Rotoiti Nature Recovery Project Annual Report 2012/13

Nelson Lakes Mainland Island, Nelson Lakes National Park

G. Harper, J. Henderson, J. Long, N. Joice, J. Waite, P. Carter, D. Chisnall, S. Wotherspoon and D. Rees

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Te Papa Atawhai

Cover: Scarlet mistletoe, *Peraxilla colensoi*. *Photo: Gareth Rapley*

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

Initiation of the A24 self-resetting trap trial across the entire Mainland Island did not affect mustelid tracking rates, which remained below 4% during 2012/13. By contrast, mustelid tracking rates at the non-treatment site at Lake Rotoroa reached 49%.

Possum control continued in the southern part of the Mainland Island and possum reinvasion from the Travers Valley remained high. No possums were detected in the Core Area during monitoring, but low to moderate numbers were counted at Big Bush. Consequently, possum trap lines were established at Big Bush to protect kākā. Despite there being less cat control this season, more cats were trapped than in 2011/12, probably due to a crash in rabbit numbers during the summer.

The kākā encounter rate was 49% lower than in the 2011/12 season, possibly due to a complete absence of beech seeding this year. Kea nest protection was carried out at two sites; chicks successfully fledged from one of these nests but there was no breeding at the other.

Almost 100 mistletoe plants belonging to three species were surveyed for foliar browse, and there was an overall improvement in cover and health for most individuals. Seventy-eight *Pittosporum patulum* plants were also monitored, for which an overall decline in health was detected, likely due to deer browse. Monitoring of *Powelliphanta* "Nelson Lakes" 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 2012/13, with at least one chick successfully fledging.

Learning objectives

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

A rodent control operation was undertaken in spring using a single application of Ratabate™. However, although there was a high bait take (52% by weight), this operation only reduced rat tracking from 47% to 24%. South Island robin nesting success was used as an outcome measure for rat control. Nesting success was 75%, with chicks fledging from three nests. Robin monitoring recorded a small increase in robin density in the survey area.

Test the effectiveness of wasp control tools

In addition to trialling different bait station configurations, the Rotoiti Nature Recovery Project (RNRP) investigated whether there were more effective measures of wasp foraging. It was found that single bait stations placed at 50-m intervals had more success at reducing wasp numbers than paired bait stations at 100-m intervals. Significantly less poison was used this year with no detectable reduction in control effectiveness. Monitoring of honeydew droplets showed a 435% increase within a few days of the control operation and an 832% increase 2 months later.

Test the effectiveness of different translocation methods

Two great spotted kiwi chicks were released during 2012/13. One of these has established while the other has not been located due to transmitter failure.

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.

No beech seedfall was recorded in 2012/13, and little or no flowering was recorded for the alpine tussocks *Chionochloa pallens* and *C. australis*.

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

No new organisms were reported, although a pair of whio was repeatedly seen at Blue Lake.

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

Research on home range size and habitat use by great spotted kiwi was completed by Peter Jahn (Edinburgh Napier University) in October 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 2011/12 annual report was published in early 2013 (Harper et al. 2013). A paper describing a predictive model for mast seeding was also published, which used the RNRP dataset among others (Kelly et al. 2013). Staff participated and gave talks at a national 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 per year and highlights the work being done in the Mainland Island.
- 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 work and a noticeboard is being developed to showcase recent events. Visitor Centre staff also assist with RNRP advocacy.

Partnerships

- Friends of Rotoiti (FOR)—A memorandum of understanding (MOU) was signed with FOR to formalise their continuing pest control work and the support that they give to the RNRP goals.
- RNRP volunteers—Individual volunteers and groups such as Nelson Marlborough Institute of Technology (NMIT) Trainee Rangers work with the RNRP staff throughout the year.

1. Introduction

The Rotoiti Nature Recovery Project (RNRP) is a 'mainland island' project that was established in 1996 to enable the recovery of a representative portion of an alpine honeydew beech 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. Comprehensive pest control began in 1997. The project was established with treatment and non-treatment sites, so that responses to management techniques at Lake Rotoiti could be compared with the 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 since the beginning of the project. Staff from the Department of Conservation's (DOC's) former Science and Research Unit (now the Science and Technical Units of the Science and Capability Group) put considerable effort into radio-tracking kākā and monitoring nesting success in response to mustelid (stoat *Mustela erminea*, ferret *M. furo* and weasel *M. nivalis*) control. Kākā nesting success improved considerably and adult female mortality declined as a result of predator control when treatment sites were compared with non-treatment sites (Moorhouse et al. 2003).

In 2001/02, the extent of mustelid trapping was increased considerably, so that over 5000 ha on the western St Arnaud Range and southern Big Bush is now 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 (GSK; *Apteryx haastii*) began in 2004 with the introduction of adult individuals from Gouland Downs in Kahurangi National Park. Additional introductions since then have ensured the successful establishment of a population. Some limited breeding has taken place over the past 9 years, and nine wild-raised kiwi chicks are known to have fledged, despite their known vulnerability to mustelid predation. The Operation Nest Egg™ (ONE) operation is currently being wound down, with the final four eggs having been removed from adults on the Gouland Downs in late 2011. One chick from these eggs was released into the Mainland Island in 2012/13.

Kea (*Nestor notabilis*) nest protection was initiated in spring 2011 at three nest sites, in conjunction with the Kea Conservation Trust. Thus far, progress has been slow, with only one successful nest in each of the past two seasons. However, possum (*Trichosurus vulpecula*) control has been particularly effective and so more nests are likely to be protected in the future.

Weka (*Gallirallus australis*) monitoring has continued, although transmitters have been removed from all birds.

The RNRP has been a leader in the large-scale control of introduced wasps (*Vespula* spp.). Under an experimental use arrangement, historically with Landcare Research—Manaaki Whenua and more recently with the Nelson-based company Entecol, the Mainland Island has been used as a trial site. Experiments have been undertaken with various toxins, but particularly X-tinguish™. The spacing and configuration of bait stations was again the focus of research in 2012/13, and once again an effective reduction of wasp activity was achieved using lower bait station densities than in previous years. In addition, a more efficacious monitoring technique for wasp foraging was developed.

Rodent (rat *Rattus* spp. and mouse *Mus musculus*) control has had a chequered history in the Core Area of the Mainland Island. Initially, brodifacoum and 1080 were effectively used to control rodents, particularly rats, between 1997 and 2000. However, after a DOC review of the use of brodifacoum, there was a switch to snap-trapping at a density of one trap/ha, which proved ineffective at controlling rat populations. The first rat control operation in over 4 years was carried out in the spring of 2010, over 600 ha of the Core Area of the Mainland Island using diphacinone in bait stations; and following an initial success, this operation was extended to almost 1000 ha. Over the past 3 years, this operation has had mixed success for environmental and operational reasons. However, the RNRP has developed a draft protocol for controlling rat populations that is dependent on the beech mast cycle and prior rat population indices. The continued use of five-minute bird counts and robin (*Petroica australis australis*) monitoring provides a response measure for rodent control that generally yields positive results.

The RNRP continues to trap feral cats (*Felis catus*) using cage traps. More cats were caught in 2012/13 than the previous year, despite a reduction in effort. Trials with Timms traps on raised sets were also begun. The trapping of possums using Sentinel™ kill traps has continued at a high level, targeting areas where fresh sign has been found, and this trapping has been extended into the northern part of the Mainland Island. Other pest species under management include ungulates, pigs (*Sus scrofa*) and hedgehogs (*Erinaceus europaeus*), for which a mixture of techniques are used.

The response of browse-sensitive plants to pest control is also being monitored. Three species of beech mistletoe (*Peraxilla colensoi*, *P. tetrapetala* and *Alepis flavida*) have responded positively to pest control since the last survey was carried out 5 years previously. However, the critically threatened understorey plant *Pittosporum patulum* is not responding to management, probably due to it being preferentially browsed by deer. Beech seedfall and *Chionochloa* tussock flowering are 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 multi-species pest control.

Invertebrate monitoring has included *Powelliphanta* "Nelson Lakes" 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, students also conduct research in the Mainland Island, which adds to our understanding of the functioning of the alpine beech forest ecosystem and improves the effectiveness of pest control. During winter 2012, Peter Jahn from Edinburgh Napier University radio-tracked GSK to analyse their home range and habitat use; some time and money from the RNRP budget was used to support this project.

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. Volunteers, including FOR, Nelson Marlborough Institute of Technology (NMIT) Trainee Rangers, Conservation Corp crews and the Over-50s tramping club, have undertaken hundreds of days of work in support of the project over the past 13 years. RNRP staff have also given time to other DOC and community initiatives, and have 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 the area being listed as one of the Top 25 Ecological Restoration Sites in Australasia.

Although day-to-day work on the Mainland Island progresses in response to annual or multi-annual ecosystem cycles, no operation of this scale can operate without a vision and objectives to provide guidance in the medium term. To this end, the Rotoiti Nature Recovery Project Strategic Plan for 2008–2013 (Brown & Gasson 2008) provided the planning framework and goals for the operation for a 4–5-year period and highlighted the three major themes running through the project, namely:

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

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

Additional information pertaining to this project, including datasets, publications produced and project management details can be found in Appendices 1–4.

2. Biodiversity restoration objectives

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

2.1.1 Introduction

The RNRP Strategic Plan 2008–2013 (Brown & Gasson 2008) identified six threatened species that would be actively maintained in the Nelson Lakes Mainland Island for their biodiversity values. These populations and their New Zealand Threat Classification System (Townsend et al, 2008) rankings are:

- South Island kākā *Nestor meridionalis meridionalis*, Category 2, Nationally Endangered
- Three species of beech mistletoe—*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 also contains some additional threatened species that may benefit from pest control. However, the above populations were specifically identified in the Strategic Plan 2008–2013 because a considerable amount of work had already been invested in monitoring and managing them through the preceding decade.

The kākā is an endemic forest parrot that is threatened by predation. Stoats are the main predators of kākā, but all three species of 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 so 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. A 2-year trial of A24 self-resetting traps was begun in 2012. cat control, although localised to date, may protect fledging kākā chicks, which spend up to 3 days on the ground between emerging from their nest holes and flying. Therefore, a more intensive cat control project is now in place. Other native bird species are also likely to benefit from predator control, particularly GSK and New Zealand falcons (*Falco novaeseelandiae*), which nest on the ground.

The three species of beech mistletoe, *Pittosporum patulum* and the 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 mainly through a sustained trapping programme. 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, *Pittosporum patulum* and *Powelliphanta* "Nelson Lakes" populations may also be threatened by red deer (*Cervus elaphus scoticus*). Detrimental browsing of juvenile *Pittosporum patulum* plants has been attributed to red deer, and red deer may deleteriously impact *Powelliphanta* habitat through concentrated browsing and trampling in the mountain beech (*Fuscospora cliffortioides*)/tussock ecotone that is favoured by both animals. Deer control is not currently 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 Deerstalker branch members in a volunteer capacity. Hunters are allocated one of four blocks within the area and all animals shot are recorded.

Hares (*Lepus europaeus*) represent another probable problem species for high montane and alpine species, as they also degrade habitat.

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

RNRP mustelid control

Methods

The RNRP mustelid trap lines cover approximately 5000 ha to the east and north of Lake Rotoiti. The aim of this trapping is to suppress mustelids to a tracking rate below 5%, enabling kākā and other native birds to breed successfully. The FOR community group also maintains several trap lines in areas outside the Mainland Island, which act as a buffer (see *Friends of Rotoiti mustelid control*, below).

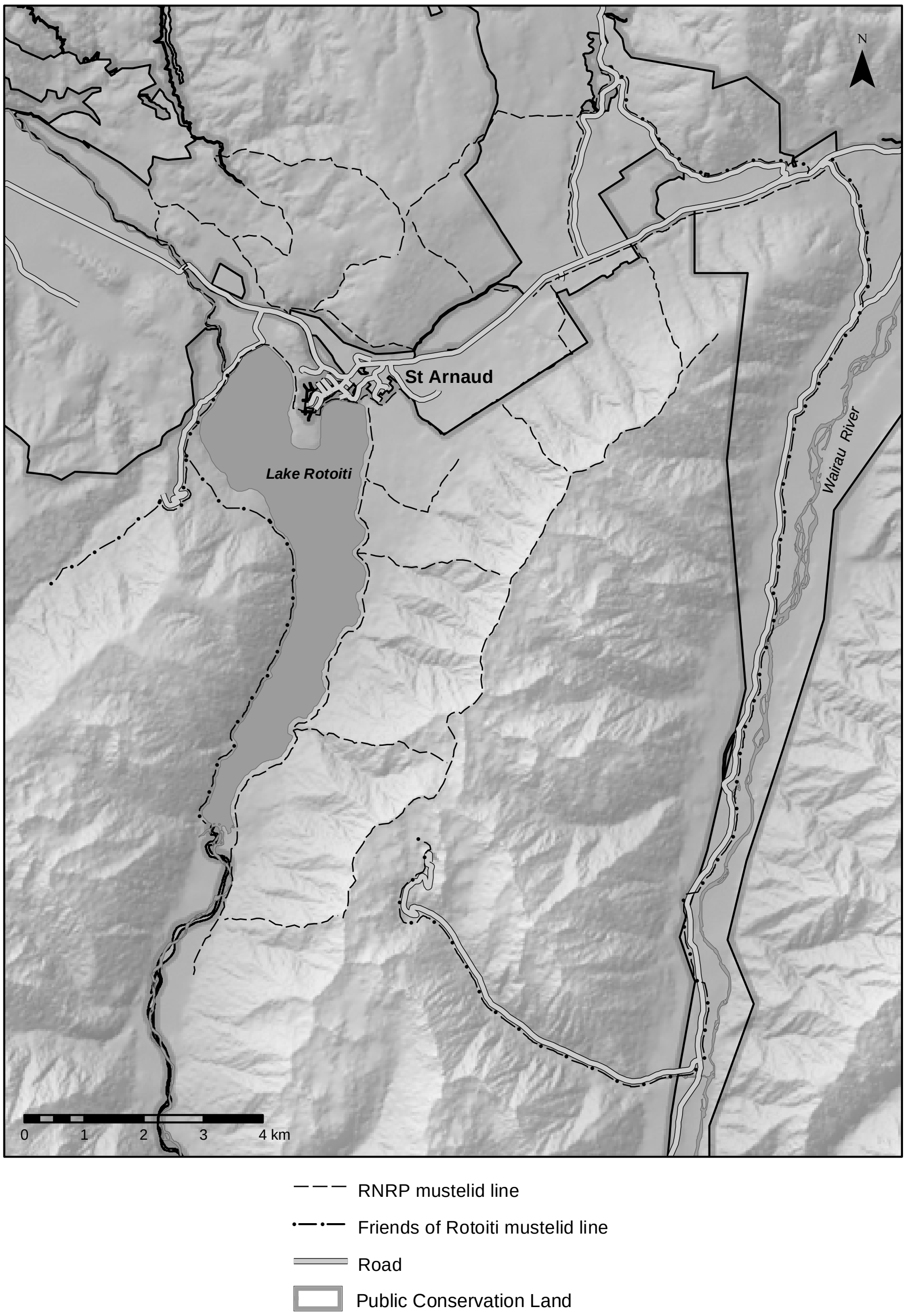

Figure 1. Location of the RNRP and FOR trap lines in 2012/13.

Since the Mainland Island has been designated a trial site for testing emerging predator control techniques, it was one of four mainland islands that were selected to be involved in a large-scale 2-year trial of self-resetting traps. The traps that are being tested at this site are Goodnature Ltd's A24 traps. These traps are designed to fire a 'kill rod' by means of a cylinder of compressed carbon dioxide, and then reset themselves 24 times before needing to be serviced.

In 2012/13, the self-resetting traps were established along the existing 24 trap lines, replacing the DOC 200s (Fig. 1). Thus, there are a total of 907 traps spaced 100 m apart along each trap line, 815 of which are now A24s. The remaining 92 traps are DOC 250s, which are able to target the larger ferrets, which A24s are not designed to kill.

To prevent the accidental bycatch of weka and other native birds, the A24s have been retrofitted to the DOC 200 trap boxes, which meet best practice standards for areas where ground-nesting birds are present. Holes were drilled into the trap box ceiling, and a wooden step and metal mesh were fitted to the interior, to block off the compartment that contained the deactivated DOC 200 and to enable access to the A24 from within the box.

The A24s were activated in September (below-bushline traps) and November (above-bushline traps) 2012. They were checked at 3-weekly intervals during summer/autumn, when stoat numbers are highest and juveniles are dispersing. Over winter, trap-check intervals were extended to 6 weeks, with higher-frequency checks scheduled to restart in August.

Initially, a rabbit-based lure from Goodnature Ltd was used in the A24s. However, there were concerns about the attractiveness of this bait to stoats. Therefore, the A24s have been baited with rabbit-based Connovations Erayz #8™ since November 2012, which was found to be an effective bait for mustelids in non-beech mast years by Steffens (2010). One piece of Erayz is placed in the A24 itself and another in the trap box. This second piece of bait is necessary because the A24s are designed to be mounted directly onto trees rather than fitted to trap boxes, as they are in the Mainland Island.

The DOC 250s are single set, and are baited with hen eggs year-round, with the addition of salted rabbit in January, April and June. They are enclosed in boxes similar to those of the DOC 200s. The DOC 250s are checked concurrently with the A24s.

Results

The A24s have successfully killed stoats, weasels, rats, mice and hedgehogs in the Mainland Island, with no evidence of bird bycatch. The number of animals that have been found killed by A24s (including those found between trap checks) is listed in Table 1; however, it should be noted that these numbers are not comparable to those of previous years as they are unlikely to accurately represent all the kills made by the traps (refer to the Discussion, below). Furthermore, this is the first year that captures by DOC 200s and DOC 250s have been separated out (Tables 2 & 3).

Concerns that killed animals would become stuck in trap boxes and block the entrance to the A24s have been allayed, with all but one either having fallen clear from the A24 entrance or been scavenged. There have also been multiple instances of more than one kill being found in a trap

Table 1. Captures by A24 self-resetting traps in the Mainland Island (September 2012 – June 2013).

SPECIES	SCIENTIFIC NAME	NUMBER FOUND
Stoat	*Mustela erminea*	41
Weasel	*Mustela nivalis*	4
Rat	*Rattus* spp.	151
Hedgehog	*Erinaceus europaeus*	14
Mouse	*Mus musculus*	265
Unknown*		62

* 'Unknown' refers to unidentifiable remains that are found in a trap box that has no previous record of a kill.

Table 2. Captures by DOC 200s in the Mainland Island (July–September 2012).

SPECIES	SCIENTIFIC NAME	NUMBER FOUND
Stoat	*Mustela erminea*	13
Weasel	*Mustela nivalis*	4
Rat	*Rattus* spp.	142
Hedgehog	*Erinaceus europaeus*	5
Rabbit	*Oryctolagus cuniculus*	1
Mouse	*Mus musculus*	2
South Island robin	*Petroica australis australis*	1

Table 3. Captures by DOC 250s in the Mainland Island (July 2012 – June 2013).

SPECIES	SCIENTIFIC NAME	NUMBER FOUND
Stoat	*Mustela erminea*	12
Cat	*Felis catus*	8
Rat	*Rattus* spp.	37
Hedgehog	*Erinaceus europaeus*	63
Rabbit	*Oryctolagus cuniculus*	40
Possum	*Trichosurus vulpecula*	2
Tūī	*Prosthemadera novaeseelandiae*	1
Blackbird	*Turdus merula*	1
Song thrush	*Turdus philomelos*	1

box at the same time; for example, a stoat and a mouse or two rats and a mouse. This shows that retrofitting the self-resetting traps to trap boxes does not prevent the main benefit of these traps from being realised, namely killing multiple pests between services.

To improve our understanding of the amount of scavenging occurring in the area, freshly killed animals that were observed in traps between trap checks were not removed, so that data could be gathered on what remained at the following trap check. The resulting information is summarised in Fig. 2.

