOUR: SEEN AND HEARD
Lake Edge	18.3	0	8	0.437
Lake Head	6.7	0	0	0.000
Hubcap	15.7	2	2	0.255
Snail Boundary	9.5	0	7	0.737
Anglers Walk	4.8	0	0	0.000
Peninsula Nature Walk	7.1	0	1	0.141
Clearwater	13.9	0	4	0.288
German Village	2.4	0	1	0.417
Borlase Boundary	12.7	0	2	0.157
Dogleg	9.5	0	2	0.211
Duck Pond Stream	8	1	4	0.625
Dome Ridge	19.9	7	16	1.156
Cedar	8.7	0	2	0.230
Struth Line	10.2	1	6	0.686
Black Sheep Gully	19.6	1	5	0.306
Grunt Boundary	15.4	0	5	0.325
Black Valley Stream	17.7	1	3	0.226
Teetotal Road	7	0	0	0.000
Middle of the Road	20.5	0	11	0.537
Total	227.6	13	79	0.404

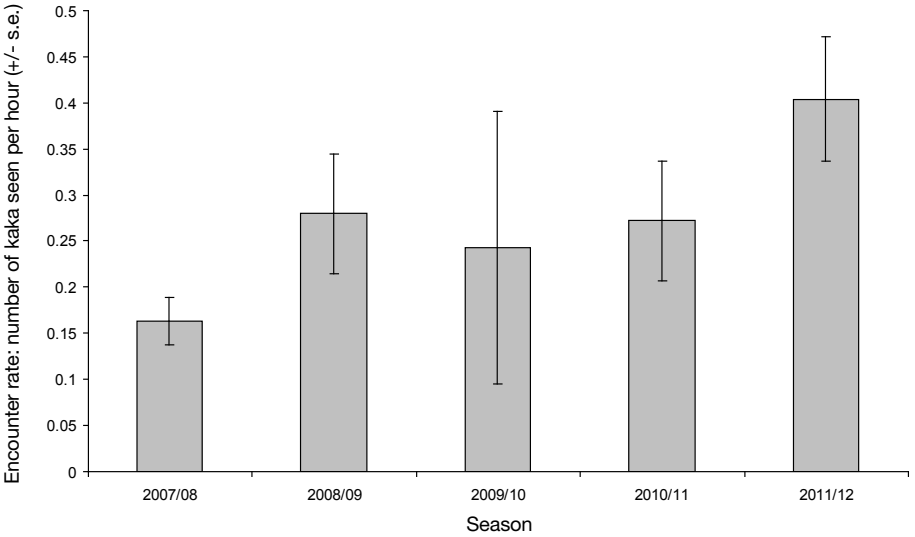

Figure 13. Kākā encounter rates for 2007–08 to 2011–12.

In light of an apparently declining kea population in the Nelson Lakes Area and that one of the principal agents of decline is likely to be predation on nests, the RNRP was asked to assist with nest protection in the area. Nest protection was centred on known nests on the MOR ridge in the Mainland Island, one near the Rainbow Skifield Road and on one to two ridges on the eastern Raglan Range. The protection involved use of DOC 200 traps for stoats and 'kea-proof' poison bait stations for possums.

Results

DOC 200 traplines and possum bait stations were established on two ridges in the Raglan Range, around a known active kea nest. Four DOC 200 traps were also established around Kea Nest No.8 in the Six-mile Valley (Rainbow Skifield Rd) and one nest was re-used very close to the existing stoat and possum control line on the MOR ridge. Both nests in the Raglan Range and the Six-mile Valley failed, apparently due to possum predation. The nest at MOR fledged three chicks.

Discussion

Of the three nests, two failed, and both of these were in areas with a very recent history of predator control. The establishment of nest protection at the Raglan Range was requested very late in the breeding season and no effective possum control was in place at either nest, as the 'kea-proof' bait stations had not been tested in a field setting.

Kea nest protection in 2012–13 will focus on establishing protection from possum interference and/or predation much earlier in the season (i.e. July), with a grid of at least a dozen traps (Sentinels™ and A12 self-resetting traps) around each nest to reduce possum population density to very low levels before nesting is likely to begin. The ongoing stoat control in the Six-mile and Wairau Valleys by FOR will provide a degree of protection from stoat predation.

2.1.8 Weka (*Gallirallus australis*) monitoring

Introduction

At the time of European settlement in the Rotoiti area, weka were very abundant, but the population was decimated during a mass die-off in 1909. For the past century the population has fluctuated at a very low level (Steffens & Gasson 2009). The reason(s) for the lack of recovery is unknown and there is a paucity of data on habitat use, reproductive success and causes of mortality in weka in alpine beech forest. In order to better understand this species, a weka monitoring programme was initiated in 2010.

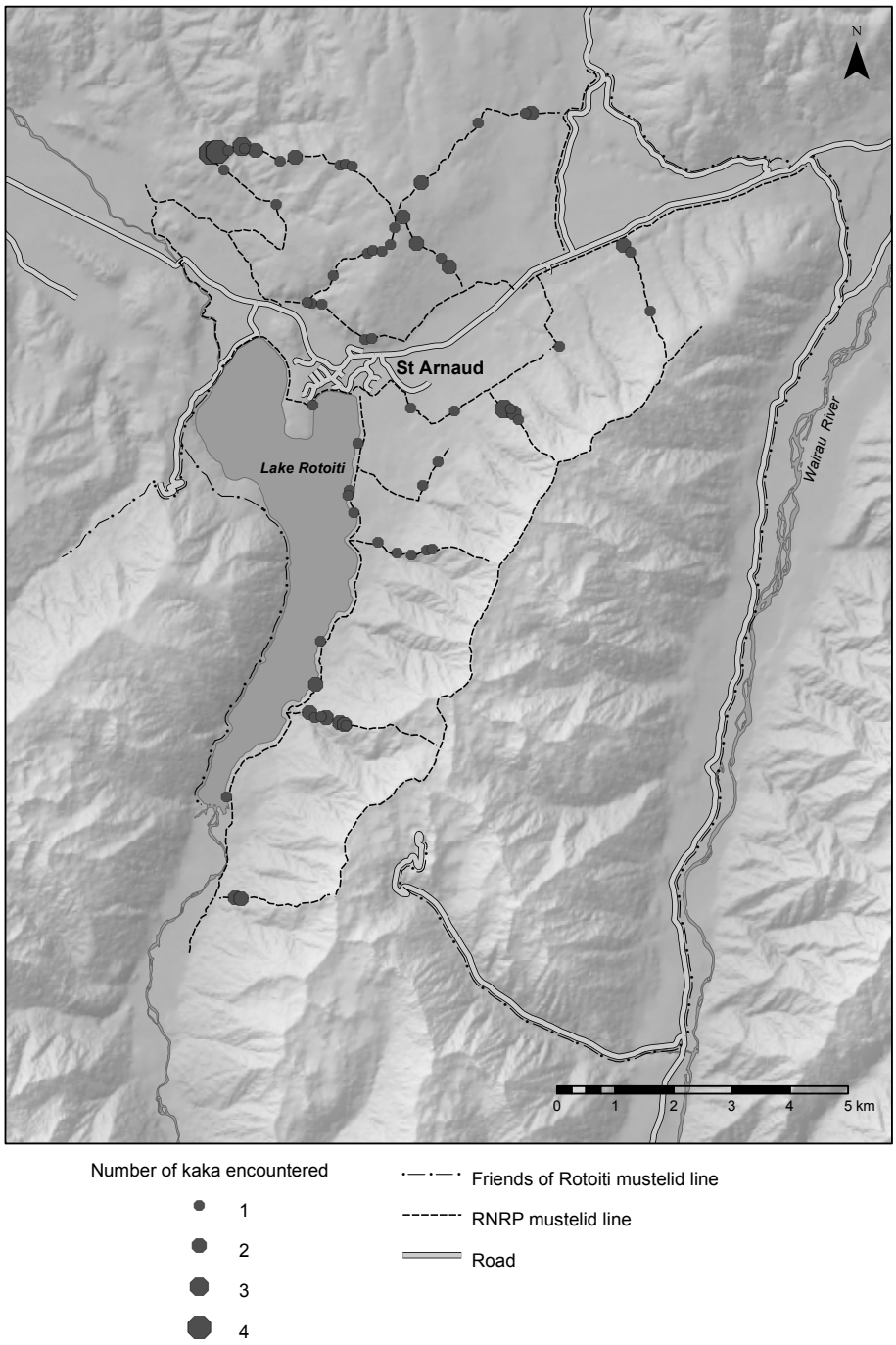

Figure 14. Map of RNRP Mainland Island showing locations of kākā encounters (October 2011 – April 2012).

Methods

Any weka sighted in or near the Mainland Island were targeted for capture, using cage traps or nets, and captured birds were fitted with backpack transmitters and a metal and colour band combination. The radio-tagged weka were checked several times a week and their location recorded using GPS. Requests for sightings of banded birds by the public resulted in much additional location information also. Home ranges were mapped as weka location data accumulated. Any nests were monitored by closely approaching and noting location, number of eggs, hatch date, number of chicks and number of successful fledglings.

Four weka (3 Juveniles [one male, two female] and one adult male) were captured during 2011–12.

One pair in St Arnaud (M-B ♀ and M-Y ♂) were monitored and nested six times, approximately every 2 months. One nest failed, but six chicks were fledged from the remaining five nests. One chick survived a heavy snowfall in August when the three original chicks were only a few days old.

Of seven radio-tagged birds, two disappeared. The rest of the transmitters were removed over the period as no extra home range data was forthcoming.

One adult died in St Arnaud after being trapped in a cage-trap set for a cat that was then left unattended for a several weeks.

Discussion

Although the weka monitoring has produced some useful interim data, there are few conclusions that can be derived from it at this early stage. Unfortunately, although we can band chicks, they are too small to fit transmitters, so we do not know what their fate is and sightings by local people produce only limited information. The RNRP will continue the current programme and plan to capture and monitor any other weka that appear in the area or are hatched here.

2.1.9 Mistletoe (*Alepis* and *Peraxilla* spp.) and *Raukawa simplex* monitoring

Introduction

No mistletoe survey took place in 2011–12. The next re-measure will be done when the possum wax tag monitoring is due during 2012–13.

Discussion

The re-establishment of Foliar Browse Index (FBI) monitoring on *Raukawa simplex* as another indicator that possum damage has been problematic. Some of the old plants were not found and not enough new plants were located to make up a useful sample size. The recommendation of the RNRP Technical Advisory Group (TAG) is to discontinue the FBI on *R. simplex* and to look at another monitoring option using *R. simplex* seedlings found in the existing 20 × 20 m vegetation plots. The *R. simplex* monitoring then will tie in with mistletoe surveys and wax tag monitoring to form a possum monitoring package. This was a recommendation from the vegetation review by Anne Brow and Mike Hawes in 2007.

2.1.10 *Pittosporum patulum* monitoring

Introduction

No *Pittosporum patulum* monitoring was undertaken in 2011–12. It is due to be done during 2012–13.

