Rotoiti Nature Recovery Project Annual Report 2013-14

Nelson Lakes Mainland Island, Nelson Lakes National Park

J. Long, J. Waite, N. Joice and T. Grose

Department of Conservation
Te Papa Atawhai

Cover: Kea (*Nestor notabilis*) on the Travers Range. Photo: Darin Borcovsky

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Executive summary

The objectives of the Rotoiti Nature Recovery Project (RNRP) have altered following the implementation of the 2014-19 RNRP Strategic Plan (Harper & Brown, 2014). These new objectives retain the same fundamental aims as previous ones, but reflect changes that have occurred since the last Strategic Plan was published in 2008, such as the change in the Department of Conservation (DOC)'s strategic direction to one with an increased focus on fostering partnerships to achieve conservation goals.

Biodiversity restoration objectives

Restore and maintain populations of kea (*Nestor notabilis*), kākā (*Nestor meridionalis*), mistletoe (*Alepis flavida* and *Peraxilla* spp.), *Pittosporum patulum* and a *Powelliphanta* sp. snail

The kākā encounter rate this season was the highest recorded in the RNRP and could have been a result of heavy beech flowering triggering breeding activity. Two of four known nest trees that were monitored were observed being used by kākā for nesting, however both nests failed. The high mustelid tracking rate was concerning for kākā nesting and one monitored nest did indeed contain the remains of a female that likely died from stoat predation.

Three kea nests were protected this year, with two nests successfully fledging three chicks. The third failed as a result of stoat predation and a re-nesting attempt also failed. Five additional unprotected sites were monitored by the Kea Conservation Trust. Of these, only two were sites of nesting attempts, both of which failed, likely as a result of predation.

No monitoring of mistletoe or *Pittosporum patulum* took place this year. The *Powelliphanta* "Nelson Lakes" snail population in the alpine zone at the northern end of the St Arnaud Range that is monitored at five-yearly intervals was due for monitoring this year, but this did not take place and will be done in 2014/15 instead.

Establish and maintain populations of whio (*Hymenolaimus malacorhynchos*), great spotted kiwi (*Apteryx haastii*), rock wren (*Xenicus gilviventris*) and other native species

Two great spotted kiwi nests were monitored in 2013/14, both of which failed, with one likely a result of stoat predation. One subadult female from the Stockton Plateau was released within the RNRP and has successfully established a territory on the Snail ridge. The Operation Nest Egg™ (ONE) program has now finished, with four of the nine chicks introduced known to have died and the fates of another three unknown. Only one ONE chick is still being monitored.

No attempt at re-establishing populations of whio or rock wren has been made this season, but doing so remains a goal for the future.

Learning objectives

Test the effectiveness of control methods for stoats (*Mustela erminea*), rats (*Rattus* spp.), cats (*Felis catus*), possums (*Trichosurus vulpecula*), wasps (*Vespula* spp.) and other potential pest species in a beech forest and alpine ecosystem

The A24 trial was ended in April 2014 after the mustelid tracking rate breached the 15% threshold set at the start of the trial, reaching 19% in January 2014. The A24s were deactivated over the period April-July 2014 and DOC200 traps were reactivated. While the mustelid tracking rate was higher than desired within the RNRP area, it was still significantly lower than the rate at the Rotoroa non-treatment site at all times when both sites were measured.

The intensity of possum control was increased in 2013/14, with more traps installed on the northern boundary lines and in Big Bush. High catches continued on the southern lines showing reinvasion from the Travers Valley is considerable. High catches were also recorded in Big Bush, possibly as a result of TBfree NZ ceasing its control work adjacent to this area.

Less effort was invested in cat control in 2013/14 and fewer cats were caught. No cats were caught in raised-set Timms traps, only cage traps.

A ground-based rodent control operation using Pindone pellets presented in Philproof bait stations was carried out in September 2013/14. This operation only reduced the tracking rate of rats from 48% to 31%, not attaining the target rate of <5% despite the bait stations below 900m above sea level being refilled three weeks later. South Island robin nesting success was used as an outcome measure for rat control. Nesting success was 83%, with chicks fledging from five nests. Robin monitoring recorded a small increase in the number of pairs within the regular survey area but the density has remained the same over the last three seasons.

Wasp control trials investigating different bait station configurations and effective measures of wasp foraging were continued. Although all bait station configurations were successful, paired stations in a 400x100m grid reduced wasp numbers to slightly lower levels than single stations in a 400x50m grid. Monitoring of honey dew droplets showed a 78% increase in droplets after the operation which is much lower than in previous operations. Predicted high wasp numbers for this summer once again did not eventuate, and it appears that some unknown factor is limiting wasp numbers. Research into a newly-discovered wasp mite began at the end of this season.

There were twenty-three recreational and five professional ungulate hunting days carried out in the RNRP in 2013/14, during which three red deer (*Cervus elaphus scoticus*) were shot. Although ungulates within the mainland island appear to be low in number or have a very patchy distribution, deer continue to be seen by staff while working and ongoing control remains necessary to reduce the impact on rare plant species.

A boar (*Sus scrofa*) that had been scavenging possum carcasses from traps in the Travers Valley was caught in a pig trap and dispatched. Although pig rooting is observed in other areas within the RNRP, pig control continues to be of lower priority than other pest control work.

Maintain long-term datasets on bird abundance and forest health in response to ongoing management and predator population cycles

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

Beech seeding was monitored using seedfall trays and the shotgun sampling method. In 2013/14 there was a heavy mast of all three species present in the RNRP and the Lake Rotoroa non-treatment site. The widespread mast event in the South Island triggered a national response (Battle for our Birds) aiming to do large-scale aerial 1080 operations in the sites with the heaviest seedfall and highest rat densities. It remains to be seen whether the RNRP will qualify to be one of these sites.

Alpine tussock seeding was monitored, as in recent years, using two different monitoring methods to allow a reliable comparison of the methods to be made, with the aim of continuing only with the most effective one.

No vegetation plot monitoring was scheduled for 2013/14.

Record observations of previously unreported native and non-native species in the RNRP area

The only newly observed species this season was a mite that has been found on common wasp (*Vespula vulgaris*) queens. Further research is being carried out by Bob Brown of Landcare Research into this mite and whether it holds any potential for use as a biocontrol agent.

Facilitate research to improve our understanding of the ecology and management of beech forest, alpine and wetland ecosystems

Chris Niebuhr (University of Otago) has been collecting data in the RNRP for a PhD on avian malaria, and RNRP staff have assisted on occasion with fieldwork.

In June 2014 RNRP staff started collecting common wasp queens hosting a newly-discovered mite for research by Bob Brown (Landcare Research). RNRP staff have also collected a small number of beech tree scale insects for research by Jacqueline Beggs (Auckland University).

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

No technical documents/presentations other than this report were produced in 2013/14. However advocacy work was carried out, in some cases including reporting on technical subjects such as the use of self-resetting traps.

Community objectives

Foster relationships with likely partners to produce conservation gains within both the Mainland Island and the local area

Pre-existing partnerships have been maintained and developed with local iwi, the Friends of Rotoiti, the Kea Conservation Trust and the Rotoiti Lodge.

The recent treaty settlements for this area provide more ways for local iwi, particularly Ngāti Apa ki te Rā Tō, to build on their aspirations.

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

Revive Rotoiti was not produced during 2014, although DOC intends to keep on producing this targeted newsletter as an effective way to tell interested people and groups about the conservation achievements in the RNRP.

A range of public advocacy has continued through the year including a stall and talks at local events; walks and talks for primary and secondary schools; and presentations to a range of community groups.

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 Transformation and Threats Unit 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 5,000 ha on the western St Arnaud Range and southern Big Bush is now under sustained mustelid 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 5,000 ha. Trapping has historically been done using Fenn mkVI then DOC-series traps, however the RNRP was one of the sites involved in a national trial of self-resetting traps for landscape-scale pest control during 2012-2014, specifically testing use of the Goodnature Ltd A24 trap to target stoats. In the RNRP the A24s were not successful at controlling stoats below the target tracking rate and therefore the DOC-series traps were reinstated in 2014.

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 nine years, and nine wild-raised kiwi chicks are known to have fledged, despite their known vulnerability to mustelid predation. Over the last five years, GSK management has focused on using the Operation Nest Egg™ (ONE) operation to attempt to overcome the poor breeding success of GSK in the RNRP. However ONE has not proven to be particularly successful overall for GSK, with four of nine released ONE chicks known to have died and only one of the remaining five currently monitored. By contrast, all adults or experienced juveniles released have survived and remained within the RNRP protected area. The ONE programme has now ceased.

Kea (*Nestor notabilis*) nest protection was initiated in spring 2011 at three nest sites in partnership with the Kea Conservation Trust (KCT), one within the RNRP' intensive pest control area, two outside this area. With ongoing support from the KCT the number of nests and extent of protection around nests has been increased, with five nest sites currently protected and resources available to expand on this in coming years. Despite removing considerable numbers of pests not all protected nests are successful, especially those outside the RNRP/FOR trapped area. This demonstrates the benefits of landscape-scale pest control over and above localised nest protection.

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, particularly X-tinguish™. The spacing and configuration of bait stations and the development of effective monitoring methods have been the focus of RNRP research over recent years. However, the RNRP has also in late 2013/14 supported Landcare Research in its investigation into the potential of a newly-discovered wasp mite as a biocontrol agent, by collecting queens hosting the mite for analysis.

Rodent (rat *Rattus* spp. and mouse *Mus musculus*) control has had a chequered history in the Core Area of the Mainland Island. Initially, ground-based operations using 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 toxin operation in over four years was carried out in the spring of 2010, covering 600 ha of the Core Area using diphacinone in bait stations. Following initial success, successive operations were extended to cover almost 1000 ha. Over the past four years, these operations have 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 South Island 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, although trapping effort varies between years. Trials with Timms traps on raised sets are ongoing, with results so far suggesting cage traps are more effective despite the extra effort required. The trapping of possums (*Trichosurus vulpecula*) using Sentinel™ kill traps has continued, with intensification where necessary in response to changes in pest control on adjacent land performed by agencies other than DOC. Other pest species under management include red deer (*Cervus elaphus scoticus*), pigs (*Sus scrofa*) and hedgehogs (*Erinaceus europaeus*), for which a variety of techniques are used.

The response of browse-sensitive plants to pest control has also been monitored. Three species of beech mistletoe, (*Peraxilla colensoi*, *P. tetrapetala* and *Alepis flavida*), continue to respond positively to possum control with levels of possum browse decreasing and overall plant health increasing in the five-year period between the 2008 and 2013 surveys. However, the critically threatened understorey plant *Pittosporum patulum* is not responding to current management, probably due to it being preferentially browsed by red deer. Beech seedfall and *Chionochloa* tussock flowering are monitored as ecological drivers of rodent and subsequent mustelid population increases, and 20x20 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 and volunteers, students also conduct research in the Mainland Island. This adds to our understanding of the functioning of the alpine beech forest ecosystem and can inform changes to threatened species and pest control management. During 2013/14 Chris Niebuhr, a PhD student from the University of Otago studying the role avian malaria may be playing in native bird declines, carried out fieldwork in the Mainland Island with some support from RNRP staff.

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 partnerships. Maintaining and developing strong positive relationships with partners such as FOR, KCT and the local iwi are a fundamental focus of RNRP staff. Hundreds of days of work in support of the project over the past eighteen years have been undertaken by volunteers, including members of FOR, RNRP volunteers, Nelson Marlborough Institute of Technology Trainee Rangers, Hot Shots and Conservation Corp crews and the Over-50s tramping club. 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 twenty-five Ecological Restoration Sites in Australasia in 2008 (Brown & Gasson, 2008).

Following DOC's change in strategic direction in late 2013 to one with an increased focus on fostering partnerships to achieve conservation goals, a new RNRP Strategic Plan 2014-19 (Harper & Brown, 2014) was implemented in April 2014, replacing the previous RNRP Strategic Plan 2008-13 (Brown & Gasson, 2008). The objectives of the new plan retain the same fundamental aims as the previous one, but reflect the increased focus on creating and developing partnerships outside of DOC.

Although day-to-day work in the RNRP 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 RNRP Strategic Plan 2014-19 provides the planning framework and goals for the operation for the next five years and highlights three major themes composing the overall goal of the project, namely:

1. Increasing our knowledge of how to carry out ecological restoration nationally, while restoring local biodiversity and retaining the biodiversity gains achieved thus far
2. Advocating the value of ecological restoration to the public leading to increased public support
3. Create new, and develop existing, partnerships in order to achieve greater conservation goals

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

Additional information pertaining to this project, including datasets, advisors and project management details can be found in Appendices 1-2.

2. Biodiversity restoration objectives

2.1 Restore and maintain populations of kea (*Nestor notabilis*), South Island kākā (*Nestor meridionalis*), mistletoe (*Peraxilla* spp. and *Alepis flavida*), *Pittosporum patulum* and a *Powelliphanta* snail

2.1.1 Introduction

Kea, South Island kākā, three species of beech mistletoe, *Pittosporum patulum* and the carnivorous land snail *Powelliphanta* "Nelson Lakes" are seven threatened species identified in the RNRP strategic plan 2014-19 (Harper & Brown, 2014) as having been present at Rotoiti prior to the establishment of the RNRP. Although there are further threatened species in the RNRP that may benefit from pest control, these populations were specifically identified because all except the kea have had considerable effort put into the restoration of their populations within the RNRP since its inception.

Kea, the only truly alpine parrot in the world, were not included in previous strategic plans. This has now been changed due to the species forming an integral part of the South Island alpine ecosystem, and the fact that the status of kea was changed from 'naturally uncommon' to 'nationally endangered' in 2013 (Robertson et al. 2012). There has been evidence of a continuing slow decline in kea numbers in Nelson Lakes National Park (Steffens & Gasson 2009, Harper et al. 2011), with predation by the introduced brushtail possums (*Trichosurus vulpecula*) and stoats (*Mustela erminea*) on kea nestlings and incubating adults a primary threat. Localised stoat and possum control has therefore been put in place around nests that lie outside the RNRP's intensive pest control area, and other threats such as lead flashing and nails in DOC huts are being addressed.

The kākā is an endemic forest parrot which is threatened by predation. Stoats are the main predator of kākā, but all three introduced mustelids (stoats, ferrets and weasels) are targeted by mustelid control. Mustelid trapping has been shown to protect the local kākā population (Moorhouse et al. 2003), and 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 two-year trial of A24 self-resetting traps took place over 2012-2014, after which the DOC-series traps were reinstated. Feral cat control, although only carried out over a small area to date, may protect fledging kaka chicks which spend up to three days on the ground between emerging from their nest holes and flying. Other native bird species are likely to benefit from this predator control, particularly great spotted kiwi (*Apteryx haastii*) and New Zealand falcon (*Falco novaeseelandiae*), which nest on the ground.

The beech mistletoes, *P. patulum* and the snail *Powelliphanta* "Nelson Lakes" are all threatened as a result of predation by the brushtail possum. Possum numbers have been reduced and suppressed within the RNRP, mainly through a sustained trapping programme. As with mustelid control, possum control is considered to be effective at protecting these species and will continue for the foreseeable future.

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

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

2.1.2.1 RNRP mustelid control

Methods

The RNRP mustelid trap lines cover approximately 5,000 ha to the east and north of Lake Rotoiti. The aim of this trapping is to suppress mustelids to a tracking rate below 5%, the target that is considered to enable kākā and other native birds to breed successfully (Greene et al. 2004; Taylor et al. 2009). The FOR community group also maintains several trap lines in areas outside the RNRP, which act as a buffer (see *Friends of Rotoiti mustelid control*, section 2.1.2.2 below), helping minimise reinvasion.

Since the RNRP 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 two-year trial of self-resetting traps. The traps that were being tested at this site were 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 twenty-four times before needing to be serviced.

In 2012/13, the A24 traps were established along the existing 24 trap lines, replacing the DOC 200s (Fig. 1). There are a total of 907 traps spaced 100 m apart along these trap lines, 815 of which were A24s during 2013/14. The remaining 92 traps were DOC 250s, which are able to target the larger ferrets which A24s are not designed to kill.

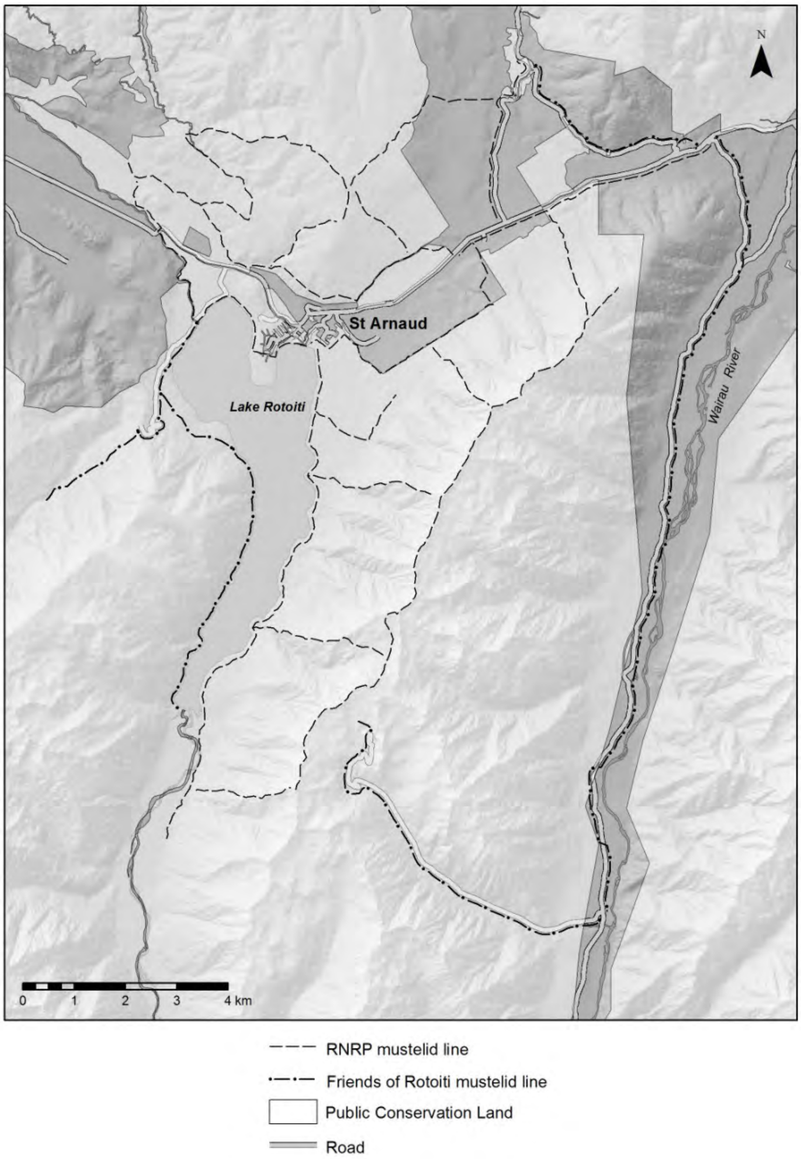


Figure 1. Location of the RNRP and FOR stoat trap lines in 2013/14

To prevent the accidental bycatch of weka and other native birds, the A24s were 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.