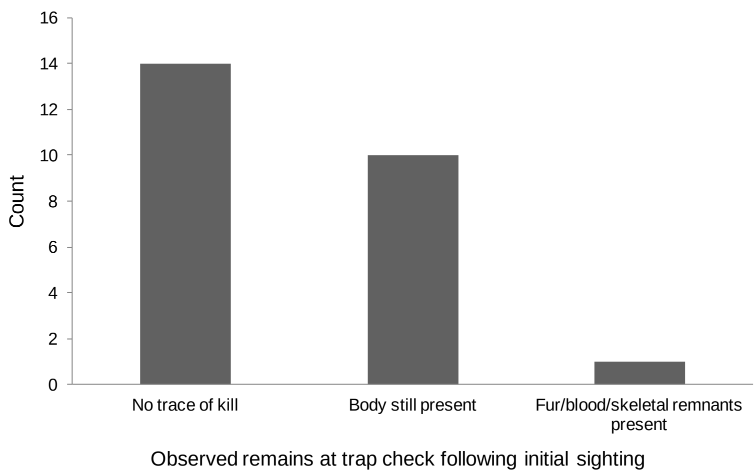

Figure 2. The fate of freshly killed animals in A24 self-resetting traps between trap checks (April–June 2013).

No ferrets were caught in any traps in 2012/13 and there were also no ferret sightings reported this year. By contrast, four ferrets were caught in 2011/12: two in DOC 200s and two in DOC 250s. Ferret catch numbers have historically been very low in this area.

The number of mustelids captured in traps and their distribution across the Mainland Island are shown in Figs 3–7.

Discussion

The deployment of the A24 traps has required a shift in the methods used to assess the performance of the trapping regime. Thus, rather than analysing catch numbers, independent indices of predator numbers (e.g. tracking tunnels) and other forms of outcome monitoring (e.g. robin breeding success) are now being monitored.

While finding dead animals under A24s is valuable confirmation that they are working as intended, there is ample anecdotal evidence that the figures shown in Table 1 are underestimates of the number of animals that are actually killed by the A24s. Bloodstains/fur were often found

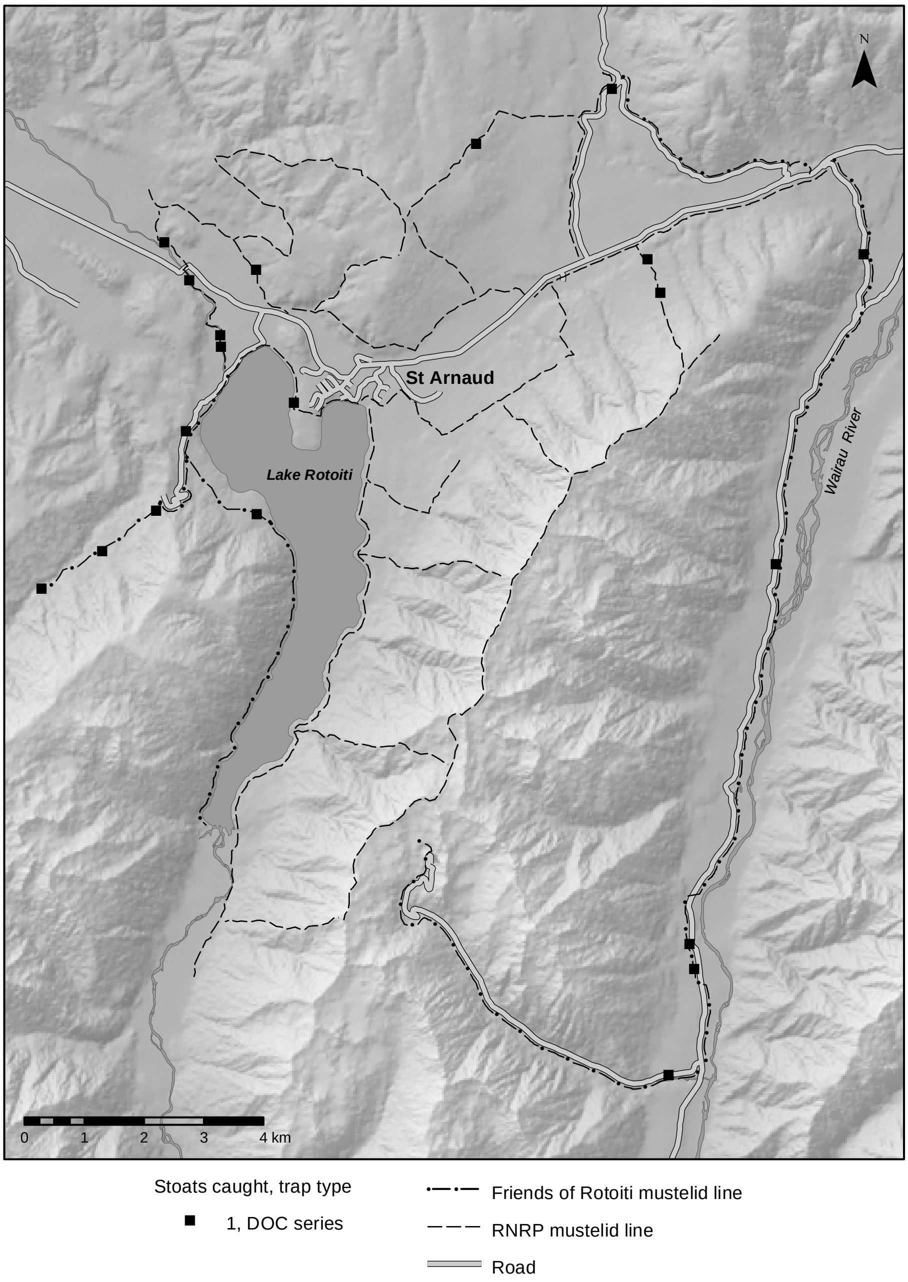

Figure 3. Map showing stoat captures along the RNRP and FOR trap lines during July–August 2012 and June 2013.

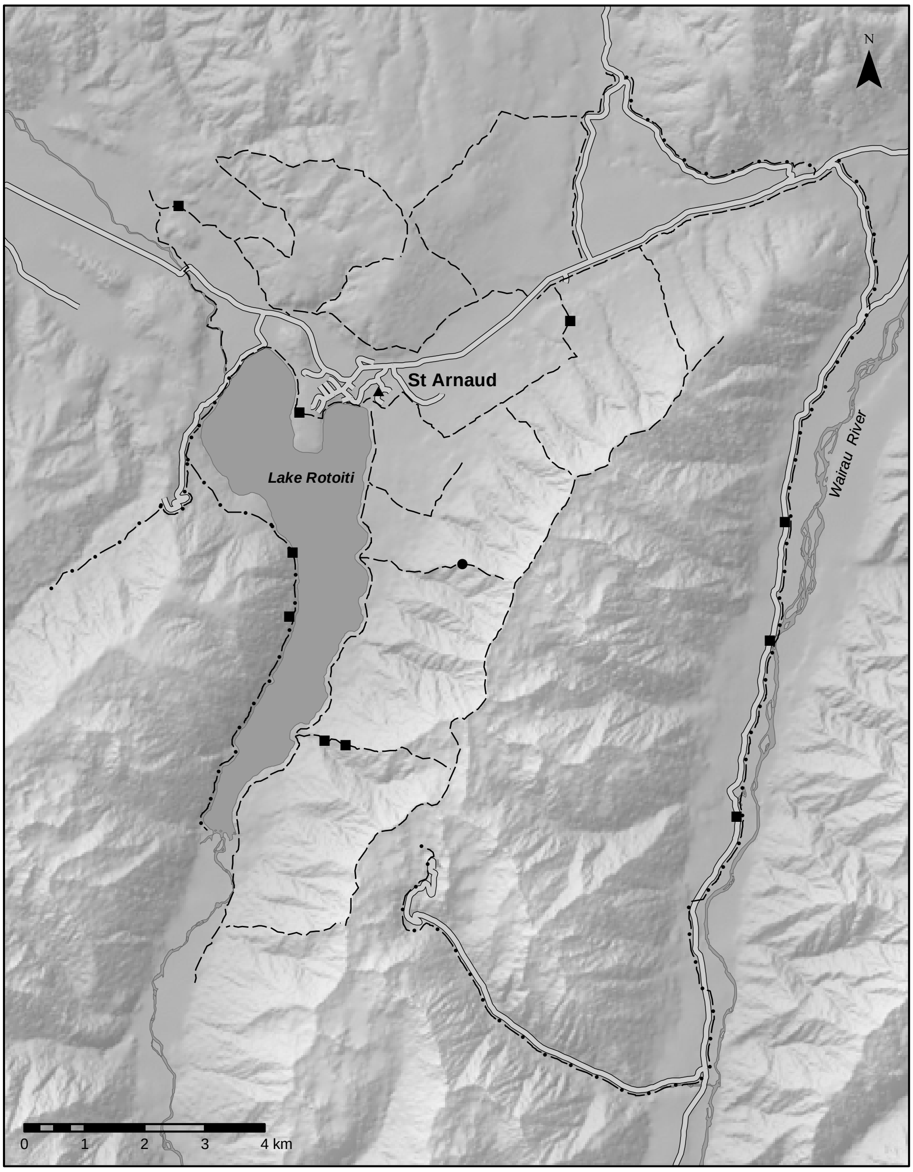

Figure 4. Map showing stoat captures along the RNRP and FOR trap lines during September–November 2012.

in previously clean boxes in which no body was present, and bodies/body parts were also found outside the trap boxes (up to 5 m away), with no trace of any remains within the box to indicate that a kill had been made. Furthermore, this is not limited to smaller species as, in addition to rats and mice, stoats have also been found outside trap boxes and/or half-scavenged. Empirical evidence suggests that over 50% of kills may be being scavenged (Fig. 2). Confidence in the accuracy of this estimate will increase over time as more data are collected and the sample size increases.

A large proportion of A24 stoat captures were found on higher-altitude trap lines, with very few captures on most of the lower-lying trap lines (Figs 3–6). No stoats were captured on the Peninsula Nature Walk trap line, which had the highest number of captures last season. It is possible that this pattern does not reflect a real difference in capture rate, but rather the fact that fewer scavengers are present at higher altitudes, meaning that carcasses are less likely to

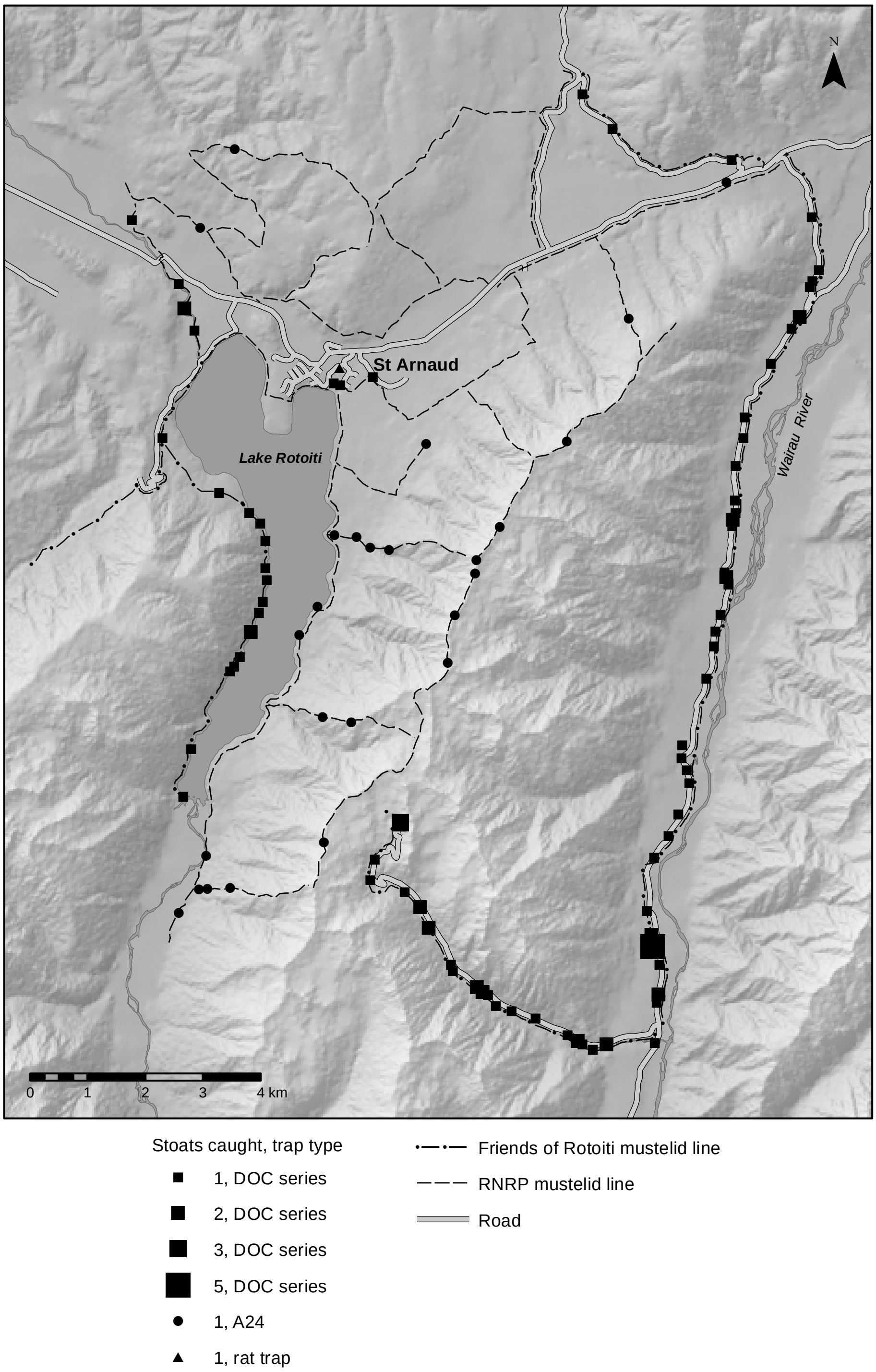

Figure 5. Map showing stoat captures along the RNRP and FOR trap lines during December 2012 – February 2013.

be scavenged and more likely to remain when the traps are checked. Unfortunately, however, the data necessary to calculate a difference in scavenging rate between trap lines has not been collected, because the higher-altitude trap lines are rarely walked between trap checks.

If mustelid tracking rates had reached 15%, the A24 trial may have been terminated. However, the March 2013 mustelid tracking rate was only 3% (see *RNRP mustelid population monitoring*, below). This result could be due to a lag effect from the many years of trapping in and adjacent to the Mainland Island though, so next season will provide a more convincing test of the ability of self-resetting A24s to control stoat numbers.

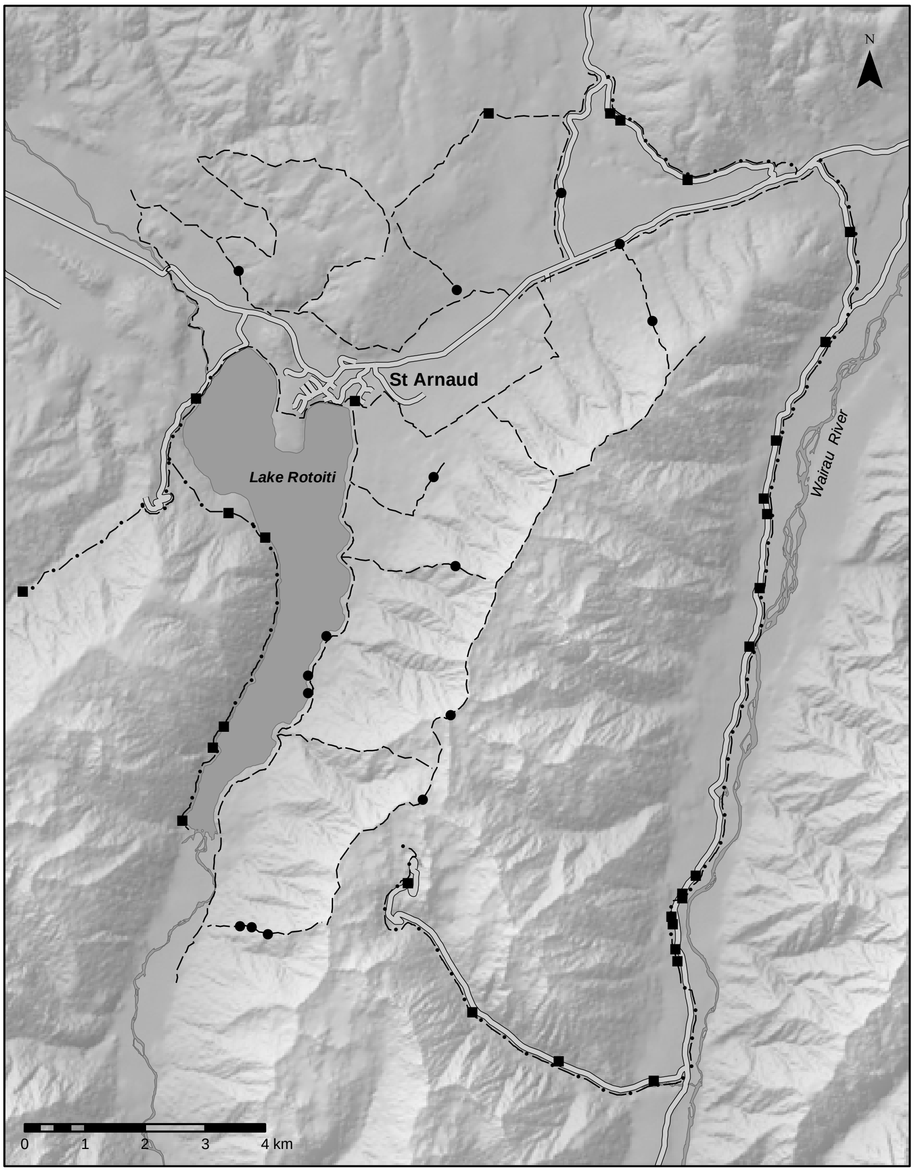

Figure 6. Map showing stoat captures along the RNRP and FOR trap lines during March–May 2013.

It should also be noted that there has not always been a full complement of functional traps deployed due to anticipated early problems with the nascent self-resetting trap technology. Issues of gas leaks from the earliest trap versions have been addressed through ongoing development of the trap design, and bait take by wasps/mice has been circumvented by installing a piece of mesh as a physical barrier. Faulty traps were returned to Goodnature Ltd for upgrading to the latest specifications and then rotated back into the field. Trap replacement was carefully prioritised to ensure that there were no large gaps containing no functional traps in the trap lines.

Further detail of the interim results of the national DOC trial of the stoat/rat A24 and possum A12 self-resetting traps up to May 2013 are available in Gillies et al. (2013).