Discussion

The planned deer and chamois exclosure, which is to be used to demonstrate the effect of ungulate browse on *Pittosporum patulum*, was not erected this year due to time constraints, although a suitable site has been selected. It is planned to erect the exclosure during the 2012–13 year and plant juvenile *P. patulum* into the site. Deer continue to appear to be the main browser on juvenile plants and although some animals were removed, the control effort for deer within the Mainland Island should be increased. It is still planned to find and protect adult plants if possible. There was some sporadic searching for adult plants during 2011–12, but no adult plants were located. It is planned to undertake a more consistent approach to searching areas with known juvenile plants over 2012–13.

2.1.11 *Powelliphanta* sp. monitoring

No *Powelliphanta* monitoring was carried out in 2011–12. The next monitoring is due in 2013–14, as recommended by Anne Brow and Kath Walker in the 2008 RNRP *Powelliphanta* Monitoring Review.

2.2 Establish and maintain populations of great spotted kiwi (*Apteryx haastii*) and other native species

2.2.1 Introduction

Great spotted kiwi, the largest of five kiwi species found in New Zealand, were likely present in the Nelson Lakes area early in the 20th century, but have since become locally extinct (Steffens & Gasson 2009). Sixteen great spotted kiwi were reintroduced to the Mainland Island in two operations in 2004 and 2006, from a population at Gouland Downs, Kahurangi National Park. The reintroduced birds settled well and have since produced at least eight chicks.

Breeding activity has not been as high as expected and a proposal to supplement the population with up to14 Operation Nest Egg™ (ONE) chicks, sourced as eggs from Gouland Downs, was approved in 2008. The operation commenced in early 2009 with the radio-tagging of adults at Gouland Downs followed by 3 years of egg lifting, with the final eggs lifted in December 2011.

2.2.2 Great spotted kiwi population management

Methods

The final year of Operation Nest Egg™ (ONE) took place over the breeding season of 2011–12. This involved removing kiwi eggs from Gouland Downs in Kahurangi NP and transferring them to Willowbank captive rearing centre at Christchurch for hatching and chick rearing. Once these chicks had reached a healthy weight above 700 g, they were released into a natural burrow within the RNRP core area. In addition, an agreement has been made for the RNRP to inherit great spotted kiwi from the Cypress Mine on the Stockton Plateau as mining operations expand there.

Indirect management that benefited kiwi consisted of threat management, principally control of stoats and cats which can prey on kiwi chicks.

Dogs remain one of the biggest threats to kiwi nationally. Signs posted at the main entrances to the National Park are maintained to remind people that dogs are prohibited. It is likely that one adult kiwi death in 2010 was caused by a dog (Harper et al. 2011). Publicity about the threat of dogs to kiwi is ongoing and appears regularly in the local paper and at the Visitor Centre.

Both ONE and wild kiwi chicks continue to be weighed and checked regularly in their first year and any mortality signals promptly investigated. Differences in survivability between ONE and wild chicks has been recorded to guide future management of the species.

Results

Four eggs were transferred to Willowbank rearing facility in two separate trips from the Gouland Downs area in November and December 2011. One egg from the first lift was infertile and the second egg was very young, but died soon after hatch. Both eggs lifted in the second trip hatched successfully and are being hand-reared and were due for release into the Mainland Island in September 2012.

The juvenile female from Stockton Plateau, 'Hine Kokoiti', was released into the holding pen (c. 200 m^2) for a week in January 2012 at a weight of 1490 g. When released from the pen, she established herself in an area close by and eventually dispersed up to higher-altitude slopes above the pen. Four months post-release she had made a 19% weight gain.

Research on home ranges of adult and juvenile kiwi and their habitat use was initiated in May 2012 by an MSc student from Edinburgh Napier University, Scotland. It is expected that this research will be finished in September 2012 and it is likely to be published in a peer-reviewed journal.

Discussion

The management of great spotted kiwi over the past 3 years has focussed on the ONE programme, as a method to potentially overcome the poor breeding success of these kiwi in the RNRP. It was suggested that their low productivity was due to either old, infertile birds, or an infertile site, and releasing young birds may have circumvented problems with the former hypothesis.

The ONE programme in the RNRP has not proved particularly successful overall, with few of the fledglings thriving once released. The final results, once the last chicks are released in 2012, will be discussed in next year's report. In contrast, releases of adults or experienced juveniles have resulted in all these birds establishing within the Mainland Island. Of note is that productivity at Gouland Downs and Lake Rotoiti has been similar. Gouland Downs is a particularly infertile site, with large areas of red tussock, but it is also at about the same altitude as Lake Rotoiti, which suggests that altitude may also be a factor to consider for lower reproductive success at these sites. Great spotted kiwi pairs at low-altitude sites like the Paparoas will produce an egg every year (G. Newton, pers. comm. 2012), which adds weight to the possibility that female great spotted kiwi in colder sites may have to trade-off resources between egg production and maintenance of body condition. This hypothesis deserves further investigation, as it has implications for management of the species at Nelson Lakes and the recently established population at Flora Saddle, Kahurangi National Park.

The management of great spotted kiwi has provided not only an opportunity for establishing a new population at Nelson Lakes, but has also meant that we have learnt about the behaviour and population dynamics of a hitherto little known species.

2.2.3 Great spotted kiwi population monitoring

Methods

Remote monitoring of radio-tagged birds for mortality and breeding has continued. Every year, the number of radio-tagged kiwi fluctuates due to transmitters failing or dropping off and through the relocation of individuals. Trail cameras were purchased by the FOR and gifted to the RNRP for use on kiwi burrows. Three cameras were put out to monitor probable nests and remained post-hatch to monitor the activities of wild-hatched chicks and their parents.

A February review of the great spotted kiwi programme at the Mainland Island stipulated that there should be an annual 'round-up' of kiwi initially, followed by five-yearly round-ups to monitor the kiwi population. These round-ups would use dogs and handlers to methodically cover the Mainland Island, searching for kiwi. In May 2012, the RNRP kiwi dog Fen was used to locate kiwi and all birds found were radio-tagged. No other handlers were available to assist so some areas were not searched.

Kiwi Call Counts, a national community-based monitoring scheme, did not take place this year due to the unavailability of sufficient volunteers. Call counts are planned to be used in future, along with the kiwi roundup to provide an index of population size. Kiwi call count stations should include sites that are known to have kiwi in addition to sites that are unlikely to have kiwi; for example, lower Travers Valley and the northern end of the St Arnaud Range, to monitor the increase in population size. As the population expands, kiwi on the edge of the population will be detected by the outlying kiwi call count stations.

Results

The kiwi round-up effort saw 1 adult and 1 sub-adult female re-discovered.

Breeding results

Onahau and Tai Tapu—the daily activity counts from the transmitter on Onahau (♂) halved on 14 November 2011 and indicated incubation activity for a prolonged period of 6 months, with only 3 days of 'normal' activity levels in late February. Onahau was located at three different

day-roosts during this period which suggested he was not incubating. A trail camera only caught footage of an unbanded, non-radio-tagged bird probing around the burrow, which is likely to be last season's chick. Onahau was found with his partner and last year's chick on 31 April 2012. He was in poor condition and there was no sign of an egg or new chick.

Puremahaia and Awaroa—a camera was established at this site in November 2011 and a chick was recorded on 28 November outside the burrow entrance. A stoat was recorded at the burrow entrance on 7 January 2012 and again on 27 January. No evidence of predation was recorded. There were no further images of the chick or adults after 27 January until 3 and 29 February, when an adult was recorded. Subsequently, replacement transmitters were fitted to the adults and two checks were made, but no chick was found. In all three cases the burrows were difficult to investigate, so a chick may have escaped detection. The outcome of this breeding attempt remains unknown.

Te Matau and unknown female—incubation began around 4 October 2011, verified by the repeated location of Te Matau in the same burrow. Once a trail camera was available it was established at the burrow on 12 January and a chick was recorded on the first night of operation. The hatch date was estimated at 20 December. Over the following weeks the chick and adults were regularly recorded in or outside the burrow entrance. The chick was radio-tagged at the burrow on 5 April 2012 at a little over 3 months old. All three birds were found roosting in separate day shelters close to each other twice during April. An attempt to catch the female subsequently failed. Anatoki, who was paired with Te Matau in 2010–2011, was located close to him early in the incubation (less than 500 m away), so it was assumed that Anatoki was the female of the breeding pair. However, she was later caught in a different area with a non radio-tagged bird.

Annual health checks were carried out during 2011–12. All radio-tagged kiwi appeared healthy with no abnormalities or major weight losses, except for Onahau who was in poor condition. His transmitter recorded very low activity, originally assumed to be incubating behaviour, for approximately 6 months prior to the health check.

Very few sub-adults have been relocated thus far. One suspected sub-adult was found in 2011 with Wainui, which was possibly the 2007 chick Ngahere. Both these birds have since lost their transmitters. Another sub-adult was found with Anatoki in 2012.

Discussion

During 2011–12, three known adults have been found with unknown kiwi. This suggests that established adults have paired with new recruits that have reached adulthood.

In the first instance, as mentioned above, a male-sized kiwi was found during 2010–11 with Wainui (♀), but had no band. It was thought that it may be Tata, who had lost his band. However, during the roundup, Tata was rediscovered. There are four possible young wild-hatched birds that could have paired with Wainui, including Ngahere (5.5 years old, son of Wainui), Rito (6.5 years old, from another pair in the neighbouring territory), Miharo or Marama (both without transmitters).

In addition to this, Anatoki (♀) has also been located with another bird. Three potential males—Onetahua, Kahurangi or Motupipi, who have been missing for about 6, 4, and 3 years, respectively—could have paired up with either Anatoki or Wainui. Besides these three possibilities, the unknown mate could be one of the wild-hatched new recruits. Marama has been in this area in the past, but two ONE juveniles were released nearby in 2010.

The third instance linked with the above is an unknown female that partnered with Te Matau and fledged a chick. Te Matau was originally paired with Onekaka when transferred to the RNRP, but she re-paired with Takaka, who subsequently died in 2010. She may have re-established a pair bond with Te Matau. Another possibility is Waitapu, as her transmitter failed in February 2010. Onekaka's also failed, in January 2011. Camera footage shows a band with a transmitter on the left leg which indicates that it is either of these two. Of the two, Onekaka is more likely to still have an intact transmitter harness.

Parentage may never be determined fully for the current new recruits reaching adulthood as it is expensive to run DNA tests, so better monitoring of nest attempts should reduce the instances of unknown chicks entering the population. Putting transponders on all chicks, including ONE juveniles, will make future identification easier, especially if transmitters or leg bands are lost.

The use of trail cameras on nest burrows has improved monitoring of breeding attempts. Prior to this, incubations have appeared to have gone full-term but with no clear evidence of a breeding attempt taking place. The cameras will be placed at future possible breeding attempts to confirm nest activity and monitor breeding outcomes. The careful use of trail cameras on great spotted kiwi nests seems likely to become a vital monitoring and management tool that should be used in future monitoring.