During 2013/14 the A24s were checked once in July 2014, and then at four-weekly intervals from August onwards through summer, when stoat numbers are highest and juveniles are dispersing. The final trap check for the A24 trial occurred in March, after which the A24s were deactivated over April-July 2015. The holes in the trapboxes were covered over with plywood and the metal mesh/wooden steps removed to allow the DOC 200s to be re-set.

The A24s were baited with rabbit-based Connovations Erayz #8™ (henceforth Erayz) during 2013/14, which was found to be an effective bait for mustelids in non-beech mast years by Steffens (2010). One piece of Erayz was placed in the A24 itself and another in the trap box. This second piece of Erayz was necessary because the A24s are designed to be mounted directly onto trees rather than fitted to trap boxes as they are in the RNRP, so a second piece was put in the closed-off section of the trapbox in order to ensure pests were attracted into the trapbox from where they could access the A24. In response to high tracking rates in February (see fig. 8, in *RNRP mustelid monitoring*, section 2.1.2.3), at the following trap check two pieces of fresh rabbit per trap were used in addition to Erayz as fresh rabbit is known to be very attractive to stoats (Pierce et al., 2007).

The DOC 250s are single set, and are baited with hen eggs year-round, with the addition of salted rabbit twice a year, once in winter and once in late summer/early autumn. They are enclosed in boxes similar to those of the DOC 200s. The DOC 250s are checked concurrently with the A24s.

The reactivated DOC 200s were baited with hen eggs.

Results

The A24s have successfully killed stoats, weasels, rats, mice, hedgehogs and one rabbit in the RNRP. During the two years of the trial, the only bird bycatch was one paradise shelduck (*Tadorna variegata*) duckling found dead inside a trapbox, the duckling too decomposed to determine the cause of death. One weta of unknown species was also found dead in a trapbox.

The number of animals that were found killed by A24s was <u>not</u> used as a means of assessing the traps' performance in this trial, due to the influence of scavenging on the number of kills seen at trap checks (refer to the *Discussion* section below). Instead mustelid tracking rates were used as an independent measure of mustelid activity (refer to *RNRP* *mustelid monitoring,* section 2.1.2.3). Nevertheless, numbers of found kills are listed in tables 1 and 2.

Table 1. Number of killed animals found under A24 traps in the RNRP during 2013/14. Note "unknown" refers to incidences of unidentifiable bloodstains/body remnants being found.

Species	Number found
Stoat (*Mustela erminea*)	43
Rat (*Rattus* sp.)	124
Mouse (*Mus musculus*)	42
Hedgehog (*Erinaceus europaeus*)	13
Rabbit (*Oryctolagus cuniculus*)	1
Paradise shelduck (*Tadorna variegata*)	1
Unknown	44

Table 2. Number of killed animals/sprung traps found in DOC250s and DOC200s in the RNRP during 2013/14.

Species	Number found
Stoat (*Mustela erminea*)	44
Ferret (*Mustela furo*)	1
Weasel (*Mustela nivalis*)	3
Rat (*Rattus* sp.)	178
Mouse (*Mus musculus*)	3
Hedgehog (*Erinaceus europaeus*)	85
Rabbit (*Oryctolagus cuniculus*)	17
Cat (*Felis catus*)	3
Sprung	33

Concerns that killed animals would become stuck in trap boxes and block the entrance to the A24s have been dispelled, with all but one having either 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 box at the same time; for example, a stoat and a mouse or two rats and a mouse. This suggests that retrofitting the A24s to trap boxes has not prevented the main benefit of these traps from being realised, namely their ability to kill multiple pests between services.

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

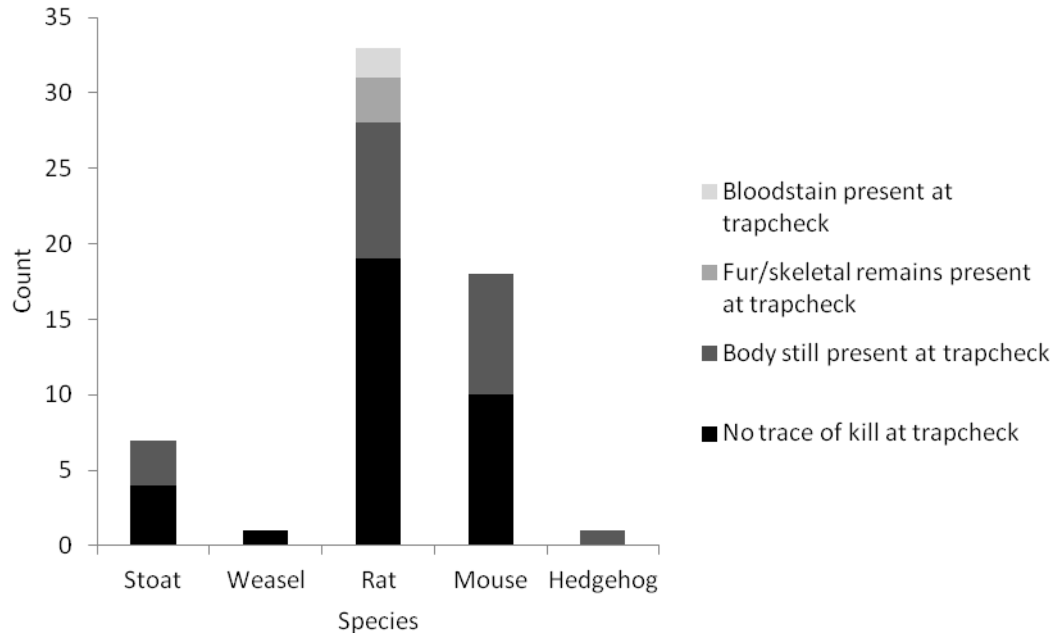


Figure 2. The fate of freshly killed animals in A24 self-resetting traps between the initial sighting and following trap check, by species (April 2013-February 2014).

The spatial distribution of known mustelid kills across the RNRP by season is shown in figures 3- 7.

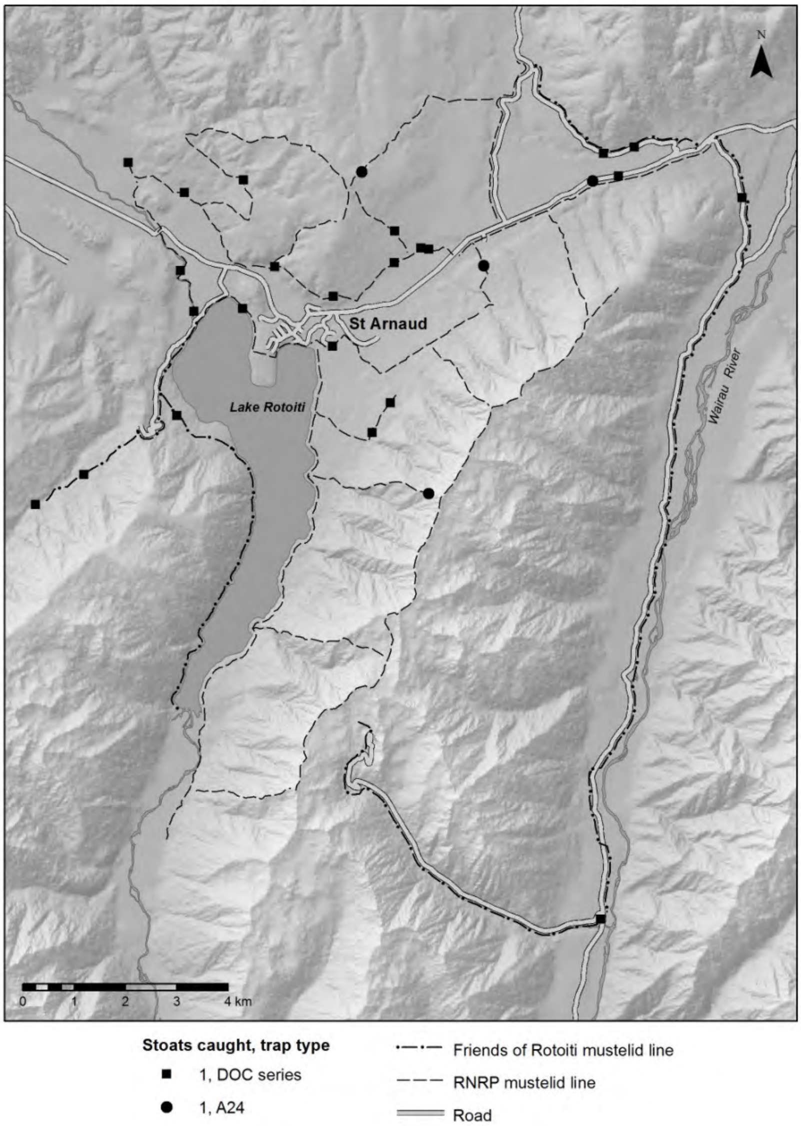


Figure 3. Stoat captures along the RNRP and FOR stoat trap lines during July-August 2013 and June 2014

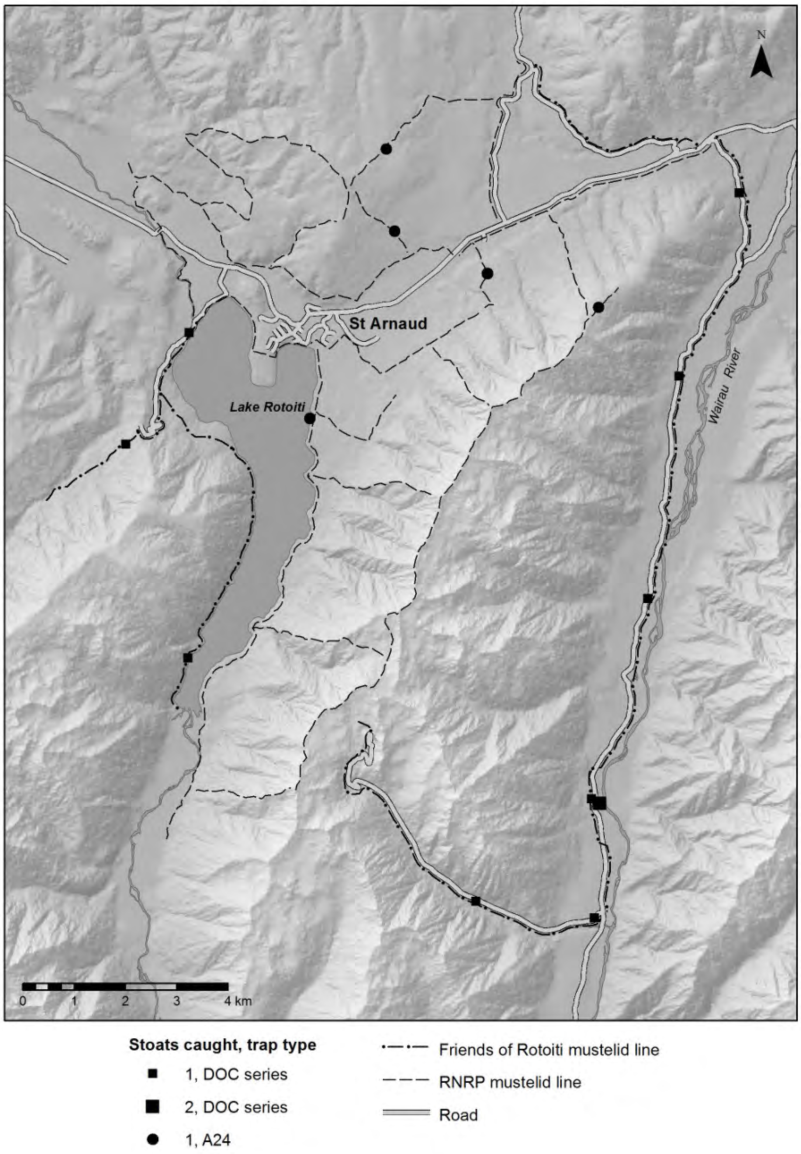


Figure 4. Stoat captures along the RNRP and FOR stoat trap lines during September - November 2013

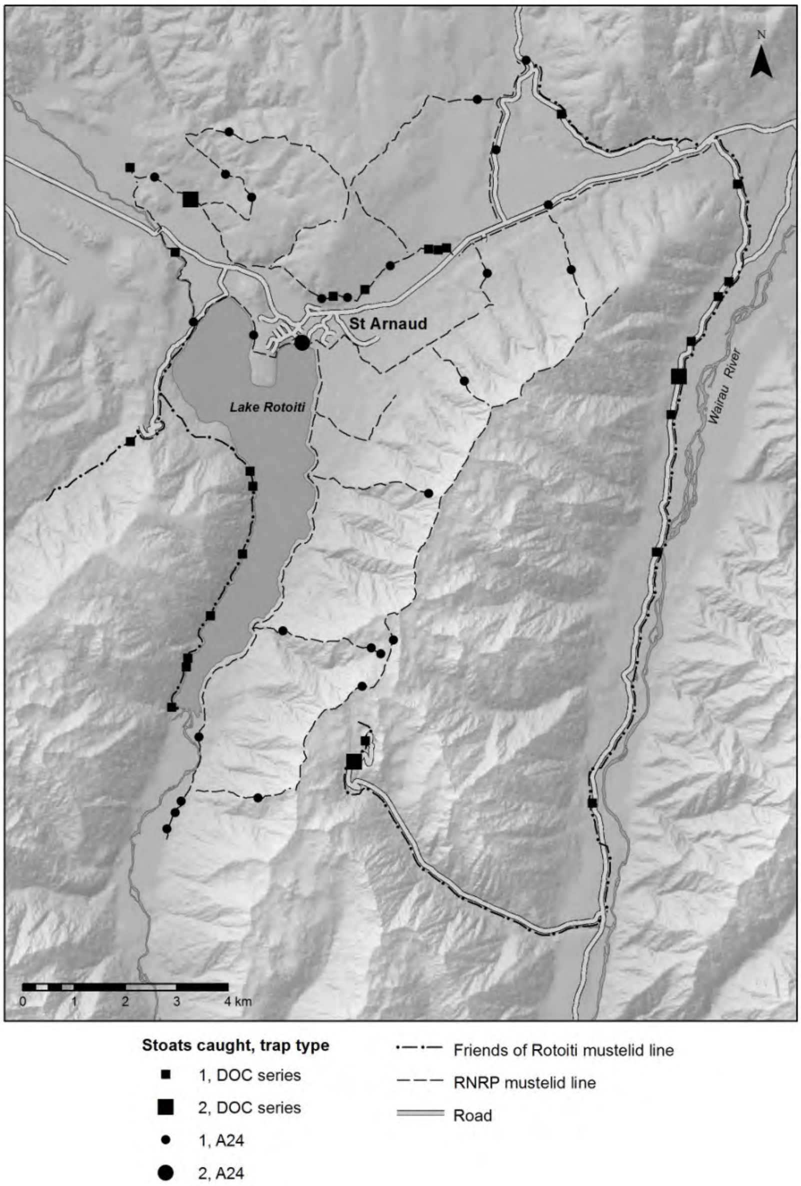
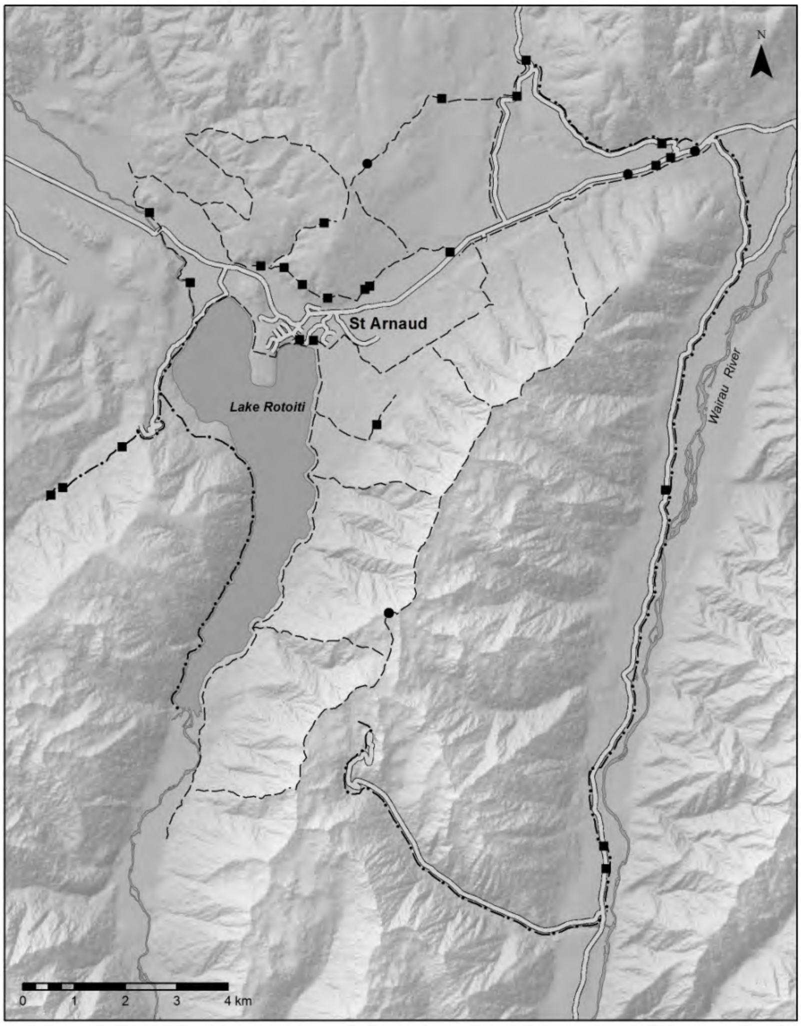


Figure 5. Stoat captures along the RNRP and FOR stoat trap lines during December 2013 -February 2014



Stoats caught, trap type
■ 1, DOC series
● 1, A24

Friends of Rotoiti mustelid line
RNRP mustelid line
Road

Figure 6. Stoat captures along the RNRP and FOR stoat trap lines during March – May 2014

