Rotoiti Nature Recovery Project

Annual Report 2017/18

Nelson Lakes Mainland Island,

Nelson Lakes National Park

J Waite, E McCool, P van Diepen, G Rapley, J Newell, T Grose, P Hale

Department of Conservation
Te Papa Atawhai

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Executive summary

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

Mustelid control continued in the RNRP in 2017/18 using the DOC200 and DOC250 network. Tracking tunnel monitoring showed that mustelid tracking was kept below the five percent target in the RNRP treatment area, while mustelid tracking remained high at the Rotoroa non-treatment site. Possum control continued at the current intensity. A feral cat control operation in the Teetotal Recreation Area caught 16 cats, while cat control carried out by the Friends of Rotoiti in the St Arnaud village and surrounding rural areas caught 65 feral cats.

The kākā encounter rate remained at low levels. It appears that the kākā population has decreased since 2013/14 and encounter rates are now similar to those observed in 2007. No kākā nesting was observed this year. Three pairs of kea had nesting attempts in 2017/18, with two failing due to predation while the third successfully fledged two chicks. No monitoring of mistletoe or *Powelliphanta sp. snails* was undertaken this year.

There was increased hunter interest in the RNRP in 2017/18, however only two chamois were shot. Pig trapping at the northern end of the St Arnaud Range caught twelve pigs.

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

Great spotted kiwi remain the only species to have been re-established in the RNRP. Two adult and one sub-adult kiwi were monitored in 2017/18. One nest was monitored with trail cameras and successfully fledged a chick. Transmitter data indicates the female Joy breed for the first time however her nest was not found. In June 2018 all transmitters were removed and the focus now is on translocating a further 20 adults into the population. The first year of monitoring using acoustic recorders was carried out and kiwi were recorded on five of eleven recorders.

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 two-year trial testing the effectiveness of stoat bedding material as a lure in mustelid traps in Big Bush was completed in June 2018. Results from this are being written up by Zero Invasive Predators.

A one-year possum trapping trial began in Big Bush in November 2017 comparing the effectiveness of sentinels baited with possum dough to those baited with clay clips soaked in aniseed oil.

No rodent control was undertaken in 2017/18 due to resourcing and past failures of ground control operations. Rat tracking indices remained high within the RNRP.

Wasp control using Vespex poison was carried out in February 2018. The operation was successful in decreasing wasp activity at monitored nests and increasing the amount of available honeydew.

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 Rotoroa non-treatment site. Skink monitoring that started in 2002 was restarted in 2017, with only *Oligosoma polychrome* skinks found. A pilot study to establish long-tailed bat monitoring was run in December 2018 and bats were detected on 6 of 20 recorders at each of Rotoiti and Rotoroa. Low levels of beech seedfall was recorded for all three beech species, and low levels of alpine tussock flowering was recorded at Mt Misery.

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

No new species were reported in 2017/18, although a whio was observed on Rotoiti in January 2018.

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

Jamie McAulay (University of Otago) took samples from the RNRP for his Masters thesis studying the diet of alpine stoats.

Sam King (Massey University) surveyed Nelson green geckos (*Naultinus stellatus*) in the Teetotal Recreation Area as part of her Masters thesis studying the genetics of green gecko in the top of the South Island.

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 reports were generated during 2017/18, however staff gave a number of presentations on learnings from the RNRP at forums and workshops.

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, Friends of Rotoiti and the Kea Conservation Trust.

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

A range of public advocacy has continued through the year, including displays and talks at public events.

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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 and the first Annual Report covered the 1997/98 business year. The project was established with treatment and non-treatment sites, so that responses to management techniques at the treatment site at Lake Rotoiti could be compared with the non-treatment site at Lake Rotoroa.

South Island kākā (*Nestor meridionalis meridionalis*) have been a key focus since the beginning of the project. Between 1997 and 2006, kākā were radio-tracked and nesting success monitored in the RNRP in response to mustelid (stoat *Mustela erminea*, ferret *M. furo* and weasel *M. nivalis*) control. This found that kākā nesting success improved and adult female mortality declined as a result of predator control in the RNRP (Moorhouse 2003, Taylor, et al. 2009).

In 2001/02, the extent of mustelid trapping was increased to include over 5,000 ha on the western St Arnaud Range and southern Big Bush. Trapping is also carried out by a local volunteer group, Friends of Rotoiti (FOR), in adjacent areas encompassing an additional 5,000 ha. Trapping was initially done using Fenn mkVI which were then replaced by DOC-series traps. From 2012 to 2014 the RNRP was involved in a national trial of self-resetting traps for landscape-scale pest control, testing the use of the Goodnature Ltd A24 traps to target stoats. In the RNRP the A24s were not successful at controlling stoats below the target tracking rate and 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 which successfully established within the RNRP. Between 2004 and 2009 limited breeding took place and from 2009 to 2016, management focused on using Operation Nest Egg™ (ONE) to overcome the poor breeding success of GSK in the RNRP and increase the number of founder individuals to 40. However, ONE did not prove to be successful at this site, with six of thirteen released ONE chicks known to have died. In contrast, all adults or juveniles released have survived. The ONE programme has finished in the RNRP, with the focus now on translocation of adult kiwi to increase the founder population to 40 individuals.

In partnership with the Kea Conservation Trust (KCT), kea (*Nestor notabilis*) nest protection was initiated in spring 2011 at nest sites. Following ongoing support from the KCT the number of nests and extent of protection around nests has been increased with six nest sites currently protected. Despite removing a considerable number of pests, protected nests can still fail due to predation, supporting the need for landscape-scale pest control to protect vulnerable species.

The RNRP has been a leader in the large-scale control of introduced wasps (*Vespula* spp.) with work done under an experimental use arrangement, historically with Landcare Research—Manaaki Whenua and more recently with the Nelson-based company Entecol, trialling effective means of wasp control. The toxin Vespex™ is now commercially available, with much of the best practise and monitoring established from trials in the RNRP.

Rodent (rat *Rattus spp.* and mouse *Mus musculus*) control has had a chequered history in the Core Area of the RNRP. Between 1997 and 2000 ground-based operations using brodifacoum and 1080 were effective at controlling rodents, particularly rats. However, after a DOC review of the use of brodifacoum there was a switch to snap-trapping at a density of one trap per hectare, which proved ineffective at controlling rat populations. In the spring of 2010 the project shifted back to ground-based toxin with an operation using

diphacinone in bait stations over 600 ha of the Core Area successfully reducing rat tracking rates below five percent. Following this initial success, operations were extended to cover almost 1,000 ha and a number of ground-based operations have been carried out since 2010, however have had mixed success for environmental and operational reasons.