3. Learning objectives

3.1 Test the effectiveness of rodent control tools in a beech forest system

3.1.1 Introduction

Three years of rat control using the toxins 1080 and brodifacoum was carried out in the Core Area of the RNRP from 1997 to 2000. This was then abandoned because of concerns about secondary poisoning effects in a suite of mammalian predators and native birds (Spurr et al. 2005). In lieu of a poisoning programme, the effectiveness of snap trapping for ship rats (*Rattus rattus*) was trialled from July 2000 to March 2007. Throughout that period, snap trapping consistently failed to achieve the performance target of a sustained rat tracking index of ≤5%. During 2006–07, a 'detection and staged response' model using 1080 was trialled, but failed to reduce the population. Snap trapping was eventually abandoned in March 2007. At that stage, the intention for the following year was to implement an operation using diphacinone presented in Defender bait stations, recently developed by Connovation.

During 2007–08 it became apparent that a new toxin operation would not be affordable that year and no rat control was undertaken. In 2008–09, a rodent control operation was cancelled due to concerns raised about effects on any possible short-tailed bat (*Mystacina tuberculata*) population in the Mainland Island. Subsequent searching and monitoring work did not find any bats.

In 2010, operation planning focussed specifically on the reason for controlling rats within the Mainland Island. Although protection of native passerines from rat predation was the principal reason for the control, actually increasing the **productivity** of passerines was the most the most important outcome. There were two principal reasons for this; one being that most depredation of birds occurs during the nesting season, rather than on adult birds; and secondly, that running a continuous rat control operation was therefore not necessary due to the reason outlined, but also because the expense and resources required to keep rat numbers in check year-round was prohibitive. Moreover, constant exposure of rats to poison runs the risk of bait-shyness developing or rats becoming immune to the poison. In essence, it was realised that pulsed control of rats in spring, when birds were nesting, was all that was required to increase passerine abundance in the Core Area of the Mainland Island.

Although no rodent control had been undertaken for several years, associated rodent population indexing and South Island robin (*Petroica australis australis*) nesting success outcome monitoring has continued. There was a very small beech seed-fall event in autumn 2012 (see section 3.4.4). The previous beech seed-fall was in autumn 2009, which was again quite small.

3.1.2 Ship rat control

Methods

Two rat control operations were carried out in the Mainland Island during 2011–12. The first operation was undertaken in September 2011 (spring) to lower ship rat numbers prior to robin breeding; the second in April 2012 (autumn) to suppress ship rat numbers prior to a partial beech mast. RatAbate™ (diphacinone in a peanut butter matrix) in paper bags, placed in the Philproof bait stations, was used in both operations. The September operation included the core, X and Y blocks. The April operation also included the newly established Z block, for a total area of 867 ha. Each operation involved one fill of 150 or 300 g of RatAbate™, dependent on likely ship rat density in that area, as indicated by tracking tunnel indices for rats. Bait was applied over 3–4 days, with any remaining bait being removed from bait stations approximately 6 weeks later.

Tracking tunnels were run for rodent population indices prior to and after both operations to determine the effectiveness of the rat control operation.

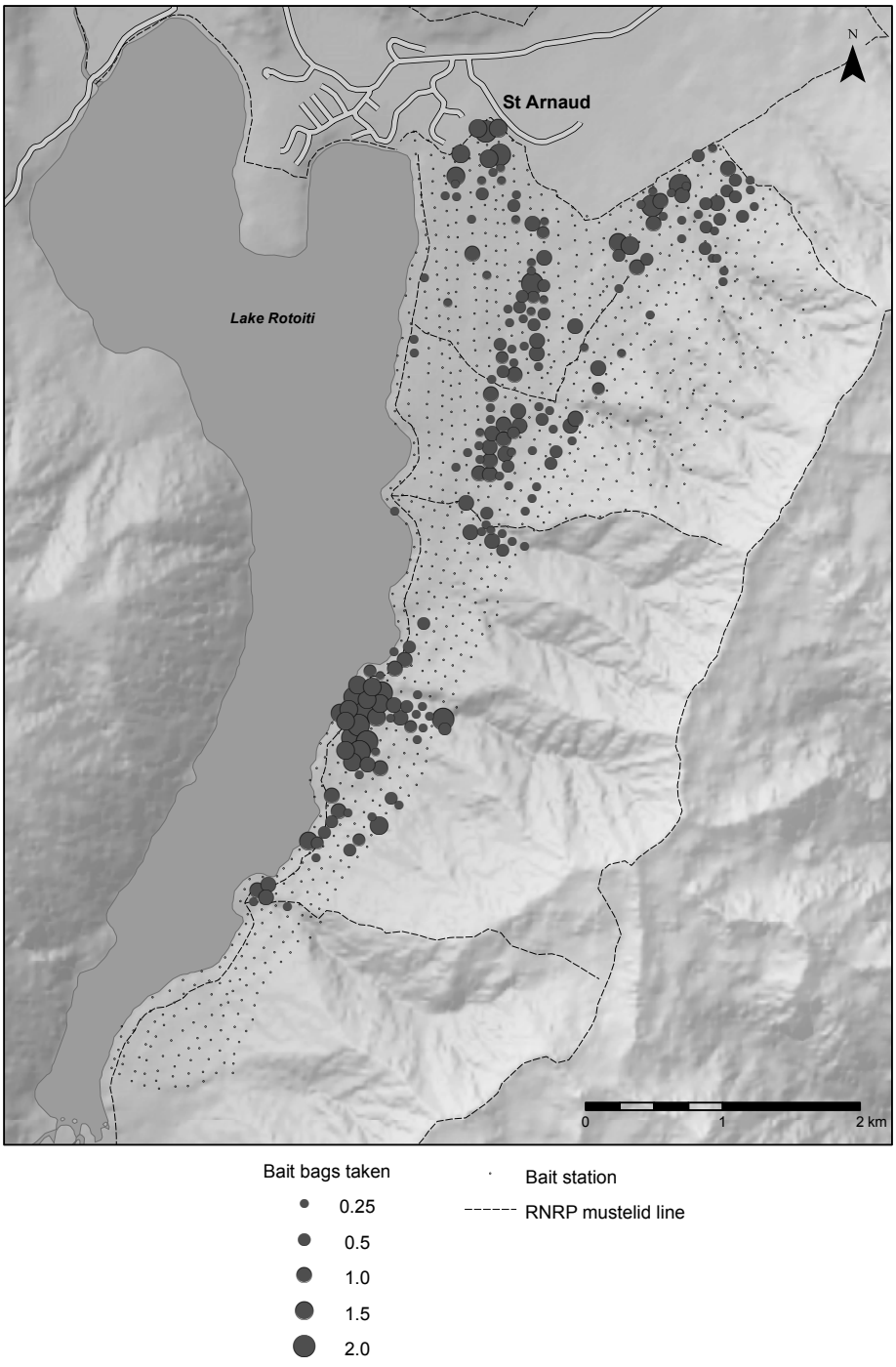

Figure 15. Rat bait consumption by bait station in the Core Area of the RNRP in spring 2011.

Results

Bait take in the September 2011 operation was 9.2% (Fig. 15), but only 4.1% in the April 2012 operation (Fig 16). Bait take was very patchy.

Prior to the poisoning operation, rat tracking was at 9%. In September 2011, tracking declined to 3%, but had increased to 25% in April 2012 (Fig. 17).

Discussion

The September 2011 operation met the 5% target; however, the April 2012 operation did not. It is likely that the April operation failed due to natural food being available as an alternative to the RatAbate™. Beech seed may have been available either on the trees or on the ground and other natural food sources may have still been available as well. During monitoring prior to the bait

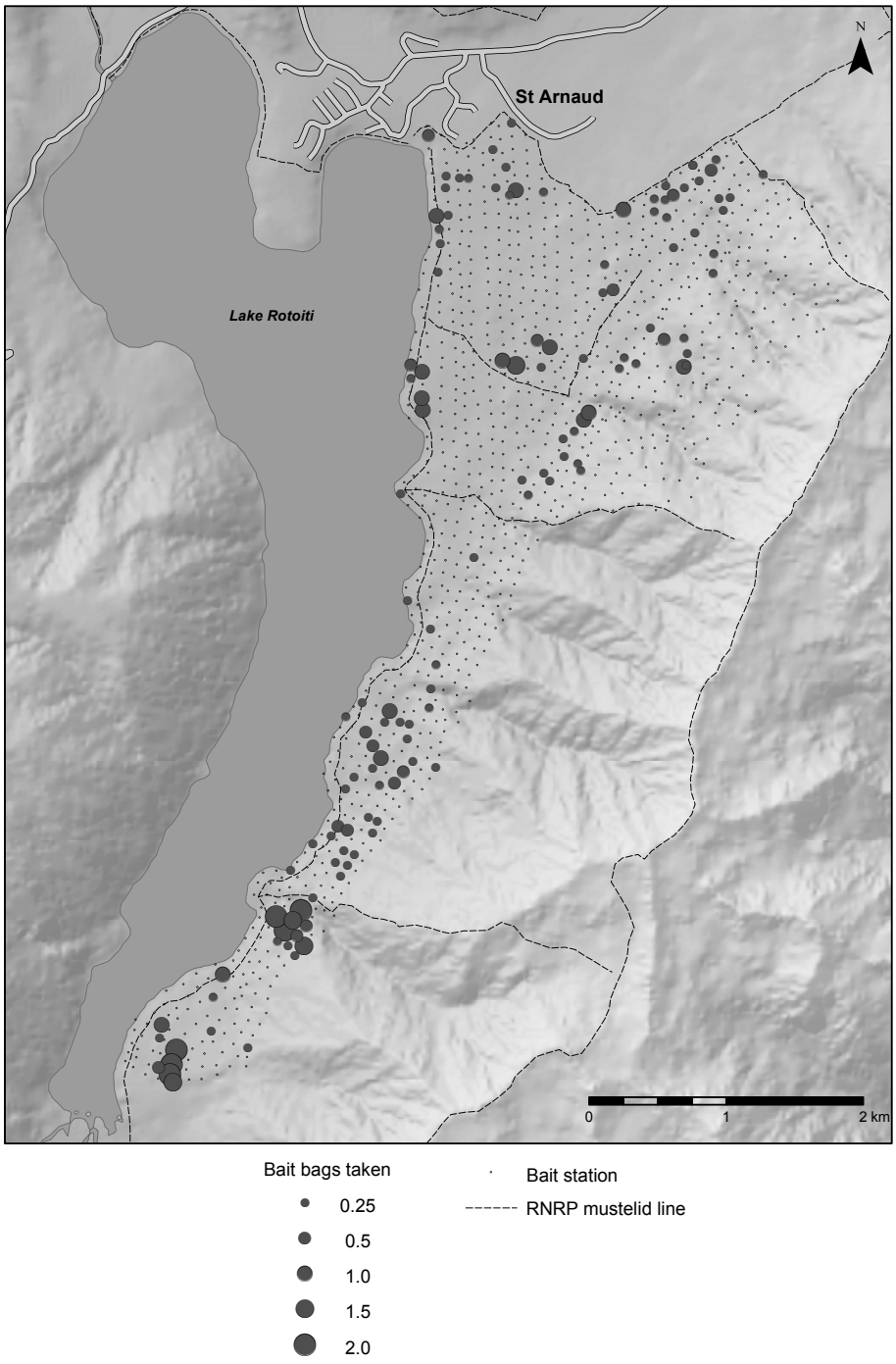

Figure 16. Rat bait consumption by bait station in the Core Area of the RNRP in autumn 2012

operation, several tracking tunnels recorded rat tracking with no peanut butter take, which is unusual and indicates rats had sufficient natural food to satisfy their requirements. RatAbate™ requires multiple feeds to kill rats, which would make it less than ideal when rats are not pressed for food. In addition, it is possible that some rats may have developed bait shyness if they had not consumed sufficient bait during the previous September 2011 bait operation.