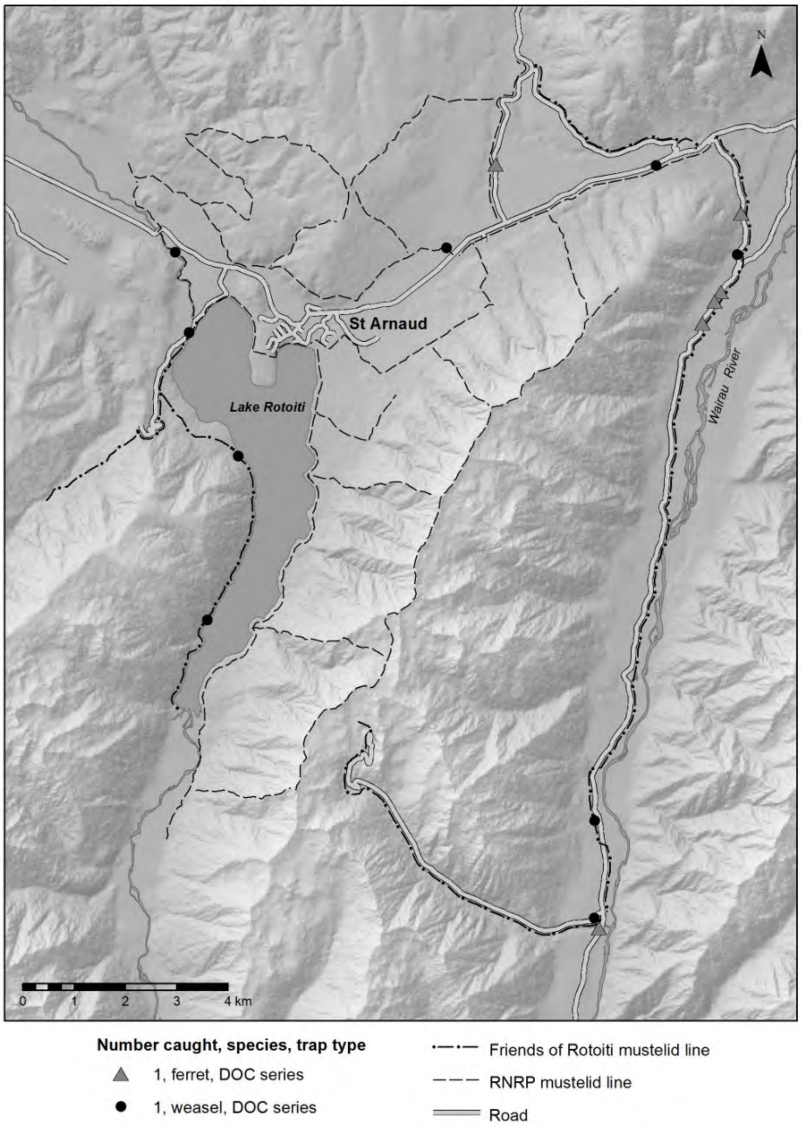


Figure 7. Weasel and ferret captures along the RNRP and FOR stoat trap lines during 2013/14

Discussion

The deployment of the A24 traps required a shift in the focus of methods used to assess the performance of the trapping regime away from analysing catch numbers to only using independent indices of predator numbers (e.g. tracking tunnels) and other forms of outcome monitoring (e.g. robin breeding success).

While finding dead animals under A24s was valuable confirmation that they were working as intended, there was ample anecdotal evidence that the figures shown in table 1 are underestimates of the number of animals that were actually killed by the A24s. Bloodstains/fur were often found in previously-clean boxes in which no body was present, and bodies/body parts were also found outside the trap boxes (up to five metres away), with no trace of any remains within the box to indicate that a kill had been made. Furthermore, this was not limited to rats and mice as mustelids have also been scavenged without trace or found outside trap boxes. The data suggests that over 50% of rat, mustelid and mouse kills may have been scavenged without leaving any trace (figure 2), whereas hedgehogs are less likely to leave no trace given their size and prickles.

Prior to the A24 trial commencing, DOC scientists and RNRP managers agreed that if the mustelid tracking rate reached 15% in February then the continuation of the trial would be reassessed. This threshold was breached in January 2014 (see *RNRP mustelid population monitoring*, section 2.1.2.3), but in February the rate was back below the 15% threshold, although still higher than the 5% target. This led to fresh rabbit being put through the A24s for the following trap check, and an additional round of tracking tunnel monitoring being done in March. Since the tracking rate in March was 20%, the A24s were deactivated and the DOC 200s reactivated. The deactivation process was completed by the end of July. Doing this, as opposed to immediately shutting down the A24s in January, ensured a robust scientific trial of the A24s while also aiming to provide time for reactivated DOC-series traps to reduce stoat numbers to an acceptable level again before the following breeding season.

Ultimately during the trial at this site the A24 traps were not able to control stoat populations at a landscape scale to an acceptable level. However it should be noted that there was not always a full complement of functional traps in the trap network due to mechanical faults in earlier trap versions, and that trap performance did appear to improve over time as the design was developed, although data from later versions of the traps is limited by the shorter time they spent deployed.

Further detail of the self-resetting trap trial results at the RNRP and other trial sites can be found in Gillies et al. (2014).

2.1.2.2 Friends of Rotoiti mustelid control

Methods

Mustelid trap lines have been maintained by the Friends of Rotoiti (FOR) as a buffer to the Mainland Island, with a total of 292 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 are put out in mid to late October to run through the summer months. (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).
  - In 2014 fortnightly checks were continued through the winter due to higher catch numbers.
- Mt Robert Line: 18 DOC 200s.
- Whisky Falls Line: 82 DOC 200s.
- Tophouse Road Line: 43 DOC 200s.
- Speargrass Line: 24 DOC 200s.

The Rainbow Ski Field, Mt Robert, Whisky Falls, Tophouse Road and Speargrass lines differ 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. The Rainbow Valley, Dip Flat and Six Mile trap lines are checked on the same frequency schedule as the RNRP.

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

A bait-less run-through trial was started in August 2013, to compare results from unbaited run-through traps with baited DOC 200 traps. The trial runs from trap numbers 1 – 153 on the Rainbow Valley trap line. In the first year even-numbered traps were run-through traps, and odd numbers baited until August 2014, when this was switched to reduce bias from the results. This 2 year trial will finish in August 2015.

Results

Mustelid captures along FOR trap lines are shown in Table 3, and non-target species caught as bycatch in the FOR mustelid traps are shown in table 4.

Table 3. Mustelid captures on the FOR mustelid trap lines in 2013/14.

Month	Stoats (*Mustela erminea*) caught	Weasels (*Mustela nivalis*) caught	Ferrets (*Mustela furo*) caught
Jul-13	2	0	0
Aug-13	6	0	0
Sep-13	4	0	0
Oct-13	2	3	0
Nov-13	5	1	0
Dec-13	1	1	0
Jan-14	15	0	0
Feb-14	5	0	0
Mar-14	0	0	3
Apr-14	2	0	1
May-14	5	1	1
Jun-14	0	0	0
Total	47	6	5

Table 4. Non-target captures on the FOR mustelid trap lines in 2013/14.

Species	Number caught
Hedgehogs (*Erinaceus europaeus*)	76
Rats (*Rattus* spp.)	320
Rabbits (*Oryctolagus cuniculus*)	29
Cats (*Felis catus*)	11
Mice (*Mus musculus*)	4
Birds (unidentified in further detail)	2

2.1.2.3 RNRP mustelid monitoring

Introduction

Mustelid monitoring is used to compare mustelid tracking rates between the Lake Rotoiti treatment site and the Lake Rotoroa non-treatment site. The Lake Rotoiti site includes the Mainland Island Core, Lakehead and Big Bush lines.

Methods

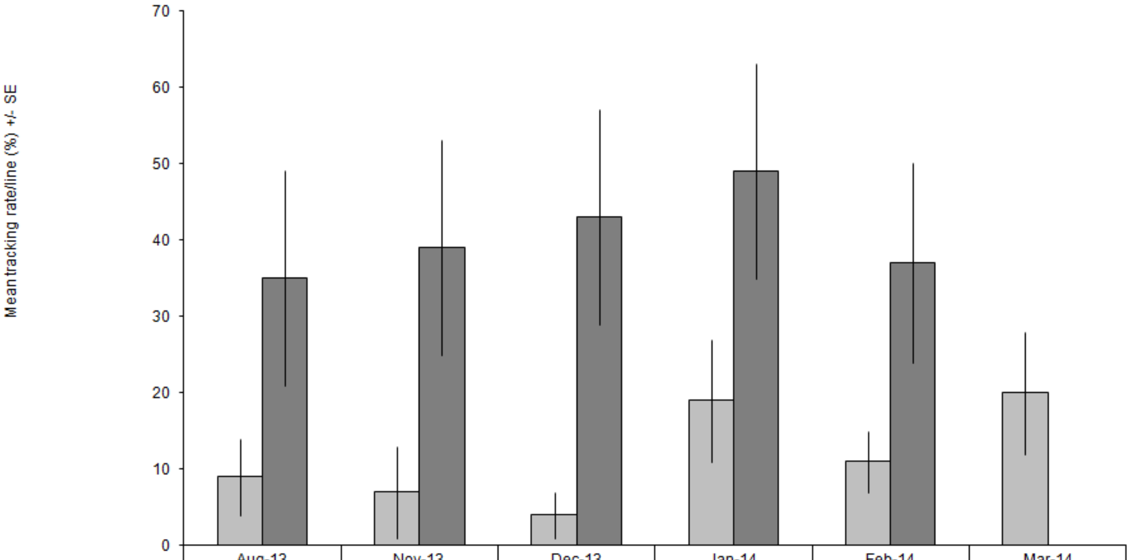
Mustelid monitoring is carried out using standard coreflute tracking tunnels with Black Trakka™ inked cards and rabbit meat bait, using the best practice method described by Gillies & Williams (2013).

During the self-resetting trap trial tracking tunnels were done more intensively in the RNRP than they were prior to the trial, in order to provide more detailed information about mustelid population dynamics (see *RNRP mustelid control*, section 2.1.2.1). Tracking tunnels were carried out in August 2013 and monthly from November 2013 to March 2014.

Results

Mustelid tracking rates at the Lake Rotoiti (treatment) and Lake Rotoroa (non-treatment) sites are shown in figure 8.

Mustelid tracking at Lake Rotoiti first breached the 15% threshold in January 2014, ultimately reaching a rate of 20% in March 2014. (See *RNRP mustelid control*, section 2.1.2.1 for more information about the threshold and the response to its breach). By comparison, the maximum mustelid tracking rate reached at Lake Rotoiti prior to the self-resetting trap trial since records began in 2002 was 8%. The 2013/14 maximum tracking rate at the Lake Rotoroa control site was 49% in January, whereas the maximum tracking rate reached at Rotoroa over the same pre-trial period was 73% in November 2007 (see figure 9). This suggests that the higher levels of mustelid tracking seen at Rotoiti in 2013/14 does not simply reflect an increase in mustelid activity in general, as the same increase is not seen at Rotoroa.



	Aug-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14
Lake Rotoiti (treatment)	9	7	4	19	11	20
Lake Rotoroa (non-treatment)	35	39	43	49	37	

Figure 8. Mustelid tracking rates in the RNRP Mainland Island in 2013/14.

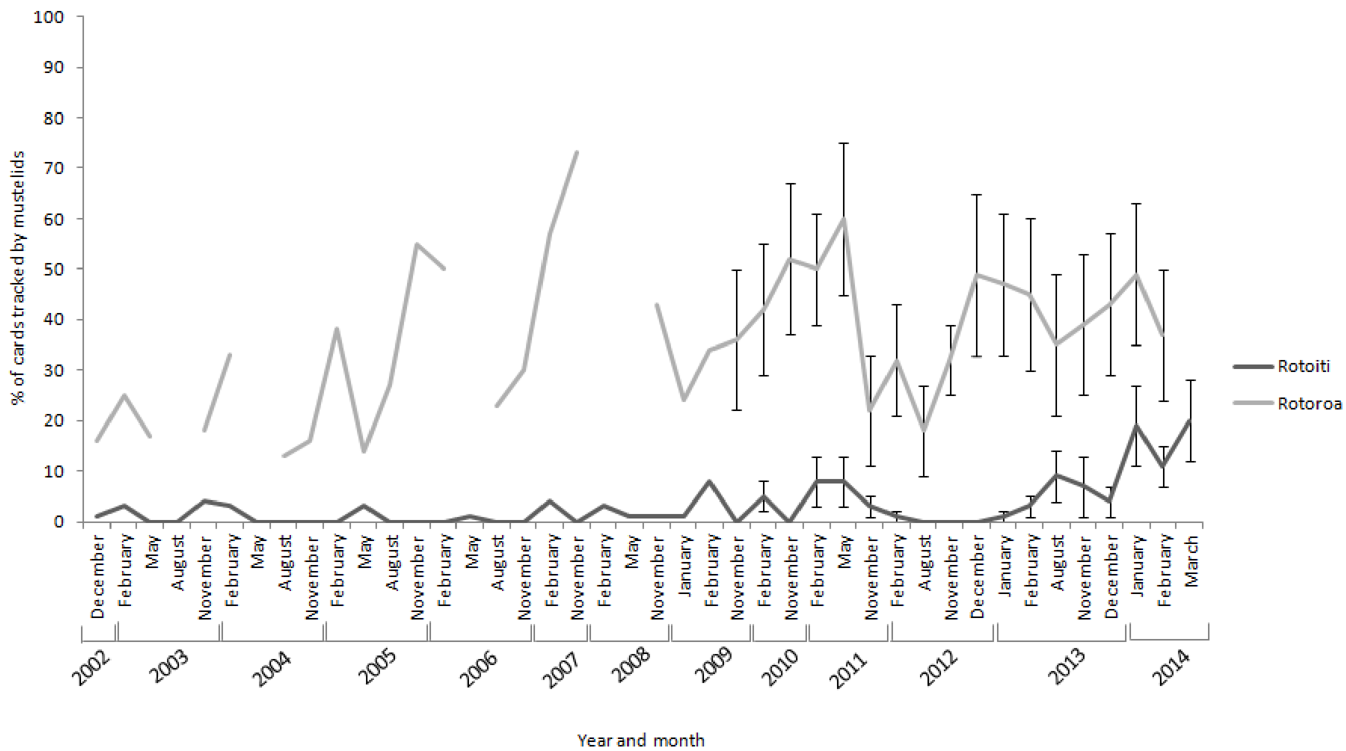


Figure 9. Mustelid tracking rate at the RNRP Rotoiti (treatment) and Rotoroa (control) sites between December 2002-March 2014.

Discussion

Considering the tracking rate at Lake Rotoiti was above the target of <5% (Greene et al. 2004; Taylor et al. 2009) in all monitoring instances during 2013/14 except for December 2013, it is probable that the mustelid control regime during the self-resetting trap trial was unable to provide adequate protection for breeding kākā and other forest birds.

Mustelid tracking at the Rotoiti treatment site remained significantly lower for any given month than at the Rotoroa non-treatment site, but this difference could be in part due to the different vegetation found at the lower altitude of Rotoroa (450m asl) compared to Rotoiti (617m asl) supporting higher densities of mustelids. However, in general there appeared to be a noticeable increase in tracking rates at Rotoiti during 2013/14 compared to the previous eleven years, whereas no such relative increase is seen at Rotoroa (Fig. 8). This suggests that the mustelid control regime at Rotoiti in 2013/14 has not been as effective as in previous years.

The self-resetting traps were deactivated during April-July 2014, with the pre-existing network of DOC 200 and DOC 250 traps fully reinstated by August 2014.

Further detail of the self-resetting trap trial at the RNRP and other trial sites can be found in Gillies et al. (2014).

2.1.3 Feral cat control

2.1.3.1 RNRP Feral cat control

Methods

In 2013/14, twenty Havahart™ cage traps were used to control feral cats in and around the RNRP. Cage trapping was undertaken from 31 March to 25 April 2014 in areas where cats had previously been trapped. Traps were baited with fish frames and were left open for a few days prior to being set 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 again deployed this season, theoretically to provide a continual, less-intensive trapping option, however as they ended up being checked daily along with the cage traps the potential savings in labour were not realised. 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. Traps were set on 31 March, rebaited two days later and again one week later, and after that they were checked daily along with the cage traps and rebaited weekly until the end of April.

The DOC-series traps on the mustelid trap lines also caught cats, although they were not the target. In addition to the standard hen's eggs, the DOC 250 traps were baited with salted rabbit once in winter 2013 and once in late summer/early autumn 2014.

Results

In total, eleven feral cats were removed from the Mainland Island this season across all methods (Fig. 10), which is fewer than in recent previous years.

Eight cats were caught using cage traps. Cage traps were visited 299 times in total, giving a catch per unit effort (CPUE) of one cat per 37.4 trap visits. Cage traps were open for 231 trap nights (# traps x # nights open), giving a catch per trap night (CPTN) of one cat per 28.9 trap nights.

No cats were captured in the raised-set Timms traps. These traps were visited 121 times in total, resulting in a CPUE of zero cats per 121 visits. The data available is not adequate to calculate the CPTN for the Timms traps.

Three cats were captured as non-target catch in the DOC-series traps. Two of these were caught with hen's eggs as bait, and one with Erayz #8 ™. No cat captures were recorded in the A24 self-resetting traps (which are not designed to target cats).

For the eight captures where age and sex were recorded (all cage captures), there were five juvenile females and three adult males. Six cats were tabby coloured and two were black.

No non-target species were caught by cage or Timms traps this year.