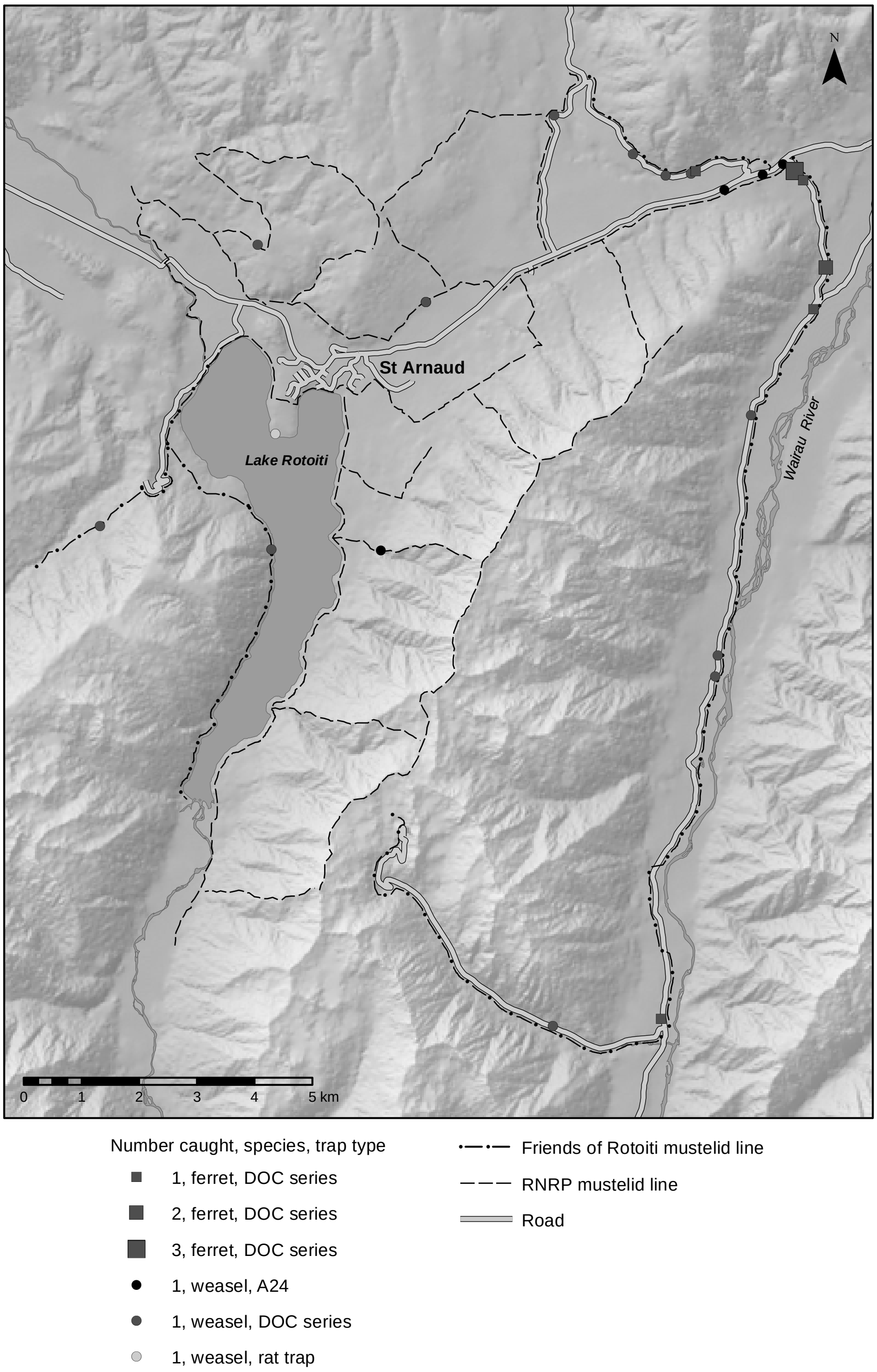

Figure 7. Map showing weasel and ferret captures along the RNRP and FOR trap lines during 2012/13.

Friends of Rotoiti mustelid control

Methods

Mustelid trap lines have been maintained by Friends of Rotoiti (FOR) as a buffer to the Mainland Island, with a total of 293 DOC 200 and 106 DOC 250 traps in operation:

- ***Rainbow Valley / Six Mile / Dip Flat Line***—55 DOC 200s and 106 DOC 250s:
  - These are set up as DOC 250s from 1 to 59, then alternate DOC 200s (odd numbers) and DOC 250s (even numbers) up to 153
  - Six Mile has four DOC 200s
  - Dip Flat was set up in October 2012 with four DOC 200s

- ***Seasonal Rainbow Ski Field Line***—70 DOC 200s.

  These traps were put out at the end of October 2012 and removed for the winter in May 2013 (this timing is always seasonally 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***—18 DOC 200s.
- ***Whisky Falls Line***—82 DOC 200s.
- ***Tophouse Road Line***—43 DOC 200s.
- ***Speargrass Line***—25 DOC 200s.

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. Polymer baits (from Trappers Cyanide Ltd) are used, and baits are changed every 8 weeks.

Results

Mustelid captures along FOR trap lines in 2012/13 are shown in Table 4. There were more captures of stoats, rats and mice this year, with stoat capture rates similar to those found in 2006/07. The number of stoat captures per trap per line is shown in Fig. 8. The increased rodent captures may be due to the use of polymer baits.

The following non-target species were also caught as bycatch in the FOR mustelid traps:

- Hedgehogs 56
- Possums 2
- Rats 385
- Rabbits 21
- Cats 3
- Mice 39

No birds were caught in the mustelid traps this year.

Table 4. Mustelid captures on the FOR mustelid trap lines in 2012/13.

MONTH	STOAT	WEASEL	FERRET
July 2012			
August 2012	3		1
September 2012	2		
October 2012	1		
November 2012	2		
December 2012	40	2	
January 2013	26	2	
February 2013	25	1	1
March 2013	8	1	4
April 2013	14	2	1
May 2013	6	1	2
June 2013	7		
Total	134	9	9

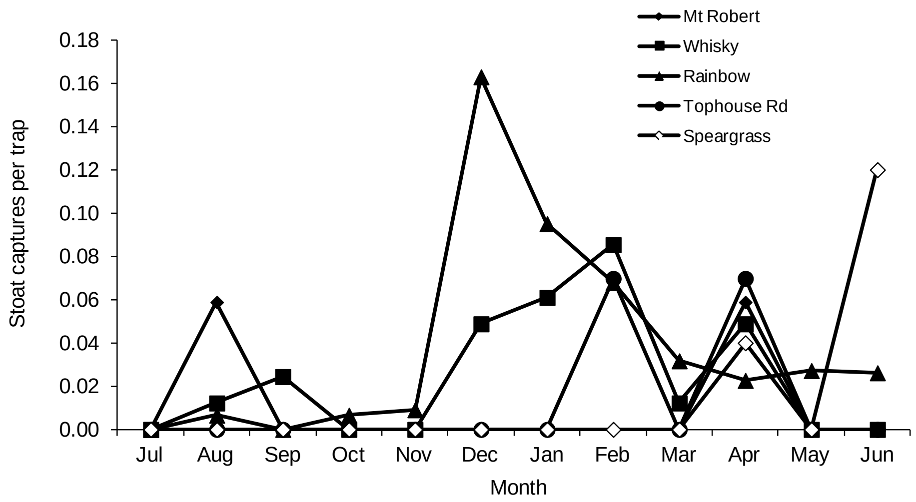

Figure 8. Stoat captures per trap per line on the FOR trap lines in 2012/13.

RNRP mustelid population monitoring

Introduction

Mustelid monitoring is used to compare mustelid tracking rates between the Lake Rotoiti treatment site (Mainland Island) and the Lake Rotoroa non-treatment site. The Lake 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, using the best practice method described by Gillies & Williams (2004). Tracking tunnels were set in August 2012 and monthly from November 2012 to February 2013. An extended period of tracking was carried out this season as extra information was required to inform the results of the A24 trial (see *RNRP mustelid control*, above).

Results

Mustelid tracking rates at the Lake Rotoiti (treatment) and Lake Rotoroa (non-treatment) sites are shown in Fig. 9. Mustelid tracking at the Lake Rotoiti site remained below the recommended 5% mean tracking rate per line, which has been shown to be of most benefit to kākā populations (Greene et al. 2004). By contrast, mean tracking rates reached a maximum of 49% at Lake Rotoroa.

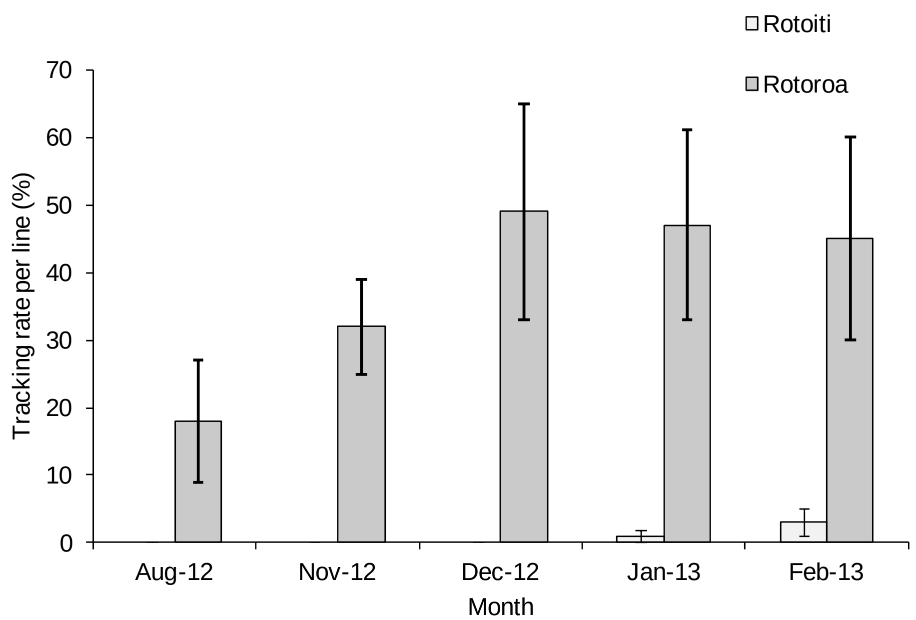

Figure 9. Mean (± SEM) mustelid tracking rates at Lake Rotoiti and Lake Rotoroa during 2012/13.

Discussion

Mustelid tracking remained below 5% in the Lake Rotoiti treatment site again this year, which contrasts with the high tracking rate at the non-treatment site at Lake Rotoroa. These results were despite the changeover to a trapping technique that has not previously been trialled at a 'landscape' scale (see *RNRP mustelid control*, above).

2.1.3 Feral cat control

Methods

In 2012/13, 19 Havahart™ cage traps were used to control feral cats in and around the Mainland Island. Cage trapping was undertaken from 2 April to 10 May in areas where cats had previously been trapped. Traps were baited with fish frames and were left open for a few days prior to setting to allow cats to get used to them. Cats were dispatched with a .22 rifle.

In addition to cage trapping, raised-set Timms traps were also deployed this season to give a continual, less-intensive trapping option. Although ground-set Timms traps have a proven record, their efficacy when raised is not well known. Timms traps were selected due to their ease of setting compared with Connibear traps and because of their built in covers. Twelve Timms traps were set on a 200-mm-wide board at an elevation of 1.2 m (to deter weka) in areas where cats had previously been cage trapped. The traps were baited with fresh rabbit meat and another piece of meat was placed on the support post as an additional lure. Traps were checked and re-baited twice weekly initially and then weekly thereafter.

The DOC 250s on the stoat trap lines also continued to catch juvenile cats. In addition to the normal hen's egg, the DOC 250 traps were baited with salted rabbit twice in autumn.

Results

In total, 25 feral cats were removed from the Mainland Island this season across all methods (Fig. 10), which is the same number as in 2011/12.

Twelve cats were caught using cage traps, which is an increase of four from last season. Cage traps were run for a total of 219 trap nights, with a catch rate of one cat per 18 trap nights.

Three cats were captured in the raised-set Timms traps at a catch rate of one cat per 296 trap nights.

Ten cats were captured in the DOC 250 traps, which is the same number as in 2011/12. The majority of these (70%) were caught with salted rabbit as bait. No cat captures were recorded in the A24 traps.

For the 14 captures where age and sex were recorded (all cage or Timms traps captures), there were eight females and six males; and six adults and eight juveniles. All cats were tabbies.

The cage and Timms traps also captured some non-target species. In the cage traps, bycatch consisted of three weka (which were subsequently released), two possums and one hedgehog; while the Timms traps also captured two stoats, two rats and one possum.

Discussion

In 2012/13, cage trapping effort was 81% of the 2011/12 season, and yet captures increased by 50%. This was most likely due to cages being set where captures had occurred in previous seasons, but we cannot discount the possibility that higher cat densities were present. Rabbit numbers were noticeably lower in autumn, probably due to a reestablishment of rabbit calicivirus disease (RCD) in the area following a spring and summer during which rabbit numbers were particularly high. Thus, it appears likely that cat numbers will have been high by summer 2012/13, making it difficult for them to find enough prey following the rabbit population crash.

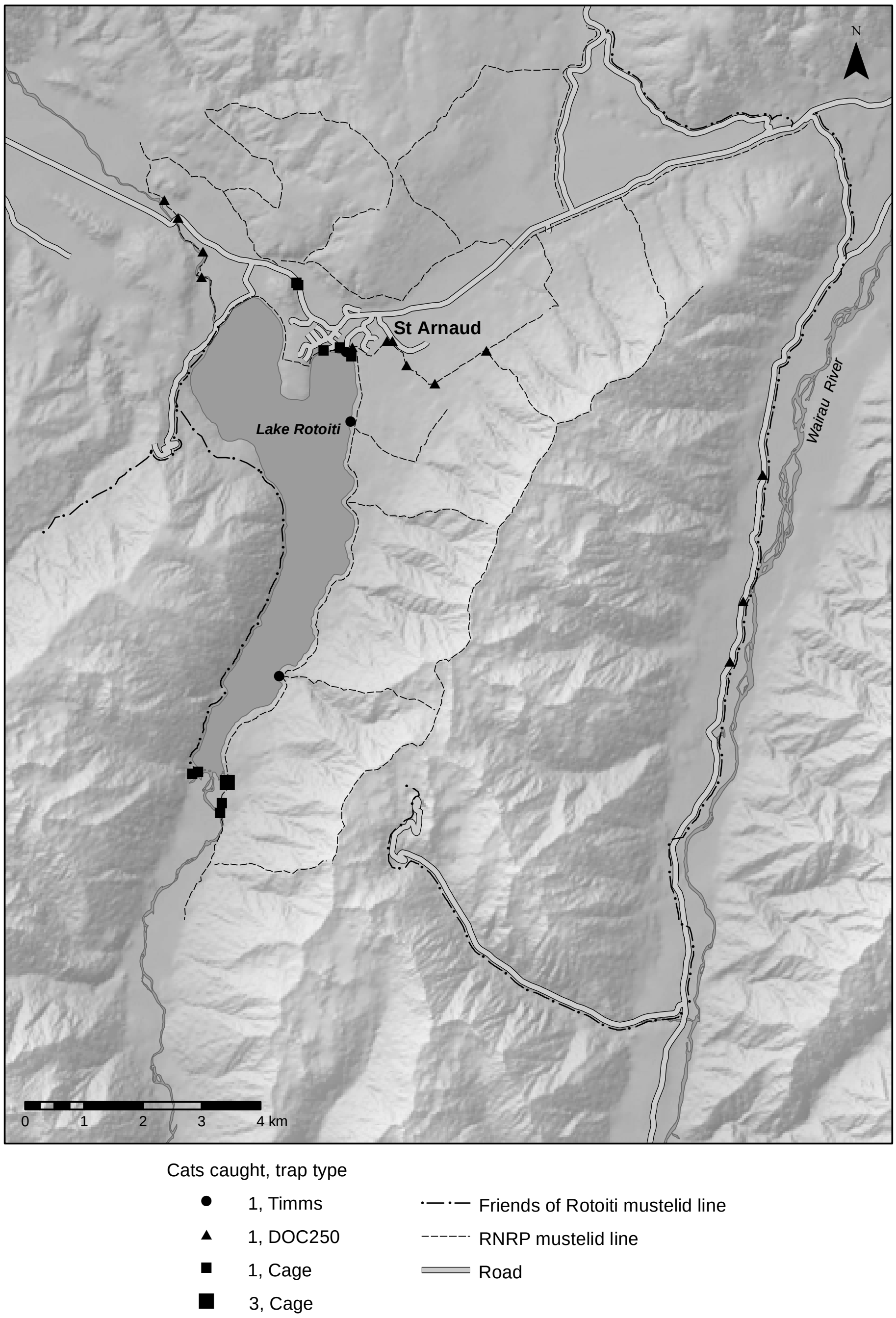

Figure 10. Map showing RNRP cat captures in 2012/13.

The Timms kill traps had disappointing capture rates given that the cage traps performed so well in the same areas and a lot of effort was put into maintaining fresh bait in the Timms traps. However, running the cage traps and Timms traps in conjunction may have reduced their success rate, as the neighbouring cage traps were easier to access. Indeed, all Timms trap captures occurred after the cage traps had been removed. Therefore, while captures were not high in Timms traps, the few hours required to service them (c. 2 hours per week) makes them worth persevering with for another season.

The use of transmitters on cage traps enabling remote checking of the cages was not trialled this season due to time and staffing constraints. However, they are still worth trialling in the future, as cage traps are still the most efficient non-lethal ground-set trap available.

The DOC 250 traps that were baited with salted rabbit for stoats also captured a few cats as bycatch. This is an issue as they do not meet National Animal Welfare Advisory Committee (NAWAC) guidelines for cat captures and there are thus concerns about their humaneness. In one instance, a cat that had been captured by the head and was still alive was found by a member of the public and had to be shot.

2.1.4 Possum control and monitoring

RNRP possum control and monitoring

Methods

Kill trapping was maintained on the Snail, Grunt, MOR, Clearwater and Lakehead mustelid trap lines. The FOR Lakehead trap line was extended south to the Travers swing bridge and then along the true left of the Travers River from the swing bridge down to Coldwater Hut in January 2013.

Possum kill traps were established at 200-m intervals along all existing mustelid trap lines in Big Bush in the northern Mainland Island in February. This served as both a surrogate possum population monitoring tool and a control tool, since there has been a reduced effort by the Animal Health Board (AHB) in this area in recent years.

All traps were Sentinel™ kill traps that were alternately baited with 'Smooth in a tube' possum lure and 'Possum Dough'. Traps were also blazed with flour and icing sugar as an additional lure.

Possum population monitoring in both the Core Area and Big Bush was undertaken in May/June using the National Possum Control Agencies (NPCA) WaxTag method.

Results

Possum captures in 2012/13 were the highest recorded since the RNRP was initiated, with 283 possums killed (Fig. 11), compared with 149 and 120 in 2010/11 and 2011/12, respectively. This higher number of captures is due to increased trapping effort and the fact that some areas had previously experienced very little possum control.

Possum population monitoring returned a nil Possum Activity Index (PAI) within the Core Area and a 15% PAI in Big Bush.

Discussion

As in previous years, trap lines situated in the southern Mainland Island caught the most possums, with traps located near Lakehead and Coldwater recording the highest numbers of captures (Fig. 11). This is due to the lack of possum control south of the RNRP area, meaning that there is likely to be a continuing high rate of reinvasion from the Travers Valley.

The RNRP had previously benefitted from adjacent AHB possum control operations in the northern Mainland Island, which suppressed possum numbers and reduced reinvasion into the northern Mainland Island. However, this effort has not occurred over the past few years as no tuberculosis (TB) has been detected in the possum population for some time. This had raised some concern, as it could result in an increase in the number of possums detected in the northern Mainland Island, including Big Bush. Therefore, since possums are known predators of nesting kākā, 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), possum control was implemented at 200-m intervals along all existing mustelid trap lines in the northern Mainland Island to serve as a surrogate possum population monitoring tool.

In the first few months of trapping, there were approximately 50 possum captures on the Big Bush trap lines. This suggested that a possum population assessment was required using the WaxTag method.

Since there was a 15% PAI in Big Bush, additional possum control will be required in the future to reduce the risk of possum predation on nesting kākā.