The rat control grid now covers at least 867 ha, although the actual area covered will be larger, as this estimate does not take slope into account. This is close to the 1000 ha that is deemed to be the minimum effective size for meaningful ground-based rat control (J. Kemp, pers. comm.).

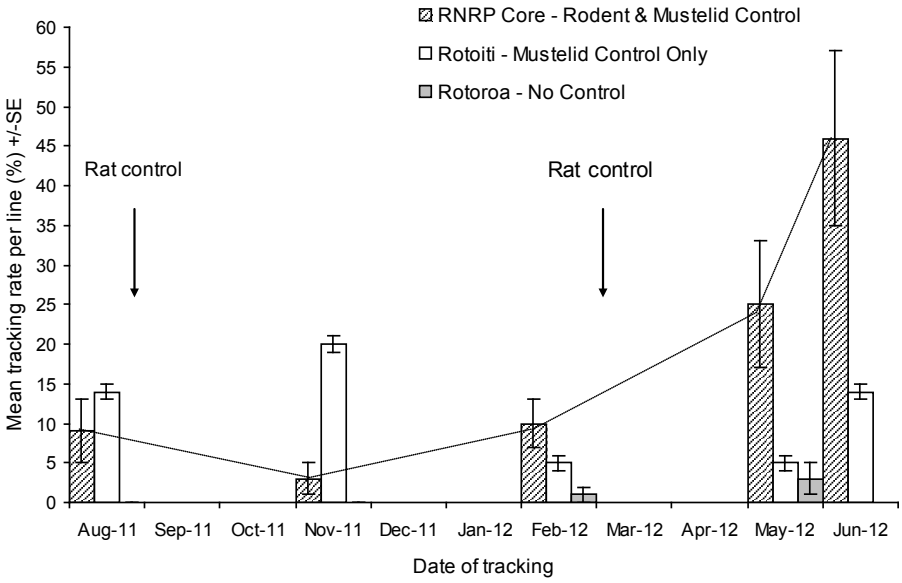

Figure 17. Rat tracking rates at Lakes Rotoiti and Rotoroa 2011–12.

Recommendations

Rat control in autumn is difficult but may be feasible with improved timing, the use of single-dose baits (such as 1080) and/or applying the bait on the ground (rather than in stations). Of these options the first and last can be readily applied, whereas the single dose bait will require more careful planning.

RatAbate™ had been used for four consecutive operations in the Mainland Island by September 2012, and best practice advises against using the same pesticide repeatedly, although pulsed baiting in the Mainland Island will lessen the problem. In future, different bait types should be used between years. A possible future replacement could be Pindone cereal pellets.

Improvements to the rat control grid should continue, such as lowering all bait stations to a maximum of 150 mm off the ground and re-cutting the bait track lines and permanently marking the remainder of the grid.

3.1.3 Rodent population monitoring

Methods

Rodent monitoring data is collected using tracking tunnels to provide a relative abundance index of rodents within the Core Area compared with Lakehead and Big Bush, where there is mustelid trapping but no rat control, and Rotoroa, where these is no control of any species. Because the the rat control grid now extends to near Lake Head, new tracking tunnel lines have been established outside of the rat control network to maintain the sample size. These new lines are located further south of the rat grid at Lake Head and northeast of the Core Area.

Rodent monitoring is carried out using Black Trakka™ cards set in 600 mm black coreflute tunnels with peanut butter applied to both ends of the wooden base as a lure (Gillies & Williams 2004).

Results

Rat tracking rates dropped from 9% to 3% in the Core Area after the spring 2011 rat control operation (Fig. 17), whereas at the Rotoiti sites with mustelid control only, rates increased from 14% to 20%. The February 2012 tracking tunnel index showed that tracking in the Core Area had increased to 10%, but had dropped to 5% outside of this area. After the autumn rodent control operation, the tracking rate in the Core Area had increased to 25%, while the rate for the other Rotoiti site remained at 5%. By early winter, rates at all sites at Rotoiti had increased, with the Core Area reaching 46%. Rat tracking at Rotoroa remained at 3% or less throughout the entire period.

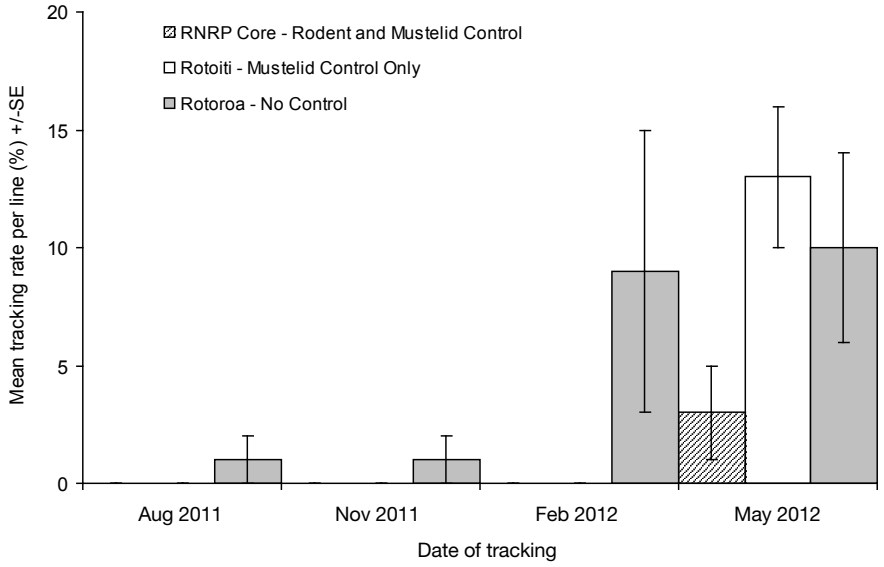

Figure 18. Mouse tracking rates at Lakes Rotoiti and Rotoroa 2011–12.

No mouse tracking (Fig. 18) was recorded in either of the Rotoiti sites until May 2012, when mice were recorded. Tracking rates at the non-treatment site at Rotoroa were consistently low until February 2012, when the rate increased. The 2012 autumn rat control operation appeared to have reduced mouse numbers inside the poisoned area where the tracking rates were much lower than at either the Rotoiti mustelid control site or the Rotoroa site.

Discussion

Based on tracking tunnel results, the rat control operation in early September 2011 appeared to have reduced numbers of rats inside the Core Area compared with Big Bush and at Lakehead. However, by February 2012, rat tracking had increased in the Core Area, with a concurrent slight increase at Rotoroa, whereas it had decreased at the Big Bush Lake Head sites. This result could have been affected, at least partially, by the extension of the rat control grid and a reduced number of tracking tunnel lines remaining outside the control grid, as new tracking tunnels were installed in June 2012. The April 2012 rat control operation was unsuccessful in reducing rat numbers, with very low bait take. There were also instances of rat tracking being recorded in tracking tunnels close to unvisited bait stations and tracking recorded without the peanut butter lure being consumed. By early winter 2012, rat tracking had increased at all sites, probably in response to a small beech seedfall (see section 3.4.4). The failure of the autumn operation may be due to timing, as seed may have been available, either on the trees or on the ground, when the rat baiting commenced on 16 April.

3.1.4 South Island robin monitoring

The South Island robin (*Petroica australis australis*) is an endemic passerine, and although the species is classified as not threatened (Miskelly et al 2008), it has declined dramatically since European settlement, primarily due to habitat loss and mammalian predation (Bell 1986). Robins are territorial year-round and mainly breed in spring, although the robin breeding season was from August to February at Rotoiti in 1998–99 (Etheridge & Powlesland 2001) and in 2010–11 (G. Harper, pers. obs.)

South Island robins have been monitored within the Core area of the Mainland Island since 1998–99 to measure the effectiveness of rat control operations.

Methods

To determine the total number of paired robins and unpaired individuals in a defined part of the Core Area at the start of the breeding season, a census was carried out. A survey was conducted four times, 1 week apart, every September. This study area (162.1 ha) is shown in Fig. 19. Until 2007, the area was approximately 120 ha in size, but was expanded south of the Loop Track to increase its size, as so few robins were being located in the few years prior to this.