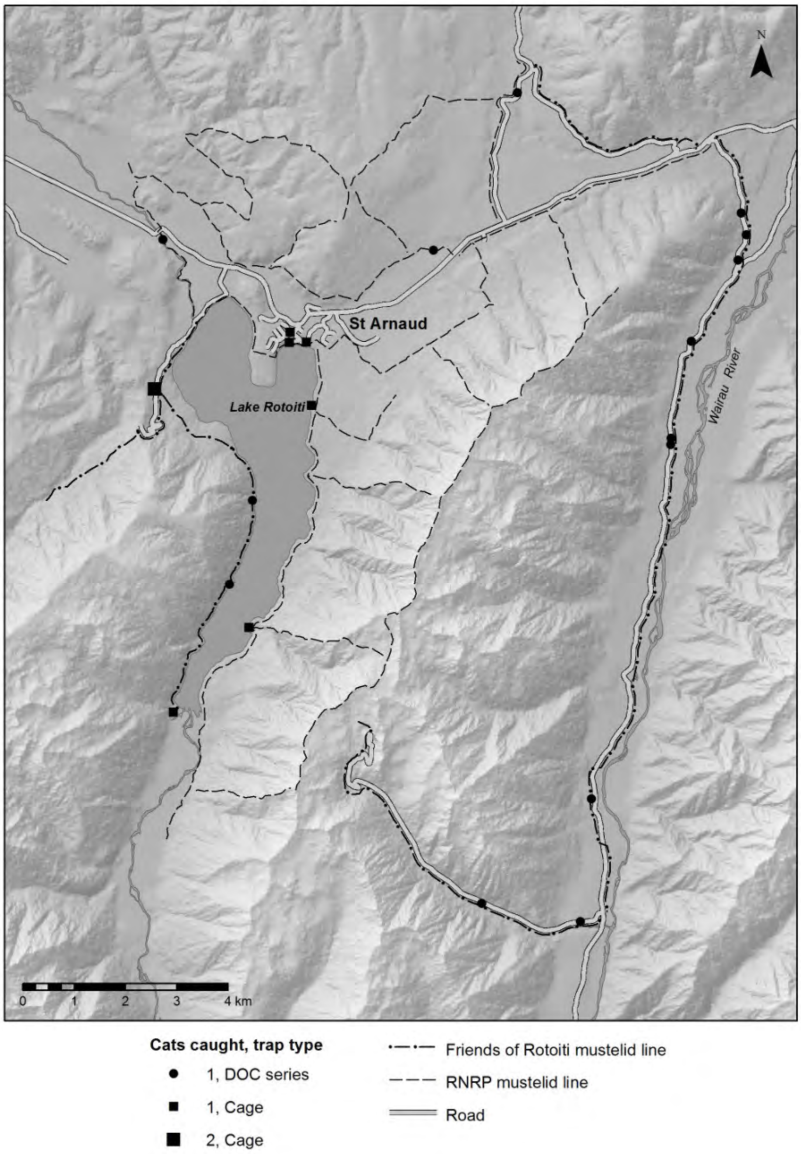


Figure 10. RNRP and DOC-series FOR feral cat captures in 2013/14.

Discussion

The effort put into cat trapping this season was less than in the 2012/13 season, in particular with respect to the Timms traps. Cage traps were visited 288 times in 2013/14 which is 96% of the effort in 2012/13 (301 visits), whereas Timms traps were visited 97 times in 2013/14 which is only 55% of the effort in 2012/13 (176 visits).

To compare trapping methods for cat control, CPUE should be used instead of, or in addition to, CPTN in order to provide a more informative comparison of effectiveness between cage traps and Timms traps, given that cage traps require daily checking whereas Timms kill traps do not. If the Timms traps provide equal success for a given amount of effort then they may still be a useful tool even if they do not catch as many cats as a cage trap would over the same number of trapnights.

In 2013/14 cage traps and Timms traps were run in conjunction, and as in 2012/13 this may have reduced the success rate of the Timms traps, as the neighbouring cage traps were easier to access. This year no effort was put into Timms traps once the cage traps had been closed which is when all Timms trap captures occurred in 2012/13.

The trial of cage and Timms traps should be continued in 2014/15. Detailed records should be kept of both trap visit effort by staff and the number of trapnights both types of trap are available, to allow a more robust comparison of the two methods.

The use of transmitters on cage traps enabling remote checking of the cages was not put into action this season due to lack of resources. However, this should be considered for the 2014/15 season, to attempt to combine the best points of both traps: the accessibility of cage traps and the lower effort required of Timms traps.

2.1.3.2 Friends of Rotoiti feral cat control

Methods
Cats are often caught as by-catch in FOR mustelid traps particularly on the Rainbow and Whisky traplines. Some volunteers also maintain their own live capture traps at points around the St Arnaud village. This data has not been formally collated.

Results
Cats caught as by-catch in FOR traps are shown in table 5.

Table 5. Cat captures on the FOR mustelid trap lines in 2013/14.

FOR stoat trapline	Number caught
Rainbow Valley	9
Whiskey	2
Total	11

2.1.4 Possum control and monitoring

2.1.4.1 RNRP possum control and monitoring

Methods

Possum kill trapping was maintained on the Hubcap, Snail, SARN, Grunt, MOR, Clearwater, Lakehead, Coldwater, Borlase, Black Valley Stream, Black Sheep Gully, Struth, Duckpond Stream, Dome Ridge and Dogleg trap lines.

Trap spacing along the Big Bush trap lines Black Valley Stream, Dogleg and Dome Ridge and along the northern boundary trap line Hubcap was reduced from 200 m to 100 m intervals in November 2013.

All traps were Sentinel™ kill traps that were lured with Connovation's Ferafeed Smooth in a Tube™ on the tree leading up to the trap and baited with Trappers Cyanide Ltd's Possum Dough™ on the bait clip attached to the trap.

Possum population monitoring was not undertaken during 2013/14, however chew cards were put out three times during September-November 2013 in Big Bush between the permanent trap lines. A line of traps was then deployed temporarily in places where evidence of possum activity was found, and relocated when no possums had been caught in the traps for several checks.

Results

Possum captures in 2012/13 were the highest recorded since the RNRP was initiated, with 596 possums killed (table 6), probably due to the increase in trapping effort – see *discussion* section below.

As in previous years, trap lines situated at the southern boundary of the Mainland Island caught the most possums, with the Lakehead and Coldwater lines up the Travers Valley and the Clearwater (southernmost spur line up to the top of the St Arnaud Range) recording the highest numbers of captures in total and per trap (table 6).

Table 6. RNRP Possum catch by trapline, 2013/14.

Trapline	Total possums caught	Possums caught per trap
Snail Boundary	2	0.1
Borlase Boundary	3	0.2
Black Valley Stream	5	0.3
St Arnaud Range North	1	0.3
Struth	3	0.3
Hubcap	8	0.3
Black Sheep Gully	6	0.4
Dome Ridge	27	0.6
Duckpond	6	0.6
Grunt Boundary	14	0.6
Dogleg	33	1.4
MOR	28	1.6
Clearwater	50	2.9
Lakehead	162	3.6
Coldwater	237	4.8
Moveable line	11	N/A (trap numbers varied)
Total	596	1.8

Discussion

The fact that possum captures in 2012/13 were the highest recorded since the RNRP was initiated, (596 possums killed, compared with 120 and 283 in 2011/12 and 2012/13, respectively) is probably to a large part due to the increase in trapping effort. However, accurately comparing the number of possums caught per trap between this year and previous ones is not possible, as the number and location of traps set as well as the frequency with which they are cleared and re-baited has varied between years.

The high possum catch on the Lakehead, Coldwater, and Clearwater trap lines indicates that there continues to be a high rate of reinvasion from the Travers Valley. These lines form the southern boundary of the RNRP possum control area (Fig. 11), and there has been no consistent possum control further up the valley.

Reasonably high numbers of possums per trap were also caught in Big Bush, an area where the RNRP had previously benefitted from adjacent TBfree NZ possum control operations. The Big Bush possum trap lines were set up in 2012/13 because TBfree NZ possum control had ceased since no tuberculosis had been detected in the area for some time. The ability of the current Big Bush possum trap network (including a moveable line of traps shifted regularly to where chew cards locate pockets of possums between the fixed lines) to keep possum numbers at a level that allows successful kākā breeding and forest regeneration will be assessed over the next few years, with a wax tag monitoring operation planned for 2014/15.

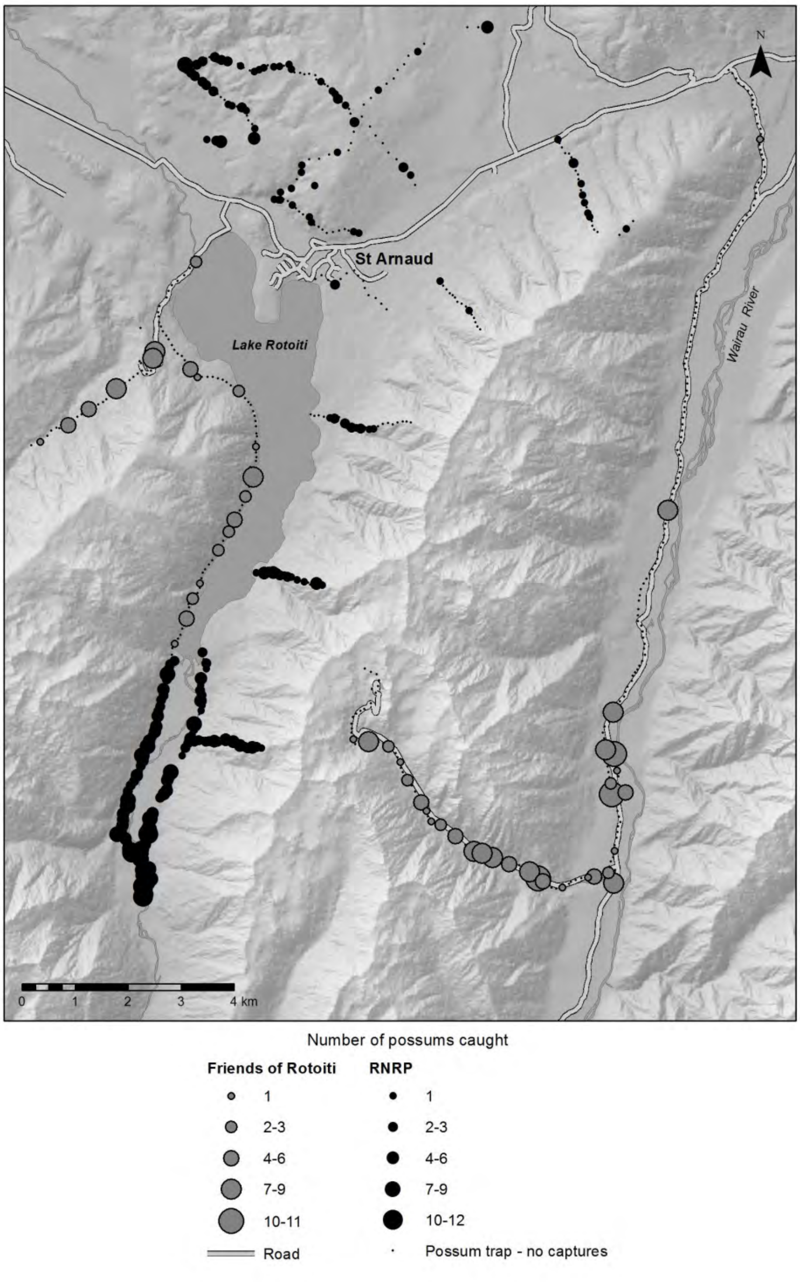


Figure 11. RNRP and FOR possum captures, 2013-14

2.1.4.2 Friends of Rotoiti possum control and monitoring

Methods

Friends of Rotoiti possum control started with Warrior kill traps in 2005, which were changed to Sentinels early in 2010. 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 until September 2013 when peanut butter began to be used. The aim of this bait change was an attempt to catch more possums and reduce browsing damage to rata along the western side of Lake Rotoiti on the Whisky line

Results

In 2013/14, 235 possums were caught, which is more than in 2012/13 (170). Trapping results are shown in table 7, and the spatial distribution of catches is shown in figure 11. The highest number of catches was in January 2014 (35).

Table 7. Possum captures on the FOR possum trap lines in 2013/14

Month	Number caught
Jul-13	5
Aug-13	13
Sep-13	3
Oct-13	16
Nov-13	27
Dec-13	34
Jan-14	37
Feb-14	21
Mar-14	17
Apr-14	17
May-14	25
Jun-14	20
Total	235

2.1.5 Deer control and monitoring

Methods

RNRP staff report deer sign and sightings on the St Arnaud Range whilst carrying out other project work. These reports 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 early November 2013, a contract hunter, Dave Wilson, hunted the RNRP with his dog.

Results

Dave Wilson shot one weaner and a yearling (was shot in the leg and would likely have died later from this injury). He saw an additional three hinds within the Mainland Island. Deer continue to be seen by staff while working, particularly within the Loop track area.

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 twenty-three recreational and five professional hunting days during 2013/14, during which three deer were shot. Dave Wilson 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 RNRP 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 very low to reduce the impact on rare plant species in particular.

2.1.6 Pig control and monitoring

Introduction

Regular pig control is not carried out in the RNRP, despite pig rooting being repeatedly observed. Pig rooting is particularly noticeable along Dome Ridge in Big Bush and just below bushline on the northernmost tip of the St Arnaud Range, as well as occasionally being seen elsewhere within the Mainland Island.

Recently there had been frequent scavenging of possum carcasses by pigs along the possum traplines up the Travers Valley. As well as using up funds replacing missing/damaged traps this also led to complaints from trampers that scavenged possum carcasses were being spread along the public walking tracks, creating a public health risk as well as an unpleasant visitor experience.

Methods

In response to the Travers Valley possum trapline scavenging, initially approximately eight hours of ground-based hunting with dogs was carried out by Dave Seelye (DOC ranger) and Scott Theobold (DOC TSO).

The lack of success of ground-based hunting led to the construction of a pig trap in January 2014. This was located close to a possum trap on the Lakehead trapline, at a site that was easily accessible by boat and a short walk to allow regular inspection.

A system was set up whereby the pig trap's open/closed status could be checked remotely, at first using a Sirtrack VHF Radio Marker with the activating magnet attached to the trap's door using fishing line, then later this system was replaced by a more reliable one using a mercury switch.

The trap was inspected and baited with fresh possums every time the Travers possum traplines were checked (approximately every three-four weeks), and the trap's status was checked remotely daily, with the trap being wired open when such checks were not possible.

Results

The small amount of ground-based hunting did not result in any pig captures, however one boar was caught in the trap in August and was shot. The trap was wired open at that point and scavenging of carcasses along the Travers Valley traplines has since ceased.

Discussion

If resources were available then regular pig control would be beneficial to the RNRP. However, given the limited resources available at present, pig control is not as high a priority as control of predators such as stoats, rats and possums, as these are considered to be a more pressing threat to the ecosystem.

2.1.7 Kākā (*Nestor meridionalis*) monitoring

Methods

Kākā encounter survey

The annual kākā encounter survey was conducted from the beginning of October 2013 through to the end of April 2014. The surveys are carried out concurrently with mustelid trap checks along the below-bushline sections of nineteen trap lines that traverse suitable kākā habitat.

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

Nest monitoring
This season John Henderson (DOC ranger) and Ron Moorhouse (DOC scientist) attempted to relocate old known nest sites within the Mainland Island for monitoring between December and March to determine the success of any kākā breeding activity in response to heavy beech flowering. Monitoring was done by climbing occupied trees and observing bird behaviour and nest contents in person.

Results

Kākā encounter survey
In 2013/14, 182 kākā were seen or heard over 369.6 hours, giving an encounter rate of 0.576 encounters per hour (table 8 and figure 12). No kākā were encountered on the Angler's Walk trap line as in previous seasons, and this season none were encountered along the Peninsula Nature Walk and Teetotal Road trap lines either.

Table 8. Kākā encounter rates on the RNRP trap lines (October 2013 – April 2014).

Trapline	Hours surveyed	Number of kākā		Encounter rate per hour (Seen and heard)
		Seen	Heard	
Angler's Walk	9.6	0	0	0.000
Borlase Boundary	26.3	0	7	0.266
Black Sheep Gully	25.3	3	6	0.355
Black Valley Stream	41.4	2	9	0.266
Cedar	13.3	1	15	1.203
Clearwater	16.8	3	9	0.716
Dogleg	19.5	1	11	0.615
Dome Ridge	23.1	1	31	1.388
Duckpond Stream	12.4	2	13	1.210
Grunt	11.5	1	15	1.389
German Village	10.3	2	8	0.974
Hubcap	18.8	4	8	0.639
Lake Edge	42.4	5	13	0.424
Lake Head	19.1	0	3	0.157
Middle of Road	16.0	2	10	0.750
Peninsula Nature Walk	18.9	0	0	0.000
Snail	11.5	5	14	1.650
Struth	8.9	2	7	1.013
Teetotal Road	24.6	0	0	0.000
Total	369.6	34	179	0.576

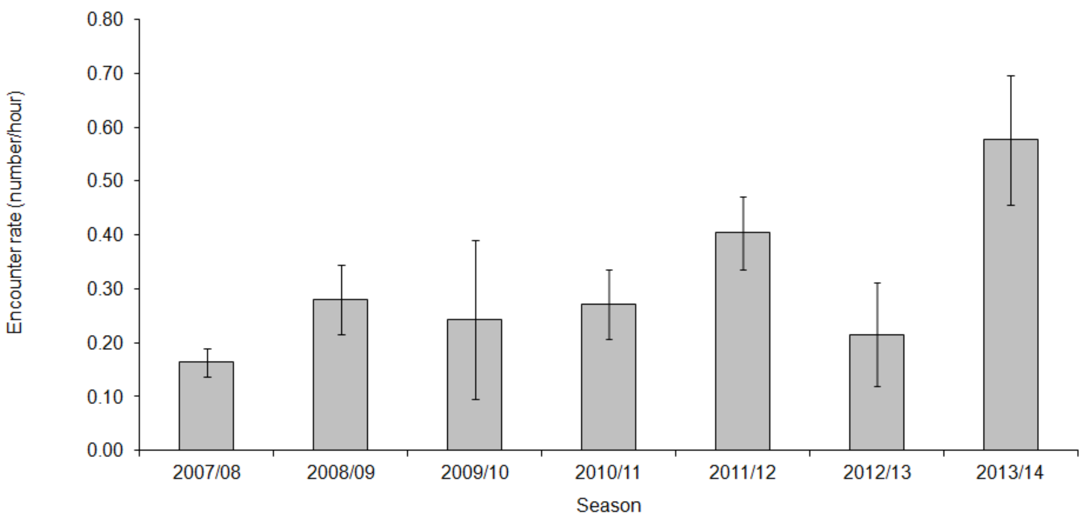


Figure 12. Mean (± SE) kākā encounter rates (number of birds seen/heard per hour) in the RNRP from 2007/08 to 2013/14.