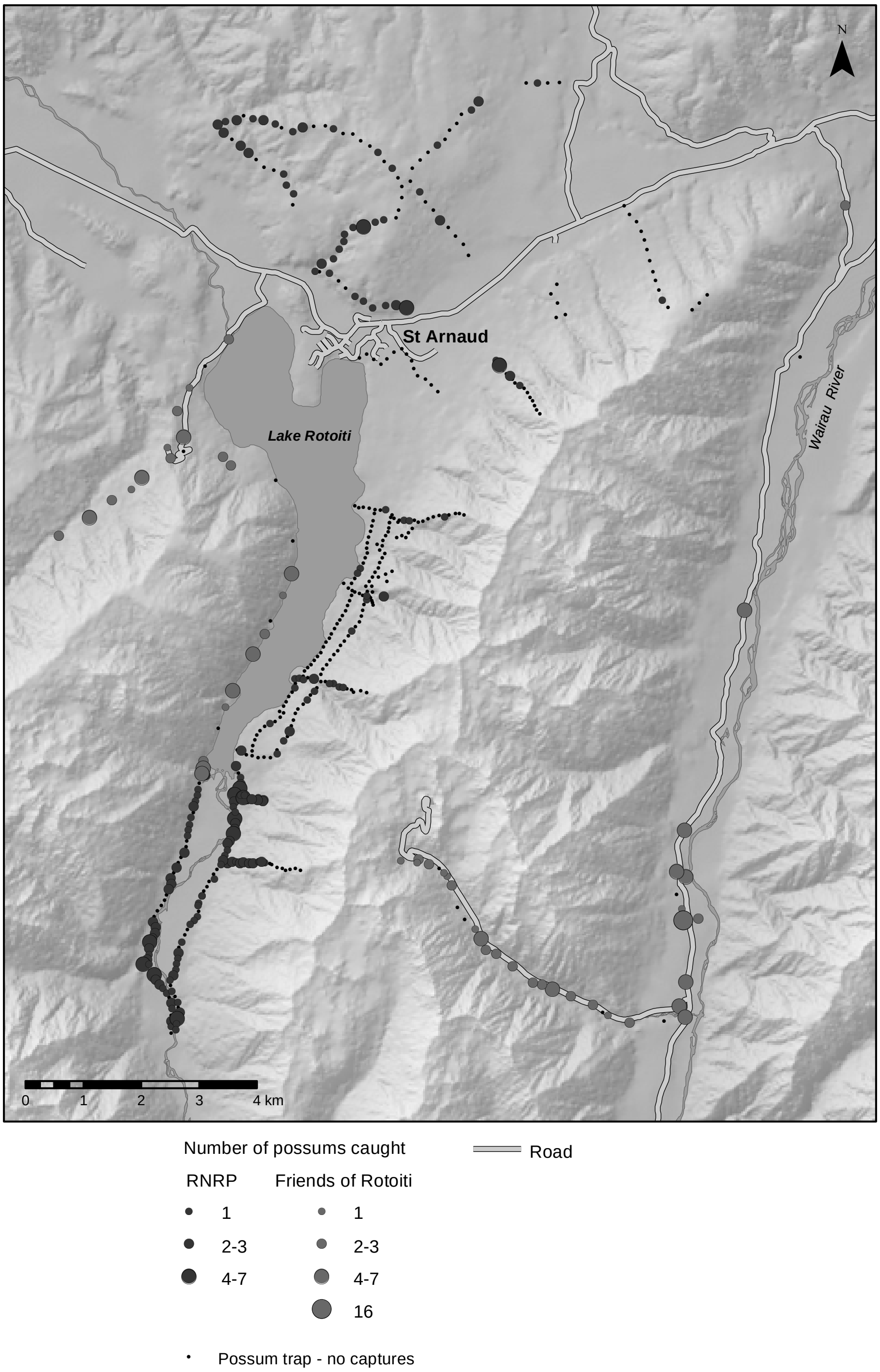

Figure 11. Map showing RNRP and FOR possum captures in 2012/13.

Friends of Rotoiti possum control

Introduction and methods

FOR first carried out possum control using Sentinel™ kill traps in 2005, to minimise possum interference with stoat traps. The number of traps across various lines has been increased over the years. In 2012/13, an additional 15 traps were put out along the Rainbow Valley and Dip Flat lines, and two traps were removed from the Mt Robert line, bringing the total to 63 Sentinel™ kill traps by the end of the year.

Ferafeed (Connovation Ltd), Possum Dough (Trappers Cyanide Ltd) and Possum Paste (Goodnature Ltd) were used as lures in the Sentinel™ kill traps in 2012/13.

Results

In 2012/13, 170 possums were caught, which is slightly more than in 2011/12 (161). This increase in captures is due to increased trapping effort with the additional 13 Sentinel™ kill traps. Trapping results are shown in Fig. 11. Of particular note was the capture of 16 possums in Sentinel™ RV135 on the Rainbow line, which is a record number for both FOR and RNRP.

2.1.5 Deer control and monitoring

Methods

RNRP staff report red deer sign and sightings on the St Arnaud Range whilst carrying out other project work. These sign and sightings are recorded in the Excel document 'Predator and Ungulate Sign'. Sign and sightings are only recorded for the St Arnaud Range, as this is where most vulnerable plant species in the Mainland Island occur.

A system has been established to allow principally NZ Deerstalkers' Association local branch members access to the Mainland Island on a volunteer basis. This allows hunters to book access to hunting blocks within the Mainland Island. In mid-June 2013, a contract hunter, Dave Wilson, hunted the Mainland Island with his dog.

Results

One stag and one yearling were shot, and an additional three hinds and two stags were sighted within the Mainland Island during 2012/13.

There has been limited use of the hunting blocks since May 2010. No hunting has been allowed during spring due to rat poison operations. There were 22 recreational and 5 professional hunting days during 2012/13, during which one stag was shot. Wilson (2013) suggested that deer numbers in the Mainland Island were generally low and that deer were largely found in the high alpine beech forest, only occasionally venturing to lower altitudes near the lake shore.

Discussion

Although numbers of ungulates within the Mainland Island appear to be low or have a very patchy distribution, they are likely to have a negative effect on preferred species of native plants, such as *Pittosporum patulum*. Therefore, the number of browsers in the Mainland Island needs to be kept low to reduce the impact on rare plant species in particular.

2.1.6 Kākā monitoring

Methods

The kākā encounter survey was conducted from the beginning of October 2012 to the end of April 2013. This survey is carried out at the same time as stoat trap checks along the below-bushline sections of 19 trap lines that traverse suitable kākā habitat.

Trapping staff record the date, start and finish time, the number of kākā encountered, whether the birds were seen or heard, the closest trap box location and the time of each encounter.

Results

In 2012/13, 86 kākā were encountered over 399.9 hours, giving an encounter rate of 0.215 encounters per hour (Table 5 & Fig. 12).

The locations of kākā encounters are shown in Fig. 13. As in previous seasons, no kākā were encountered on the Angler's Walk trap line. In addition, no kākā were encountered along Borlase Boundary, Struth and Teetotal Road trap lines.

Discussion

Significantly fewer kākā were encountered in 2012/13 than in 2011/12, with this season's encounter rate being similar to those of the seasons prior to 2011/12 (Fig. 12). In 2011/12, a small amount of beech flowering and seeding was noted, which may have stimulated kākā to breed and

Table 5. Kākā encounter rates on the RNRP trap lines (October 2012 – April 2013).

TRAPLINE	HOURS SURVEYED	NUMBER OF KĀKĀ		ENCOUNTER RATE PER HOUR (SEEN AND HEARD)
		SEEN	HEARD	
Angler's Walk	9.3a	0	0	0.000
Borlase Boundary	30.3	0	0	0.000
Black Sheep Gully	25.9	3	11	0.541
Black Valley Stream	34.5	0	3	0.087
Cedar	16.7	3	11	0.838
Clearwater	17.4	1	1	0.115
Dogleg	21.9	2	4	0.274
Dome Ridge	32.3	0	2	0.062
Duckpond Stream	16.3	7	21	1.720
Grunt	14.6	0	3	0.205
German Village	12.7	0	2	0.157
Hubcap	18.7	1	0	0.053
Lake Edge	46.1	0	1	0.022
Lake Head	21.2	0	1	0.047
Middle of Road	18.6	0	2	0.108
Peninsula Nature Walk	20.1	0	1	0.050
Snail	14.3	1	5	0.420
Struth	10.2	0	0	0.000
Teetotal Road	18.8	0	0	0.000
Total	399.9	18	68	0.215

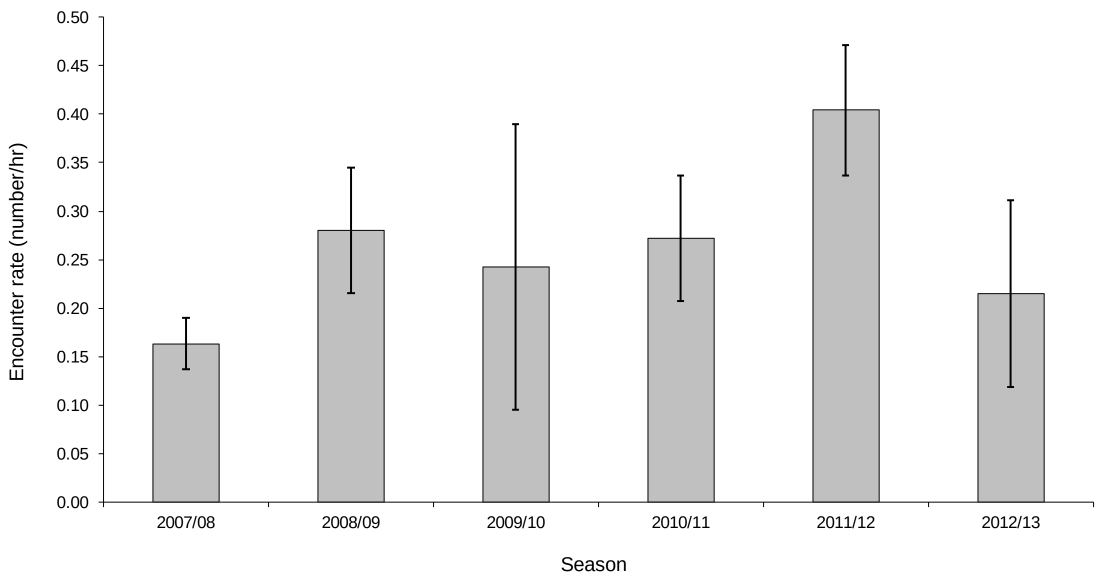

Figure 12. Mean (± SEM) kākā encounter rates (number of birds seen/heard per hour) in the Mainland Island from 2007/08 to 2012/13.

thus account for the increase in encounter rate due to increased activity by the birds. By contrast, no beech seedfall was recorded this year. However, it is also possible that rather than this variation in encounter rate being due to changes in the status of the kākā population between seasons, it is an artefact of various aspects of the survey methodology.

Firstly, the total survey time has differed greatly between seasons; for example, 227.6 hours of survey in 2011/12 compared with 486 hours in 2008/09. If the probability of encountering

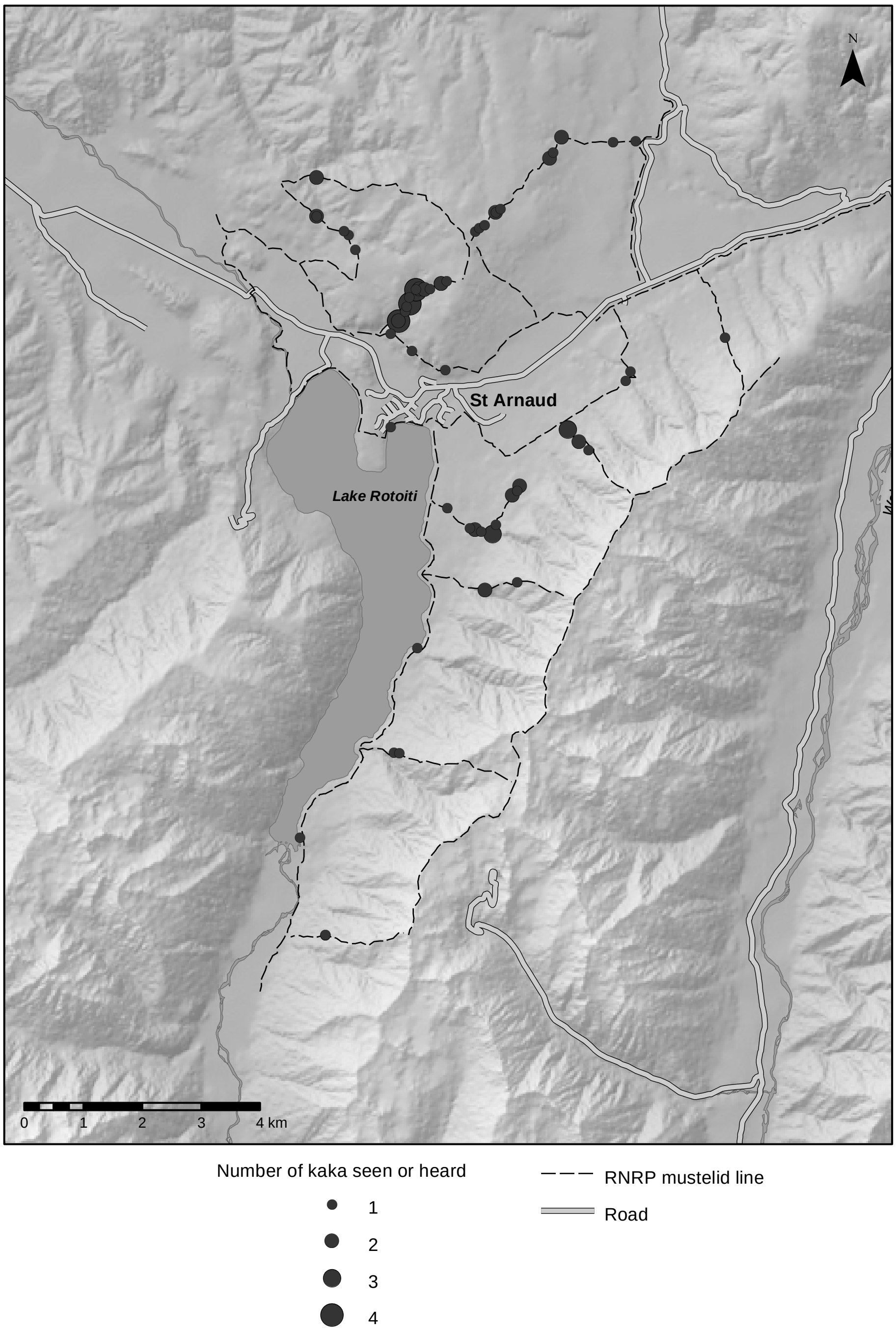

Figure 13. Locations of kākā encounters on the RNRP trap lines (October 2012 – April 2013).

kākā does not increase linearly with an increase in time spent on a given trap line, a negative correlation could be expected between the time spent monitoring and the final encounter rate, i.e. there would be lower encounter rates as more time is spent on each line. This does not appear to be the case, as the slight negative trend shown in Fig. 14 is not significant (Pearson's $r = -0.67$, $P = 0.14$) and the regression line would be horizontal if the highest encounter rate point was removed. However, if the current survey method continues to be used, this relationship should continue to be monitored, as it may become significant with more data.

An alternative methodology that would avoid this problem is to base the encounter rate measure on distance rather than time, since the length of each trap line is generally constant and any changes that have occurred between 2007 and 2013 are on record and so could be accounted for. However, two confounding variables would still remain: the number of times a given trap line is monitored each season and the level of kākā identification skills of the observer.

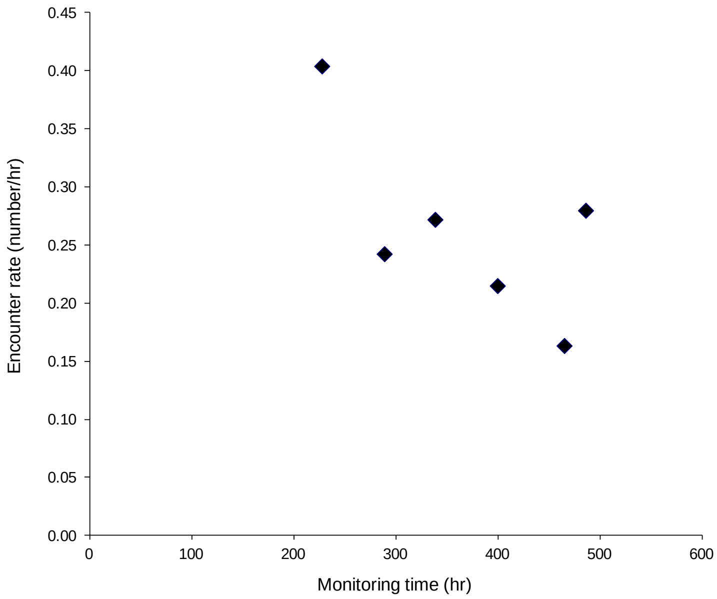

Figure 14. Kākā encounter rate (number of birds seen/heard per hour) vs. monitoring time (hours) in 2007/08 to 2012/13.

In recent seasons, volunteers have been used to a greater extent to carry out trap checks. These volunteers did not carry out the kākā survey unless staff were confident of their identification skills, which reduced the potential for an observer effect. However, this then led to greater discrepancy in the number of times that kākā surveys were carried out on different trap lines. For example, in 2009/10, a kākā survey was carried out only once on Struth line, with four kākā seen on that single occasion, whereas 11 surveys were carried out on Snail line but only one kākā was ever heard.

In summary, the total kākā survey effort has varied greatly between seasons, as has the proportion of effort within different habitat types, since trap lines traversing dissimilar habitat types were not surveyed in the same proportions each season. This means that the final encounter rate data cannot be used to reliably infer trends over time and so, as it stands, this measure of kākā population status is probably not particularly useful as a monitoring tool. Therefore, the effectiveness and feasibility of alternative monitoring methods, such as distance sampling, should be investigated. An assessment of how well the results of the current survey method correspond to actual kākā numbers could also be considered as a potential student research topic.

2.1.7 Kea nest protection

Introduction

Kea are present in low numbers in Nelson Lakes National Park and there is evidence of a continuing slow decline (Steffens & Gasson 2009). The Kea Conservation Trust has carried out kea surveys in the Lake Rotoiti / Raglan Range area in recent years and this work supports evidence of a decline (J. Kemp (D.O.C) pers. comm.). After monitoring 36 nests over 5 years, Kemp (1999) found little evidence of predation; however, information from this recent monitoring suggests that possums and stoats kill kea nestlings and incubating adults fairly often. There is also evidence that lead roofing nails and flashings on buildings in the alpine zone (e.g. huts and ski field buildings) have caused lead poisoning in kea.

In light of an apparently declining kea population in the Nelson Lakes Area and the fact that one of the principal agents of decline is likely to be predation at nests, the RNRP was asked to assist with nest protection in the area.

Methods

Kea nest protection was centred on known nests on the MOR ridge in the Mainland Island and on two additional nests near the Rainbow Skifield Road in Six Mile Creek. Protection involved the deployment of a rough grid of ten Sentinel™ kill traps and five A12 self-resetting traps for possums over 300 × 300 m (9 ha) between 1000 and 1300 m AMSL. DOC 200 traps for stoats were already established on the MOR ridge and up the Skifield Road.

Results

Nest protection from possums is run year-round on the MOR ridge, and from mid-August to December in Six Mile Creek as a part of normal RNRP operations. Only one nest (#5 on the north side of the Skifield Road) was active in 2012. Therefore, the possum control at site #8 on the south side was discontinued after 6 weeks, during which time four possums were trapped. Nine possums were removed from the #5 nest site over the first 2 months of trapping. Of these, six were females with young and three were males. The A12 traps killed at least three possums with few recorded problems.

Two kea chicks fledged from Nest 5. Activity was also recorded at the MOR nest site but no breeding occurred.

Discussion

The successful fledging of chicks from Nest 5 following possum control is encouraging and suggests that intensive possum trapping (c. 1 trap/ha) before nesting begins improves nesting success. However, this will only be confirmed with further trapping effort around kea nests in the future. Stoats are present in very low numbers in these areas until late spring, so appear to be less of a threat for early nesting attempts by kea. However, they should be controlled as usual over late spring and summer. 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 monitoring

Introduction

At the time of European exploration of the Rotoiti area, weka were very abundant. However, the population was devastated 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 are only limited data on habitat use, reproductive success and causes of mortality in weka in alpine beech forest.

To increase knowledge of the local population, a weka monitoring programme was initiated in 2010. Between 2010 and 2012, weka were caught and fitted with backpack radio transmitters, as well as metal and colour leg bands. Birds were located multiple times per week using telemetry equipment, which, along with additional sighting information from the public, allowed their home ranges to be mapped. Fledgling survival was also monitored at any nests found.