In 2014, the first aerial 1080 operation was carried out in the RNRP in response to a heavy beech masting event. Similar heavy masting was widespread over the South Island and led to a national DOC response in the form of the Battle For Our Birds (BFOB) programme, primarily carrying out aerially-applied 1080 operations. In December 2014, one of these BFOB operations was carried out in Nelson Lakes National Park, covering a large part of the RNRP and extending up the Travers and East Sabine catchments. In 2016 ground-based toxin control of rodents was again trialled using diphacinone in bait stations, however this operation failed. Five-minute bird counts continue to provide an outcome measure for rodent control.

In previous years, the RNRP has trapped feral cats (*Felis catus*), although trapping effort and method has varied between years. Methods used have included Belisle traps set in wooden boxes with chimneys, live cage traps and raised set Timms. In 2018 cat control and monitoring was undertaken in the Teetotal recreation area for protection of the Nelson green gecko (*Naultinus stellatus*) population.

Possums (*Trichosurus vulpecula*) have been controlled within the RNRP using both toxins and kill traps. Currently possums are targeted along mustelid trap lines using Sentinel kill traps. Following the aerial 1080 operation in December 2014, wax tag monitoring showed that possum numbers were reduced in the Travers valley. The success of the 1080 operation in reducing possum numbers in the Travers Valley may have subsequently reduced reinvasion pressure into the core of the RNRP.

Other pest species under management include red deer (*Cervus elaphus scoticus*) and pigs (*Sus scrofa*).

As a measure of the success of pest control, the response of browse-sensitive plants is monitored. Three species of beech mistletoe, (*Peraxilla colensoi, Peraxilla tetrapetala* and *Alepis flavida*), continue to respond positively to possum control with levels of browse decreasing. Surveys carried out since 2008 have shown an overall increase in plant health. However, the critically threatened understorey plant *Pittosporum patulum* is not responding to management. This is likely the result of preferential browsing by red deer (Townsend, et al. 2008).

Beech seedfall and *Chionochloa* tussock flowering are monitored as ecological drivers of rodent and subsequent mustelid population increases. Vegetation plots are monitored to determine the trends and responses of native vegetation to multi-species pest control.

Invertebrate monitoring has included monitoring of *Powelliphanta "Nelson Lakes"* snails on the St Arnaud Range, and beech scale insects which as honeydew producers are ecological drivers in the honeydew beech forest ecosystem.

In addition to the core work, students also conduct research in the RNRP. This adds to our understanding of the functioning of the alpine beech forest ecosystem and can identify changes required to improve threatened species and pest control management.

The involvement of the community in the RNRP is essential for the success of the project. Hundreds of days of work in support of the project have been undertaken by volunteers, including members of FOR, RNRP volunteers, Trainee Rangers, Hot Shots, 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 RNRP, and various printed media. Many events and achievements from the RNRP have also been picked up by local and national media. In

2009 the RNRP was recognised by the international Global Restoration Network as one of the Top 25 Ecological Restoration Sites in Australasia (Department of Conservation 2009).

Although day-to-day work in the RNRP progresses in response to annual or multi-annual ecosystem cycles, no project 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 (Harper and Brown 2014) provides the planning framework and goals for the project and highlights three major themes encompassed within the primary 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 to achieve greater conservation goals.

It is essential that these themes remain the core values for ongoing work within the RNRP. 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 Appendix 1 and Appendix 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

The RNRP Strategic Plan 2014-19 (Harper and Brown 2014) identified seven threatened species present in the Rotoiti area prior to the establishment of the RNRP. These species and their New Zealand Threat Classification System rankings are as follows (Robertson, Dowding, et al. 2013, de Lange, et al. 2013):

- Kea (*Nestor notabilis*), Nationally Endangered
- South Island kākā (*Nestor meridionalis meridionalis*), Nationally Vulnerable
- Three species of beech mistletoe (*Peraxilla colensoi, P. tetrapetala* and *Alepis flavida*), all Declining
- *Pittosporum patulum*, Nationally Endangered
- Carnivorous land snail *Powelliphanta "Nelson Lakes"*, Range Restricted

The RNRP also contains other threatened species that may benefit from pest control. However, the above populations were specifically identified because all except kea have had considerable amounts of work already invested in monitoring and managing them since the RNRPs inception.

Kea were not included in previous strategic plans but included after the threat status was upgraded in 2013 from 'naturally uncommon' to 'nationally endangered' and following recognition that the species forms an integral part of the South Island alpine ecosystem

(Robertson, Dowding, et al. 2013). Evidence suggests a continuing slow decline in kea numbers in Nelson Lakes National Park (Steffens 2009, Harper, Forder, et al. 2011). The primary threats to kea are predation by introduced brushtail possums and stoats on eggs, nestlings and incubating adults (Taylor, et al. 2009). Localised stoat and possum control has been put in place around nests that lie outside the RNRP's intensive pest control area, and it is planned to address other threats such as lead flashing and nails in DOC huts. An aerial 1080 operation carried out over part of the RNRP in 2014 had extra monitoring and mitigation measures put in place to minimise the risk to kea of ingesting poison baits (Long, et al. 2015).

The kākā is an endemic forest parrot that is threatened by predation, mainly of eggs, chicks and nesting adults by stoats and possums (Moorhouse 2003). Stoats and possums are controlled within the RNRP via an extensive trapping programme and both are able to be kept at low levels. However, between 2012 and 2014 a trial of A24 self-resetting traps took place which failed to control stoats, with mustelid tracking rates exceeding the five percent threshold levels during what was likely to be a big kākā breeding season. It appears this has impacted the kākā population. The control of feral cats may help to protect fledging kākā chicks which spend a significant amount of time on the ground between emerging from their nest holes and being able to fly. Cat control was carried out in previous years over a small area, however due to limited resources this was ceased in 2015 and is now carried out by the Friends of Rotoiti. Other native bird species present are also likely to benefit from this predator control, particularly great spotted kiwi and kārearea/New Zealand falcon (*Falco novaeseelandiae*), which also nest on the ground.

The three species of beech mistletoes, *Pittosporum patulum* and the snail *Powelliphanta "Nelson Lakes"* are all threatened as a result of predation by brushtail possums. Possum numbers have been reduced within the RNRP, mainly through a sustained trapping programme. The aerial 1080 operation carried out in late 2014 resulted in the successful reduction of possum numbers up the Travers Valley where historically there has been no possum control. This will aid in reducing reinvasion pressure into the RNRP from the

south. Possum control is considered effective at protecting these species and will continue in order to protect biodiversity values.