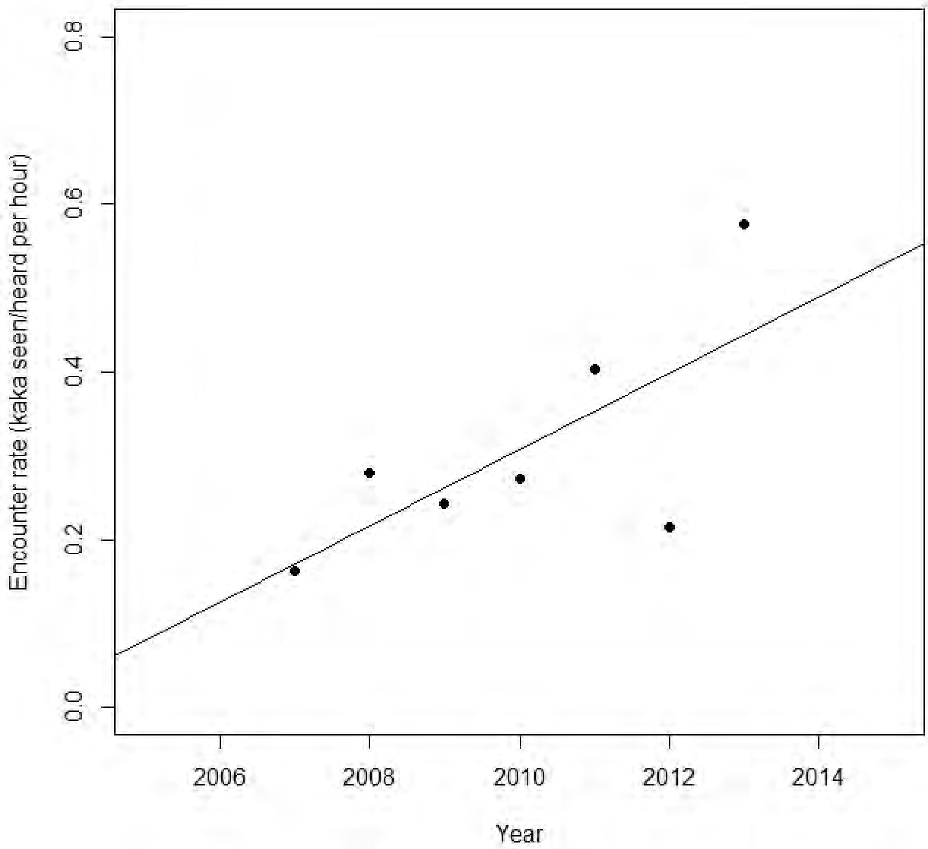


Figure 13. Kaka encounter rate against year within the RNRP from 2007/08 to 2013/14. Trend line indicates a non-significant (Pearson's test in programme R, p = 0.08) correlation of 0.7.

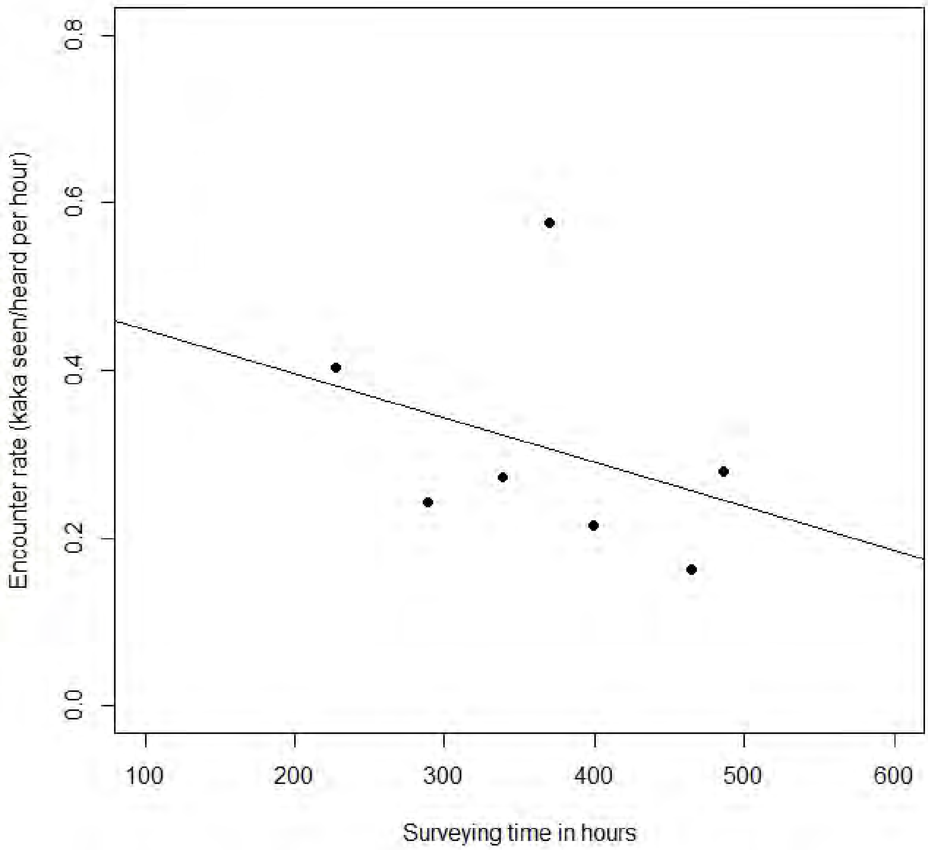


Figure 14. Kaka encounter rate against time spent surveying per year within the RNRP from 2007/08 to 2013/14. Trend line indicates a non-significant (Pearson's test in programme R, p = 0.4422) correlation of -0.35.

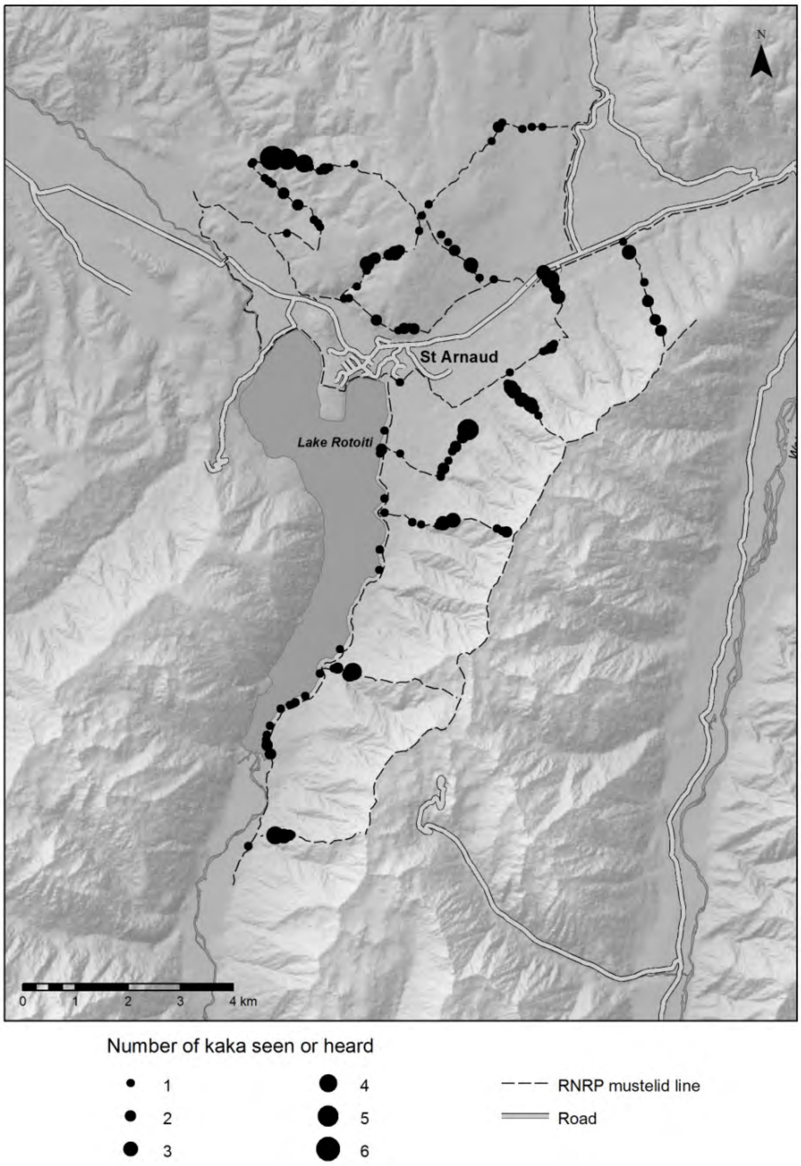


Figure 15. Locations of kākā encounters on RNRP traplines (October 2013 – April 2014).

Nest monitoring

Four known nest site trees were relocated although kākā activity was only observed at two of these, and a member of the public found a new active kākā nest.

One of the three nests with kākā activity was concluded to have failed in January, probably at the chick stage. The male (banded M/R) was observed entering the nest repeatedly in December, but in January the cavity was empty although both the male and the female (unbanded) were still in attendance. The nest had been used, and there was ample faecal material in it suggesting chicks had probably been present at some point.

The second nest had had kākā observed foraging close by, but on closer inspection in January and March it was found that there were cobwebs over the cavity entrance and the remains of an egg that looked like it had been preyed on or had failed to hatch. This egg was likely to have been from the previous season in 2012/13.

The third monitored nest was observed in March to contain the remains of an adult bird, presumed to be a nesting female, which had been killed during this 2013/14 season judging by the condition of the remains. The skull was missing, which could indicate stoat predation as decapitation is common in stoat-killed kākā (R. Moorhouse, *pers. comm.*, 2014). The body was sent to Craig Gillies (DOC scientist) for necropsy, whose examination suggested that feeding damage observed on the carcass was caused by a stoat (full necropsy report filed as DOC-2334234).

Discussion

The encounter rate in 2013/14 was considerably higher than in all the previous seasons since the surveys began in 2007/08, significantly so in all cases except in comparison with 2011/12.

This high encounter rate could be due to abundant beech flowering stimulating kākā breeding activity. Nest monitoring found evidence of breeding attempts, but no sign of successful fledging in the small sample. Alternatively, the elevated encounter rate could reflect an actual increase in the population size, however the positive correlation between year and encounter rate seen in figure 13 is not statistically significant (Pearson's test in programme R, $p = 0.08$) and there is not currently sufficient additional information to determine whether or not this is the case.

The signs of mustelid predation found during nest monitoring is of great concern, in particular the adult female found dead in a nest cavity, as predation of adult females is the type of mortality that does the most harm to kākā populations (Moorhouse et al. 2003). As discussed in sections 2.1.2.1 (*RNRP mustelid control*) and 2.1.2.3 (*RNRP mustelid monitoring*), mustelid tracking rates in 2013/14 imply that the mustelid control regime during the second year of the self-resetting trap trial was not able to control the mustelid population to the required degree to provide protection to the kākā population. As the trial has now ended, the pre-existing DOC-series trap network has been reinstated.

There will potentially be more intensive monitoring of kākā in the Mainland Island during and after the predicted rodent and stoat irruptions in 2014/15 following the beech mast.

In the previous 2012/13 report concerns were raised that the encounter rate survey method was inadequate for monitoring the RNRP kākā population due to variation in the survey effort between seasons and between habitat types for any given season. It was suggested that the relationship between the total time spent surveying and the final encounter rate should be monitored for any significant correlation as more data accumulated. When the latest data from 2013/14 is included there is no significant relationship between the total time spent surveying and the final encounter rate (Pearson's test in programme R, $p = 0.4422$), as seen in figure 14. Whether variation in survey effort between habitat types has had any influence has not yet been investigated.

At a Technical Advisory Group meeting the issue of survey methodology was discussed and it was decided that given previous research in Nelson Lakes concluded that keeping mustelid tracking rates below 5% resulted in adequate kākā nest protection (Taylor et al. 2009), the coarse data resulting from the minimal-effort surveys was adequate for longterm population monitoring, while more intensive monitoring could be considered for mast years. Therefore, the current kākā encounter survey method will continue to be used unchanged unless more resources become available.

2.1.8 Kea (*Nestor notabilis*) 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). Kea surveys and monitoring carried out by the Kea Conservation Trust (KCT) in the Lake Rotoiti/Raglan Range area in recent years provide evidence supporting a decline (J. Kemp (DOC) *pers. comm.,* in Harper et al. 2011.), and suggesting 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 (C. Mosen (KCT) *pers. comm.*).

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, in 2011/12 the RNRP embarked on a partnership with the KCT to set up nest protection in the form of stoat and possum traps around known active nests on the St Arnaud and Raglan ranges. The number of kea nests protected and the extent of protection provided to each nest has increased each year since then.

Methods

Three active kea nest sites were protected this year. One was on the MOR ridge which is within the area where year-round landscape-scale

RNRP stoat and possum control occurs, so no additional protection was set up around the nest.

A second nest near the Rainbow Skifield road on the St Arnaud Range had a network of twelve Sentinel™ kill traps and two A12 self-resetting traps targeting possums covering approximately 300x300m (9ha), as well as an existing line of DOC 200 traps targeting stoats along the Skifield road passing within 200m of the nest. The possum traps were set in August and checked/rebaited after two weeks, then three weeks later, then monthly until they were closed in mid-December.

The third nest, on the Raglan Range above Dip Flat, was protected by two new lines of DOC 200 traps spaced at 100m intervals up the ridges either side of the nest site ≤1.1 km apart, as well as a 300x600m (18ha) grid of twenty-one Sentinel™ traps. These traps were set in early September, then it was discovered that the nesting female had moved to a new nest site nearby. Consequently another nine DOC 200s were set up along the creek bed on the opposite side of the new nest site to the pre-existing stoat trap lines, and nine Sentinel™ traps were set up in a 200x200m (4ha) grid surrounding the new nest site. These traps were set in mid-September then checked three times in October and once in November before being closed when that nest's brood failed.

Corey Mosen from the KCT monitored these and five additional nest sites using trail cameras. Four of these additional nests were unprotected and the fifth one protected to some degree by a ring of four Sentinel™ and three DOC 200 traps set up and serviced by Corey.

Results

In total twenty-three possums, three rats and seventeen stoats were removed by the traps set up specifically for kea nest protection. Seven possums were removed from around the nest near the Rainbow Skifield road, nine possums and six stoats were caught around the northern Raglan Range nest site and seven possums, three rats and eleven stoats were removed from around the southern Raglan Range nest site.

One juvenile fledged from the nest on the MOR spur and two are thought to have fledged from the nest near the Rainbow Skifield road (these juveniles were observed developing over the nesting period but were not able to be caught and banded before fledging).

The nests on the Raglan range were unsuccessful. Despite eleven stoats being caught in a short period in the newly set-up traps around the new nest site, the brood disappeared and a stoat was observed on cameras monitoring the cavity. The female was located in another cavity within the trapped area later, but there was eggshell around the nest entrance so the renesting attempt failed as well.

Of the five additional nests monitored by Corey Mosen, two had no kea activity, a third had kea visiting regularly but no breeding attempt was made (possibly because there was a high level of stoat activity in the area) and a fourth had eggshell found outside the nest cavity but keas removed the cameras so there was no confirmation of either breeding or predation. Cameras monitoring the fifth nest showed regular kea activity as well as frequent stoat, possum and rat visitation. Nothing was caught in the traps around the nest. Eggshell was found outside the nest later in the season, so despite there being no camera footage of any predation activity the nest is considered to have failed, and predators continued to visit the cavity after the adult kea had stopped visiting.

Discussion

The successful fledging of up to three juveniles is encouraging, however the failure of other monitored broods suggests that trapping effort needs to be:

- implemented earlier to ensure early nesting activity is adequately protected (especially if high levels of predator activity deter kea from even attempting to nest, as suggested by Corey Mosen)
- expanded to protect a greater number of nests.

In 2014/15 traps should be set around all known recently-active nest sites in early July to attempt to remove predators before nesting activity begins, then once it is known which cavities are being used that season trapping effort can be focused solely on those particular sites.

Lead remains present in the Nelson Lakes area in the form of nails, flashing and the like on huts. Although the lead removal process from huts is underway, lead is such a major threat to kea (C. Mosen, *pers. comm.*) that more effort should be put into removing lead from the huts and skifield buildings where it remains.

2.1.9 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, locally-caught weka were monitored intensively between 2010 and 2012 by Akira Doura, a DOC Trainee Ranger, to establish adults' home ranges and monitor fledgling survival. Juvenile dispersal was not monitored beyond the limited information provided by sightings and the adults' transmitters were removed once no further home range information was forthcoming. Since 2012 weka monitoring has been minimal, limited to banding locally-caught birds and recording sightings.

Methods

Locally-caught birds were banded with metal and coloured leg bands, and sightings of all weka by DOC staff and the public were recorded.

Results

One pair of weka seen around the St Arnaud village very frequently (m/b ♀ and m/g ♂) successfully raised four known clutches with at least nine chicks surviving to juvenile age this season, of which two were caught and banded.

For the first time since weka monitoring began in 2010, banded adults other than the aforementioned pair have been seen with chicks. One female (m/lr) was seen by RNRP staff in the RNRP core area with a large unbanded juvenile. Another female (m/yr) was seen by a member of the public on Hill road in the St Arnaud village with another unbanded adult and two chicks.

No weka were seen in Big Bush this year.

Discussion

Since weka monitoring in the Mainland Island is currently limited to birds around the St Arnaud village being irregularly caught and banded, 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 still 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 trialling this technique at sites within the subalpine/alpine zone could also provide an indication of its value at higher altitudes for future studies.

2.1.10 Mistletoe monitoring

No mistletoe monitoring was scheduled to be undertaken this season. The next re-measure will be done during the 2015/16 season.

2.1.11 *Pittosporum patulum* monitoring

No *Pittosporum patulum* monitoring was scheduled to be undertaken this season. The next re-measure will be done during the 2015/16 season.

However, deer are likely to continue to be the main browser on juvenile plants. Although some deer were removed this year (see section 2.1.5 *Deer control*), the deer control effort within the Mainland Island should be increased. It is still planned to find and protect adult plants, and an intensive and directed search for these will be undertaken in 2014/15.

2.1.12 *Powelliphanta* sp. monitoring

Although *Powelliphanta* monitoring was due in 2013/14 as recommended in the RNRP *Powelliphanta* Monitoring Review (Gaze & Walker 2008), no such monitoring was carried out this season. *Powelliphanta* monitoring will instead be carried out in 2014/15.

2.2 Establish and maintain populations of whio (*Hymenolaimus malacorhynchos*), great spotted kiwi (*Apteryx haastii*), rock wren (*Xenicus gilviventris*) and other native species

2.2.1 Introduction

As of this date, only great spotted kiwi have been reintroduced to the RNRP, however similar reestablishments of whio, rock wren and other native species known to once have been present in the area remains a goal for the future.

2.2.2 Great Spotted Kiwi reintroduced population management

Introduction

Great spotted kiwi (GSK), 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 in two operations in 2004 and 2006. The reintroduced birds settled in well, however breeding activity has not been as high as expected and the population has been supplemented through Operation Nest Egg™ (ONE).

ONE 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. Chicks were reared at Willowbank and released into the Mainland Island once they had reached a healthy weight above 700g.

Additional ONE chicks have been moved from the Stockton mine area under an agreement relating to the 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 a holding pen (c. 200 m^2) and released after one week.