The intensive telemetry work resulted in home range estimates for five adult birds. However, since chicks are too small to be fitted with transmitters, it was not possible to monitor their dispersal beyond the limited information provided by sightings. The transmitters were removed from the adults once no further home range information was forthcoming.

Methods

The weka monitoring programme was run less intensively in 2012/13 and birds were no longer fitted with radio transmitters. However, sightings by RNRP staff and the public were recorded, and any unbanded birds were caught and banded with metal and coloured leg bands when possible.

Results

A known pair of weka in St Arnaud (M-B ♀ and M-Y ♂) successfully raised multiple clutches of chicks to juvenile age this season, of which five (one ♂, one ♀, three sex unknown pending DNA results) were caught and banded. One of the juveniles of unknown sex was later found dead on the road outside the DOC Visitor Centre, probably having been killed by a car.

There have been several sightings of an adult weka along the Black Valley Stream stoat trap line in the Big Bush conservation area to the north of Lake Rotoiti. As yet, no attempt has been made to catch this bird. However, if it continues to be regularly seen in the same area, an attempt could be made to catch it in the coming season.

Discussion

Due to limited staff time and resources, weka monitoring in the Mainland Island is minimal at present. Although public sightings from the wider area are recorded, only birds around the St Arnaud village are caught and banded, so information about survival, dispersal and characteristics of the wider population remains limited.

The setting up of regular call count monitoring following the national protocol is being considered, to provide a standardised index of changes in the local population over time. Call counts have not previously been carried out in alpine areas (T. Beauchamp (DOC), pers. comm.), so the use of this technique at sites within the subalpine/alpine zone would also provide an indication of its usefulness at higher altitudes for future studies.

2.1.9 Mistletoe monitoring

Introduction

New Zealand native mistletoes are particularly susceptible to browse by introduced herbivores. Therefore, mistletoe monitoring is used as an outcome monitoring tool to assess the effectiveness of possum control in the Core Area of the Mainland Island.

Methods

In April 2013, the health of three tagged mistletoe species (*Alepis flavida*, *Peraxilla colensoi* and *P. tetrapetala*) was assessed along the existing mistletoe survey lines in the Core Area. The Payton et al. (1999) standard Foliar Browse Index technique was used for this assessment, the results of which were compared with the last survey in 2008.

Results

A total of 98 mistletoe plants were surveyed for foliar browse in 2012/13 (32 *A. flavida*, 35 *P. colensoi* and 31 *P. tetrapetala*). Fifteen mistletoes have disappeared from the area since the 2008 survey (11 *A. flavida*, one *P. colensoi* and three *P. tetrapetala*), nine as a result of the death of the host tree or branch; the remaining six were no longer found on living hosts.

The level of possum browse observed in the Core Area was very low, with all three species having lower levels of browse than was observed in 2008 (Table 6). Of the five plants that had been browsed, four (two *P. tetrapetala* and two *A. flavida*) had only minimal hedging (5% of leaves browsed), while only one *P. colensoi* had been heavily browsed (51–75% of leaves browsed). Low

Table 6. Percentage of mistletoe plants with no possum browse observed in the 2008 and 2013 Foliar Browse Index surveys.

SPECIES	2008	2013
Alepis flavida	90.0	93.8
Peraxilla colensoi	61.3	97.1
Peraxilla tetrapetala	60.0	93.5

levels of insect browse were observed on all species of mistletoe. There was a slight increase in the mean foliage cover of *A. flavida* surveyed between 2008 and 2013, from 22% to 27%; however, there was no difference for the other two species (Fig. 15).

Only nine tagged *A. flavida* could be compared between the 2008 and 2013 surveys, one of which had died (Table 7). No possum browse was observed on these plants in either survey and the overall health of most plants had improved during this period. The size had increased in 50% of these plants, and foliar cover had increased in 75% of them and decreased in none. There was less of an improvement in the level of dieback observed, which had decreased in only 25% of plants and increased in 38%. A further 21 *A. flavida* were found during this survey, bringing the total number of tagged plants up to 30.

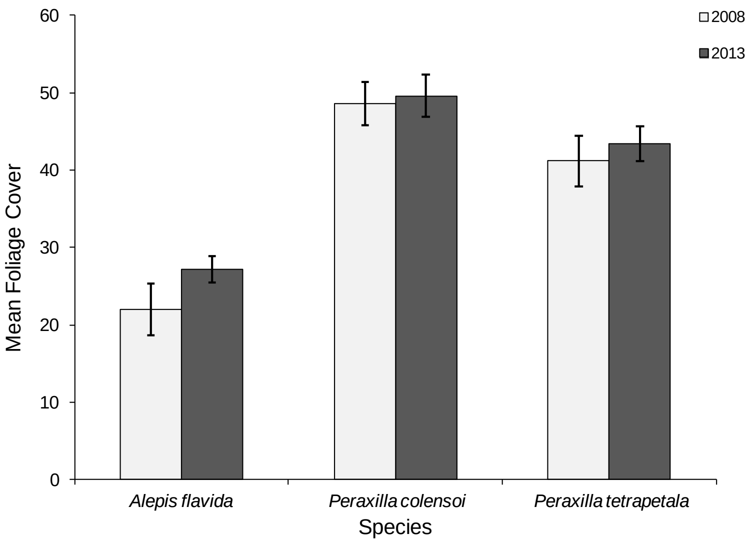

Figure 15. Mean foliage cover (% ± SEM) of mistletoe species within the RNRP Core Area in 2008 and 2013 Foliar Browse Index surveys. Sample sizes for 2008 and 2013, respectively: *Alepis flavida* = 10 and 32, *Peraxilla colensoi* = 31 and 35, and *Peraxilla tetrapetala* = 30 and 32.

Table 7. Changes in the health of eight tagged *Alepis flavida* found in the Core Area from 2008 to 2013.

	DECREASED	EQUAL	INCREASED
Size	3	1	4
Foliar cover	0	2	6
Dieback	2	3	3
Possum browse	0	8	0

Thirty *P. colensoi* could be compared between 2008 and 2013, one of which had died (Table 8). The overall health of 38% of plants had improved, having been browsed in 2008 but not in 2013, while a further 59% of plants had no browse observed in either survey. The size had increased in 59% of plants, and foliar cover had increased or stayed the same in 69% of plants. Dieback had increased in only one plant, with 34% of plants recovering from dieback observed in 2008.

Twenty-seven *P. tetrapetala* could be compared between the 2008 and 2013 surveys (Table 9), three of which had died There was a small increase in the health of these plants, with possum browse decreasing in 29% of plants and no browse being observed in either survey in 63% of plants. While 46% of plants had increased in size, only 38% had experienced an increase in foliar cover, with the same number experiencing a reduction. While 46% of plants had no change in the level of dieback, this had increased in 33% of plants.

Table 8. Changes in the health of 29 tagged *Peraxilla colensoi* found in the Core Area from 2008 to 2013.

	DECREASED	EQUAL	INCREASED
Size	7	5	17
Foliar cover	9	10	10
Dieback	10	18	1
Possum browse	11	17	1

Table 9. Changes in the health of 24 tagged *Peraxilla tetrapetala* found in the Core Area from 2008 to 2013.

	DECREASED	EQUAL	INCREASED
Size	4	9	11
Foliar cover	9	6	9
Dieback	5	11	8
Possum browse	7	15	2

Discussion

Mistletoes within the Core Area were generally healthy, with low levels of possum browse observed. Since the 2008 survey, the level of possum browse has decreased in all three mistletoe species and overall health has increased in tagged individuals. Only one *P. tetrapetala* was found with heavy browse in 2013, and this mistletoe had an approximate height of 1 m above ground, making it unclear whether this browse was caused by possums or deer. Since all other browsed plants were located in the subcanopy, damage can be attributed to possums; however, they only suffered light hedging. As mistletoe health is a primary measure of possum control and these results show that possum browse has decreased to very low levels, this indicates that current levels of control are adequate.

Although a high number of *A. flavida* deaths were observed between 2008 and 2013, most of them appear to have resulted from death of the host plant. It appears that the *A. flavida* population within the Core Area is healthier than previously thought, as previous surveys had not found adequate numbers to provide a meaningful sample size. Most new *A. flavida* were found on the lake edge and Borlase farm boundary in areas of more open bush. These locations could indicate either a habitat preference for this species or be due to ease of detection in forest edges.

2.1.10 *Pittosporum patulum* monitoring

Introduction

Pittosporum patulum is an endangered South Island endemic plant species. The Mainland Island has patches of *P. patulum*, mostly juveniles, which are susceptible to browse by deer and possums. The monitoring of *P. patulum* is used to assess the effectiveness of herbivore control in the Mainland Island.

Methods

In April and May 2013, a subsample of 40 *P. patulum* within the Mainland Island were assessed for health using a modified Foliar Browse Index technique. These individuals were selected based on which plants had the best long-term data sets. Any new plants located during the survey were assessed but not included in analysis.

Results

Population comparison

A total of 35 plants were assessed for health, as five were not able to be relocated. Of these, 27 were juveniles and two were subadults. A further 22 new plants were found, all juveniles.

Of the 35 plants assessed, one had died in the 2006/07 survey and a further five had died since then. Of the live population (Fig. 16); 22% were classified as unhealthy, which was similar to the 26% recorded in 2006/07 but higher than the three previous surveys which were all below 10%. The proportion of healthy plants had increased since the last survey to 40%, but this was still lower than the three previous surveys which had between 45% and 50% healthy. The proportion of very healthy plants was at the lowest recorded level of 20% after fluctuating between 37% and 49% in all previous surveys.

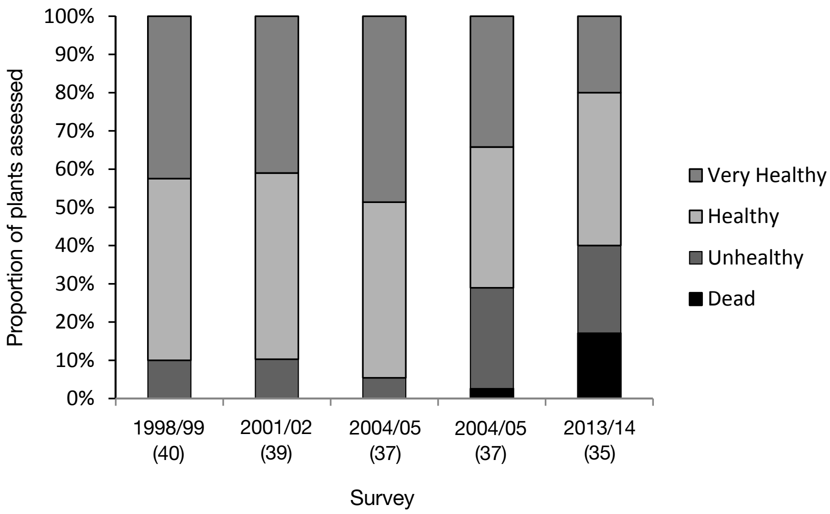

Figure 16. The proportion of *Pittosporum patulum* surveyed within different health categories.
Sample sizes: 1998/99 = 45, 2001/02 = 39, 2004/05 = 56, 2006/07 = 59, 2013 = 73.

The proportion of plants with obvious leaf browse was high at 72% which was similar to the previous survey (Table 10).This is considerably higher than the 27% recorded in the 1998/09 survey. The average height of all plants has increased since 1998/09 (Table 10).

Table 10. Proportion of *Pittosporum patulum* showing obvious leaf browse in each survey.

SURVEY (SAMPLE SIZE)	PROPORTION BROWSED (%)	AVERAGE HEIGHT (mm)
1998/99 (40)	27.5	1241.0
2001/02 (38)	26.3	Not recorded
2004/05 (38)	81.6	1384.2
2006/07 (36)	69.4	1435.7
2013/14 (29)	72.4	1561.8

Individual comparison

Comparisons between the individually tagged *P. patulum* showed that height had increased in 57% of plants between 2006/07 and 2013/14 and 71% of plants since 1998/09 (Tables 11, 12). However, health had only improved in 15% of plants since 2006/7 and declined in 24% with a further 15% dying (Table 11). Since 1998/09, 45% of individuals had declined in health, with 17% dying. Only 11% had improved in health since the initial survey (Table 12).

Discussion

Based on this survey there appears to have been a decline in the health of the *P. patulum* population within the Mainland Island. While comparisons of health between the 1998/99 baseline survey and the 2013/14 survey showed that the height of plants had increased, there was also an increased proportion of plants that were unhealthy or had died and a decrease in the health of the majority of tagged individuals. The main cause of this health decline appears to be

Table 11. Changes in health of a subsample of 33 *Pittosporum patulum* plants between the 2006/07 survey and the 2013/14 survey.

CHANGE	HEALTH		HEIGHT	
	NUMBER OF PLANTS	% OF SAMPLE	NUMBER OF PLANTS	% OF SAMPLE
Died	5	15.2	N/A	N/A
Declined	8	24.2	10	35.7
No change	15	45.5	2	7.1
Improved	5	15.2	16	57.1

Table 12. Changes in health of a subsample of 35 *Pittosporum patulum* plants between the 1998/09 survey and 2013/14 survey.

CHANGE	HEALTH		HEIGHT	
	NUMBER OF PLANTS	% OF SAMPLE	NUMBER OF PLANTS	% OF SAMPLE
Died	6	17.1	N/A	N/A
Declined	16	45.7	8	28.6
No change	9	25.7	0	0.0
Improved	4	11.4	20	71.4

browse, with the level of obvious foliar browse having increased since the baseline survey. Deer are likely to be the main browsers of juvenile plants in the Mainland Island, and preferential browsing by deer would likely have a deleterious impact on the health of individual *P. patulum* and the population as a whole even at low numbers (see section 2.1.5). The low number of subadult plants and lack of known adults suggests that further recruitment of *P. patulum* will be poor. Therefore, finding and protecting adult plants within the Mainland Island to provide a dispersal point for seeds should be a priority.

2.1.11 *Powelliphanta* sp. monitoring

No Powelliphanta monitoring was carried out this season. The next monitoring is due in the 2013/14 season, as recommended in the RNRP Powelliphanta Monitoring Review (Gaze & Walker 2008).

2.2 Establish and maintain populations of great spotted kiwi 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 GSK sourced from a population at the Gouland Downs, Kahurangi National Park, were reintroduced to the Mainland Island via two operations in 2004 and 2006. 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 to 14 Operation Nest Egg™ (ONE) chicks, sourced as eggs from the Gouland Downs, was approved in 2008. The operation commenced in early 2009 with the radio-tagging of adults at the Gouland Downs followed by three seasons of egg lifting, with the final eggs lifted in December 2011.

2.2.2 Great spotted kiwi population management

Methods

ONE translocations took place during the 2012/13 season. Chicks were reared at Willowbank and released into the Mainland Island once they had reached a healthy weight above 700 g. The RNRP also received ONE chicks from the Stockton Plateau this year, under an agreement from expansion of mining operations at Cypress Mine. Eggs were removed from monitored pairs on the plateau and reared at the Stockton crèche before being translocated to the Mainland Island once they had reached a healthy weight. All chicks were placed into artificial burrows within the holding pen (c. 200 m^2) and released after 1 week.

Indirect threat management also benefitted kiwi, principally through the control of stoats and cats, which can prey on kiwi chicks.

Dogs remain one of the biggest threats to kiwi nationally. Signs 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. 2010). 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 the first year, and any mortality signals from transmitters are promptly investigated. Differences in survivability between ONE and wild chicks has also been recorded to guide future management of the species.

Results

Four ONE eggs were transferred from the Gouland Downs to the Willowbank rearing facility in late 2011. Two of these chicks, both females, were received by the RNRP on 27 September 2012 and were released from the holding pen on 3 October. One of these died on 14 October following a significant weight loss of 34%. The other chick (Turimawiwi) initially lost 12% body weight; however, its weight then began to increase until reaching its release weight after 4 months, at which time it had not moved far from the holding pen.

A chick from the Stockton Plateau, northern Buller (Tuia), was released into the holding pen on 9 April and released on 15 April. Tuia also did not move far from the pen and lost weight. Following a weight check on 3 May, the decision was made to remove and return Tuia to the crèche. However, later that day, Tuia was observed feeding well and left the crèche. No transmitter signal was detected after this date and subsequent searches by dog teams have not located the chick.

Discussion

The last of the Gouland Downs ONE chicks were released in September 2012 with mixed results, reflecting the past experience of the RNRP with this technique. It is likely that further releases of GSK of various ages from the Stockton Mine site in northern Buller will occur over the next few years.

Over the past 3 years, the management of GSK has focussed on using the ONE programme to potentially overcome the poor breeding success of GSK in the Mainland Island. It was suggested that the low productivity of GSK was due to either the birds being old and infertile or the release site not being conducive to breeding. The release of young birds may have circumvented any problems associated with the former hypothesis. However, ONE has not proven to be particularly successful overall, with only one fledgling from three that were released known to have survived this season. The success of Tuia's translocation cannot be determined, as the transmitter has probably failed and/or moved to a location where it cannot be detected. Extensive searching by dog teams around the kiwi holding pen where Tuia was last located has been unsuccessful. By contrast, releases of adults or experienced juveniles have resulted in all of these birds establishing within the Mainland Island.

The management of GSK has provided not only an opportunity for establishing a new population at Nelson Lakes, but has also allowed us to learn 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 GSK fluctuates due to transmitters failing or dropping off and through the relocation of individuals. In 2012/13, two trail cameras were put out to monitor probable nests, and were then left in place post-hatch to monitor the activities of wild-hatched chicks and their parents. In May 2013, a 4-day round-up of non-radio-tagged kiwi in the Mainland Island was carried out by James Fraser and Natasha Coad from 'With A Nose For Conservation', using their three kiwi dogs. Kiwi Call Counts, a national community-based monitoring scheme, did not take place this year. This scheme is planned to be used in the future, however, along with the kiwi round-up to provide an index of population size.

Peter Jahn's research on GSK home ranges over the winter of 2012 was completed and submitted to *Notornis* for publication.

Results

Round-up

The round-up effort saw two adults (Motupipi (♂) and Waitapu (♀)) rediscovered, sharing a burrow along with a chick from the 2012/13 breeding season. Motupipi was fitted with a transmitter and the chick was fitted with a transponder. Another non-radiotagged kiwi was located on Rito's Ridge but was not captured.

Breeding results

Onahau (♂) and Tai Tapu (♀)—On 27 September, Tai Tapu's transmitter indicated incubation activity. A camera was established at the site but the birds continued to move around and were tracked to several different burrows, suggesting that they were not incubating. When both individuals were caught for transmitter changes in May 2013, there was no re-feathering of brood patches or other kiwi present.

Te Matau (♂) and Onekaka (♀)—On 28 September, while checking for chick 7, Te Matau was discovered sitting on an egg. A trail camera was established at the burrow on 3 October and a chick was first recorded on 3 December. Over the following week, the chick and both adults were regularly recorded outside the burrow entrance. However, on 21 February, Te Matau only had the subadult chick 7 (♂) present and the new chick has not been located since with either parent. Therefore, although a chick was produced, it is not known whether it is still alive.

Motupipi (♂) and Waitapu (♀)—On 28 May, this pair was located by the kiwi dog survey team with a chick from the 2012/13 breeding season.

Annual health checks

In 2012/13, health checks were carried out on all birds with transmitters. All appeared healthy with no abnormalities or major weight losses, with the exception of Tai Tapu, who had lost 500 g but was still in moderate health. Seven adults, one subadult and one ONE chick currently carry transmitters in the Mainland Island. Only one bird potentially dropped its transmitter this season, with Tata's (♂) transmitter switching to mortality mode on 28 March; this was tracked to an inaccessible gully, making it impossible to know whether the transmitter was dropped or the bird had died. A further two transmitters also appear to have failed (Awaroa (♀) and Tuia (a ONE chick)), and Onekaka's (♀) transmitter was removed in June.

Research

Peter Jahn's research revealed that there is a substantial amount of home range sharing between adults and their offspring up to 3 years of age, and supported the hypothesis that GSK are markedly more social than most other kiwi species. This work has been accepted for publication in *Notornis* in late 2013.