In addition to being threatened by possums, *Pittosporum patulum* and *Powelliphanta "Nelson Lakes"* populations may also be threatened by red deer (*Cervus elaphus scoticus*). Red deer have caused detrimental browsing of juvenile *P. patulum* plants, and may impact *Powelliphanta* habitat, through concentrated browsing and trampling of the mountain beech (*Fuscospora cliffortioides*)/tussock ecotone. 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 2010.

Hares (*Lepus europeaus*) represent another likely problem species for high montane and alpine species, as they degrade habitat through browsing, however no hare control is being undertaken in the RNRP. Pigs (*Sus scrofa*) are known to be present near the snail colony within the RNRP and are a threat as their rooting activity degrades snail habitat. Regular pig control has only been implemented in the RNRP since the 2015/16 season.

2.1.2 Mustelid control and monitoring

Introduction

Landscape-scale ground-based mustelid control has been carried out in the RNRP since 1998. Mustelid control continued throughout 2017/18 using the existing network of DOC series traps. The FOR community group also maintain several trap lines in areas outside the RNRP which act as a buffer helping minimise reinvasion. The aim of ongoing ground-based mustelid control is to reduce mustelid numbers to a tracking rate below 5%, the target that is considered to enable kākā and other native birds to breed successfully (Taylor, et al. 2009).

Methods

Control

RNRP mustelid trap lines cover approximately 5,000 ha to the east and north of Lake Rotoiti. A total of 883 single-set traps are spaced 100m apart along 24 trap lines. The majority are DOC200 traps, with 92 DOC250 traps spread along lines adjacent to farmland to target ferrets. The wooden trap boxes are a FOR design that hinges open at one end and meet "best practice" standards for use in areas where weka (*Gallirallus australis*) and kiwi are present.

In July 2016 a two-year trial was initiated in conjunction with Zero Invasive Predators trialling the effectiveness of stoat bedding material from oestrus stoats as a lure. This trial would compare the number of stoats caught between traps baited with Erayz and bedding material to traps baited with only Erayz. The trial was carried out in the Big Bush area of the RNRP using 308 DOC200 and DOC250 traps. On lines with only DOC200's alternating traps were baited with the different lures, while on lines with DOC200's and 250s alternating pairs of traps were baited with different lures (Figure 1). In the second year of the trial the type of lure a trap contained was swapped to the opposite lure type to avoid trap site bias. In February 2017, the trial design was changed to compare stoat bedding material only to Erayz. Stoat bedding material was supplied from captive oestrous stoats at Lincoln University. This bedding material was placed in tea strainers which were placed into the egg holder of a trap. All traps included in the trial were checked and rebaited monthly.

For traps within the RNRP not included in the lure trial, the traps were checked monthly in spring and summer and two-monthly in autumn and winter. Traps were baited with hen eggs, Connovation Erayz #8 blocks (a rabbit-based compound) or fresh rabbit.

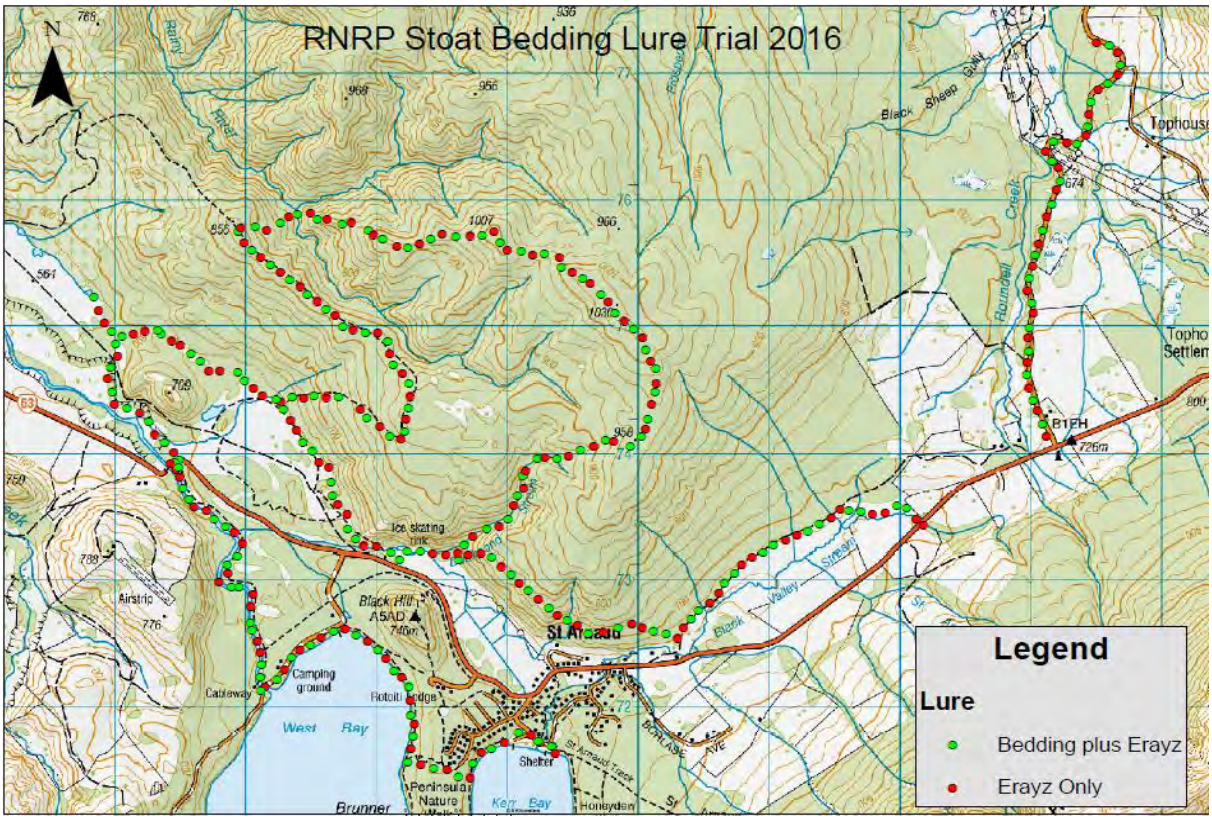


Figure 1: Stoat bedding lure field trial with location of traps containing different lure types

Monitoring

Monitoring to determine the effectiveness of mustelid control within the RNRP is carried out using three nightly tracking tunnel indices. Standard 60cm coreflute tracking tunnels with Black Trakka™ inked cards are used, with five tunnels at 100m spacings along lines and a minimum of 1km between lines (Gillies 2013). Standard monitoring is carried out in the Rotoiti treatment site (trapping) and the Rotoroa non-treatment site (no trapping) in November and February. Fresh rabbit is used as a lure placed in the middle of the card and left out for three fine nights. As different mustelid species cannot be reliably distinguished by footprints, mustelid prints from ink cards are not identified to the species level. Therefore, the mustelid tracking index is for all mustelid species combined.