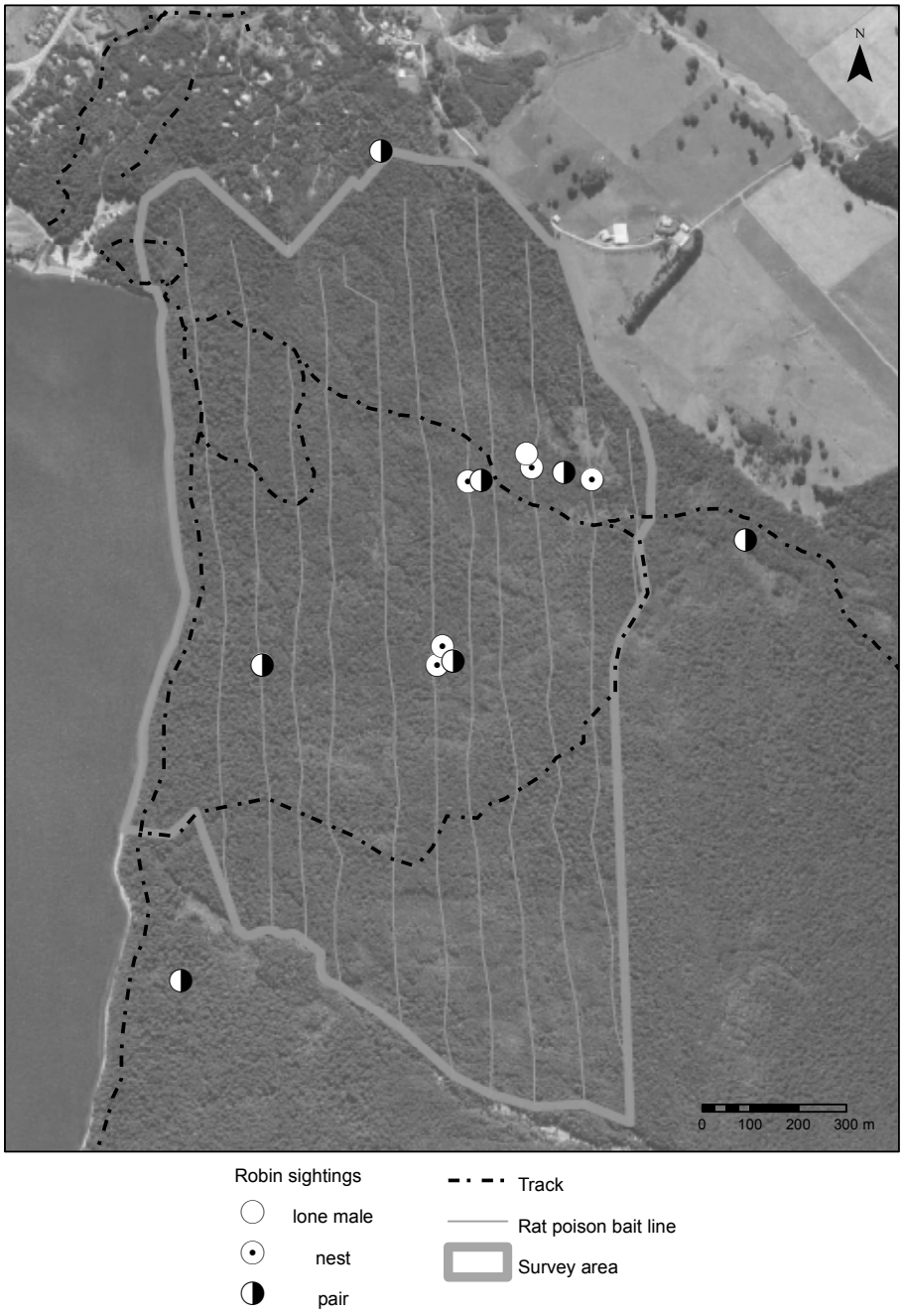

Figure 19. Map of robin survey area within the RNRP Core Area, 2011.

Pre-census—a combination of audio robin calls and 'tapping' a mealworm container was carried out within the census area in order to attract robins for colour-banding for individual recognition. An audio system was used to call robins into the vicinity of the observer. When a robin was nearby, the audio system was switched off and a mealworm container was tapped at the same time as mealworms were being fed to the robin in order to train it to come to a 'tapping' sound. We attempted to band all robins within the census area. This pre-census work was carried out during August. This work required three appropriately trained staff for 2 days.

Census—three staff were required for 1 day a week over 4 weeks throughout September. The census site was split into three areas for ease of monitoring (one person per area per day of surveying). Each surveyor walked slowly along each line while tapping a mealworm container, stopping at every second bait station for 1–2 minutes, tapping loudly to attract robins:

- If a robin was sighted, the container was tapped until the robin approached and was then fed as a reward. The following information was recorded: the band combination (or 'no

bands' if none present), sex, date, whether paired or alone, observer, location and behaviour e.g. eating mealworms, caching mealworms, flying off with mealworms. These behaviours indicate whether it has a nesting partner nearby.

- If a robin was not sighted, the surveyor continued walking and tapping along the line.

The survey data were entered into an Excel spreadsheet. If an un-banded robin was sighted during the survey, subsequent attempts were made to capture and band the robin shortly after.

Results

In the pre-census and census period in 2011, six robins (4 ♂; 2 ♀) were banded within the study area. During the 2011 census, four pairs plus four males, of which three were banded, were counted. The four pairs (♀ = YM-DB; ♂ = RM-YDB), (♀ = RM-LBY; ♂ = RM-LB), (♀ = YM-W; ♂ = YM-O), (♀ = RM-LG, ♂ = RM-LG) were seen at bait stations WJ2, LG15, LF9 and LB7 respectively. The latter pair were never recorded nesting, despite being located every 10–14 days until late February 2012. The four males (RM-YDG, RM-LGY, YM-LB and unbanded) were observed at bait stations LB1, LJ8, WI2 and RD25. YM-LB was a one-year old bird. The first nest was found on 23 September 2011, and fledged three chicks. After that, three nests were found in late October and one in late December. All five nests fledged chicks. Two pairs produced two clutches each and one pair the remaining clutch. A minimum of nine and possibly up to 15 chicks fledged successfully. Three pairs were also located just outside the study area (Fig. 19).

Robin numbers within the RNRP Core Area have fluctuated since 1998 (Fig. 20), but the general trend has been for a decline in the number of robins counted. The years with the lowest counts were 2004 (n = 3) and 2009 (n = 4). In general, robin numbers tended to decline when only rodent trapping was carried out and the number of robin pairs increased following toxin operations, with a lag of about 1 year. It is important to note that robins were not banded in 2007 and 2008, so it is possible that some robins were double counted, and density may be a little high for these 2 years.

Discussion

The rat control operation in September again resulted in successful robin breeding, which reinforces the need to control rats to low densities during the spring. Now that the rat control area has almost been doubled in size, increasing numbers of robins should be recorded in the

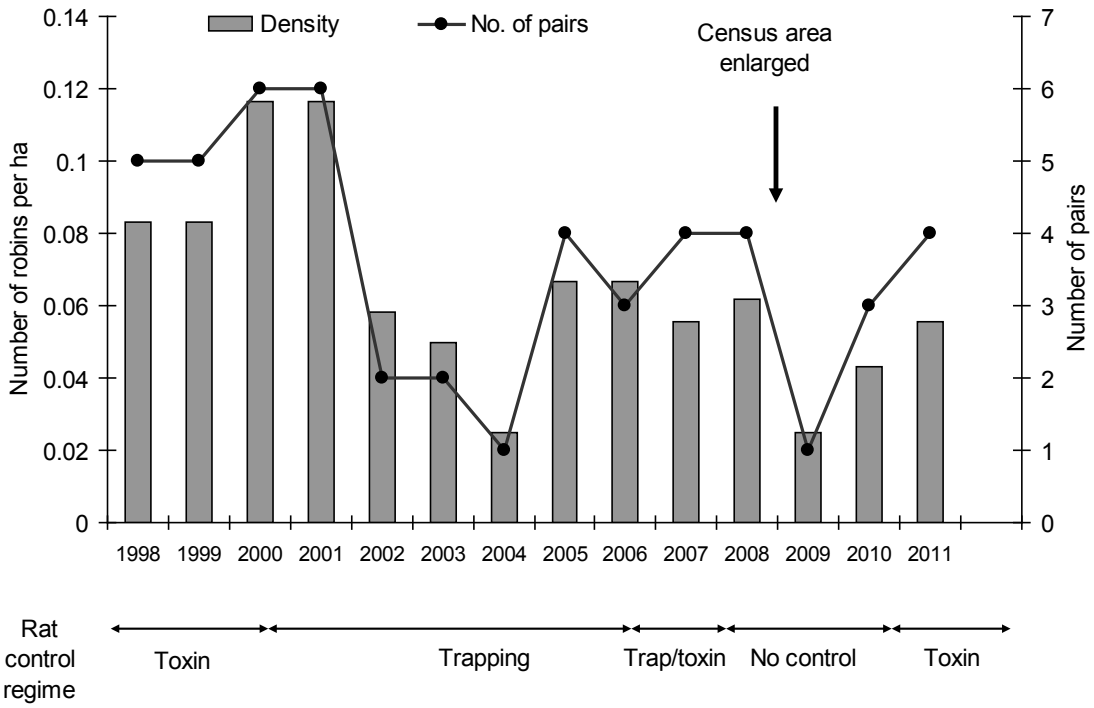

Figure 20. Robin density and number of pairs in the RNRP Core Area during differing rodent control regimes.

Mainland Island in the future. Considering the size of the area surveyed—162.1 ha—the 2011 population of eleven robins, with only four breeding pairs, indicates that the population density remains low. It is possible that the Core Area is not preferred habitat for robins. There may be a variety of reasons for this, including high wasp numbers during the summer and autumn, the altitude, and/or forest composition. For example, robin abundance appears to be higher in mānuka/kānuka forest in nearby Big Bush, where wasp numbers are lower.

Of note is the continued sex bias in the robin census counts. Over the past 14 years the mean number of single males counted is 1.1 compared with 0.2 for single females. The factors producing this effect are unknown, although differing predation rates on females is probable, as they are highly vulnerable when on the nest. As the current rat control area is limited to only approximately 1000 ha and there is some degree of dispersal in robins, it is possible that the sex bias indicates the state of the robin metapopulation in the wider Nelson Lakes area.

3.2 Test the effectiveness of wasp control tools

3.2.1 Introduction

From 1998, common wasps (*Vespula vulgaris*) have been controlled in the Core Area of the Mainland Island using various protein-based baits containing mainly the toxins Finitron or Fipronil. This work was originally carried out in close association with Landcare Research and, more recently, with the Nelson-based company Entecol, which is currently the only supplier of the toxic bait X-stinguish (0.1% Fipronil). Fipronil has proven to be the more effective of the two toxins, but access is currently constrained by commercial imperatives and it is only available under an experimental use arrangement. Finitron has also not always been available and due to the unavailability of any suitable toxin there was no wasp control undertaken during 2006–07. However, the following year, X-stinguish™ was again available for experimental purposes and has been used for subsequent operations. Experimental trials by the community group 'Friends of Rotoiti' (FOR) in the Big Bush area during summer in 2008–09 suggested that effective control of wasp nests could extend up to 350 m from poison bait stations (Brow et al. 2010). As a result of this, trials in the last 3 years have focussed on determining the widest possible spacing between wasp bait lines that still allowed the desired reduction in wasp densities to be achieved.

3.2.2 Wasp control and monitoring

Methods

To ensure that the toxic operation will be effective, pre-operation monitoring of wasp visitation on non-toxic protein-based baits is carried out. An average of one wasp per bait is considered the trigger point for initiating the decision-making process to start the toxic operation. For further detail on wasp monitoring and the decision-making process refer to the RNRP 2011–12 Field Manual.

During summer 2011–12, a control operation was carried out again in the Core Area, with toxic bait placed in every second line to achieve 400 m spacing between the lines. The Core Area was also divided into two grid arrays, one with a single bait station every 50 m and the other with paired bait stations every 100 m. In Big Bush, the bait station grid that was set up in 2010–11 was used again. This grid also has paired stations at 100 m intervals, but bait stations are on vertical lines which run up- and down-slope 400 m apart instead of along contours. The rationale for vertical lines was to test the theory that wasps may be able to carry toxic bait further distances across slopes and may also forage further from their nests across slopes.

During 2011–12, wasp nests were marked along transects and flight counts were recorded before poison was put out and repeated around 2 weeks after poisoning was completed. Along the same transects an attempt was also made to establish a monitoring system that did not require wasp nests to be located. Two systems were trialled; one, the 'wasp foraging index', recorded wasp

numbers on non-toxic baits before and after the control. This is similar to the method used to determine the trigger point for initiating the poison operation. The other system, the 'biological off-take', counted the number of mealworms removed from a dish after one hour and counted honeydew droplets on marked trees. Again, both were done before and after the poisoning operation. The new method using the mealworms failed to produce any useful data due to the worms escaping from the dishes, so the results are not included in this report.

Monitoring was only carried out in the Core Area during 2011–12.