Discussion

One of the highlights of the season was the capture of the hitherto unknown chick with Motupipi and Waitapu. It had been suspected that breeding was occurring without being detected and this bodes well for the population. Moreover, the production of an egg by Te Matau and Onekaka for each of the past 2 years is encouraging and suggests that productivity may be higher than previously recorded at some prime sites within the Mainland Island. At low-altitude sites, such as the Paparoa Range, most GSK pairs will produce an egg each year (G. Newton, DOC, Greymouth), pers. comm. 2012). However, this generally does not occur at the Mainland Island, possibly due to a trade off between egg production and the maintenance of body condition. This hypothesis deserves further investigation, as it has implications not only for management of the species at the Mainland Island, but also for the recently established population at Flora Saddle, Kahurangi National Park.

The use of trail cameras on nest burrows has continued to prove very useful for monitoring breeding attempts, with one successful nest recorded—although the whereabouts of that chick are now unknown.

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 Mainland Island from 1997 to 2000. However, this was then abandoned due to concerns about secondary poisoning by second-generation anticoagulants in a suite of non-target mammalian predators and native birds (Spurr et al. 2005). In lieu of a poisoning programme, the effectiveness of snap trapping for controlling 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 also 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.

No rat control was undertaken in 2007–2009 due to budgetary constraints and concerns about possible non-target effects. In 2010, operation planning focussed specifically on the reason for controlling rats within the Mainland Island, principally the protection of native passerines from rat predation. Two factors meant that pulsed rat control in Spring was chosen as the best method: Firstly, passerines are most vulnerable to rat predation of eggs/ chicks/ brooding adults when nesting in spring; Secondly, continuous rat control is expensive and can lead to bait shyness or rats becoming immune to the poison. Thus, pulsed control of rats in spring, when birds were most vulnerable, was all that was required to increase passerine abundance in the Core Area of the Mainland Island.

Although no rodent control was undertaken for several years, associated rodent population indexing and South Island robin (*Petroica australis australis*) nesting success outcome monitoring continued. A very small beech seedfall event occurred in autumn 2012. The previous beech seedfall was in autumn 2009, which was also quite small.

3.1.2 Ship rat control

Methods

A rat control operation was carried out in the Mainland Island in spring 2012/13 to lower ship rat numbers prior to breeding by native passerines. RatAbate™ (diphacinone in a peanut butter matrix) in paper bags was placed in the Philproof bait stations. The operation included the Core, X and Y blocks, and the recently established Z block, covering a total planar area of 867 ha. Thus, the rat control grid now covers at least 867 ha—it may be larger, as this estimate does not take slope into account. This is close to the 1000 ha deemed to be the minimum effective size for meaningful ground-based rat control.

The operation involved one fill of 150 g or 300 g of RatAbate™, depending on the likely ship rat density in a particular area, as indicated by tracking tunnel indices for rats. Rat tracking above 900 m AMSL is invariably low, so all the lines above this altitude were baited at the lower rate. Bait application occurred over 3–4 days, and the bait was removed from bait stations approximately 6 weeks later.

Tracking tunnels were run to calculate rodent population indices prior to and after both operations, to determine their effectiveness.

Results

In the September 2012 operation, 51.6% (136.7 kg) of the 265 kg of bait presented was taken (Fig. 17).

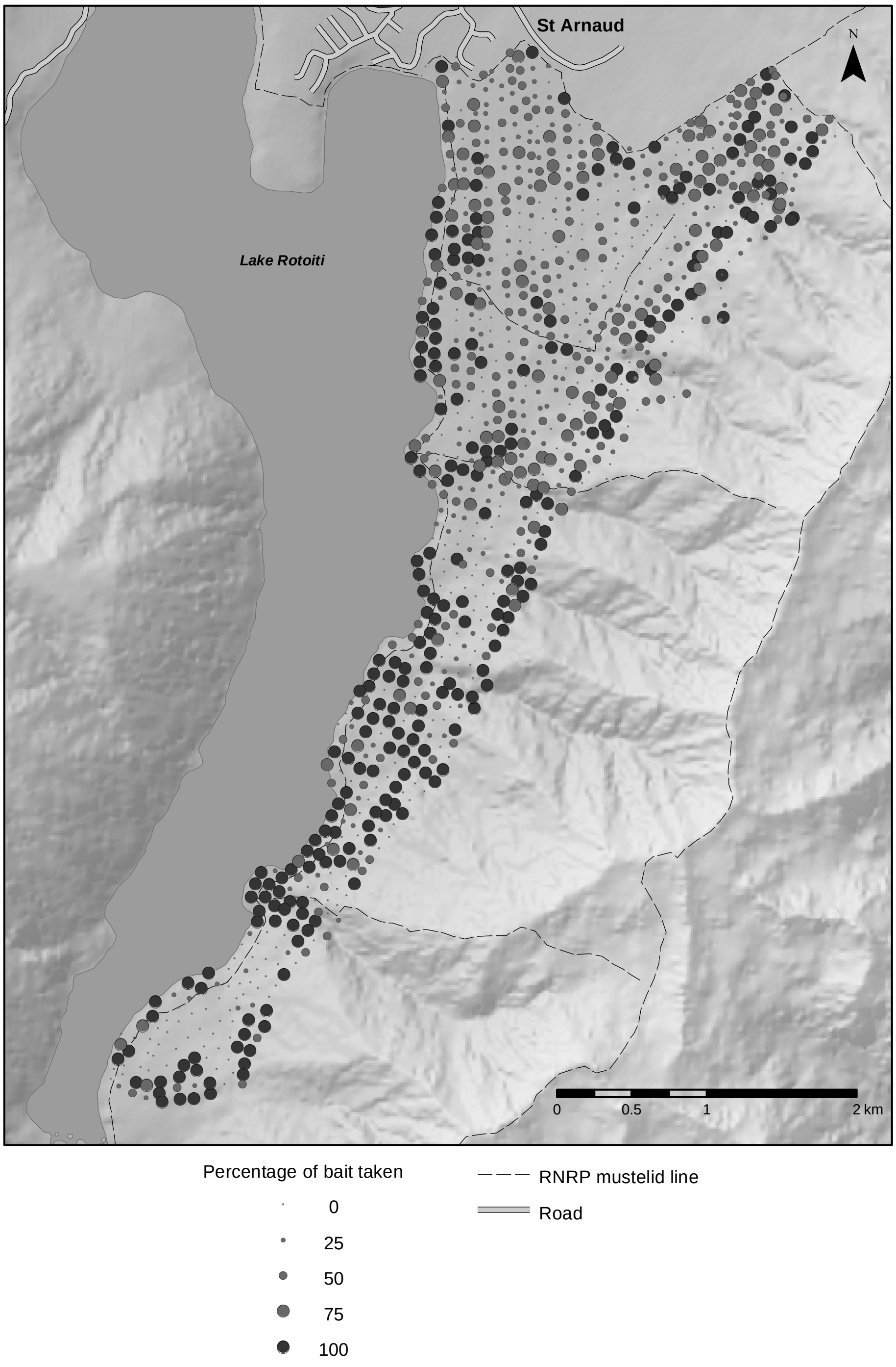

Figure 17. Rat bait consumption by bait station in the Mainland Island in spring 2012.

Discussion

Despite just over half of the bait being consumed, the September 2012 operation only reduced the tracking rate of rats by about half (see section 3.1.3) and did not attain the 5% rat tracking target, meaning that rats were still present in high numbers.

Rat control in the Mainland Island has met with mixed success since September 2010. In 2010 and 2011 there were initial successes as a result of single deployments of poison each September. However, an operation in April 2012 following a very light beech seedfall had no detectable effect, which, coupled with the fact that rats were ignoring peanut butter on the tracking tunnels at the same time, suggests that there was a plentiful supply of natural food available in autumn. The single application in spring 2012 halved the tracking rate from 47% to 24%, compared with no change in the non-treatment sites (see section 3.1.3). However, over the following summer and autumn, rat abundance indices increased in both the treatment and non-treatment sites in the Mainland Island.

The underlying strategy for the operation, namely to protect native birds during the breeding season, needs to be retained. However, it is evident that the operation requires some fine tuning. We are dealing with a dynamic system in which the rat population changes through time and space. There is generally an inverse relationship between rat density and home range size (Innes & Skipworth 1983), meaning that home ranges are small when rat abundances are high. This suggests that when densities are high, many rats are unlikely to even encounter bait stations when a rat grid of 100 × 100 m (i.e. 1 bait station/ha) is used, as their home range will be substantially smaller than 1 ha (Hickson et al. 1986; Dowding & Murphy 1994; Hooker & Innes 1995) and they will be some distance from a bait station. This particularly applies to female rats (Pryde et al. 2005). By contrast, when rat densities are low, their home ranges are likely to be large enough to encompass a bait station. Since a rat's home range will increase within a few days of the removal of a conspecific (Hickson et al. 1986; Innes & Skipworth 1983), it is likely that a neighbouring non-poisoned rat will subsequently find a bait station. However, if the bait station is largely empty, the poison operation will ultimately fail, as approximately half the rats will not have access to a lethal dose of bait, particularly when using first-generation anticoagulants which require multiple feeds to kill rats. This appears to have occurred in September 2012. Future operations can only test this model by running the poison operation through various permutations of rat densities and natural food availabilities to allow fine-tuning to occur.

It seems unlikely that the stainless steel baffles on the Philproof bait stations (fitted in 2009) affected bait take, as previous operations have been effective with the baffle in place using the same poison. Of additional note is the fact that tracking suggests that rat abundance is apparently little affected by low winter temperatures and snowfall, particularly when food is available.

There is no 'one plan fits all years' approach and it is recommended that future rat control is more responsive to likely spring rat densities, with the main rationale continuing to be the protection of native birds during the nesting season. Therefore, when rat operations are being planned in beech forest, careful consideration should be given to whether there is alternative food available and rat tracking rates should be monitored for the 6-month period prior to the operation (Fig. 18). When rat tracking is above 15% in May, it is recommended that an operation should plan for two bait applications approximately 3 weeks apart. This timing is based on a rat taking 1 week to find

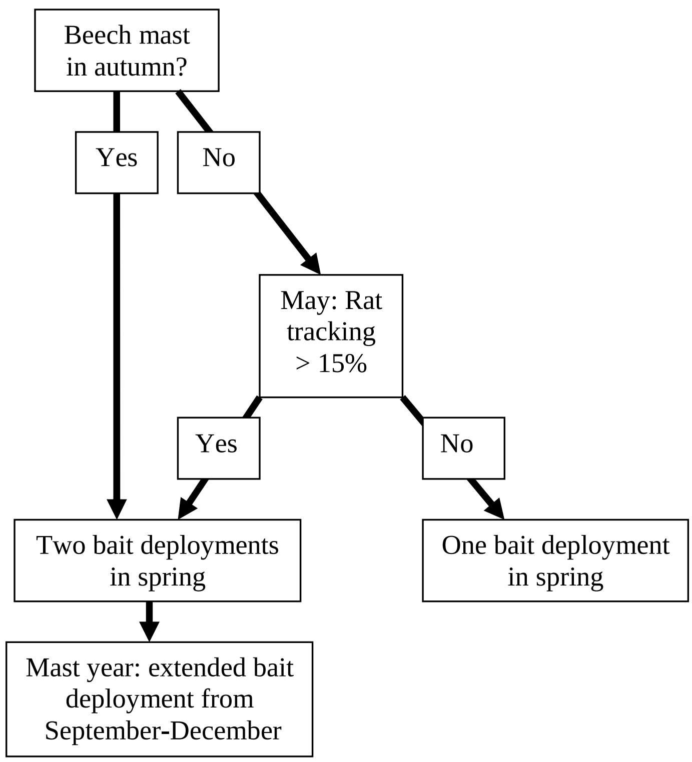

Figure 18. Flow chart for planning for preliminary rat control.

a bait station, 5 days to die and 3 days for a neighbour to move into the vacant home range. The repeat operation probably only needs to take place below 900 m altitude, as above this altitude rat numbers rarely reach high numbers. When rat tracking is 15% or less, a single operation should suffice.

When rat numbers are increasing during a beech mast event, it appears that the bait needs to be put 'under the rat's nose' in the same way that the alternative food (i.e. beech seed) is. Therefore, it is likely that only single feed poison bait (second-generation anticoagulants or 1080) that is spread on the ground (either by hand or aerially) at a higher rate than the current 100 × 100 m spacing will result in effective reductions in numbers. However, this option cannot be easily applied by the RNRP at present because it would require a large number of staff to have a Controlled Substances Licence and there are restrictions on the use of second-generation anticoagulants on Public Conservation Land on the New Zealand mainland.

Future poison operations should also alternate the type of poision being deployed. RatAbate™ has been used for four consecutive operations in the Mainland Island and best practice advises against using the same pesticide repeatedly (although pulsed baiting in the Mainland Island will likely lessen any adverse affects). Consequently, in spring 2013, Pindone cereal pellets will be used.

3.1.3 Rodent population monitoring

Methods

Tracking tunnels are used to provide a relative abundance index of rodents within the Core Area (rat control) compared with Lakehead and Big Bush (no rat control but mustelid trapping) and Lake Rotoroa (no control of any species).

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

Results

In August (prior to the rat control operation), mouse tracking in the Core Area was lower than in Lakehead and Big Bush, but similar to Lake Rotoroa (Fig. 19). Following the 2012 spring rat control operation, mouse tracking increased to 37% in the Core Area, which was similar to levels in Lakehead and Big Bush, but higher than Lake Rotoroa. By May, mouse tracking had decreased to c. 20% in the Core Area, which was similar to all other sites.

Rat tracking was higher in the Core Area than at Lake Rotoroa in all monitoring periods (Fig. 20). After the 2012 spring rat control operation, rat tracking in the Core Area dropped from 47% to 24%, while there was no change at Lakehead and Big Bush. Tracking in the Core Area increased throughout the year and was back to pre-poisoning levels by May, with 48% tracking. During this

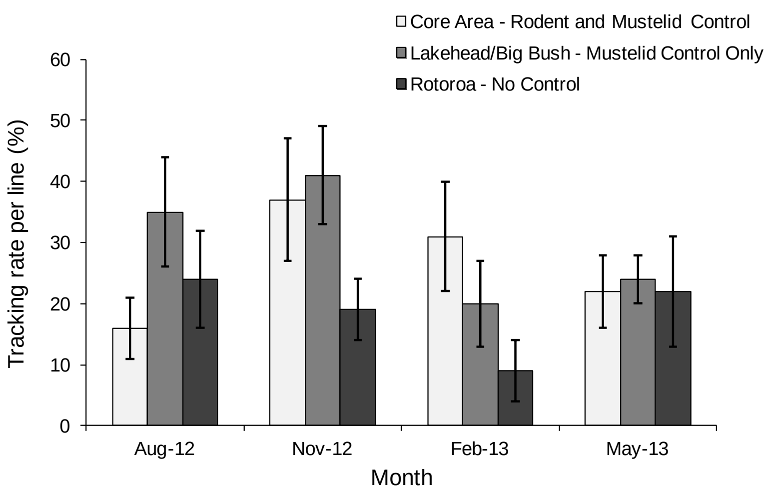

Figure 19. Mean (± SEM) mouse tracking rates at Lake Rotoiti and Lake Rotoroa during 2012/13.

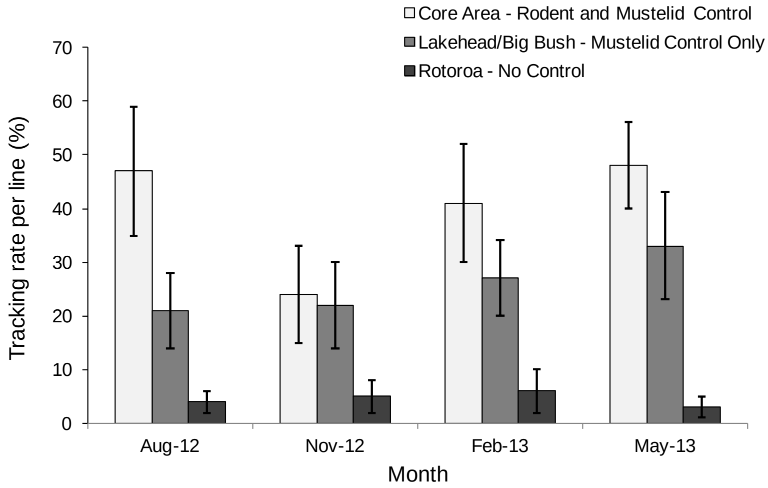

Figure 20. Mean (± SEM) rat tracking rates at Lake Rotoiti and Lake Rotoroa during 2012/13.

same period, Lakehead and Big Bush also increased to a maximum level of 33%. Rat tracking at Lake Rotoroa remained at 6% or less throughout the entire period.

Discussion

Based on the tracking tunnel results, the rat control operation in early September 2012 did not control the rat population within the Core Area. Although the tracking rate in the Core Area was halved (whilst remaining more or less the same at Lakehead, Big Bush and Rotoroa during the same period), the target rate of 5% was not achieved and tracking had increased to pre-operation levels by February 2013, while there had been only slight increases at the other sites during this time. Tracking rates for rats remained low at Lake Rotoroa where stoats are not controlled.

During the previous winter (August), rat abundance had increased to high levels as a result of a small beech seedfall, which provided sufficient food for the population, and the failure of a second bait application to reduce the abundance to low levels. This resulted in enough rats surviving to enable the population to return to pre-poisoning levels within 9 months.

3.1.4 South Island robin monitoring

The South Island robin is an endemic passerine which, although classified as not threatened (Miskelly et al. 2008), 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 at Lake Rotoiti the robin breeding season ran from August to February in 1998/99 (Etheridge & Powlesland 2001) and 2010–2012 (G. Harper, DOC, pers. obs.)

South Island robins have been monitored within the Core Area of the Mainland Island since 1998/99 as a measure of the effectiveness of rat control operations.

Methods

The annual robin census was carried out to determine the total number of paired robins and unpaired individuals in a defined area within the Core Area at the start of the breeding season. Each September, a survey was conducted four times at 1-week intervals. Until 2007, the study area was approximately 120 ha. However, since so few robins were being located in the few years prior to this, the area was then expanded south of the Loop Track. The present study area (162.1 ha) is shown in Fig. 21.