Extended 21-night monitoring was run this year using salted rabbit meat as a lure. The salted rabbit was secured in a light mesh parcel and attached inside the centre of the tracking tunnel with a zip tie.

Results

Control

During 2017/18, 156 stoats, 16 weasels and 6 ferrets were caught within the RNRP (Table 1). The number of stoats caught was slightly lower than the 2016/17 year when 184 stoats were caught (Table 2). The number of weasels caught (n=16) was similar to previous years, but much lower than the 2014/15 beech mast year when 83 weasels were caught. Ferret captures (n=6) were higher than previous years.

Table 1: Trap catches and sprung traps in the Rotoiti Nature Recovery Project in DOC200 and DOC250 traps from July 2017 to June 2018.

Species	Number caught
Stoat (*Mustela erminea*)	156
Ferret (*Mustela furo*)	6
Weasel (*Mustela nivalis*)	16
Rat (*Rattus* sp.)	788
Mouse (*Mus musculus*)	7
Hedgehog (*Erinaceus europaeus*)	177
Rabbit (*Oryctolagus cuniculus*)	35
Cat (*Felis catus*)	10
Possum (*Trichosurus vulpecula*)	1
Sprung	317

Table 2: Total number of stoats caught each year in DOC200 and DOC250 traps in the Rotoiti Nature Recovery Project since 2009.

Year	Total Number of Stoats
2009/10	198
2010/11	164
2011/12	164
2014/15	273
2015/16	215
2016/17	184
2017/18	156

Captures of stoats was low through winter and spring of 2017 (Figure 2) with 15 mustelids caught in the winter months (July and August 2017), and 13 caught in spring (September to November 2017). The capture rate increased over summer with 81 stoats caught from December to February, with 42 in the February trap checks. In the autumn months (March to May 2018) 58 stoats were caught.

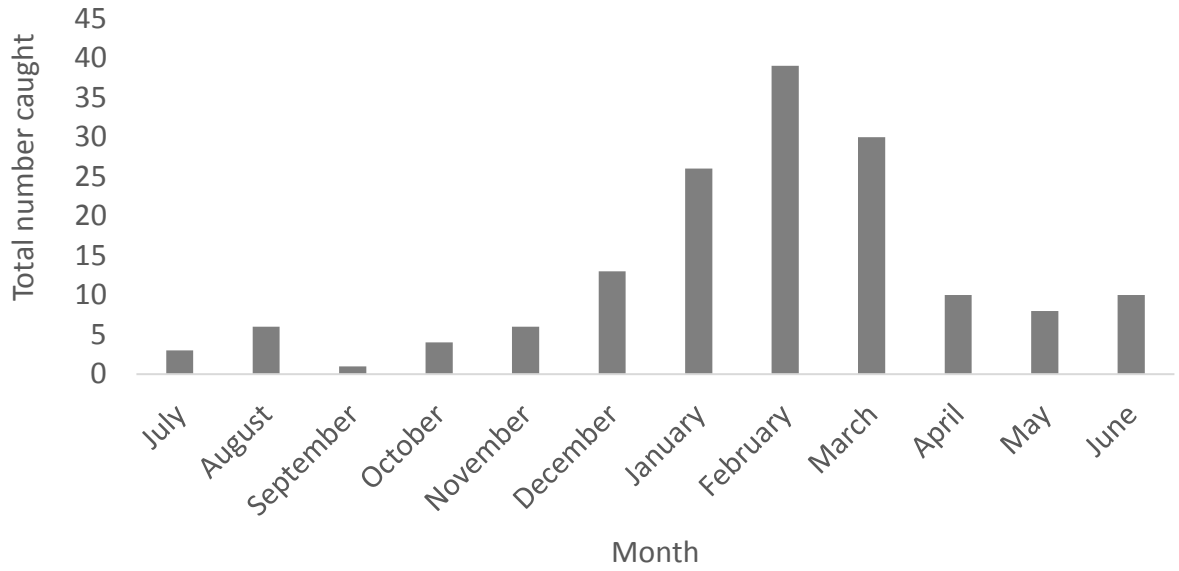


Figure 2: Total number of stoats caught each month in the Rotoiti Nature Recovery Project from July 2017 to June 2018.

Monitoring

Mustelid tracking rates at Rotoiti from three-night surveys remained below the recommended five percent tracking, with no mustelids tracked in November 2017 or February 2018. At Rotoroa tracking was considerably higher with a tracking rate of 23% (SE±11) in both November and February.

Tracking rates during extended 21-night monitoring at Rotoiti was 0% in November and 4% (SE±2) in February. While at Rotoroa the November extended tracking rate was at 71% (SE±13). No extended monitoring was done at Rotoroa for February 2018 due to high possum interference in the November monitoring.

Discussion

During 2017/18 mustelid control within the RNRP was successful at maintaining tracking indices below the five percent target. In comparison at Lake Rotoroa where no mustelid control is carried out, mustelid tracking was well above five percent tracking. The results show that the intensity of trapping within the RNRP was able to control the mustelid population to low levels. The number of mustelid captures for the 2017/18 year was similar to other non-beech mast years, as was the high capture rate of stoats in February.

The two-year stoat oestrus bedding lure trial was completed in June 2018 and will be reported on by Zero Invasive Predators, although it appears that the oestrus bedding material does not provide an advantage over Erayz as a trap lure.

For the past two years considerable effort has been put into clearing windfall on traplines caused by storms in 2013 and 2014, with this work completed in the 2017/18 year. The focus now shifts to an upgrade of the existing trap network to double set traps in new boxes, with this work scheduled to be carried out in 2018/19.

2.1.3 Friends of Rotoiti mustelid control

Methods

Mustelid trap lines are maintained by FOR as a buffer to the RNRP, with a total of 302 DOC200 and 96 DOC250 traps in operation:

- Rainbow Valley Line: DOC200s (76) in run-through boxes alternating with DOC250s (76).
- Six Mile/Dip Flat lines: Each has four DOC 200s.
- Seasonal Rainbow Ski Field Line: 20 DOC250s from the Rainbow gate followed by 50 DOC200s. These traps are put out in mid to late October to run through the summer months (exact timing is always seasonally dependent on when the snow falls at the beginning of the season and when the ski field closes at the end of the season).
- Mt Robert Line: 17 DOC200s.