Methods

No ONE translocations took place in the 2013/14 season and the ONE program has now ceased.

The RNRP received one subadult female (Joy) from the Stockton mine site in northern Buller in October 2013, and it is likely that further releases of GSK of various ages from the Stockton Plateau will occur over the next few years.

Dogs remain one of the biggest direct threats to kiwi nationally. Signs at the main entrances to the National Park are maintained to remind visitors 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, appearing regularly in the local paper and at the Nelson Lakes Visitor Centre. Indirect threat management has also benefitted kiwi, principally through the control of stoats and cats which can prey on kiwi chicks.

Both ONE and wild kiwi chicks continue to be weighed and checked regularly and any mortality signals from transmitters are promptly investigated. Differences in survival between ONE and wild chicks has also been recorded to guide future management of the species.

Results

Of the nine ONE chicks that were introduced to the RNRP during the ONE program, four are known to have died. The whereabouts and survival of three are unknown. Of the remaining two; Hine kokoiti's transmitter failed in June 2013 but Turimawiwi is still monitored.

The sub-adult female Joy, after being released from a holding pen in October 2013, disappeared and could not be located. When her signal was picked up again in March 2014 she had moved to the northern end of the RNRP on Snail Ridge, and when caught in tussock on the tops was in poor health. In July 2014 when caught for a regular health check she was found on Snail Ridge again suggesting she has settled and was in very good condition.

Discussion

Over the past five 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 44% of ONE chicks released known to have died and only one of the remaining five currently monitored. By contrast, all adults or experienced juveniles released have survived and remained 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 2013/14, two transmittered pairs had breeding attempts and both nests were monitored using trail cameras.

Acoustic Bird Song Recorders are now being deployed into areas to try to locate missing birds within the RNRP and follow up on reports from the public in other areas. 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, along with the kiwi round-up using kiwi dogs to provide an index of population size.

Results

Breeding results

Motupipi (♂) and likely partner Waitapu (♀ , not transmittered):

> Early in October Motupipi's activity level indicated incubation. Two cameras were set up outside the nest monitoring the entrances to the burrow. Footage recorded both adults coming and going from the nest along with a chick from the 2012/13 breeding season. Camera footage suggests this nest was abandoned on December 6 with no subsequent visits recorded until the 16th when a kiwi was recorded entering the burrow but only stayed for twelve minutes. On December 10 a stoat was recorded entering the nest, however it is likely that at this stage the nest had already being abandoned for some time. A check found the nest empty and it is likely to have failed at the egg stage. When Motupipi was caught for a regular transmitter change in June 2014, only the chick from the 2012/13 season was present.

Onahau (♂) and unknown female (possibly Tai tapu):

> On 24 October Onahau's activity level indicated incubation. Two cameras were set up outside the nest, monitoring the entrances to the burrow. A stoat is first seen investigating the nest on January 18.
>
> On the evening of the 21st, footage showed a stoat making multiple attempts over an eight-minute period to enter the nest and being fought off from within by a kiwi. A stoat is then recorded visiting and freely entering the nest most days from the 22nd to 29th. A kiwi is seen leaving the nest and covering the entrance early (1 am) on the 22nd and is again seen at the nest on the 24th covering the entrance but neither time is it recorded re-entering the nest. Ten days later when the camera footage was

checked the remains of an egg were found stashed in a hole behind the burrow. Whether the egg was crushed in the fight and the nest then abandoned or the nest was lost to predation is unknown.

Annual health checks

In 2013/14, health checks were carried out on all birds with transmitters. All appeared healthy with no abnormalities or major weight losses. Four adults (3 ♂, , 1 ♀), one subadult, one ONE chick and one wild chick currently carry transmitters. Two birds, Onahau (♂) and Wild Chick 7 (♂ sub-adult), dropped transmitters this season. A further two transmitters also appear to have failed; Anatoki (♀) and Hine Kokoiti (ONE ♀).

Acoustic Recorders

Bird song recorders were deployed on Mt Misery at Lake Rotoroa in August (five recorders for four nights) and November (five recorders for eleven nights) 2013 after reports of kiwi calls being heard from Misery Hut by a researcher. No calls were recorded.

Discussion

The nesting by Motupipi for each of the past two years is encouraging, as this is only the second time nesting in consecutive years has been recorded in the RNRP. This suggests that productivity may be higher at some prime sites within the Mainland Island than previously recorded. 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 invaluable for monitoring breeding attempts. The loss of both nests within the RNRP to stoat predation shows the importance of predator control for protecting GSK. While adults are large enough to protect themselves from predators, eggs and young chicks will always be vulnerable to predation and must be protected if populations are to be self sufficient. Acoustic recorders will also provide a useful tool for monitoring GSK in the future. As so many of the kiwi within the RNRP are untransmittered, it is difficult to determine the size of the population. Future monitoring will need to focus on establishing the population size.

3. Learning objectives

3.1 Test the effectiveness of control methods for stoats, rats, cats, possums, wasps and other potential pest species in a beech forest and alpine ecosystem

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

Introduction

Three years of ground-based 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 ground-based 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 a ground-based toxin 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 theoretically all that was required to increase passerine abundance in the Core Area of the Mainland Island. This approach has been trialled since 2010 with varying degrees of success.

To assess the effectiveness of the rodent control operations, result monitoring in the form of rodent tracking tunnels (see section 3.1.1.2 *Rodent population monitoring*) and outcome monitoring in the form of South Island robin (*Petroica australis australis*) nesting success (see section 3.1.1.3 *South Island robin monitoring*) is undertaken. Beech seedfall, a key driver of rodent population trends in beech forest, is also monitored (see section 3.2.3 *Beech seedfall monitoring*).

3.1.1.1 Rodent control

Methods

A rat control operation was carried out in the Mainland Island in September 2013/14 to lower ship rat numbers prior to breeding by native passerines. Pindone pellets (toxic loading 0.5 g/kg) were placed loose in Philproof bait stations with a small amount of peanut butter placed on the entrance to the bait station. The operation included the Core, X and Y blocks, and the recently established Z block near the head of Lake Rotoiti, covering a total area of at least 867 ha - it may be larger, as this estimate does not take slope into account. This is close to the 1,000 ha deemed to be the minimum effective size for meaningful ground-based rat control.

The operation involved an initial fill of 300g of Pindone pellets into all stations. Three weeks later stations below 900m above sea level (ASL) were revisited and topped back up to 300g to provide a continuous supply of bait. Bait stations above 900m ASL were excluded, as tracking tunnel indices for rats indicate rat densities are low above this altitude, so less bait would be required. The initial bait application occurred over three days, and reloading over two. Any remaining bait was removed from bait stations approximately eleven weeks later.

Tracking tunnels were run to calculate rodent population indices prior to and after the operation, to determine its effectiveness (see section 3.1.1.2 *Rodent population monitoring*).

Results

In the September 2013 operation, something in the range of 33-40% (115-140 kg) of the ~350 kg of bait presented was taken. More accurate information on bait take than this is unavailable as the data has been misplaced.

Discussion

Despite 33-40% of the bait being consumed, the September 2013 operation only reduced the tracking rate of rats by approximately a third (see section 3.1.1.2, *Rodent population monitoring*) 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 2013 reduced the tracking rate from 48% to 31%, compared with little change in the non-treatment sites (see section 3.1.1.2, *Rodent population monitoring*). However, over the following summer rat abundance indices decreased in both the treatment and non-treatment sites in the RNRP, possibly as a result of high stoat tracking in all sites, before all tracking rates increased to similar levels in autumn.

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. one 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 was thought to have being the case in the failure of the 2012 operation. By refilling stations after three weeks in the 2013 operation it was thought that this would provide a supply of bait to rats that expanded their home ranges after the first round of baiting and might now encounter bait stations. While the 2013 operation was not successful it does not mean the theory is incorrect and future operations should continue to test this model by running the poison operation through various permutations of rat densities, toxin types and natural food availabilities.

It seems unlikely that the stainless steel baffles on the Philproof bait stations which were 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 rates suggest 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 toxin 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 six-month period prior to the operation (fig. 16). When rat tracking is above 15% in May, it is recommended ground-based toxin operations should continue to plan for two bait applications approximately three weeks apart. This timing is based on a rat taking one week to find a bait station, five days to die and three days for a neighbour to move into the vacant home range. The repeat operation probably only needs to take place below 900m ASL, as above this altitude rat numbers rarely reach high numbers. When rat tracking is 15% or less, a single operation should suffice.

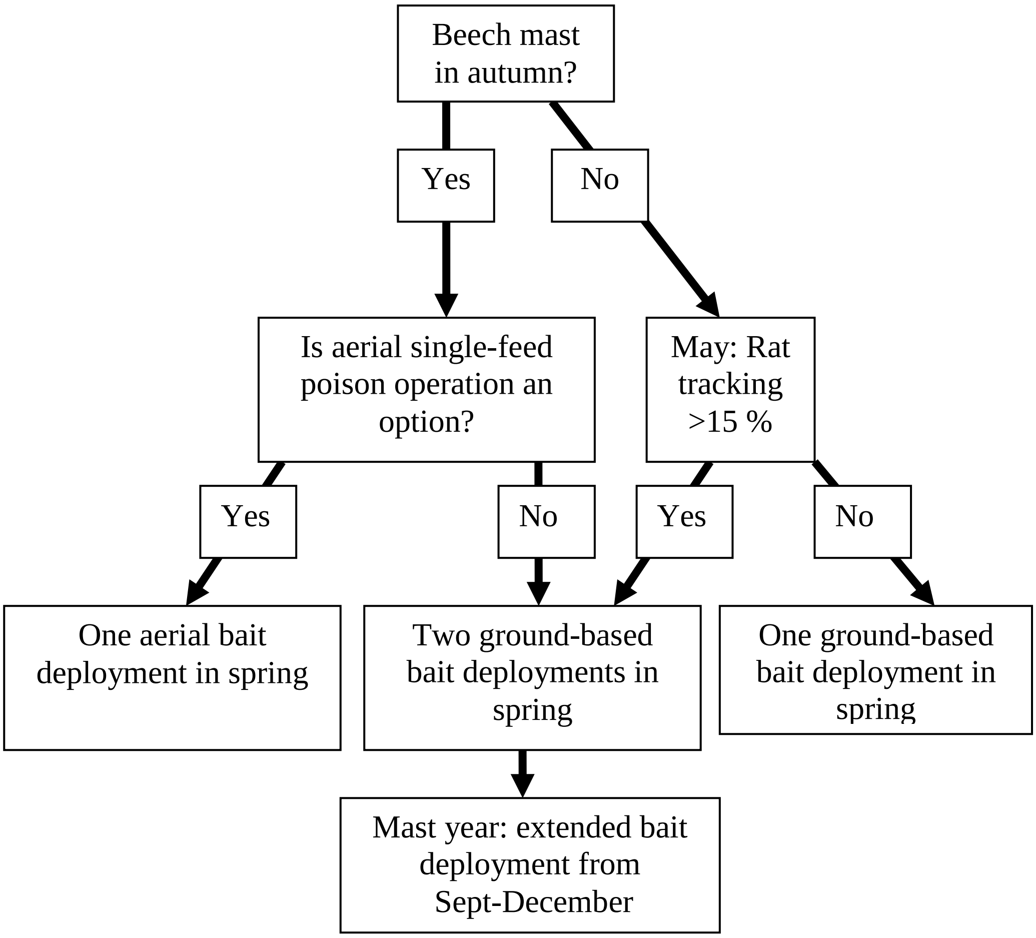


Figure 16. Flow chart for planning preliminary rodent control

When rat numbers are increasing during a beech mast, 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.

Future poison operations should also alternate the type of poison being deployed. Prior to this operation RatAbate™ had 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) which may have contributed to the failure of the 2012 operation. This was the main reason for the switch to Pindone pellets for the 2013 operation.

3.1.1.2 Rodent population monitoring

Methods

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

Rodent monitoring is carried out four times a year (August, November, February and May) 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 as per the method in Gillies & Williams (2013).

Results

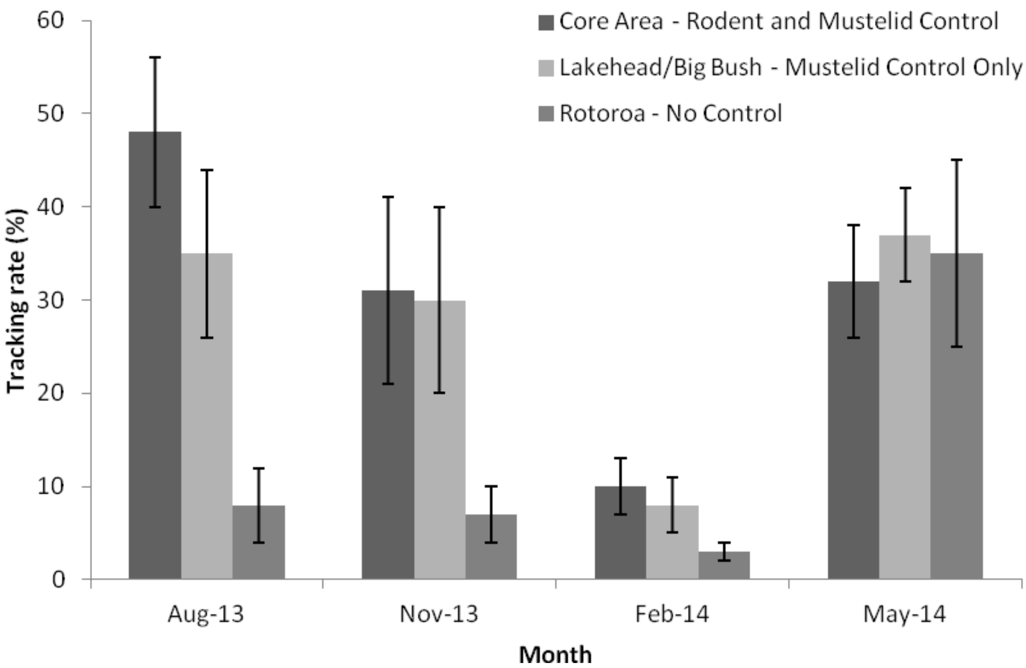


Figure 17. Mean (±SEM) rat tracking rates at Lake Rotoiti and Lake Rotoroa during 2013/14.

In August (prior to the rat control operation) rat tracking was at high levels in both areas with rat control (Core Area) and areas without rat control (Lakehead/Big Bush) but at low levels in the non-treatment area (Rotoroa) (fig 17.). After the 2013 spring rat control operation, rat tracking in the Core Area dropped from 48% to 31%, while there was a small decrease of five percent at Lakehead/Big Bush and no change at

Rotoroa. Tracking had decreased in all areas by February 2014 with the Cora Area dropping from 31% to 10% and Lakehead/Big Bush from 30% to 8%. By May tracking had increased in all sites and was at similar levels between 32 and 37%.

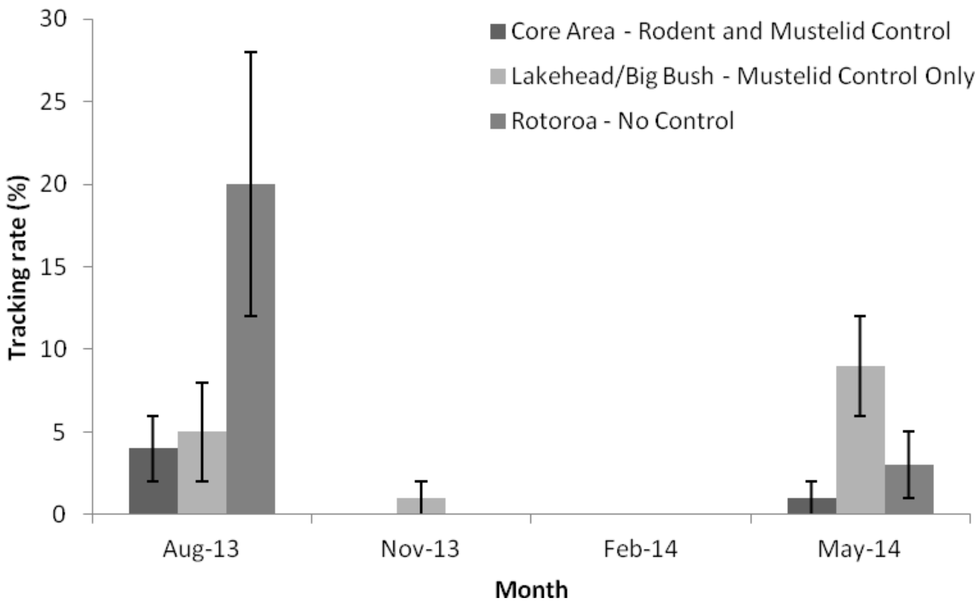


Figure 18. Mean (±SEM) mouse tracking rates at Lake Rotoiti and Lake Rotoroa during 2013/14.

In August (prior to the rat control operation), mouse tracking in the Core Area and Lakehead/Big Bush was lower than Lake Rotoroa (fig. 18). Following the 2013 spring rat control operation, mouse tracking decreased to undetectable levels in the Core Area, but it also decreased to this at Rotoroa and to one percent in Lakehead/Big Bush. In February 2014 mice were undetectable at all sites. By May, mouse tracking was still very low in the Core Area at two percent which was similar to Lakehead/Big Bush but lower than Rotoroa on eight percent.

Discussion

Based on the tracking tunnel results, the rat control operation in early September 2013 did not control the rat population within the Core Area. Although the tracking rate in the Core Area was reduced from 48 to 31 percent (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. Tracking decreased in February in both the Core Areas and Big Bush/Lakehead which corresponds to increased mustelid tracking at both sites. Tracking rates for rats remained low at Lake Rotoroa where stoats are not controlled. By May all sites had increased to similar high tracking rates. The rat operation can be considered to have had little effect on the rat population in the Core Area, the reasons for this failure are unclear but may be related to abundance of alternative food.

3.1.1.3 South Island robin monitoring

Introduction

The South Island robin (*Petroica australis australis*) is an endemic passerine which, although classified as not threatened (Robertson et al. 2012), 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 and unpaired robins in a defined area within the Core Area at the start of the breeding season. Each September, a survey is conducted four times at one-week intervals. Until 2007, the study area was approximately 120 ha. However, since so few robins were being located in years prior to 2007, the area was then expanded south of the Loop Track. The present study area (162.1 ha) is shown in figure 19.

Three staff were required for one day per week over four 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 one–two 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.

If an unbanded robin was sighted during the survey, subsequent attempts were made to capture and band the robin shortly after. When behaviour indicated that birds were nesting, their nest was located and monitored in order to determine fledging success.