X-stinguish™ bait (protein matrix with active ingredient Fipronil 0.1%) packaged in 1.5 L plastic pails was obtained from the Entecol lab in Nelson in early January 2012 and stored frozen until the day before the wasp control operation. During 2011–12, the operation was started on 20 February 2012, with toxic bait laid in the RNRP Core and St Arnaud Village/Brunner Peninsula areas. Bait stations in the Big Bush grid and the line on the western side of Lake Rotoiti (filled by the FOR group) were filled on 21 February. Because of perceived low wasp numbers in 2011–12, only 30 g of bait was placed in each bait station. For further information regarding the bait and bait station layout, refer to the RNRP 2011–12 Field Manual.

Operational performance standards specify that uneaten bait must be collected from bait stations within 5 days of application. All uneaten bait was retrieved and weighed to determine the amount of bait taken.

Results

On 3 February 2012, the average number of wasps observed on non-toxic baits was 4.5. Although this result was high enough to initiate the poison operation, inclement weather and time restraints meant that the toxic baits were not placed into stations until later in the month.

Including all of the DOC and FOR operations, a total of 24.7 kg toxic bait was deployed. The bait take in 2011–12 appeared to be very low, with only 5.4 kg (21.7%) of the bait removed by wasps.

After 2 weeks, the operation achieved an 80.9% overall reduction in flight counts of marked nests inside the two grid arrays in the Core Area. The 400 m × 50 m (single station) grid performed best, with an 82.6% reduction, while the 400 m × 100 m (two stations) fared slightly worse, reducing flight counts by 75.7%, although only a few nests were monitored in that area.

The new monitoring methods produced mixed results, with a 68% reduction of wasps noted foraging on non-toxic bait post-poison in the 400 m × 50 m grid and a 75% reduction in the 400 m × 100 m grid. There was a 71% reduction for the combined grids. Honeydew droplets increased by 253% post-poison inside the 400 m × 50 m grid (Fig. 21); no biological off-take monitoring was done in the other grid.

There does not appear to be any useful comparison between wasp foraging or biological off-take monitoring points and the distance from poison bait stations.

Discussion

During summer 2011–12, wasp numbers appeared lower than average, so the control operation was initiated later in the season, as has been the pattern for the last 3 years. Less bait was placed per station than in previous operations and assessment of the amount of uneaten bait recovered suggests the amount could have been further reduced. The bait take appeared well below average which could have been the result of apparently lower wasp numbers this year, although the recovered bait was very wet, which could have also reduced the bait take.

The toxic bait operation was successful in reducing the wasp nuisance around St Arnaud Village.

Wasp activity within the Core Area was observed to fall within a few days of the operation, although there were still some active nests noted in the following months. Preliminary results inside the Core Area also indicated that the operation was successful in increasing the availability of honeydew to native birds, with around an 80% reduction in flight counts of marked wasp nests. Results also indicated that a 71% reduction in the wasp foraging index could be enough to stop wasps having a detrimental impact on the ecosystem.

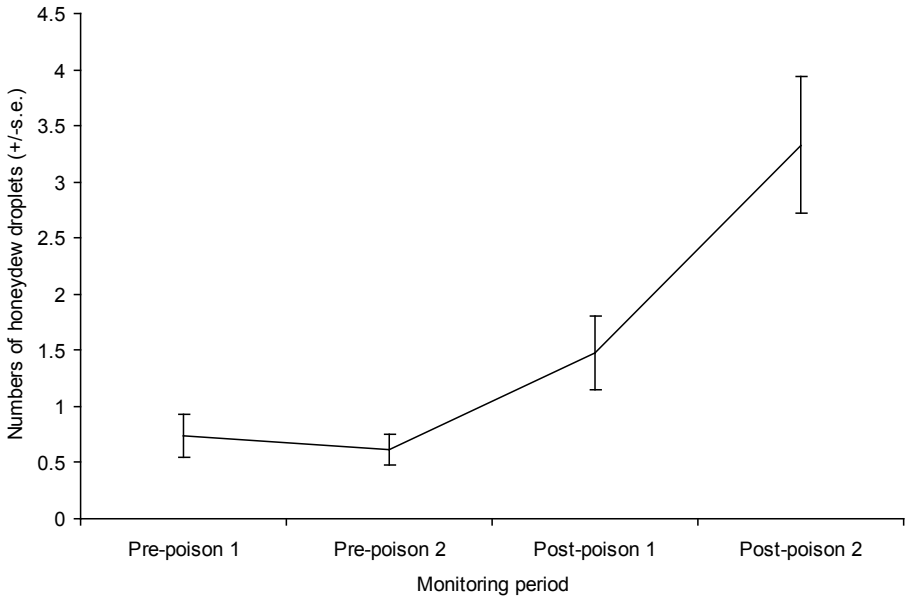

Figure 21. Effect of wasp poison operation on availability of honeydew in the RNRP Core Area.

For next year's operation we will be looking at re-trialling the two grid systems. It is also planned to repeat the wasp foraging index using non-toxic bait and biological off-take by counting honeydew droplets. The results will be compared with flight counts on marked nests pre- and post-poisoning.

A trial investigating potential lures to increase the amount of toxic bait taken by wasps is planned for summer 2012–13. Lures such as fish oil would be applied to freshly baited stations. Previous study into bait preferences found sardine cat-food was the bait most favoured by wasps (Spurr 1995).

Although the high wasp numbers predicted for summer 2011–12, based on low wasp numbers in 2010–11, did not eventuate, models suggest that much higher wasp numbers are likely in 2012–13.

3.3 Test the effectiveness of different translocation methods

3.3.1 Introduction

Great spotted kiwi is the only species to have been translocated to the RNRP through wild-to-wild translocations (of adults in 2004 and 2006; Gasson 2005). No work has commenced on introducing any other species. There is more that can be done to test the effectiveness of different translocation methods for great spotted kiwi. Planning commenced in 2008 for future translocations of juvenile great spotted kiwi through an ONE project involving the collection of eggs from Gouland Downs in Kahurangi National Park. Eggs were to be incubated at Willowbank Wildlife Park in Christchurch, and subsequent chicks put on a crèche island. At a weight of >1 kg, the juveniles were to be released into the Mainland Island. There were two broad objectives for the ONE translocations:

- Biodiversity objective: to augment the existing founder population with young birds from another site
- Research objective: a pilot study to compare the success of ONE birds to the success of RNRP-hatched birds, with respect to territory establishment and breeding success in the RNRP

A funding application submitted to the Bank of New Zealand's Save the Kiwi Trust was approved. This pilot study is relevant because of increasing interest in using ONE to manage existing great

spotted kiwi populations and to perhaps establish new populations. The RNRP is a site where the fate of ONE birds can be monitored and compared with that of wild-raised chicks protected by predator control. The project should indicate whether ONE birds can be successfully incorporated into an existing population and, if so, whether the process (including dispersal and age of breeding) is broadly similar to that of wild-raised birds.

Methods

An ONE operation was carried out again in 2011–12 to supplement the RNRP kiwi population with young individuals. Eighteen kiwi, mainly males, in the Gouland Downs, had been fitted with egg-timer transmitters by the time of the operation in November 2010. Additional transmitters had been fitted to kiwi in March 2010 (Harper et al. 2010). In 2011–12, individual RNRP team members went into Gouland Downs during spring to monitor the radio-tagged kiwi for three-day trips every 2 weeks. When it was assessed that individual bird's or pairs' activities suggested incubation had begun, the aim was to remove eggs after approximately 45–60 days incubation. When the eggs were removed, they were flown out to Wakefield near Nelson and then driven to Willowbank in Christchurch. At Willowbank, the eggs were to be incubated, and successfully hatched chicks reared until release into the Mainland Island.

In addition to the Gouland Downs birds, great spotted kiwi from the Stockton Plateau in northern Buller have been made available to the RNRP. These are birds that are likely to be affected by the expansion of the Stockton mine over the next 5 years. Initially, chicks were to be harvested from the affected site, but if the mine expanded then adults would also be removed.

Results

The RNRP team carried out seven separate trips to Gouland Downs in spring and summer 2011–12. Two trips involved egg transfers. The first, from 14 to 18 November 2011, transferred two eggs from between Gouland Downs and Perry Saddle. The nests were located by Dave Rees and his dog. Only one other nest near Gouland Downs Hut was checked, but was left, as the egg was only a few days old. A second transfer was carried out over 5–8 December. The egg located on the previous trip was taken to Willowbank, along with one other from Gouland Downs. Of the four eggs removed, the first was infertile and the second hatched but the chick died after 2 months of assisted feeding. The third and fourth eggs hatched successfully and the chicks were due to be released in September 2012.

The 18th and final trip to Gouland Downs was completed in February 2012. Four days were spent catching all remaining radio-tagged kiwi (10) to remove their transmitters. The team used a 'gang-tackle' approach, whereby five to six people either approached the bird from several directions, or moved in unison to 'beat' the bird to two hidden catchers. This worked well and all the birds were caught, and in one case, a dropped transmitter located. One bird was not located despite a lot of search effort.

Thus far, 10 ONE eggs have been transferred to Willowbank over 3 years. The number of kiwi radio-tagged multiplied by the number of breeding seasons equates to 38 'individual breeding seasons'. Of the 10 eggs transferred, one was infertile, two died at Willowbank and of the five that have been released, two are alive in the Mainland Island. Two presently remain at Willowbank. The amount of time spent working in the field at Gouland Downs for the RNRP ONE programme equates to 228 person days over almost exactly 3 years.

One chick from the Stockton Plateau was removed and held at Bois Gentil in the Grey Valley during 2011–12. It was subsequently released into the Mainland Island on 23 January 2012, weighing almost 1.5 kg. This juvenile has settled in well and has continued to gain weight.

Discussion

The trip to Gouland Downs in February 2012 has nearly concluded the ONE programme for the RNRP. With only two chicks left to release to the wild, a tentative summary of the programme can be attempted. It is obvious that this programme has taken a lot of time and effort. Almost two-

thirds of a 'person-year' was spent in the field over the 3 years the programme ran. For this effort only 10 eggs were harvested, resulting in only two, or possibly four, chicks successfully released at Nelson Lakes (from seven attempts). Several factors have led to this situation. The first is the low number of breeding attempts by kiwi at Gouland Downs, which meant that despite a large number of kiwi having been radio-tagged, few bred in each year, so that few eggs were available for transfer. The hand-rearing went well, with only two chicks dying at the rearing facility. Of particular note was the one chick that required assisted feeding for 2 months before it finally died. This pattern was repeated with the chicks that were released at Nelson Lakes. Of the five that were released and subsequently died, two died of misadventure, but three did not appear to feed at all and subsequently died of starvation. Their weights at release did not affect this, as two chicks were successfully released weighing c. 700 g. There may be some behavioural effect that induces chicks to not feed, possibly related to lack of socialisation. It is becoming apparent that great spotted kiwi are substantially more social than several other kiwi species except southern tokoeka (Colbourne 2002), with the chicks associating with the adults for at least 1–2 years after hatching. It may be that the majority of great spotted kiwi chicks require social interaction as chicks to survive, which casts doubt on the usefulness of ONE for management of this species.