- Whisky Falls Line: 82 DOC200s.
- Tophouse Road Line: 43 DOC200s.
- Speargrass Line: 26 DOC200s.

The Mt Robert, Speargrass, Whisky Falls and Tophouse Road lines are checked fortnightly during spring/summer (November to April), and then monthly during autumn/winter (May to October). The Rainbow Valley, Dip Flat, Six Mile and Rainbow Ski field lines are checked weekly or fortnightly from October to April, and fortnightly or monthly during the colder months depending on catch rates. Erayz is used in all baited traps and changed monthly.

The Rainbow line is currently being run as a trial to compare DOC200s in a bait-less run-through tunnel design to DOC250s baited with Erayz which is changed monthly. This trial started in November 2016 with DOC250 boxes fitted with mouse excluders to prevent mice from eating the Erayz bait. Mouse excluders are cage boxes made from 8mm square mesh that attaches to the DOC250 box end and closes over the Erayz bait when the box is closed (design can be found at www.friendsofrotoiti.org.nz).

Results

Friends of Rotoiti recorded lower stoat captures (n = 70, Table 3) during the 2017/18 year compared to the previous year (n = 157). Stoat catches were highest during the summer months with 44 caught over the December to February period (Figure 3).

Table 3: Trap catches and sprung traps on the Friends of Rotoiti mustelid traplines in DOC200 and DOC250 traps from July 2017 to June 2018.

Species	Number caught
Stoat (*Mustela erminea*)	70
Ferret (*Mustela furo*)	2
Weasel (*Mustela nivalis*)	9
Rat (*Rattus* sp.)	258
Mouse (*Mus musculus*)	2
Hedgehog (*Erinaceus europaeus*)	60
Rabbit (*Oryctolagus cuniculus*)	18
Cat (*Felis catus*)	9

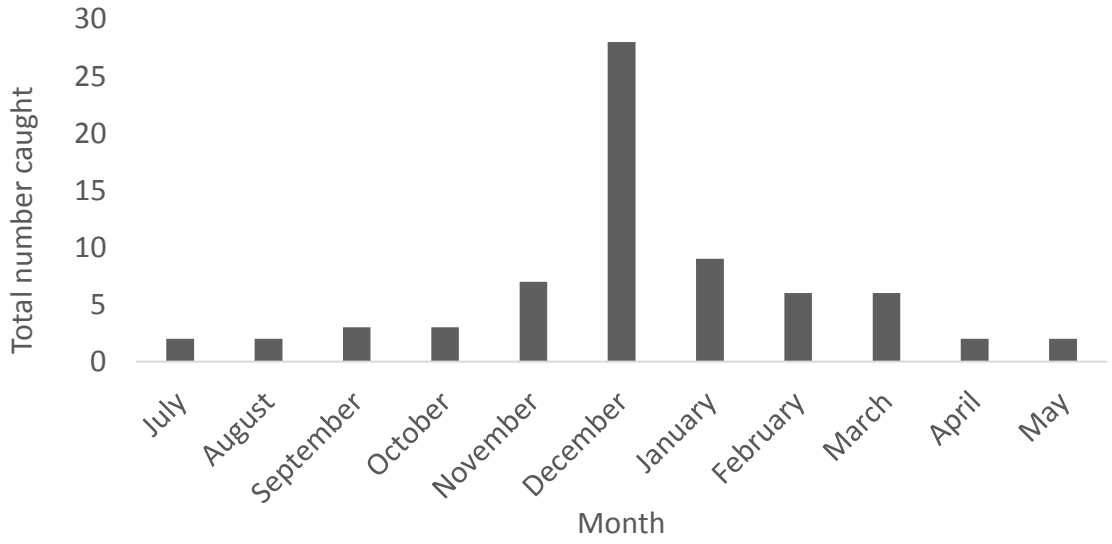


Figure 3: Number of stoats caught each month on Friends of Rotoiti mustelid trap lines in DOC200 and 250 traps in 2017/18.

2.1.4 Feral cat control

Introduction

Cat control in the RNRP has been problematic due to the presence of weka. In the past the RNRP has trialled Belisle traps in wooden boxes, live cage traps and raised-set Timms traps. The most successful of these methods has been live cage trapping in Autumn, with Belisle trapping ceased due to weka captures and Timms traps due to low capture rate. Cat control in the RNRP was ceased in 2015 due to low returns for effort required, with cat trapping now undertaken by the FOR. However, in 2017/18 cat control and monitoring was undertaken in the Teetotal recreation area to provide protection to the Nelson green gecko population (*Naultinus stellatus*). DOC200 and DOC250 traps targeting mustelids continue to catch juvenile cats.

Methods

Monitoring

Trail camera monitoring was carried out before and after the operation using a methodology trialled at Whangamerino wetland (C. Gillies pers. comm.). Ten trail cameras

were deployed from the 21 March to 29 June 2018 at 600m spacing. Cameras were set to take 2 photos per camera trigger, with a forced delay of 5 minutes between triggers. Cameras were baited with rabbit wrapped in galvanised chicken wire and pegged to the ground 50cm in front of the camera. Cameras and bait were set so that vegetation forced animals to approach the bait in the cameras field of view. Cameras were baited weekly for three weeks, then two weekly during the control operation, and weekly for three weeks following trapping. Cat relative abundance was measured as the percentage of cameras with cat interactions in the first four nights of monitoring.

Control

On 3 April 2018 fifteen Havahart cage traps were set out 200m apart along the Skating Pond Loop trail. After three weeks the cage traps were moved to the other end of Teetotal along the Rattler Rim trail. Traps were baited with rabbit twice weekly for the first four weeks and weekly thereafter as wasp numbers had died down. Two Timms traps were set in a clearing on the flats and baited two weekly with rabbit. Traps were checked daily by staff or FOR volunteers, with photos taken of any cats caught. Trapping finished 24 May.

Results

Monitoring

Prior to the control operation over four nights of monitoring cats were recorded on thirty percent of cameras. After the control operation no cats were recorded on cameras. Other species observed at baits included harriers, stoats, possums, hedgehogs and weka.

Control

Sixteen cats were caught in Teetotal, all of which were tabby coloured. Harriers entering traps was an issue, with three harriers caught and released. The Teetotal Timms traps had no captures.

Ten cats were caught in DOC200s and DOC250s in the wider RNRP mustelid control area in 2017/18.