Pre-census

A combination of audio robin calls and 'tapping' of a mealworm container was carried out within the census area to attract robins for colour-banding to allow individual identification. An audio system was used to call the robin into the vicinity of the observer. When the robin was nearby,

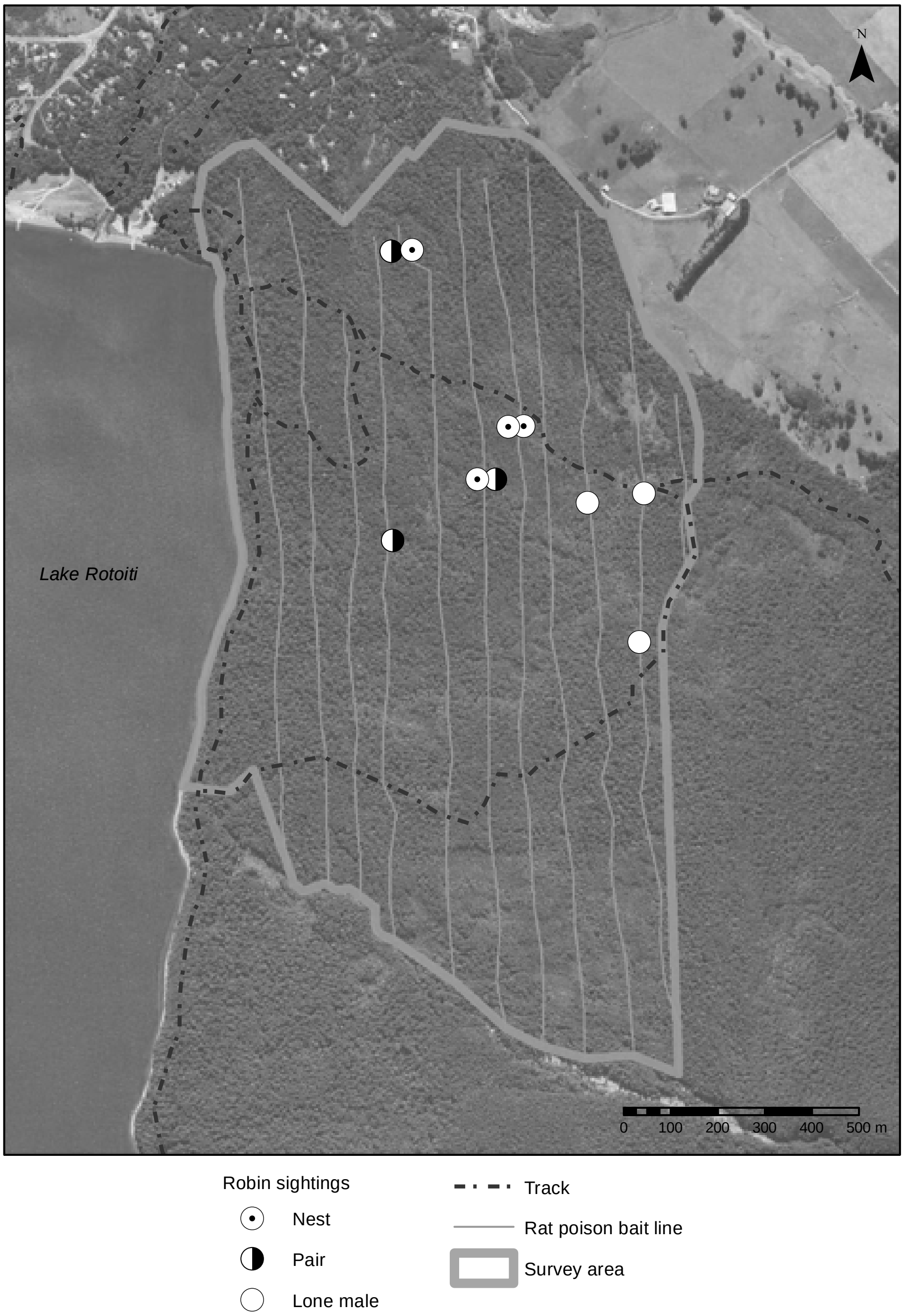

Figure 21. Map of South Island robin locations within the survey area in 2012.

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. This pre-census work was carried out during August and we attempted to band all robins within the census area. Three appropriately trained staff were required for 2 days.

Census

Three staff were required for 1 day per 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 whilst tapping a mealworm container; they stopped at every second bait station for 1–2 minutes and tapped loudly to attract robins:

If a robin was sighted, the container was tapped until the robin approached; the bird was then fed as a reward and 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 the bird has a nesting partner nearby).

If a robin was not sighted, the surveyor continued to walk and tap along the line.

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

Results

During the 2012 pre-census and census periods, four South Island robins (3 ♂; 1 ♀) were banded within the study area. During the 2012 census, three pairs and three individual males were counted. The three pairs (♀ = RM-LBY, ♂ = YM-LB; ♀ = GM-W, ♂ = GM-R; ♀ = RM-LG, ♂ = YM-O) were seen at bait stations LF15, WD6 and LD12, respectively. The latter pair was never recorded nesting, despite being located every 10–14 days until January 2013. This male has successfully bred prior to this season, but this female has not nested for 2 years since being caught in August 2011. The three males (RM-YG, GM-Y, GM-DB) were observed at bait stations LJ9, LI10 and LJ2.

Four robin nesting attempts were recorded. The first nest was found on 20 August and at least two chicks fledged from this. Three further nests were then found in September, October and late December, and chicks fledged from 75% of these nests. One pair produced two clutches successfully and one pair the remaining clutch. At least eight and possibly up to nine chicks fledged successfully (Fig. 22).

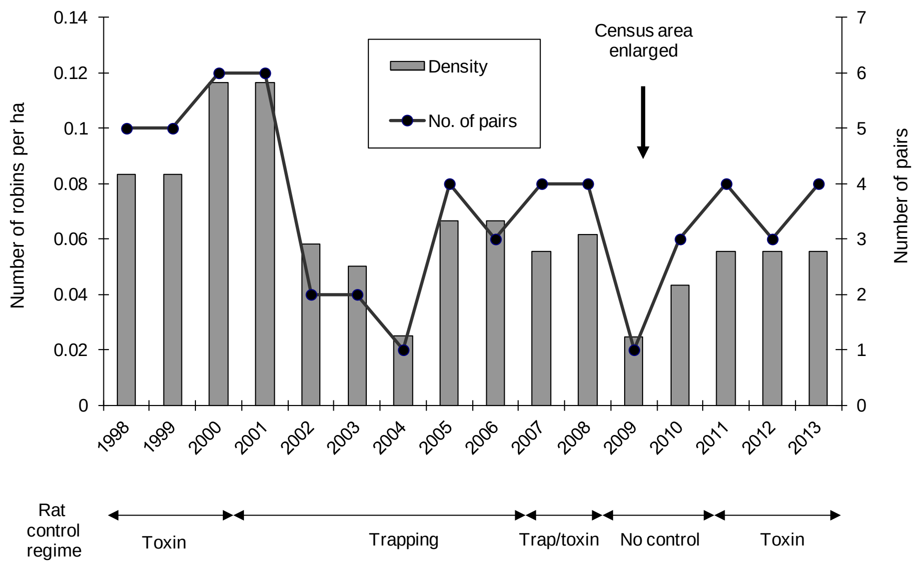

Figure 22. South Island robin density and number of pairs in the Core Area of the Mainland Island following differing rodent control regimes.

Since 1998, robin numbers within the Core Area of the Mainland Island have fluctuated, but there has been a general decline (Fig. 22). The lowest counts were observed in 2004 (n = 3) and 2009 (n = 4). In general, robin numbers have tended to decline when only rodent trapping has been carried out, whereas the number of robin pairs has 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 thus densities may be a little high for these two seasons.

Discussion

The rat control operation in September 2012 did not successfully reduce rats to the desired level and the number of breeding pairs of South Island robins also declined this year, despite robin density having increased for the past 4 years (Fig. 22). This finding highlights the need to control rats to low densities during the spring. As the rat control technique is fine-tuned, it should be possible to keep rats below the desired 5% tracking during the robin breeding season. However, at this stage, the 2012 robin population continues to remain at a low density.

Figure 23 shows the relationship between rat abundance in August and robin breeding success during the following year. The principal impact of high rat density is likely to be predation of females on nests, which will reduce the number of females that are available for breeding in the following year. A male sex bias has consistently been reported in the Mainland Island, supporting this hypothesis.

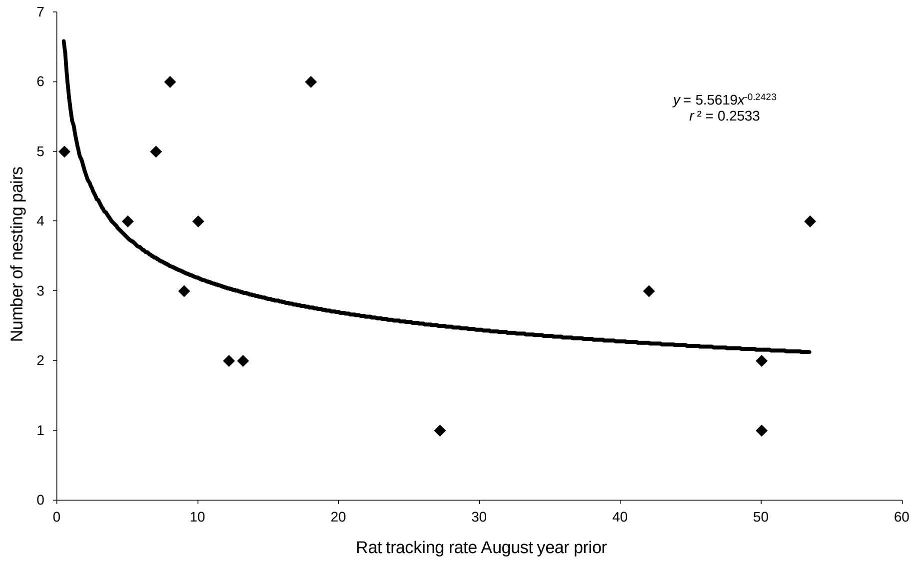

Figure 23. The relationship between rat abundance and the number of South Island robin pairs nesting in the following year.

3.2 Test the effectiveness of wasp control tools

3.2.1 Introduction

Common wasps (*Vespula vulgaris*) have been controlled in the Core Area of the Mainland Island since 1998, using various protein-based baits that mainly contain 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 to it is currently constrained by commercial imperatives and it is only available under an experimental use arrangement. Since the 2007/08 season, only X-stinguish™ has been used for subsequent operations in the Core Area. The most recent research has focussed on determining the widest possible spacing between wasp bait lines whilst still achieving the desired reduction in wasp densities. A trial that was carried out by FOR during the summer of 2008/09 indicated that wasp nests could be effectively controlled up to 350 m from poison bait stations (Brow et al. 2010).

3.2.2 Wasp control and monitoring

Methods

To ensure that the poison operation will be effective, wasp visitation on non-toxic protein-based baits is monitored prior to an operation. An average of one wasp per bait is considered the trigger point for initiating the decision-making process to start a poison operation. For further details on wasp monitoring and the decision-making process, refer to the 'RNRP 2012–13 Field Manual' (docdm-431791).

In 2012/13, toxic bait was again placed in every second line in the Core Area, giving a spacing of 400 m between the lines. As in previous years, the Core Area was also divided into two grid arrays, one of which had a single bait station every 50 m and the other paired bait stations every 100 m. In Big Bush, the existing bait station grid that was set up two seasons previously was used.

This grid also has paired stations at 100-m intervals with vertical lines 400 m apart. The rationale for using vertical lines (up- and downhill) was to test the theory that wasps may be able to carry toxic bait further distances across a slope and may also potentially forage further from their nest across a slope.

The poison operation was started earlier this season, with the bait stations in the Core Area and the St Arnaud village / Brunner Peninsula areas being filled with poison bait on 21 January 2013, which is around 1 month earlier than the last few years. The rest of the bait stations in the Big Bush grid and the line on the western side of Lake Rotoiti were filled on 22 January. Only 20 g of bait was placed in stations this season due to the perceived low wasp numbers. All uneaten bait was removed from bait stations and weighed to determine the amount of bait take. For further information regarding the bait and bait station layout, refer to the 'RNRP 2012-13 Field Manual'.

A trial that investigated the use of lures to increase bait uptake was also attempted this year. A small amount of fish-based cat food was placed on the front edge of half of the bait stations as a lure. A previous study into bait preferences showed that sardine-based cat food was the most favoured bait for wasps (Spurr 1995).

Monitoring was only carried out in the Core Area in 2012/13. This year's monitoring consisted of wasp nests being marked along transects and flight counts being recorded. Two of the monitoring methods that were trialled in 2011/12 were also repeated along the same transects. Firstly, the 'wasp foraging index' was determined by counting the number of wasps on non-toxic baits after c. 1 hour. This is similar to the method used to determine the trigger point for initiating the poison operation. Secondly, honeydew droplets inside a 100 × 100 mm square on marked trees were counted to measure the 'biological off-take'. All three of these methods were carried out both before and after the poison operation. Also, because the poison operation was carried out earlier this season, additional monitoring was performed 2 months after the operation to determine whether wasp numbers had increased back to pre-poison levels.

Results

On 18 January 2013 (i.e. prior to the operation), an average of 2.7 wasps were observed on non-toxic baits. Since this was above the one wasp per bait threshold, it was sufficient to initiate the poison operation.

In total, 21.8 kg of toxic bait was deployed this season and 9 kg (42%) of this was removed by wasps. Bait take was much higher in the Core Area / village (50%) than in the Big Bush grid (27%).

Bait stations with a lure (fish-based cat food) had lower average bait take than stations that had no lure (34% vs. 40%, respectively).

After 1 week, the operation achieved an 82.6% overall reduction in flight counts of marked nests inside the two grid arrays in the Core Area. The 400 × 50 m (single station) grid reduced flight counts by 92%, while the 400 × 100 m (two stations) grid only reduced flight counts by 71%.

Overall, there was a 71% reduction in the wasp foraging index for the combined grids. The foraging index was reduced from 3.57 to 0.71 wasps per non-toxic bait in the 400 × 50 m grid (equivalent to an 80% reduction). By contrast, there was only a 44% reduction from 1.35 to 0.75 wasps per bait in the 400 × 100 m grid.

Overall, honeydew droplets increased by 435% for the combined grids in the Core Area. Post-operation levels increased by 315% inside the 400 × 50 m grid and by 711% in the 400 × 100 m grid.

Despite a small increase in the flight counts on marked nests, a further reduction in the wasp foraging index was noted in the additional monitoring that was carried out 2 months after the operation. There was also a further increase in the amount of honeydew recorded—up 832% from pre-poison levels (Fig. 24).

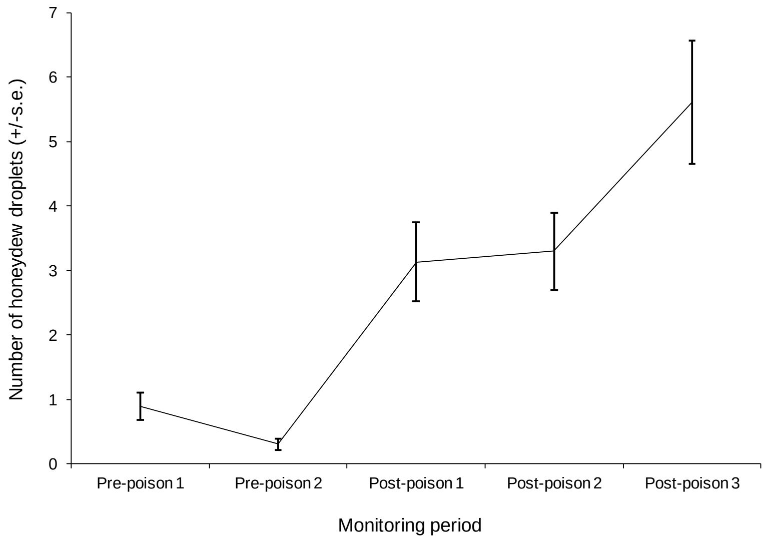

Figure 24. Effect of the wasp poison operation on the mean (± SEM) number of honeydew droplets in the Core Area of the Mainland Island in 2012/13.

Discussion

The 2012/13 wasp control operation was initiated approximately 1 month earlier than it has been for the last 3 years. Although the numbers of wasps appeared lower than average in early January, they had still reached the threshold amount to indicate that the poison operation would be successful.

Less bait was deployed in 2012/13 than in previous operations, with approximately 20 g of bait being put out per bait station—and an assessment of the amount of uneaten bait recovered suggests that this could be reduced yet further. The toxic bait take was above average for this operation, with nearly twice as much eaten as last season.

The toxic operation was again successful in reducing the wasp nuisance around St Arnaud village.

Wasp activity within the Core Area was observed to decline within a few days of the operation, and this was also reflected in the reduced wasp foraging index and the increase in honeydew recorded. Despite the earlier operation and a long period of hot, dry weather, the wasp numbers did not manage to recover to pre-poison levels. While some active wasp nests still remained in mid-March, the number of honeydew droplets was still higher than recorded 1 week after the operation.

The monitoring in the Core Area indicated that the operation was successful in increasing the availability of honeydew to native birds. An 82.6% reduction in wasp nest flight counts and a 71% reduction in the wasp foraging index resulted in a 435% increase in honeydew droplets.

The 400 × 100 m grid appeared to have fewer wasps, lower flight counts and a lower foraging index than the 400 × 50 m grid. This is probably due to some of these monitoring transects passing through more scrub and less beech forest.

The results from the lure trial suggest that adding a lure to the bait station has a detrimental effect on the amount of toxic bait taken. Consequently. no further lure trials are planned.

For the third year running, it was predicted that there would be high wasp numbers during the summer of 2012/13, based on a model whereby low numbers one year will result in higher numbers the next. However, once again this did not eventuate. The lower wasp numbers in 2012/13 could not be explained by poor weather in spring affecting nest establishment. Rather, it appears that some unknown factor may be reducing wasp numbers, possibly by affecting nest establishment by queens or the health of workers. Examination of wasp nests and workers in the early part of the season may help to determine the apparent decline in wasp densities. Models again suggest that the 2013/14 season should result in higher wasp numbers.

In 2013/14, the two grid systems will be re-trialled, as they still need to be tested during a season with high wasp numbers. It is also planned that the wasp foraging index will be monitored again using non-toxic bait and biological off-take by counting honeydew droplets. This will be compared to flight counts on marked nests pre- and post-poisoning.

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 Mainland Island. This occurred through wild-to-wild translocations of adults in 2004 and 2006 (Gasson 2005). No work has commenced on introducing any other species. Translocations of juvenile GSK was initiated in 2009 through a ONE project that involved the collection of eggs from the Gouland Downs in Kahurangi National Park. These eggs were incubated at Willowbank Wildlife Reserve in Christchurch, and subsequent chicks were released either directly from Willowbank or via a holding crèche on the West Coast. This operation was concluded in early 2012. However, additional eggs have also been removed from the Stockton Mine site north of Westport and were added to the population from 2012 onwards (Harper et al. 2013). Juveniles were released into the Mainland Island once they reached a weight of around 1 kg. There were two broad objectives for these ONE translocations:

- Biodiversity objective—To augment the existing founder population of GSK with young birds from another site; and
- Research objective—A pilot study to compare the success of ONE birds to the success of wild-hatched birds, with respect to territory establishment and breeding success in the Mainland Island.

In the Mainland Island, it is possible to monitor the fate of ONE birds and compare this to that of wild-raised chicks that are protected through predator control. The project should indicate whether ONE birds will successfully establish within an existing population and, if so, whether their life history traits (including dispersal and age of breeding) will be broadly similar to those of wild-raised birds.

Methods

In addition to the Gouland Downs derived birds, GSK were sourced from the Stockton Plateau in northern Buller, as these birds were likely to be affected by the expansion of the Stockton mine over the next 5 years. Initially, only chicks were to be removed from the affected site. However, if the mine expands then adults will also be removed from the area.

Results

One Stockton Plateau sourced ONE chick was released into the Mainland Island in September 2012 and established a home range near the release site. The last ONE chick from Gouland Downs was released in April 2013. Unfortunately, however, the transmitter on this chick failed after 3 weeks and, at the time of writing, the chick has not been located.

Discussion

Based on recent management (Harper et al. 2013) and research (Jahn et al. 2013), it appears that GSK are substantially more social than most other kiwi. This, in turn, suggests that GSK chicks may rely on their parents more than was expected at the beginning of the ONE programme, which likely explains the poor results for translocating chicks into the Mainland Island. The loss of chicks has been tragic, but has highlighted the pitfalls in assuming that techniques that may work for one species will automatically work for others. In the course of the translocation trials, we have learnt that adult GSK can be transferred and established successfully, and that it is likely that juveniles will also transfer well. Further releases are likely from the Stockton Plateau, which will allow us to fine-tune the translocation methods used.

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. The monitoring of beech seedfall adds to the national picture of forest seedfall and enables the project to plan appropriate management responses.

3.4.2 Five-minute bird counts

Methods

Five-minute bird counts (5MBC) 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, February and May using the technique detailed by Dawson & Bull (1975). Four different observers were used this year.

Results

The bird count data were entered into a spreadsheet (RNRP 5MBC) and will be included in the national 5MBC database.

Discussion

There has been no analysis of the 5MBC data to date—rather, the spreadsheet simply contains the raw data. Given, the time and effort that is required to collect and enter these data (c. 144 h each year) and the fact that this is such a long-running dataset, the analysis of the 5MBC data should be encouraged. Any analysis should be carried out in a separate spreadsheet in order to keep the size of the database down (as databases larger than c. 5 MB take a considerable time to open and save) and to reduce the risk of the raw data becoming corrupted.