3.4 Determine long-term trends in bird abundance and forest health in response to ongoing management

3.4.1 Introduction

The RNRP continues to play an important role in monitoring bird calls and forest health as part of DOC's commitment to measuring long term biodiversity trends. Monitoring of beech seed-fall adds value to the national picture of forest seed-fall and enables the RNRP project to plan appropriate management responses

3.4.2 Five-minute bird counts

Methods

Five-minute bird counts (5MBC) were conducted in November 2011 and February and May 2012 using the technique detailed by Dawson & Bull (1975). The counts were conducted on the St Arnaud Range Track in the Core Area, at Lakehead and along the Mt Misery Track at Lake Rotoroa. Each site was sampled three times in November and February; however, in May, Lakehead and Rotoroa were only sampled twice. Three different observers were used during 2011–12.

Results

The bird count data was entered onto a spreadsheet (RNRP 5MBC). Mean counts were calculated for each bird species at each location for May 2012. These were graphed against the pooled averages since 1997 in RNRP and Lakehead and 2003 in Rotoroa. The bird count data will be included in the national 5MBC database.

Discussion

With the extension of the rat control bait station grid to encompass the Lakehead 5MBC line, this line is now no longer operating as a stoat control only bird-monitoring line; essentially, it now has the same treatment as the St Arnaud Track line.

3.4.3 Vegetation plot monitoring

Nineteen out of twenty 20 × 20 m vegetation plots within the RNRP have been re-measured from 2009 to 2011. During 2011–12, a few corrections were made to plant identification, particularly *Coprosma* species, and many trees tagged low were re-tagged at breast height. Most plots were

measured for the third time (initial measurements took place from 1997 to 1999). Vegetation plots are monitored using the updated field protocols for permanent plots and the RECCE method (Hurst & Allen 2007a, b).

3.4.4 Beech seed-fall monitoring

Methods

Beech seed-fall monitoring is conducted within the Core Area of the Mainland Island at Lake Rotoiti and along the Mt Misery track at Lake Rotoroa. Twenty seed-fall trays are located at each of the two sites. Collection bags are fitted in early March then replaced in mid-April and finally removed mid-June. Any seed collected is separated into species, counted and then tested for viability.

Results

Beech seed counts at Lake Rotoiti and Lake Rotoroa were again low during 2011–12 (Fig. 22). Red beech (*Nothofagus fusca*) was the predominant species for seed production and was the only species that recorded higher than 50% viability at either site (Table 3). Both mountain beech (*N. solandri* var. *cliffortioides*) and silver beech (*N. menziesii*) produced about 20% of the seed production of red beech and viability was less than 30% for both species and both sites.

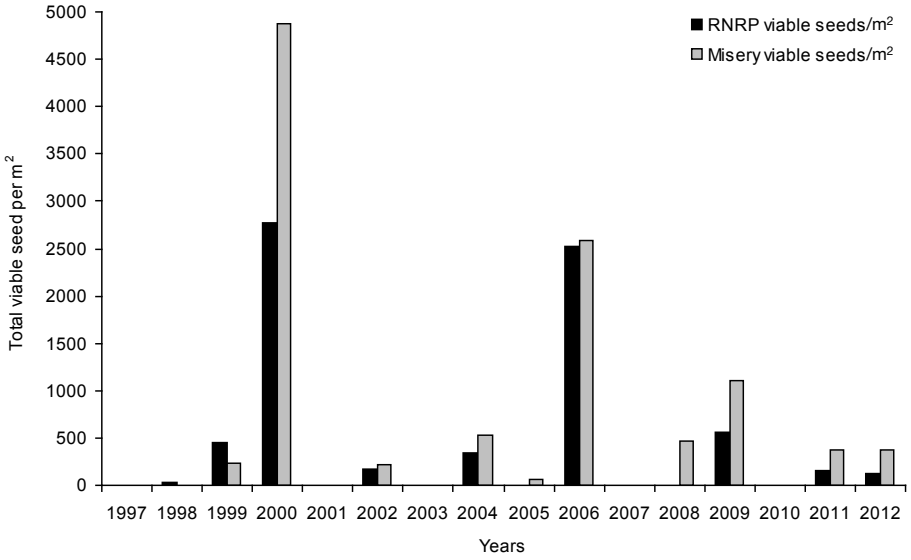

Figure 22. Total viable beech seed from the RNRP at Lake Rotoiti and Mt Misery, Lake Rotoroa 1997–2012.

Table 3. Beech seed counts at Lake Rotoiti and Lake Rotoroa 2011–12.

SITE	SEED COUNTS			
	TOTALS	RED BEECH	MOUNTAIN BEECH	SILVER BEECH
Mainland Island	Total count	1097	203	17
	Total viable seed	642	49	4
	Proportion viable (%)	59	24	24
Lake Rotoroa	Total count	3548	247	359
	Total viable seed	1977	69	17
	Proportion viable (%)	56	28	5

Discussion

There has been low or no seed production since 2009 at the sites the RNRP manages, but it appears that the rodent population responded to beech seed-fall in 2011–12 in any case, as rat and mouse tracking tunnel tracking was elevated by autumn 2012 (see section 3.1), and there was no decline in rodent indices in response to the autumn rodent poison operation. The causal links between rodent abundance and beech seed-fall in montane forest is well documented, but methods and timing for truncating a rodent irruption when plentiful beech seed is present are not clear at present and require continued research and long-term monitoring like the work that is carried out in the RNRP.

3.4.5 Tussock plot monitoring

Methods

The tussock monitoring historically carried out at Mt Misery was reinstated during the 2010 to measure the flowering of *Chionochloa australis* and *Chionochloa pallens*. Following advice on methodology, a new 20 × 20 m plot was permanently marked to replace the old method used, which had involved counting flowering stems within an 'arm sweep' of the old DSIR points. It was also recommended that counts using the old method be continued in conjunction with the new plot for comparative analysis (D. Kelly pers. comm.).

Results

Using the new (plot) method, the average number of flowers per plant for *Chionochloa pallens* was 0.26. Using the old (arm sweep) method it was 0.19. Averages for *Chionochloa australis* were 121.84 with the new method and 4.63 with the old method.

Discussion

Although *Chionochloa pallens* flowering was minimal during the February 2012 count, both, the new (plot) and old (arm sweep) methods provided similar results. However, the results were not quite so conclusive for *Chionochloa australis*, most of which had flowered before the survey. It is anticipated that further tussock surveys during the next few years will provide more robust results.

3.5 Systematically record observations of previously unreported native and non-native organisms in RNRP

3.5.1 Introduction

Methods

The systematic recording of previously unreported native and non-native organisms is a new objective identified in the proposed RNRP Strategic Plan 2008-13. The intention of this objective is to maximise the learning from observations of species previously not known to be present, regardless of whether the observation is part of an organised survey or not. Increased knowledge of the native species present in the RNRP is useful. Detection of invasive plants or animals will inform management actions to protect biodiversity values.

Results

There is currently a repository for new information: 'Flora and fauna of Lake Rotoiti Recovery Project'. A white heron (*Egretta alba modesta*) was recorded at the Travers River delta on 15–17 February 2012.

3.6 Facilitate research to improve our understanding of the ecology and management of beech forest and alpine systems

3.6.1 Introduction

The RNRP continues to be a place of learning for external researchers. Three students conducted research with the RNRP during 2011–12.

3.6.2 Research conducted during 2011-2012

The three students who carried out research for the RNRP this year were

- Jenny Long, Otago University, who assessed hare abundance measures at Cupola Basin for her Post-graduate Diploma in Wildlife Management.
- Matt Kavermann, a PhD student from Lincoln University, who conducted research on audio lures to improve efficiency of wax tags, chew tags and traps for possums at low and medium densities. This work was carried out at the Mainland Island, including Big Bush, and at Lake Rotoroa.
- Petr Jahn, Edinburgh Napier University, Scotland, who began research on home range and habitat selection of great spotted kiwi at the RNRP in May 2012.

3.7 Analyse and report on the effectiveness of management techniques and ensure that knowledge gained is transferred to the appropriate audiences to maximise conservation gain

3.7.1 Introduction

Analysing and communicating technical information about the effectiveness of management techniques is a key learning objective, linking directly to National Mainland Island Principle 2: Results and outcomes are communicated. The RNRP transfers technical information to target groups through various documents including annual reports, field trial reports, and occasional publications, as well as through presentations to technical audiences and input to periodic workshops and hui. Technical analysis and communications need to be distinguished from advocacy work which is discussed in section 4.1.3, and includes brochures, newsletters and presentations targeted at non-technical groups. In addition, there is ongoing interest from the media in work by the RNRP, mainly focusing on the kiwi project.

3.7.2 Reports generated during 2011–12

Besides the Annual Report, no additional reports were produced in 2011–12.

3.7.3 Hui, workshops, presentations and media articles

Grant Harper gave presentations at the BNZ kiwi hui at Nelson, the Sanctuaries Workshop at Nelson, the Nelson Marlborough Conservation Board at Nelson Lakes, and the Friends of Rotoiti 10th anniversary. Several presentations were given to visiting groups, such as university classes.

There was substantially less media interest in the RNRP during 2011–12 than in previous years.

Media articles included:

Bringing back the birdsong. *Nelson Mail*, 8 August 2011.

4. Community objectives

4.1 Increase public knowledge, understanding and support for mainland islands and ecological restoration nationally through education, experience and participation

4.1.1 Introduction

Visitors to Nelson Lakes have a wide range of opportunities to learn more about the RNRP and the other mainland island programmes. The Nelson Lakes Visitor Centre provides a central hub for those wanting to make contact with DOC staff and also to peruse the interpretive displays.

The FOR conservation volunteers are directly involved in the project through their continued pest control that support the efforts of the RNRP.

The Community Relations Ranger and RNRP staff continue to provide advocacy for and education about the project. All visiting schools and groups are given the opportunity to learn more about the RNRP through powerpoint presentations or guided walks. Most of these educational activities are provided as part of the school camp programmes at the Rotoiti Lodge Outdoor Education Centre.

4.1.2 Friends of Rotoiti (FOR)

FOR celebrated 10 years of partnership with DOC in December 2011. Established in 2001, FOR was formed to support and enhance the work done in the RNRP.

The group has c. 50 active volunteers who maintain pest control trapping for mustelids, rodents, possums and wasps. The area that they control pests on has expanded over the years to now encompass c. 5000 ha where mustelid and possum trapping is carried out adjacent to the RNRP and 300 ha where rodent trapping is done around St Arnaud village. Over the years, these volunteers have also been involved in species monitoring and re-introductions.

All active volunteers in this group are expected to stay up-to-date with the groups' activities and to attend at least two training meetings a year, to ensure they remain trained in best practice techniques. The group contributed 279 workday equivalents (1 workday = 6 hours) during 2011–12.

FOR Supporters Group

2011–12 was the third year of operation of the Friends of Rotoiti Supporters Group who provide donations towards FOR and RNRP conservation work. Supporter funds received to June 2012 were $2731, compared with $3330 for the same period in 2010–11.