Discussion

A high number of cats were caught in Teetotal which should reduce predation pressure on the green gecko population. The Teetotal cage trapping operation will be repeated in 2019.

2.1.5 Friends of Rotoiti feral cat control

Methods

Cats are occasionally caught as bycatch in FOR mustelid traps, particularly on the Rainbow and Whisky trap lines. FOR members and local supporters maintain 19 Havahart cage traps targeting cats in the St Arnaud village and rural areas adjacent to the Nelson Lakes National Park, particularly the Tophouse Road area. Feral cats are killed humanely with a .22 rifle while cats identified as pets are released from the cage. The use of raised-set Timms traps was discontinued in 2017/18 due to lack of captures.

Results

Nine feral cats were caught as by-catch in FOR mustelid traps in 2017/18. Seven were in Rainbow Valley, with two in run-through traps, four in DOC250s and one in a DOC200. One cat was caught in a DOC200 on the Whiskey Line, and one in a DOC200 on the Tophouse Road Line. The cage trapping resulted in 65 feral cats being caught, one of which was caught on the Mt Robert Road where eight cage traps were deployed in June 2018.

2.1.6 Possum control and monitoring

Introduction

Since 1997 possum control has been undertaken in the RNRP using a combination of toxins and kill traps. Possum control is carried out to maintain possums at low numbers to allow the recovery of threatened plant species that are damaged by possum browse and providing protection to nesting kākā that are at risk from possum predation (Moorhouse 2003). Control is currently undertaken using Sentinel kill traps placed along mustelid trap lines.

Monitoring to determine the effectiveness of possum control in the RNRP is undertaken two-yearly using seven night wax tag monitoring. The target of the possum control programme within the RNRP is to keep the Possum Activity Indices (PAI) below five percent. This monitoring is next scheduled for March 2019.

Methods

Control

Sentinel kill traps are set at 100m spacings along existing mustelid trap lines in the RNRP. In 2017/18 the Travers Valley trapline that provided a buffer to limit possum reinvasion was not run, as the 1080 operation in 2015 had reduced possum numbers in the valley and reinvasion from this area was low.

Sentinel traps are attached to trees 1500mm above ground level and fitted with white coreflute covers to help prevent non-target bycatch. Trap checking and rebaiting was done in conjunction with the monthly mustelid trap checks. Traps were baited with Connovation's Ferafeed Smooth in a Tube lure on the base of the tree in three blobs, and Trappers Cyanide Ltd's Possum Dough on the bait clip attached to the trap.

In December 2017 a field trial testing the lure in Sentinel possum traps began in Big Bush. This trial is to compare the number of possums caught in traps baited with possum clips filled with Possum Dough to traps baited with a clay clip soaked in aniseed oil. Lure type was alternated in traps along trap lines, with the lure type a trap received swapped every check to avoid trap site bias. Clay clips were made by drilling out part of the plastic bait clip and filling it with clay. This was then dried and soaked in aniseed oil. Following each check clay clips are dried out and then soaked in aniseed oil immediately before use. The results of this trial will be reported on in the 2018/19 annual report when the trial has been completed.

Monitoring

Two-yearly Travers Valley possum monitoring was undertaken in March 2018. This monitoring was completed following the National Pest Control Agency's (NPCA) established wax tag three-night survey method as this is what had been done previously at this site.

Wax tags were mounted approximately 300mm above the ground on tree trunks. A glow in the dark tab was attached at the tree attachment point. Ten monitoring lines were deployed and each line consisted of 20 wax tags spaced 10m apart on a compass bearing. Only six of the monitoring lines were able to be pulled in due to high river levels. The wax-tags are checked for possum chews on the wax block and the Possum Activity Index (PAI) is calculate as the percentage of wax tags in each area with possum bitemarks.

Results

In 2017/18 105 possums were caught in the RNRP with 85 caught in Big Bush, compared to only 16 on the St Arnaud Range (Table 4). Monitoring in Travers Valley recorded a PAI of 8% (SE ±3%), this compares to 4% (SE ±4%) in February 2015.

Table 4: Possum trap catches within the Rotoiti Nature Recovery Project from July 2017 to June 2018.

Trapline	Total Possums caught	No. of traps	Catch per trap
Black Sheep Gully	7	28	0.25
Black Valley Stream	5	19	0.26
Dogleg	33	38	1.43
Dome Ridge	30	46	0.65
Duckpond Stream	4	20	0.20
Struth	6	17	0.35
Big Bush Total	85	168	0.51
Borlase Boundary	2	14	0.14
Clearwater	5	17	0.29
Grunt	2	23	0.09
Hubcap	2	23	0.09
MOR	2	17	0.12
SARN	1	3	0.33
Snail	2	15	0.13
St Arnaud Range Total	16	112	0.14
Total	105	359	0.29

Discussion

The number of possums caught in 2017/18 was similar to the previous year. Monitoring undertaken in 2016/17 showed that the current trapping intensity is keeping possums below the five percent PAI target, however this will be reviewed following the 2018/19 monitoring.

Monitoring from Travers Valley showed that possum numbers are still at relatively low levels (PAI of 8% (SE ±3%)) following the 2014 1080 operation when a PAI of 19% (SE±6%) was recorded. Given this slight increase over the spring/summer months the Travers Valley trapline may be reinstated to prevent reinvasion into the RNRP.

2.1.7 Friends of Rotoiti possum control

Methods

Possum control on FOR traplines started with Warrior kill traps in 2005, which were changed to Sentinel kill traps in early 2010. The number of traps along lines has been increased over the years. Currently there are 38 traps in the Rainbow Valley, 39 on the Whisky Falls line, 14 on the Speargrass line and five on the Mt Robert Road line. One Trapinator possum trap is being used on the Speargrass line.

Sentinel traps are baited with Trappers Cyanide Ltd's Possum Dough on the bait clip and Connovation's Ferafeed Smooth in a tube as a lure on the tree leading up to the trap. Traps are checked and rebaited monthly.

Results

In 2017/18, 220 possums were caught, which is more than previous seasons with 119 caught in 2016/17 (Table 5). This is likely due to an increase in the number of possum traps on FOR lines, with the highest number of possums caught on the Whiskey Falls line (n = 100) which had the number of traps along it increased throughout the year. The one Trapinator trap deployed along the Speargrass trap line caught two possums in 2017/18.

Table 5: Total number of possums caught on Friends of Rotoiti traplines from July 2017 to June 2018.