3.4.3 Vegetation plot monitoring

Nineteen out of twenty 20 × 20 m vegetation plots within the Mainland Island were re-measured between 2009 and 2011. In 2012/13, a few corrections were made to plant identification, particularly *Coprosma* species, and many trees that had been tagged low were re-tagged at breast height. Most plots were also measured for the third time (initial measurements took place in 1997–1999). Vegetation plots are monitored using the updated field protocols for permanent plots and the RECCE method (Hurst & Allen 2007a, b).

3.4.4 Beech seedfall monitoring

Methods

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

Results

A small amount of viable beech seed was recorded at Lake Rotoiti and Lake Rotoroa in 2012/13 (Table 13 & Fig. 25).

Table 13. Beech seed counts at Lake Rotoiti (Mainland Island) and Lake Rotoroa in 2012/13.

SITE	COUNTS	RED BEECH (*Fuscospora fusca*)	MOUNTAIN BEECH (*Fuscospora menziesii*)	SILVER BEECH (*Lophozonia cliffortioides*)
Lake Rotoiti	Total count	1	4	6
	Total viable seed	0	1	1
	% viable	0	25	17
Lake Rotoroa	Total count	3	1	0
	Total viable seed	0	0	0
	% viable	0	0	0

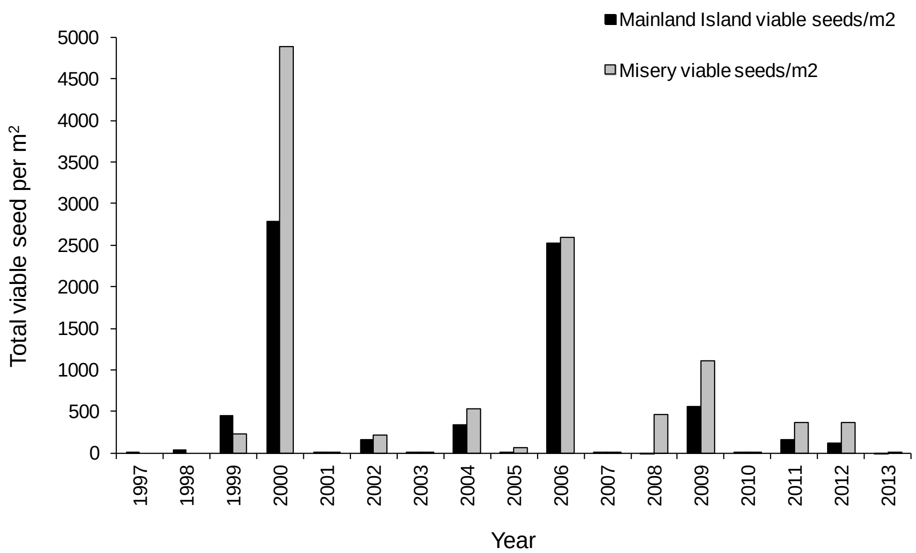

Figure 25. Total viable beech seed from the Mainland Island, Lake Rotoiti, and Mt Misery, Lake Rotoroa, in 1997–2013.

Discussion

There has been very little seed production at the sites the RNRP manages since 2009. However, it appears that the rodent population responded to the limited seedfall in the two previous seasons, as rat and mouse tracking remained elevated through to autumn 2012 (see section 3.1). Although the causal links between rodent abundance and beech seedfall in montane forest is well documented, the methods and timing that are required to truncate a rodent irruption when beech seed is present are not clear at present. Thus, continued research and long-term monitoring, such as is currently occurring at the Mainland Island, is required.

The cool summer that occurred in 2011/12 and warm summer in 2012/13 may suggest that a beech mast is likely in autumn 2014 (Kelly et al. 2013).

3.4.5 Tussock plot monitoring

Methods

The tussock monitoring that was historically carried out at Mt Misery was reinstated during the 2010 season to measure the flowering of mid-ribbed snow-tussock (*Chionochloa pallens*) and carpet grass (*C. australis*). The original method involved counting flowering stems within an 'arm sweep' of the old Department of Scientific and Industrial Research (DSIR) points; however, following advice on methodology, a new 20 × 20 m plot was permanently marked in 2012/13—although it was recommended that a count using the old method was also carried out to allow a comparative analysis (D. Kelly, University of Canterbury, pers. comm.). This is only the second season in which a comparison between the two methods has been made.

Results

No flowering was recorded for *C. pallens* using either of the two monitoring methods. The averages for *C. australis* were 0.19 inflorescences/m^2 using the new 'plot' method and 0.17 for the old 'arm sweep' method.

Discussion

In 2012/13, no flowering was observed on *C. pallens* plants in the Mainland Island or at Mt Misery. Although minimal *C. australis* flowering was noted during the February 2013 count, the two methods showed similar results. Further tussock surveys over the next few seasons and through at least one mast flowering will hopefully provide a more robust result.

3.5 Systematically record observations of previously unreported native and non-native organisms in the Mainland Island

3.5.1 Introduction

The systematic recording of previously unreported native and non-native organisms was a new objective identified in the RNRP Strategic Plan 2008–2013 (Brown & Gasson 2008). The intention of this objective is to maximise the learning from observations of species previously unknown to be present, regardless of whether or not these observations are part of an organised survey. Increased knowledge of the native species present in the Mainland Island is useful, and the detection of invasive plants or animals will inform management actions to protect biodiversity values.

3.5.2 Results

The repository for new information is the document: 'Flora and fauna of Lake Rotoiti Recovery Project' (docdm-172620). A pair of whio/blue duck (*Hymenolaimus malacorhynchos*) were seen repeatedly at Blue Lake, upper Sabine Valley, in 2013.

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

3.6.1 Introduction

The Mainland Island continues to be a place of learning for external researchers. On student conducted research with the Mainland Island in 2012/13.

3.6.2 Research conducted during 2012/13

One student carried out research for the RNRP this year:

Petr Jahn, Edinburgh Napier University, Scotland, completed research on home range and habitat selection of GSK in the Mainland Island in October 2012, the results of which have been accepted for publication in Notornis in 2013.

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

The analysis and communication of technical information about the effectiveness of management techniques is a key learning objective, which links 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 analyses and communications need to be distinguished from advocacy work, which is discussed in section 4.1.4 and includes brochures, newsletters and presentations that are targeted at non-technical groups. In addition, there is ongoing interest from the media in work by the RNRP, mainly focussing on the kiwi project.

3.7.2 Reports generated during 2012/13

No reports other than the Annual Report were produced this year.

3.7.3 Hui, workshops, presentations and media articles

Grant Harper gave presentations at the Sanctuaries Workshop in Taranaki in August 2012 and at the Tasman Regional Bio Forum on 2 November 2012. Several presentations were given to visiting groups, including university classes.

The Minister of Conservation, DOC Director-General and Green Party Spokesperson for Conservation visited the Mainland Island on 23 October to officially launch the A24 self-resetting trap trial.

There was some media interest in the RNRP this year, particularly around the self-resetting trap trial.

Media articles included:

3 November 2012—*Stuff* news website: 'War on predators takes big leap'

3 November 2012—*Marlborough Express*: 'Self resetting pest traps in National Park trial'

7 November 2012—*Nelson Mail*: 'Kiwi release results mixed'

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 National Park 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 to peruse the interpretive displays.

The FOR conservation volunteers are directly involved in the RNRP through their continued pest control, which supports the efforts of the project.

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 was formed in 2001 to support and enhance the work being carried out in the Mainland Island. To recognise and strengthen this partnership, a Management Agreement was signed on 3 March 2013. This agreement is based on the following management activity: 'In conjunction with the Nelson Lakes Area office—support the Rotoiti Nature Recovery Project; wider conservation projects within the Nelson Lakes Area; and pest control advocacy (by way of practical advice and education)'.

The group has approximately 50 active volunteers who maintain pest control trapping for mustelids, rodents, possums and wasps. The area over which they control pests has expanded over the years to now encompass a 5000-ha mustelid and possum trapping area adjacent to the Mainland Island, and a 300-ha rodent trapping area around St Arnaud village. Over the years, these volunteers have also been involved in species monitoring and reintroductions.

All active volunteers in this group are expected to stay up-to-date with the FOR group's activities and to attend at least two training meetings each year, to ensure that they remain trained in best practice techniques. The group contributed 316 workday equivalents (1 workday = 6 hours) in 2012/13.

FOR Supporters Group

This is the fourth year of operation of the FOR Supporters Group, who provide donations towards FOR and RNRP conservation work. Supporter funds received to June 2013 were $2190, compared with $2731 for the same period in 2011/12.

The options given to supporters in 2012/13 were:

- $20 membership ($220 received from 36 members)
- $30 Timber rat tunnels × 4 ($60 received from 2 members)
- $50 Sentinel™ kill possum traps × 4 (nil received)
- $75 DOC 200 stoat trap and box ($75 received from 1 member)
- $100 kea nest protection ($500 received from 5 members)
- General donation ($1335 received)

FOR wasp control

To assist locals with controlling wasp nests around St Arnaud village during summer, a small number of FOR members operate 'Wasp Busters'. The volunteers use the contact insecticide 'Permex'. Wasp control is also carried out in January–February along the Whisky Falls mustelid trap 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. In 2012/13, fortnightly checks were carried out throughout the year.

Due to continued and escalating interference from weka, which enjoy pulling the captures out of the rat traps, a solid timber tunnel design was tried this year, which has a 'weka-proof' clip on the wire mesh door end. None of these tunnels were opened by weka, so FOR have decided to gradually replace the existing coreflute tunnels with the solid timber tunnels.

Table 14. FOR rat trapping results for the past 6 seasons.

	RODENT CAPTURES	
YEAR	RATS	MICE
2007/08	112	422
2008/09	113	446
2009/10	116	4343
2010/11	148	523
2011/12	144	531
2012/13	115	2377

The number of rat captures in 2012/13 was lower than in the previous few years. However, the number of mouse captures was significantly higher than all previous years, with the exception of 2009/10 (Table 14). This year's bycatch included one hedgehog (for the first time since February 2005), one slug, two stoats, one weasel and three birds (one South Island robin, one sparrow *Passer domesticus* and one bellbird *Anthornis melanura*). The additional 41 traps on the Peninsula Nature Walk remained set for the whole year.

FOR lizard monitoring

Lizard monitoring was once again put on hold in the summer of 2012/13 to allow a student to use the pitfall traps to complete their research into the effect of introduced mammalian predators on indigenous skink populations.

4.1.3 Volunteers

This was the second year of a structured RNRP volunteer programme, which was promoted on the DOC website. Seven volunteers were inducted and experienced a wide range of field work within the Mainland Island under the supervision of RNRP staff. These volunteers comprised four New Zealanders and three international visitors. In 2011/12, the length of stay varied from a few days to a few weeks, whilst in 2012/13 six volunteers stayed for 2–4 weeks and one stayed for 6 weeks.

During January 2013, the RNRP also hosted a party of five Hotshots, who are the elite of professional wildfire-fighters in the USA—our summer is their off-season. They came to New Zealand as a group and travelled between Nelson/Marlborough DOC offices for 4 weeks, donating their labour in exchange for accommodation and food. We were lucky enough to get them on the end of chainsaws, clearing the new rat poisoning lines.

In total, RNRP volunteers worked the equivalent of 116 days this year.

4.1.4 Advocacy and education

RNRP guided walks, PowerPoint and other presentations

The most popular option during 2012/13 was again guided walks (Table 15), with most of these being provided to students staying at the Rotoiti Lodge Outdoor Education Centre as part of their school camp. The majority of these visiting schools or groups were 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 15. RNRP advocacy and education opportunities over the past 4 seasons.

YEAR	RNRP ADVOCACY WALKS AND TALKS	NO. OF PARTICIPANTS
2009/10	96	1814
2010/11	71	1593
2011/12	63	1529
2012/13	77	1705

Most walks are based around the Bellbird and/or Honeydew Walks, and usually start or finish at the Nelson Lakes Visitor Centre. A PowerPoint presentation is given in the evenings or is available as an option during inclement weather. This year, a new interactive style of indoor presentation was trialled at Rotoiti Lodge for the night-time slot with Year 9 and 10 students. This was very well received by teachers and students, and allowed for a more informal advocacy and education experience than the formal PowerPoint presentation.

Revive Rotoiti

One edition of the 6-monthly newsletter *Revive Rotoiti* was published: Spring 2012 (Issue 27). The autumn/winter edition (Issue 28) is planned for production later in 2013. 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 DOC website continues to be a central source of information 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 presented at the Murchison A&P Show (February 2013) and Antique and Classic Boat Show (March 2013).

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

Visitor services

The back-lit interpretive displays, which feature 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 the beech forest ecology and pest control challenges, and broaden the experience for visitors.

5. Discussion

This Annual Report has been completed as DOC is coming to the end of the most comprehensive restructuring it has experienced in many years, which brings with it a substantially different approach to achieving conservation gains for New Zealand. The principal change is the much greater focus on building relationships to assist each other in attaining conservation goals. For the RNRP, it will largely be a case of 'business as usual', as we have recently built relationships with several organisations that are helping to improve the biodiversity gains in the Mainland Island. The recent signing of an MOU with FOR is a sign of the strength of and mutual regard for the relationship that has burgeoned in recent years. In addition, new partnerships with the Kea Conservation Trust to improve kea nest success and Landcare Research for research on climate change and the biological control of wasps are two recent examples of other partnerships that are likely to produce tangible gains for the Mainland Island, DOC and the wider conservation community. The volunteer programme has also gone from strength to strength and has had mutual gains for both parties.

The initiation of the A24 self-resetting trap trial brings with it a change in the way that pest control will be carried out in the Mainland Island, although this is again a case of 'business as usual', as trialling new techniques and tools are a raison d'être of the Mainland Island. Indeed, the mixed success of rat control with bait stations and poison in recent years highlights the need to adjust techniques depending on the current ecological drivers of pest population growth and shows that one method does not fit all seasons.

Some of the most valuable outcomes of the RNRP are the long-term datasets of bird abundance, forest health and, in particular, pest abundance it produces. These are becoming of national importance, and so need to be maintained and continued, as they currently inform us about ecosystem functioning in the montane and alpine zones in both managed and unmanaged sites. It certainly appears that positive change is occurring after some 14 years of management, and the marked improvement in forest health shows that the hard work is beginning to pay off.

These gains provide the RNRP team with the impetus to embark on new projects, such as the kea nest protection project, which is supported by the Kea Conservation Trust and is likely to show results within the next few years. There are always risks involved when starting new projects, however, and the likely beech mast year in 2014 will provide a test of the various techniques and tools that have been fine-tuned since the inception of the RNRP. There will be some failures and some successes and, as usual, the RNRP will learn from both and pass that learning on.

6. Recommendations

- Produce a strategic plan for 2014–2019
- Maintain current partnerships with FOR, Kea Conservation Trust and iwi, and look to build new relationships
- Increase pest control in Big Bush to protect kākā and investigate possum control at the head of Lake Rotoiti
- Trial possum control directed by 100 × 100 m chew card grids and draft a possum ground control protocol from the results
- Build capacity for kea nest protection measures and support the Kea Conservation Trust work
- Implement a rat control plan, as suggested in section 3.1.2
- Undertake further wasp control trials to determine the optimum distance between bait stations and extend bait station lines to the head of Lake Rotoiti
- Investigate possible wasp mite infestation and support wasp mite research
- Continue to release kiwi from the West Coast and monitor their nest success in the Mainland Island
- Monitor scavenging rates in the A24 self-resetting trap trial
- Investigate possible cat control using Sentinel™ kill possum traps
- Continue with work on the newly discovered *P. Patulum* plants
- Investigate the feasibility of a 1080 operation for the Travers and/or Sabine River valleys for kea and whio protection

7. Acknowledgements

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

We would like to thank the temporary fieldworkers—Gareth Rapley, Jen Waite, Ruth Garland and Jo Joice; and the volunteers—Emma Bardsley (NZ), David Cook (NZ), Tony Doy (NZ), Matt Edwards (USA), Steve Edwards (UK), Oliver Kirsch (Ger.) and Gareth Rapley (NZ).

Other staff at Nelson Lakes Area Office also assisted the project on occasion, with shared logistics and costs, and occasional help in the field.

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

Members of the Technical Advisory Group and external advisors provided advice at various times during the year (see Appendix 4 for a list of members).

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Appendix 1

RNRP datasets

Datasets referred to within this report, and others that were maintained during the 2012/13 year, are listed below.

Introduced species

DATASET DESCRIPTION	DOC FILE NAME AND LOCATION	CONTACT PERSON
Wasp monitoring results	RNRP—Wasp Data 2013 DOCDM-1137144	Nik Joice (njoice@doc.govt.nz)
Possum captures	DOCDM-516760	Dan Chisnall (dchisnall@doc.govt.nz)
Possum monitoring results	Possum box files in bio room	Dan Chisnall (dchisnall@doc.govt.nz)
Mustelid captures	A24s: DOCDM-1047417 DOC200s/DOC250s: DOCDM-1022663	Jenny Long (jlong@doc.govt.nz)
RNRP Tracking Calculator 2012-13 Mustelid and rodent tracking tunnel results	Mustelid: DOCDM-1021180 Rodent: DOCDM-1002710	Nik Joice (njoice@doc.govt.nz)
Ungulate sightings	DOCDM-148952	Grant Harper (gharper@doc.govt.nz)

Native species

DATASET DESCRIPTION	DOC FILE NAME AND LOCATION	CONTACT PERSON
20 × 20 vegetation plots	Vegetation Plot ring binder in RNRP office	Nik Joice (njoice@doc.govt.nz)
Beech (*Fuscospora* spp. and *Lophozonia menziesii*) seedfall monitoring	RNRP Beech Seed Data: 2 DOCDM-60998	Nik Joice (njoice@doc.govt.nz)
Tussock monitoring data	RNRP Tussock Counts DOCDM-72336	Nik Joice (njoice@doc.govt.nz)
Mistletoe monitoring results	DOCDM-72306	Jennifer Waite (jwaite@doc.govt.nz)
Pittosporum patulum monitoring results	DOCDM-199798	Nik Joice (njoice@doc.govt.nz)
Powelliphanta monitoring results	DOCDM-546239	Nik Joice (njoice@doc.govt.nz)
Great spotted kiwi (*Apteryx australis*) monitoring	DOCDM-156428	Jennifer Waite (jwaite@doc.govt.nz)
RNRP Robin monitoring	DOCDM-459805	Grant Harper (gharper@doc.govt.nz)
Kākā (*Nestor meridionalis*) monitoring	DOCDM-171970	Jenny Long (jlong@doc.govt.nz)
Weka (*Gallirallus australis*) monitoring	DOCDM-833080	Jenny Long (jlong@doc.govt.nz)
Five-minute bird counts	5 minute bird count data DOCDM-769826	John Henderson (jmhenderson@doc.govt.nz)

Appendix 2

Publications generated

Jahn, P.; Harper, G.A.; Gilchrist J. 2013: Home range sharing in family units of great spotted kiwi (*Apteryx haastii*) at Nelson Lakes National Park. *Notornis 60*: 201–209.

Kavermann, M.J.; Paterson, A.; Ross, J. 2013: Sensitivity of audio-lured versus silent chew-track-cards and WaxTags to the presence of brushtail possums (*Trichosurus vulpecula*). *New Zealand Natural Sciences 38*: 1–8.

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Appendix 3

Research reports received

Nil

Appendix 4

Project management

Budget

Staff (Salary & wages):	$199,711
Operating:	$31,946
Total	**$231,657**

Staffing

Grant Harper, Nik Joice, John Henderson, Jenny Long, Jen Waite, Gareth Rapley, Jo Joice, Dave Rees, Ruth Garland, Dan Chisnall.

Technical Advisory Group

Kerry Brown, Craig Gillies, Grant Harper, Dave Rees, Alison Rothschild.

RNRP Advisors

Mick Clout, Graeme Elliott, Dave Kelly.