The options for supporters in 2011–12 were:

- $20 membership (29 memberships = $580)
- $55 Feed 'Fen' the kiwi dog ($55 received from 1 member)
- $75 Eggs for stoat trapping ($150 received from 2 members)
- $100 Kea nest protection ($600 received from 6 members)
- $200 Meat baits for stoat trapping (nil received)
- $400 Great spotted kiwi transmitter (nil received)
- General donation ($1346 received)

FOR wasp control

To assist local people with controlling wasp nests around St Arnaud village during summer, a small number of the group operate 'Wasp Busters'. The volunteers use the contact insecticide *permex*. Wasp control is also carried out in January/February along the Whisky Falls mustelid trapping line along the western shore of Lake Rotoiti.

FOR rat control

The FOR rat control programme has been operating since 2001 and covers 300 ha adjacent to St Arnaud village (Brunner Peninsula, Black Hill and Black Valley stream areas). Victor Professional rat traps are positioned inside coreflute tunnels and are baited with a combination of peanut butter and rolled oats. Two-weekly checks were carried out throughout the year.

Table 4. Friends of Rotoiti rat trapping results for the past 5 years.

YEAR	RODENT CAPTURES	
	RATS	MICE
2007/08	112	422
2008/09	113	446
2009/10	116	4343
2010/11	148	523
2011/12	144	531

The 'by-catch' this year was one weasel, one slug and four birds (two sparrows, one chaffinch and one unidentified (not a robin). In 2009–10, mouse numbers were very high, so the additional 41 traps on the Peninsula Nature Walk have remained set for the whole year, just in case that happened again. Table 4 shows Friends of Rotoiti rat trapping results for the past 5 years.

FOR lizard monitoring

Lizard monitoring was put on hold again over summer in 2011–12 to allow a student to use the pitfall traps to complete research into the effect of introduced mammalian predators on indigenous skink populations.

4.1.3 Volunteers

During 2011–12 a structured RNRP volunteer programme was launched via DOC's website. Fourteen volunteers were welcomed and experienced a wide range of field work within the mainland island under the supervision of RNRP staff. These volunteers comprised six New Zealanders and eight international visitors, whose length of stay here varied from a few days to a few weeks. The project also benefitted from a Pacific Discovery group of 12 international volunteers. In combination, these RNRP volunteers worked the equivalent of 190 days.

4.1.4 Advocacy and education

RNRP guided walks, PowerPoint and other presentations

The most popular option during 2011–12 was again guided walks (Table 5), with most of these provided to students staying at the Rotoiti Lodge Outdoor Education Centre as part of their school camp. The majority of these visiting schools are from the Nelson/Marlborough area, with a small number from Wellington. Some students were completing National Certificate Education Achievement (NCEA) unit standards for their Year 12 and 13 studies.

Table 5. RNRP PowerPoint presentations and walks for the past 3 years.

YEAR	ROTOITI LODGE		OTHER GROUPS		RNRP WALKS	NO. OF PARTICIPANTS
	POWER POINTS	NO. OF PARTICIPANTS	POWER POINTS	NO. OF PARTICIPANTS		
2009/10	24	760	8	240	64	814
2010/11	20	770	6	143	45	680
2011/12	14	667	10	296	39	566

Most walks are based around the Bellbird and/or Honeydew Walks, and a PowerPoint presentation is used for evenings or as an inclement weather option. When requested, staff have also provided RNRP talks at other venues within St Arnaud village, Nelson and Blenheim.

Revive Rotoiti

Two publications of the six-monthly newsletter *Revive Rotoiti* were published: Spring 2011 (Issue 25) and Autumn 2012 (Issue 26). These newsletters are available online on the DOC website. Printed copies are mailed out to our main stakeholders, and copies are also available at the Nelson Lakes Visitor Centre and Nelson Regional Visitor Centre.

Other advocacy work

The Department of Conservation's website continues to be a central information source for the RNRP, with several pages providing background information and links to the project's annual reports, strategic plan and newsletters.

Updates and stories were published in the Lake Rotoiti and Murchison Community newsletters. A DOC tent and interpretive displays were again presented at the Murchison A&P Show (February 2012), Antique and Classic Boat Show (March 2012) and Power Boat Show (March 2012).

Updates were given at Rotoiti District Community Council meetings and Nelson Community forums.

Visitor services

The back-lit interpretive displays, featuring the RNRP, continue to be a focus for visitors to the Nelson Lakes Visitor Centre. Visitor Centre staff are also kept up-to-date with RNRP events, so that they are able to answer queries from the general public.

The interpretive displays along the Bellbird and Honeydew Walks provide more information about beech forest ecology and pest control challenges, and broaden the experience for visitors.

5. Discussion

The RNRP was established for three reasons: biodiversity restoration, research and knowledge transfer of biodiversity protection methods, and advocating the value of ecological restoration to the public. It is apparent that the greater RNRP team, which includes the FOR and volunteers, have achieved all three during 2011–12.

On the biodiversity front, 2011–12 has been a successful year, with more wild-hatched kiwi chicks and better monitoring of nests. Kākā call counts have increased, consistent with the population trend and successful breeding. Robins have continued to have good nesting success, although their population density still remains low within the Mainland Island. So, biodiversity outcomes are improving, and it appears that the RNRP is making a positive difference.

There has certainly been a lot learnt this year. Two rat control operations were carried out, with the second being unsuccessful in the face of a much more palatable alternative food in the form of beech seed. Rat control operations are generally effective when there is little alternative food around, but an operation carried out when beech seed was falling was likely to be problematic. This proved to be the case, and the failure of this operation has been discussed with other rat researchers. It is clear that more work is required to define appropriate management responses to future rat irruptions.

Another 'failure' has been the ONE work with great spotted kiwi; although, like the rat control operations, more can sometimes be learnt from management actions that don't work than from those that do. In this case, establishing hand-reared great spotted kiwi chicks into the Mainland Island has had poor success, whereas transfers of adults and more experienced juveniles have been successful. The process has revealed some aspects of great spotted kiwi behaviour and this information will be passed on to other practitioners dealing with this species.

Three students have worked with the RNRP during 2012 on individual projects that have been useful for management of pest species and native species, while the long-term datasets that are collected every year are being used for ground-breaking research. The work of Dave Kelly et al. on seed-masting prediction arose partly from the beech seed monitoring that has been done by the RNRP for many years.

FOR have been working well with the RNRP and RNRP staff have a good rapport with them. Their continuing trapping work, along with bait trials, assistance with adjusting trap boxes for new trap types, and simply building new trap boxes, has made work a lot more efficient and RNRP staff members are very grateful for this assistance. The RNRP and FOR relationship has been a good model for DOC community project relations elsewhere and should be celebrated.

6. Recommendations

- Review and investigate control methodology for rodents during beech seed-fall (rat irruption) years. Continue with spring poison operations.
- Establish possum monitoring and control trapping in Big Bush, northern St Arnaud Range and at the lower Travers Valley tracks.
- Investigate transferring weka from Marlborough Sounds to Lake Rotoiti.
- Continue with intensive nest monitoring of great spotted kiwi nests using nest cameras.
- Continue with research on biological off-take by wasps.
- Trial fish-oil lures for wasp bait stations.
- Trial new trap types for stoats in association with FOR.
- Support trialling A24 traps at the Mainland Island.
- Investigate more intensive deer control in the Mainland Island.
- Plan a larger trial of 'Muscattract'.
- Establish raised trap sets for cats.
- Continue with kea nest protection grids where required.
- Continue with comparisons of tussock seed monitoring techniques.

7. Acknowledgements

The Rotoiti Nature Recovery Project relies on support from fieldworkers, volunteers, technical staff and experts.

We wish to particularly thank the temporary fieldworkers—Katrina Hale, Adam Ross and Jo Joice, and the volunteers—Bettina Gerns (Ger.), Gerald Freeman (NZ), Petah Low (Aus.), Hamish Sutton (NZ), Karima Englefield (UK), Rosalie Willacy (Aus.), Richard Cherepak (Can.), Lance Glasgow (USA), Laura Wollschlaeger (Ger.).

Other staff at Nelson Lakes Area Office also assisted the programme on occasions with shared logistics and costs.

Richard Toft of Entecol provided us with valuable advice and assistance relating to wasp control yet again.

Members of the Technical Advisory Group and external advisors provided advice at various times during the year (membership in Appendix 5).

Sandra Wotherspoon provided assistance with maps, Jenny Long proof-read the text and Lynette Clelland edited and produced the final report.

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Appendix 1

RNRP datasets

Datasets referred to in the report, and others that were maintained during the 2011–12 year are listed below:

Introduced species

DATASET DESCRIPTION	DOC FILE NAME AND LOCATION	CONTACT PERSON
Wasp bait stations	docdm-612441/	Nik Joice
Possum captures	docdm-516760/	Dan Chisnall
Possum monitoring results	docdm-458218/	Dan Chisnall
Rodent tracking tunnel results	docdm-621366/	Nik Joice
Mustelid captures	RNRP stoat database 09/10 docdm-788735	John Henderson
Mustelid tracking tunnel results	docdm-621366/	John Henderson
Ungulate sightings	docdm-148952/	Grant Harper

Native species

DATASET DESCRIPTION	DOC FILE NAME AND LOCATION	CONTACT PERSON
20 × 20 m vegetation plots	Vegetation Plot Ring binder in RNRP office	Nik Joice
Beech seed fall monitoring	docdm-60998/	Nik Joice
Mistletoe monitoring results	docdm-72306/	Sarah Forder
Pittosporum patulum monitoring results	docdm-199798/	Nik Joice
Powelliphanta monitoring results	docdm-546239/	Nik Joice
Great spotted kiwi monitoring	docdm-156428/	Sarah Forder
Robin (*Petroica australis*) monitoring	docdm-459805/	Grant Harper
Kākā (*Nestor meridionalis*) monitoring	docdm-171970/	Nik Joice
5-minute bird counts	5 minute bird count data docdm-769826	John Henderson

Appendix 2

RNRP reports generated

Nil.

Appendix 3

Project reviews

Nil.

Appendix 4

Research reports received

Long, J. 2011: An assessment of cleared-plot faecal pellet counts as an abundance estimation method for European hares (*Lepus europaeus*) in the alpine zone of Nelson Lakes National Park. Post-graduate Diploma in Wildlife Management thesis, University of Otago (unpublished).

Appendix 5

Project management

Budget

Staff (Salary & wages):	$199,711	[excluding volunteer hours]
Operating:	$31,946	
Total	**$231,657**	

Staffing

Grant Harper, Nik Joice, John Henderson, Sarah Forder, Jenny Long, Jo Joice, Katrina Hale, Dave Rees, Adam Ross, Ruth Garland, Rosie Willacy, Dan Chisnall, Akira Doura.

Technical Advisory Group (TAG)

Kerry Brown, Peter Gaze, Craig Gillies, Grant Harper, Mike Hawes, Martin Heine, Dave Rees, Alison Rothschild.

RNRP Advisors

Mick Clout, Graeme Elliott, Dave Kelly.