Trapline	Number caught
Rainbow Valley	64
Mt Robert	16
Speargrass	37
Whisky Falls	100
Black Hill Contour	3
Total	220

2.1.8 Deer control and monitoring

Methods

A volunteer hunter system operates within the RNRP with approved recreational hunters able to book access to hunting blocks within the RNRP. In previous years interest in the RNRP hunting blocks from the public has been limited, however since 2016/17 there has been increased interest in volunteer hunting. The BFOB aerial 1080 operation in December 2014 may have also contributed towards controlling deer within the Travers Valley and East Sabine catchments (Long, et al. 2015).

Results

Deer and deer sign continue to be seen throughout the RNRP by DOC staff and volunteers. In 2017/18 there were 20 known recreational hunting days in the RNRP with two chamois shot.

Discussion

Although there was a high number of hunter days in the RNRP low numbers of animals were shot, with only two chamois shot. This compares to the previous year when the same number of hunter days were recorded but 5 deer and 4 chamois were shot.

2.1.9 Pig control and monitoring

Introduction

Regular pig control has only recently become a programme in the RNRP due to an increase in the number of pigs and pig rooting observed in the area, particularly on the northern end of the St Arnaud Range. Sign is occasionally found elsewhere within the RNRP core and in Big Bush, however a large pig population has built up in the northern area of the St Arnaud Range. Since 2016 trapping has been trialled as a pig control method on the

northern St Arnaud Range, with a trap at Beech Hill Rise catching four young pigs in 2016/17.

Method

The existing pig trap near Beech Hill Rise was reused this year and a new trap built at the end of 2016/17 near Alpine Meadows Drive. The bait used was either spent brewing grain, whole grain or crushed barley, mixed with water and molasses. Before use, this was left in a warm room for several days to ferment and increase the scent of the bait.

The area at Alpine Meadows was selected for the new pig trap due to the high level of pig rooting and obvious pig trails in the area. Prior to establishing the trap, the area was monitored for pigs with two trail cameras set up on obvious pig runs approximately 200m apart. From this cameras footage sixteen separate pigs were able to be identified from size and colour markings. A potential trapping site about 50m from one of the runs was selected and baited with a camera monitoring. Once pigs were taking this bait the trap was constructed at the site over the course of a month so as not to alarm the pigs with the sudden appearance of a fully constructed trap. Once constructed, the trap was baited and monitored, and then only set once pigs were entering it.

Results

The pig trap at Alpine Meadows was pre-baited from May 2017 and constructed by July. It was then set in October with six pigs caught (one on 15 October, four on 23 October and one on 26 October).

At the Beech Hill Rise trap, pig activity was found in May 2018 and bait was placed near the trap. Within a week a large boar and sow were recorded at the bait and the bait was moved into the trap. A week later the sow was entering the trap and it was set, with the sow caught three days later. One week later five small pigs were caught.

Discussion

Once pig traps are set up then trapping continues to be a low-cost method of catching pigs in the RNRP, with approximately ten hours spent at the Alpine Meadows trap for six pigs caught. This is largely as traps are able to be located close to road access, and camera monitoring enables the trap to only be set once pigs are feeding in the trap, limiting the length of time daily checks need to be carried out.

Future management will continue to involve live trapping when staff time is available, and hunting with dogs when staff are able or the opportunity for an appropriate volunteer arises.

2.1.10 Kākā monitoring

Monitoring of South Island kākā (*Nestor meridionalis meridionalis*) populations and breeding success has been a key focus of the RNRP since its beginning. This work found that mustelid trapping provided protection to the local kākā population, and that keeping mustelid tracking indices below 5% improved kākā breeding success (Moorhouse 2003).

Intensive kākā research in the RNRP ceased after 2005/06, with low effort encounter rate monitoring taking its place as a means of observing long-term changes in the population.

In 2015 monitoring was increased, as Project Janzoon planned for the RNRP to be a source population for chicks to be hand reared and then released into Abel Tasman National Park to begin re-establishing the population. In October 2015 Project Janzoon staff fitted transmitters to five kākā (three male and two female) caught within the RNRP core. These kākā were monitored in subsequent breeding seasons for nesting attempts, so that chicks could be taken for captive rearing and release into Abel Tasman National Park. In July 2016 one of the adult males monitored was found dead and appeared to have been dead for several months with no obvious cause of death. Four chicks were removed for captive rearing for Project Janzoon in 2015/16 breeding season (Waite, van Diepen, et al. 2016).

In 2016/17 no nesting attempts were observed from the radio-tracked kākā, and in 2017/18 these kākā were not monitored as no beech flower was observed to trigger breeding.

Methods

Encounter rate monitoring

The annual kākā encounter survey was carried out between the 1st October 2017 and 31st April 2018. The surveys are carried out concurrently with mustelid trap checks along nineteen trap lines that traverse suitable kākā habitat below the bushline. In 2017/18 the trapline German Village was combined with a new line State Highway Traverse and is now recorded as part of the State Highway Traverse line. Observers record the start and finish time, number of kākā encountered, closest trap box location, and whether the birds were seen or heard.

Results

Encounter rate monitoring

In 2017/18, 28 kākā were seen or heard over 262 hours of surveying, with a mean encounter rate of 0.128 encounters per hour (SE± 0.049) (Figure 4). Kākā were only encountered along 8 of 19 lines surveyed in 2017/18 and the highest encounter rates were recorded on the Grunt and Duckpond Stream traplines (Table 6).