Results

During the 2013 census, four pairs and one individual male were counted. The four pairs (♀ =unbanded, ♂ = GM-R; ♀ =unbanded, ♂ = YM-LB; ♀ = RM-LG, ♂ = YM-O; ♀ = unbanded, ♂ =unbanded) were seen at bait stations WD6, LG15, LF9 and LA8, respectively. One male (GM-Y) was observed at bait station WI2. Two adults were banded; the unbanded male at LA8 (LBM-DG) and an unbanded female at WD6 (LBM-W).

Six nesting attempts were recorded (fig. 19) with only one of these failing. One pair (LA8 ♀ = unbanded, ♂ =unbanded) made no nesting attempts despite being monitored until the end of January, while the other three made two attempts each. At least eight chicks fledged successfully but some chicks were likely lost. The first nest was found on 13 September, three chicks were banded on the nest but only two fledglings were found with parents (LBM-R, LBM-Y). A further two nests were found in September; at the first three chicks were banded on the nest but only one fledgling found with parents (LBM-YW). The second failed after reaching the chick stage, the cause of which was not determined. Three nests were found in November. One was checked and found to have two chicks both of which fledged. The other two were too high to check but two chicks fledged from one and one from the other.

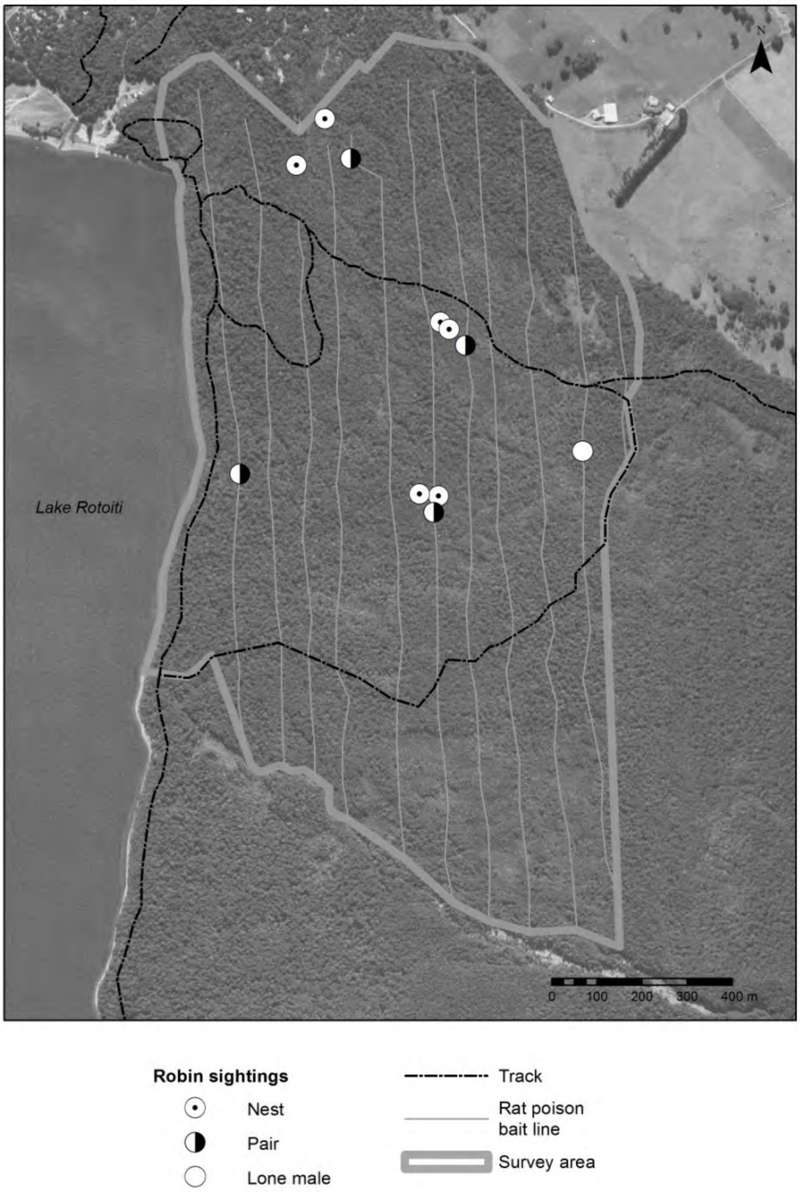


Figure 19. South Island robin locations within the RNRP survey area in 2013/14.

Since 1998, robin numbers within the Core Area of the Mainland Island have fluctuated. Since 1998 there has being an overall decline in both the density of robins and the number of pairs, although density seems to have stabilised over the last three years at 0.05 robins per ha (fig. 20). 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 one 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.

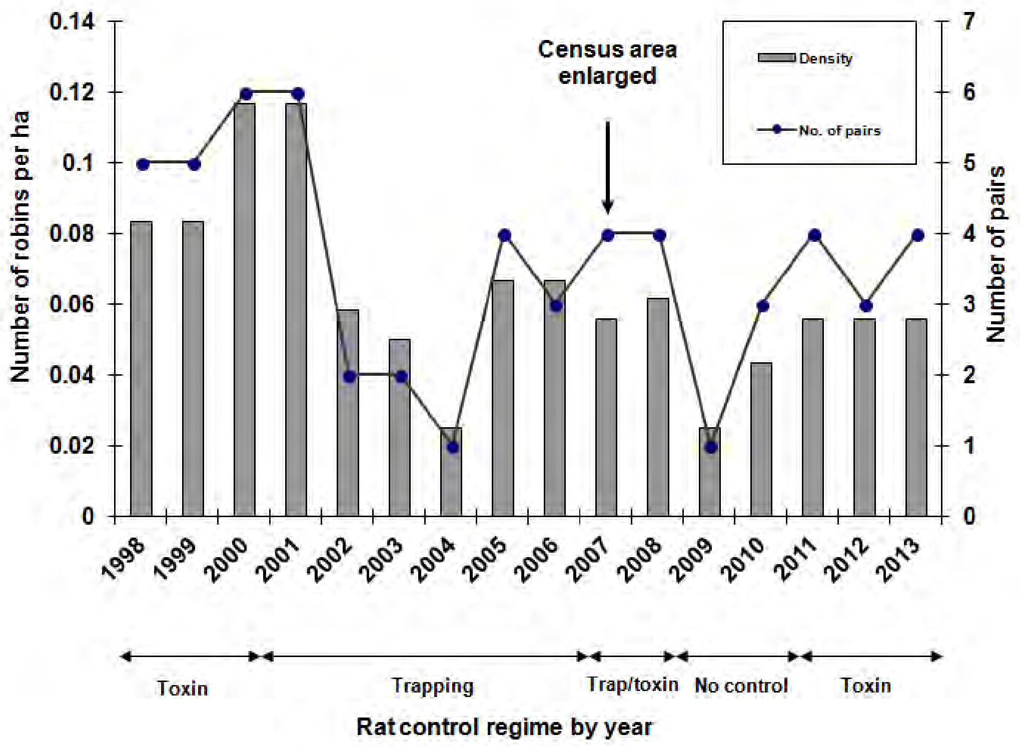


Figure 20. Robin density and number of pairs in the RNRP Core Area during differing rodent control regimes.

When rat tracking rates in August are compared to the number of nesting pairs found within the Core Area (fig. 21) it suggests that when tracking rates are high then the next breeding season there will generally be fewer breeding pairs found than in a year following low rat tracking.

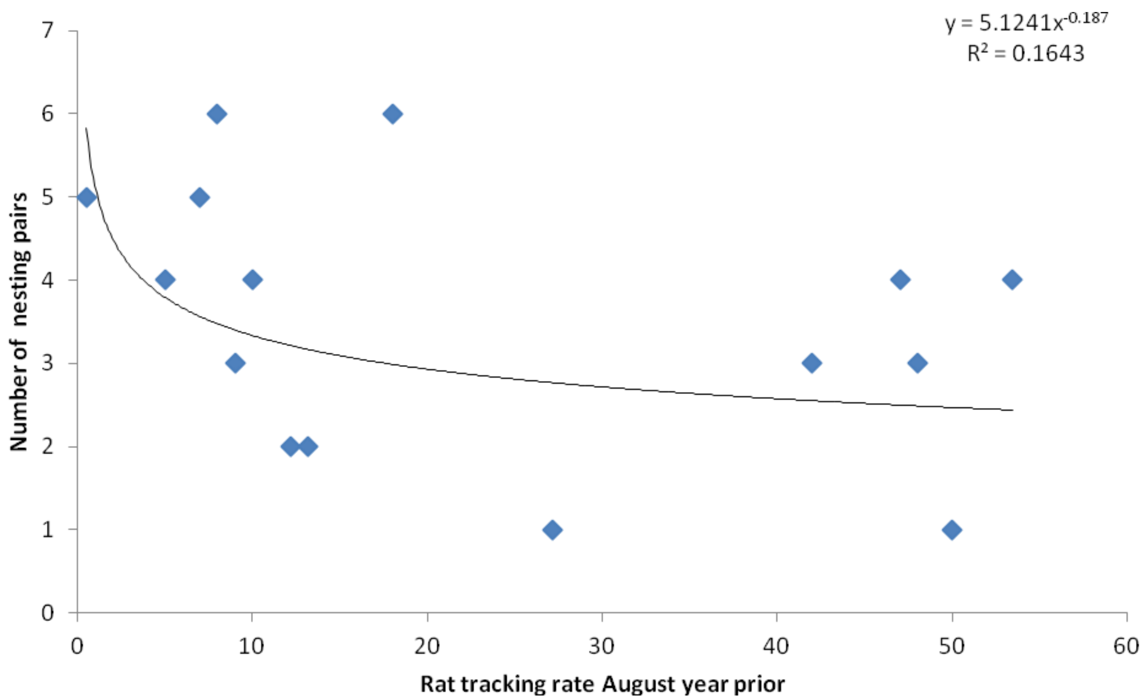


Figure 21. The relationship between rat abundance and the number of South Island robin pairs nesting in the following year.

Discussion

Although the rat control operation in September 2013 did not successfully reduce rats to the desired level, the number of breeding pairs of South Island robins increased by one pair this year and robin density remained unchanged at 0.05 robins per hectare (fig. 20). However this result is still lower than 2000 and 2001 seasons which had six pairs each and densities of 0.12 robins per hectare and highlights the need to control rats to low densities during the spring. 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 and reduce the number of pairs found (fig. 21). A male sex bias has consistently been reported in the RNRP, supporting this hypothesis. As rat control techniques are improved, it should be possible to keep rats below the desired 5% tracking during the robin breeding season. However, at this stage, the robin population continues to remain at a low density.

3.1.2 Test the effectiveness of wasp control tools

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.

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 Field Manual' (docdm-431791).

In 2013/14, the Core Area was divided into two grid arrays, one of which had single bait stations on a 300 x 50m grid, the other having single bait stations on a 400 x 50m grid. In Big Bush, the existing bait station grid that was set up in 2010/11 was used.

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 28 January 2013, which is around one month earlier than in 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 29 January. Only 20g of bait was placed in stations this season due to the perceived low wasp numbers. All uneaten bait was removed from bait stations two-three days later and weighed to determine the amount of bait take. For further information regarding the bait and bait station layout, refer to the 'RNRP Field Manual'.

Monitoring was only carried out in the Core Area in 2013/14. 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. one hour. This is similar to the method used to determine the trigger point for initiating the poison operation. Secondly, honeydew droplets inside a 100 × 100mm 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.

Results

On 23 January 2014 (i.e. prior to the operation), an average of 2.6 wasps were observed on non-toxic baits. Since this was above the one wasp per bait threshold, the poison operation was initiated.

In total, 21.4 kg of toxic bait was deployed this season and 14.8 kg (69%) of this was removed by wasps. Bait take was higher in the Big Bush grid (76%) than in the Core Area / village (66%).

After one week, the operation achieved an 93.4% overall reduction in flight counts of marked nests inside the two grid arrays in the Core Area. The 400 × 50 m grid reduced flight counts by 90%, while the 300 × 50 m grid reduced flight counts by 96%.

Overall, there was a 93% reduction in the wasp foraging index for the combined grids. The foraging index was reduced from 3.0 to 0.2 wasps per non-toxic bait in the 400 × 50m grid (equivalent to an 92% reduction). There was a 95% reduction from 1.6 to 0.09 wasps per bait in the 300 × 50m grid.

Overall, honeydew droplets increased by 78.1% for the combined grids in the Core Area. Post-operation levels increased by 104% inside the 400 × 50m grid and by 53% in the 300 × 50m grid (fig. 22).

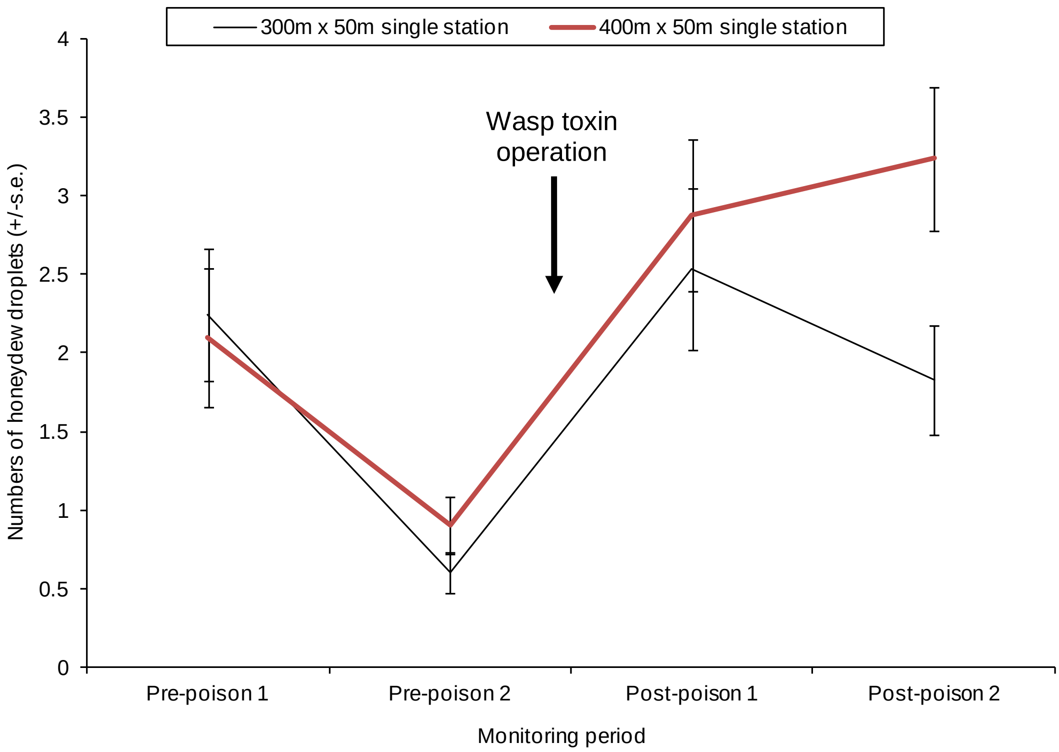


Figure 22. Effect of the wasp poison operation on the mean (±SEM) number of honeydew droplets in the Core Area of the Mainland Island in 2013/14.

Discussion

The 2013/14 wasp control operation was initiated approximately one month earlier than it has been for the last three 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 2013/14 than in previous operations, with approximately 20g 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 in this operationwas above average for all operations done so far.

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 operation taking place relatively early in the season and a long period of hot, dry weather, the wasp numbers did not manage to recover to pre-poison levels.

The monitoring in the Core Area indicated that the operation was successful in increasing the availability of honeydew to native birds. A 93.4% reduction in wasp nest flight counts and a 93% reduction in the wasp foraging index resulted in a 78% increase in honeydew droplets.

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

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. A mite has recently been discovered on some common wasp queens. Landcare Research is conducting an investigation into this mite and whether it holds any potential for use as a biocontrol agent. The RNRP is supporting this research by collecting queen wasps hosting the mites. Examination of wasp nests and workers in the early part of the season may also help to determine the apparent decline in wasp densities. Models again suggest that the 2013/14 season should result in higher wasp numbers.

In 2014/15, the two grid systems should 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.

3.2 Maintain long-term datasets on bird abundance and forest health in response to ongoing management and predator population cycles

3.2.1 Five-minute bird counts

Methods

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

Results

The raw bird count data was entered onto a spreadsheet (see Appendix 1.), but no analysis has yet been carried out on it by RNRP staff.

Discussion

There has been no local analysis of the raw 5MBC data to date. 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, analysis of the 5MBC data should be encouraged.
It is also important that the 5MBC data from Nelson Lakes is copied into the national 5MBC database, to add to what is an increasingly valuable dataset for big-picture analysis.

3.2.2 Vegetation Plot Monitoring

Twenty 20 × 20m vegetation plots were set up in 1997-1999. These are monitored regularly using the updated field protocols for permanent plots and the RECCE method (Hurst & Allen 2007a, 2007b), however no vegetation plot monitoring took place in 2013/14.

Nineteen out of the twenty plots within the RNRP 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.

3.2.3 Beech seedfall monitoring

Introduction
Beech seed is an important driver of rodent and correspondingly stoat population dynamics in beech forest. Mast events, where beech seeds are produced in quantities several orders of magnitude higher than in non-mast years, lead to rodent irruptions and subsequently stoat irruptions, which in turn can have devastating impacts on the nesting success and survival of native birds. It is therefore important to monitor beech seedfall in order to be able to plan and implement the necessary increase in rodent and stoat control effort during mast years.

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, these are collected and new bags deployed in mid-April, the second set collected in mid-June. Any seed collected is separated into species, counted and then tested for viability.

Results
In 2013/14 there was a full mast at both Lakes Rotoroa and Rotoiti with all three beech species seeding heavily (see table 9 and figure 23. This coincided with patchy heavy masting across the entire South Island. Red and mountain beech seed numbers at Rotoiti were the highest recorded anywhere (as measured by shotgun sampling) in New Zealand this year (J. Tinnemans (DOC), *pers. comm.*)

Table 10. Beech seed counts per m^2 at Lake Rotoiti and Lake Rotoroa in 2013/14

Site	Count type	Red beech (*Fuscospora fusca*)	Mountain beech (*Fuscospora menziesii*)	Silver beech (*Lophozonia cliffortioides*)
Lake Rotoiti	Total count	18456	13413	8698
	Total viable seed	11768	6685	3225
	% viable	64%	50%	37%
Lake Rotoroa	Total count	11206	11228	17668
	Total viable seed	6623	3804	5217
	% viable	59%	34%	30%

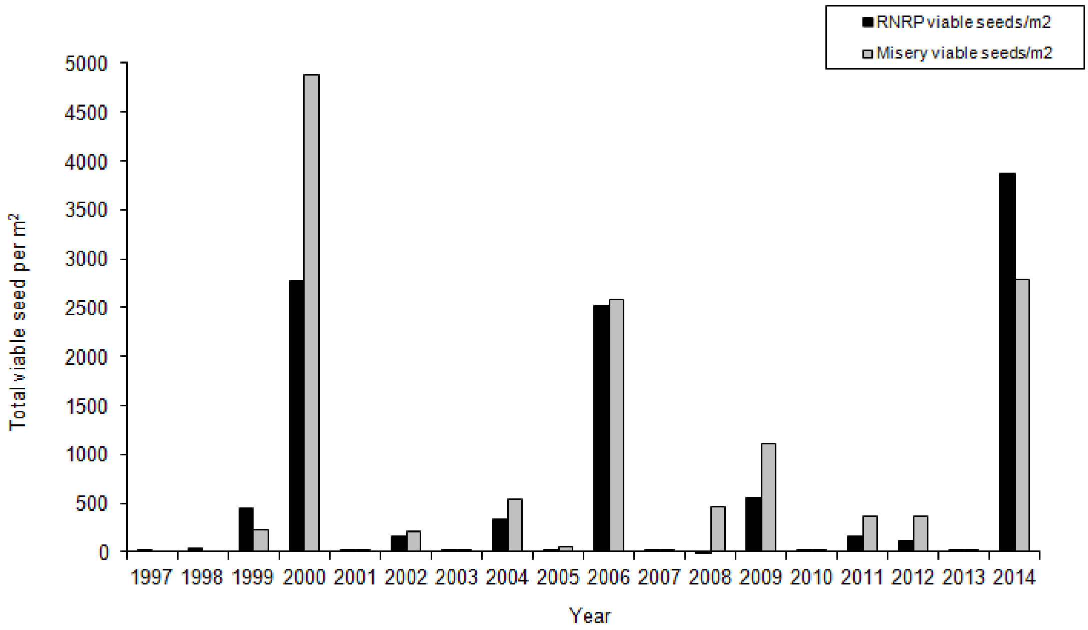


Figure 23. Total viable beech seed from the RNRP (Lake Rotoiti) and Mt Misery (Lake Rotoroa), over 1997-2014

Note that due to the high numbers of seed and the increase in workload for RNRP staff during preparation and implementation of an aerial 1080 operation in 2014/15, the viability of the collected beech seeds was not measured until May 2015. Due to poor storage conditions, over this period it is likely that seed viability decreased from when it originally fell and became available to rodents. Hence, the total viable seed per m^2 figures reported in table 9 and figure 23 are likely to be underestimates of the true energy input to the ecosystem in 2013/14.

Discussion

The heavy beech seeding experienced in the South Island in 2013/14 was triggered by a cool summer that occurred in 2011/12 and warm summer in 2012/13. The level of beech seeding experienced in the South Island in the 2013/14 season is so heavy that it has triggered a nationwide response (Battle For Our Birds) that will target sites with high seeding and rat numbers using aerial 1080.

There has been very little seed production at the sites the RNRP manages since 2009 however 2013/14 saw a full mast for all three species. Given the extent to which the rodent population responded to limited seedfall in 2011 and 2012 based on elevated tracking rates, the response of rodent population to the masting event of the coming season is likely to be catastrophic. Although the causal links between rodent abundance and beech seedfall in montane forest is well documented, the exact methods and most effective timing to truncate a rodent irruption when beech seed is present have not been settled at present. The long-term research and monitoring that is currently occurring in the RNRP is therefore important in working towards a better understanding of how to respond to a mast event, and consideration needs to be put into which specific research questions could be looked into in the RNRP during the predicted coming rodent and stoat irruptions.

3.2.4 Tussock plot monitoring

Introduction

Tussocks in New Zealand, like the beech trees, are mast seeders. They are therefore an important driver of mouse population dynamics in the alpine zone, and consequently influence the populations of other pests who prey on mice such as weasels and stoats. Tussock monitoring had been historically carried out at Mt Misery and was reinstated in 2010 to continue this long-term dataset. In the future climate change and its influence on tussock masting might allow rats to regularly inhabit higher-altitude areas than they currently do, providing another rationale for regular tussock monitoring to be carried out.

Methods

The flowering of mib-ribbed snow tussock (*Chionochloa pallens*) and carpet grass (*C. australis*) was measured in February 2014. Originally flowering stems were counted within an 'arm sweep' of the old Department of Scientific and Industrial Research (DSIR) points. Following advice on improvements to the methodology, a new method where flowering stems are counted within a permanently-marked 20×20 m plot was initiated in 2012/13. It was recommended that counts using both methods should be carried out for several years to allow a comparative analysis (D. Kelly, University of Canterbury, *pers. comm.*). 2013/14 is the third season in which both methods have been used.

Results

Tussock flowering results are shown in table 10. Both methods reported a mean number of flowering stems per m^2 above zero for both species, however the new 20×20 method recorded a large increase in flowering stems counted over the old DSIR method for *C. australis* but a decrease compared to the old method for *C. pallens*. This is different from in 2012 when the 20×20 method consistently counted more stems than the old method for both species. In 2013 no flowering stems of *C. pallens* were found in either method.

Table 10. Number of flowering stems per m^2 of two tussock species on Mt Misery, Nelson Lakes National Park, February 2014

Species	Mean number flowering stems per m^2	
	Old DSIR method	New 20x20 method
Chionochloa pallens	1.57	0.90
C. australis	3.31	137.38

Discussion

The results (as seen in table 9) suggest that in 2013/14 there was at least some degree of tussock masting, in particular for *C. australis*. However, personal observations of RNRP staff and information from other sites where tussock seed is measured (J. Kemp (DOC), *pers. comm.*.) suggest that it was patchy, with some individual tussocks having a lot of seed and others nearby having none. More data using both methods needs to be collected to allow a reliable comparison to be made.

3.3 Record observations of previously unreported native and non-native species in the RNRP area

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.

Results

The repository for new information is the document: 'Flora and fauna of Lake Rotoiti Recovery Project' (docdm-172620). While no new species were recorded in 2013/14 other sightings of less frequently seen species include:

- The single male whio/blue duck (*Hymenolaimus malacorhynchos*) at Blue Lake, upper Sabine Valley, appears to be resident now as it is often reported being there.
- Falcon (*Falco novaeseelandiae*) continue to be sighted intermittently in the RNRP with a pair possibly nesting in Big Bush near the DOF line.

3.4 Facilitate research to improve our understanding of the ecology and management of beech forest, alpine and wetland ecosystems

The RNRP provides an accessible site with a long history of data collection for external researchers.

One student conducted research within the RNRP this year. Chris Niebuhr, a PhD student from the University of Otago, began investigating the role avian malaria may be playing in native bird declines in the area. Avian malaria is a mosquito-borne disease that does not affect humans, but has caused the death of native New Zealand birds in recent years.

RNRP staff have been collecting common wasp (*Vespula vulgaris*) queens to check for the presence of mites. Any which had mites present were sent to Bob Brown of Landcare Research who is looking into the potential of a recently discovered mite to be used as a biological control of introduced wasps in New Zealand.

RNRP staff have also collected beech tree scale insects when found to send to Jacqueline Beggs of Auckland University for research into the honeydew beech forest ecosystem.

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

Introduction

Analysing and communicating technical information about the effectiveness of management techniques is a key learning objective, linking directly to national Mainland Island strategic principle two: "Results and outcomes are communicated". The RNRP transfers 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.

Following the implementation of the DOC restructure in spring 2013 it has been unclear whose role it is to maintain this technical communication. This needs to be clarified during the post-restructure period to ensure this objective is not neglected in the future.

Advocacy work is also carried out however, including the publication of brochures and newsletters as well as presentations targeted at generally non-technical groups. These sometimes presented information on technical subjects such as the use of self-resetting traps at a landscape scale. This is discussed in more detail in section 4. *Community objectives*.

Reports generated during 2013-14
Besides this annual report, no additional reports were produced this year.

Hui, workshops, presentations and media articles
No technical presentations were held or media articles concerning the RNRP published in 2013/14.

4. Community objectives

4.1 Foster relationships with likely partners to produce conservation gains within both the Mainland Island and the local area

The partnerships model will further empower DOC to look for more opportunities to work with a wider range of people and groups.

4.2 Increase public knowledge, understanding and support for Mainland Islands and ecological restoration nationally through education, experience and participation

Introduction

Education programmes delivered through Rotoiti Lodge and to other school and community groups are a popular way to help people connect to the RNRP and to better understand the purpose and achievements of the project.

The Nelson Lakes Visitor Centre provides a vibrant hub for visitors to learn more about the work in the RNRP. Video presentations, attractive displays, constantly updated information and well-informed staff all help the public to access current information. Over 60,000 people visit the Visitor Centre each year, with the summer months being the busiest.

Other means of engagement include attending a range of local festivals and workshops, as well as working with existing partners like the Friends of Rotoiti (FOR) and Kea Conservation Trust (KCT) to increase public knowledge and support.

The Partnerships Team (formerly Community Relations) and RNRP staff provide advocacy for the project. Many school groups learn more about the RNRP from talks and guided walks during their outdoor education programmes at Rotoiti Lodge. As Rotoiti Lodge is the only outdoor education centre located in a national park, it gives students and teachers from Nelson and Marlborough an insight into conservation across a large scale project.

Community groups are increasingly asking for talks and guided walks in the national park.

Friends of Rotoiti

Friends of Rotoiti (FOR) was formed in 2001 by a group of conservationists who wanted to support the aims of the RNRP. Their effort is targeted to areas adjacent to the RNRP so that they are a line of defence against predators coming into the RNRP.

There are about 50 current volunteers who devote considerable time annually undertaking trapping, wasp control, trap building and maintenance, administration, planning and advocacy tasks (Precise work day equivalents are not available for 2013/2014). FOR members also contribute to developing more effective trapping methods, for example the run-through trap trial, participating in discussions and sharing ideas with DOC staff.

Volunteers attend two training meetings per year. This is a chance to learn new information from RNRP staff, and to keep their skills current. FOR continues to attract new volunteers and they are continuing their trapping effort that supports the RNRP.

FOR Wasp control

A small group of FOR volunteers known as the 'Waspbusters' undertake wasp control using Permex around the village over the summer months.

They also assist rangers to control wasps around the RNRP, in particular along the west side of Lake Rotoiti along the Whisky mustelid trap line.

Friends of Rotoiti village rat trapping programme

A good example of an ongoing relationship is the trappers from the Nelson area, as well as local volunteers, running a comprehensive rat trapping programme around the St Arnaud village.

Their work provides conservation gain by removing predators from the popular Brunner Peninsula Walk, Black Hill area, Black Valley stream and Brunner Peninsular residential area.

Visitors to the Visitor Centre comment on the traps so it gives staff an advocacy opportunity for both conservation and the Friends of Rotoiti.

Table 11. Catches in FOR rat trap lines, 2013/14

Trap line	Catch			
	bird	mouse	rat	stoat
Black Hill Contour		17	8	
Black Hill Walk		22	12	
Black Valley Walk		98	29	1
Gibbs Walk		14	6	
Holland Street		22	13	
Lodge Road		14	7	
Moraine Walk		43	2	
Peninsula Centre Line		10	5	
Peninsula Nature Walk	1	98	56	
Robert Road		21	8	
View Road		12	7	
Ward Street	2	18		
Water Tank		29	3	
Total	3	418	156	1

Advocacy

DOC staff gave a number of talks at the Nelson Lakes Festival in January 2014. Sandra Wotherspoon spoke about local threatened plants; John Henderson held popular talks on conservation dogs and brought his kiwi-tracking dog 'Fen'; he also spoke on the technology and gadgets used in modern conservation. Jenny Long spoke on the A24 self-resetting trap trial.

A stall displaying informative material about the work of DOC in the RNRP, Friends of Rotoiti, and Fish and Game attracted a lot of attention. The same groups held a display at the Classic and Antique Boatshow in February 2014.

Staff talked about local threatened plants at the 2014 Murchison A&P show.

Jenny Long gave a brief presentation on the A24 trial at a Friends of Rotoiti meeting.

Education programmes

The Partnerships team undertook a large number of talks to schools at the Rotoiti Lodge (at least 30 during the year, data incomplete).

Increasingly, schools not staying at Rotoiti Lodge are seeking walks and guided walks from DOC staff.

Community groups visiting St Arnaud enjoy talks given by mainly Partnerships staff. Specialist groups such as sports clubs, gardening or botanical groups frequently request talks in line with their interests.

Staff give these talks keenly as they are a great way to reach a wide number of interested people.

5. Discussion

The period covered in this annual report is the first season for the RNRP following the comprehensive restructure of DOC in spring 2013. It has been a challenging year, but the RNRP's core values have been maintained and disruption to the work towards meeting its objectives has been kept to a minimum. The RNRP therefore continues to be an invaluable project for rigorous scientific testing of conservation techniques and tools as well as protecting the biodiversity values of the honeydew ecosystem within the protected area.

However, the restructure has strongly influenced the management of the RNRP due to alterations to role descriptions. For example there is no longer an RNRP programme manager nor an RNRP-specific field team, instead management of the RNRP now falls within the scope of all Nelson Lakes biodiversity rangers' roles. Although the biodiversity team has managed to maintain the RNRP's workstreams at their former level throughout the period of change and confusion, an effort needs to be made to clarify who is now responsible for the different aspects of RNRP management within the new local structure.

The new RNRP Strategic Plan 2014-19 (Harper & Brown, 2014) captures the essence of DOC's change in strategic direction towards an increased focus on fostering partnerships to achieve conservation goals. Existing partnerships have been maintained and strengthened during 2013/14 and advocacy of biodiversity conservation to the public continues while potential options to develop new partnerships in the future are explored.

The volunteer programme plays an increasingly important part in the upkeep of the RNRP as staffing levels are reduced, with volunteers essentially acting as extra staff members and doing fundamental work rather than additional 'nice to do' work on the side. One task for the new Partnerships team will be to look into the potential for expansion of the volunteer programme to provide additional resources in the future. The full immersion in DOC that volunteers experience gives those who are intending to work in the conservation field new skills and greater understanding of conservation in practice, as well as contacts within DOC which stand them in good stead for future employment.

Research to inform biodiversity management throughout New Zealand remains a core focus of the RNRP. Although the two-year trial of self-resetting traps at this particular site ended with disappointing results, the trial formed part of a bigger picture study which continues. Hence the information gained here in the RNRP will contribute towards further development of these and similar tools, which is ultimately what will enable them to be successful in the future. The predicted coming beech mast will provide a rigorous test of the improvements to our management and tools that have been made since the last mast event in 2000, and as always the RNRP will learn from the outcomes from this test and use those findings to effect further progress towards the goal of effective conservation in New Zealand.

6. Recommendations

- Plan and implement an aerial 1080 operation for spring 2014 as part of the Battle for our Birds in response to the heavy beech mast, maintaining the current non-treatment site as well as 1080-only, 1080-and-trapping and trapping-only sites in order to maximise learning.
- Expand the annual robin monitoring programme to provide more effective outcome monitoring for the aerial 1080 operation.
- Set up additional tracking tunnel lines up the Travers Valley to provide 1080-only treatment data
- Carry out possum wax tag monitoring up the Travers Valley before and after aerial 1080 operation.
- Maintain and build on current partnerships with iwi, FOR, Kea Conservation Trust and the Rotoiti Lodge and look to develop new relationships, for example with the NMIT trainee ranger programme.
- Increase the number of kea nests under protection, be proactive in opening these traps prior to the breeding season and support the work of the Kea Conservation Trust.
- Expand on existing RNRP volunteer programme, aim to host two volunteers per month.
- Collect queen wasps for Landcare Research wasp mite research and support the project in other ways where possible.
- Investigate potential of using still-functioning later-series A24 self-resetting traps for rodent control trials.
- Monitor the results of possum control in Big Bush directed by 100m x 100m chew card grids and draft a ground-based possum control protocol from the results.
- Investigate the need for and feasibility of low-level monitoring of species that are not currently receiving attention locally, such as herpetofauna and invertebrates.
- Investigate use of transmitters for cat control allowing remote checking of live cage traps.
- Continue with the relocation of old kākā nesting sites for future breeding monitoring.

7. Acknowledgements

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Other staff at the Rotoiti/Nelson Lakes office also assisted the project on occasion, sharing logistics and costs and occasionally helping in the field.

Members of the Technical Advisory Group provided advice at various times during the year (see Appendix 2 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 2013/14 year, are listed below.

Introduced species

Dataset	File location	Contact person
Possum trapping results	DOCDM-516760	Jenny Long (jlong@doc.govt.nz)
Wasp monitoring results	DOCDM-1546039	Nik Joice (njoice@doc.govt.nz)
Kea protection trapping results	DOCDM-1283015	Jenny Long (jlong@doc.govt.nz)
DOC-series mustelid trapping results	DOCDM-1251695	Jenny Long (jlong@doc.govt.nz)
A24 mustelid trapping results	DOCDM-1047417	Jenny Long (jlong@doc.govt.nz)
Cat trapping results	DOCDM-586801	Nik Joice (njoice@doc.govt.nz)
Mustelid tracking tunnel results	DOCDM-1346209	Jen Waite (jwaite@doc.govt.nz)
Rodent tracking tunnel results	DOCDM-1261708	Jen Waite (jwaite@doc.govt.nz)

Native species

Dataset	File location	Contact person
Five-minute bird counts	DOCDM- 769826	Jen Waite (jwaite@doc.govt.nz)
Beech seedfall monitoring	DOCDM-1365121	Nik Joice (njoice@doc.govt.nz)
Great spotted kiwi monitoring	DOCDM- 747464 DOCDM-1454781	Jen Waite (jwaite@doc.govt.nz) Jen Waite (jwaite@doc.govt.nz)
Kākā monitoring	DOCDM- 171970	Jenny Long (jlong@doc.govt.nz)
Weka monitoring	DOCDM- 833080	Jenny Long (jlong@doc.govt.nz)
Robin monitoring	DOCDM- 459805	Jen Waite (jwaite@doc.govt.nz)

Appendix 2.

Project management

Budget

Staff (salary & wages):	$199,711
Operating:	$31,946

Staffing

Nik Joice, John Henderson, Dave Rees, Grant Harper, Jenny Long, Jen Waite, Gareth Rapley, Ben Wood, Eilidh Hilson, Cameron Beer, Darin Borcovsky.

Technical Advisory Group

Kerry Brown, Graeme Elliott, Craig Gillies, Dave Kelly.

RNRP advisors

Josh Kemp, Mike Hawes.