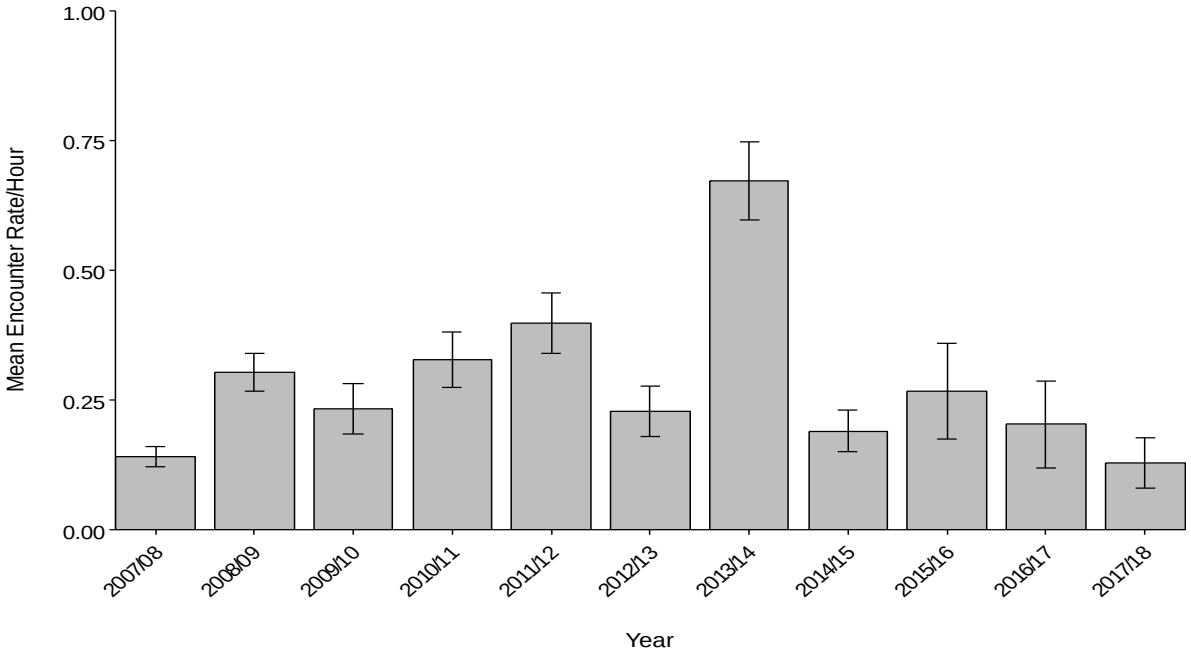


Figure 4: Mean (±SE) kākā encounter rates (number of birds seen/heard per hour) in the Rotoiti Nature Recovery Project.

Table 6: Encounter rates of kākā on traplines within the Rotoiti Nature Recovery Project between October 2017 and April 2018.

Trapline	Hours surveyed	Number of kākā		Encounter rate per hour (Seen and heard)
		Seen	Heard	
Angler's Walk	5.9	0	0	0.000
Borlase Boundary	17.1	0	0	0.000
Blacksheep Gully	19.6	0	0	0.000
Black Valley Stream	24.6	0	1	0.050
Cedar	11.4	0	5	0.346
Clearwater	11.5	1	0	0.086
Dogleg	22.6	0	0	0.000
Dome	24.8	0	4	0.165
Duckpond	10.1	2	4	0.650
Grunt	10.4	0	4	0.667
Hubcap	16.4	0	3	0.170
Lake Edge	17.7	0	0	0.000
Lake Head	10.6	0	0	0.000
Middle of Road	10.5	0	0	0.000
Peninsula Nature Walk	9.6	0	0	0.000
Snail	7.1	0	0	0.000
State Highway Traverse	13.8	2	2	0.226
Struth	8.3	0	0	0.000
Teetotal Road	10.3	0	0	0.000
Total	**262.3**	**5**	**23**	

Discussion

The kākā encounter rate in 2017/18 was low in comparison to other years, similar to the levels recorded in the first survey year in 2007/08 (Figure 4). From 2007/08 to 2013/14 the kākā encounter rate seemed to be increasing, with the highest encounter rate observed in 2013/14. However, since 2013/14 the encounter rate has dropped. The high encounter rate observed in 2013/14 may be partly a result of a large kākā breeding season in response to heavy beech flowering, with breeding behaviour increasing the call rate of kākā in the area. It is likely that the kākā population was recovering prior to 2013 and that the A24 trial undertaken from 2012 to July 2014 may have contributed to a recent decline in the kākā population with high mustelid tracking rates recorded during the kākā breeding season (Waite, van Diepen, et al., Rotoiti Nature Recovery Project Annual Report 2016/17 2017).

The number of traplines recording kākā encounters has decreased over the last two years, with eleven out of 19 traplines recording no encounters in 2017/18 and ten in 2016/17. In previous years the lines with the fewest or no encounters recorded all traversed through more marginal kākā habitat, like mānuka-dominated shrubland, whereas in the last two years lines within continuous beech forest which previously recorded higher encounter rates have recorded no encounters.

Given the importance of kākā within the RNRP, more intensive monitoring would be beneficial to ensure the population is recovering and that in breeding years predator control is providing adequate protection to nesting kākā.

2.1.11 Kea nest protection

Introduction

Kea are present in low numbers in Nelson Lakes National Park and there is evidence of a continuing slow decline (Steffens 2009). This finding is further supported by kea surveys and monitoring carried out by the Kea Conservation Trust (KCT) in the Lake

Rotoiti/Raglan Range area over recent years (J. Kemp pers. comm.). This monitoring shows that possum and stoat predation on kea nestlings and incubating adults is likely to be the primary cause of kea decline in the area. There is also DNA evidence that feral cats have predated on female adult kea in the Hawdon Valley (Dr L. Young, pers. comm.) and nest camera footage has also shown cats visiting kea nests in Rotoiti. There is 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 pers. comm.).

Considering the declining kea population in the Nelson Lakes area and that one of the principal agents of decline is likely to be predation at nests, the RNRP embarked on a partnership with the KCT in 2011/12 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

In 2017/18 five kea nests were protected, with an additional nest within the RNRP management area (Figure 5). As the kea nest trap networks were set up in different years and have expanded slowly over time, in addition to the difficult terrain making tidy grid patterns unfeasible, there is a lot of variation between them. In 2017/18, the trap networks were as follows:

Nest 5:14 Sentinel possum traps covering approximately 300×300m (9ha) around the nest as well as one A12, nine DOC200 stoat traps and six A24 around the nest. An existing Friends of Rotoiti trapline of DOC200 traps along the ski field road passes within 200m of the nest.

Nest 9: Six Sentinel possum traps, six DOC200 and five A24 stoat traps in a straight line up the ridge where the nest is located. Five sentinel possum traps, five DOC200 stoat traps along a line beneath the nest along the valley floor.

Nests 27 and 42: Eleven Sentinel possum traps and eight DOC200 stoat traps in a 400×200m grid around the nest 27(8ha). Eleven sentinels, three DOC200, three A12s and seven A24s around nest 42. An existing Friends of Rotoiti trapline of DOC200 and Sentinel traps along the Speargrass Track passes within 150m of the nest.

Raglan north nests: Twenty-one Sentinel possum traps, two DOC200 stoat traps and three A24s in a 700×200m grid around the three nest sites (14ha), and 24 DOC200 in two lines of 12 going straight up the ridges either side of the nest sites.

Nest 22: Protection to this nest located on the northern part of the Raglan Range is carried out by the Kea Conservation Trust.

Nest 3: Within the RNRP management area on the MOR Ridge. No additional protection was provided.

Nest 8: Old nest site that has not been used for many seasons. Was not monitored or protected this season.

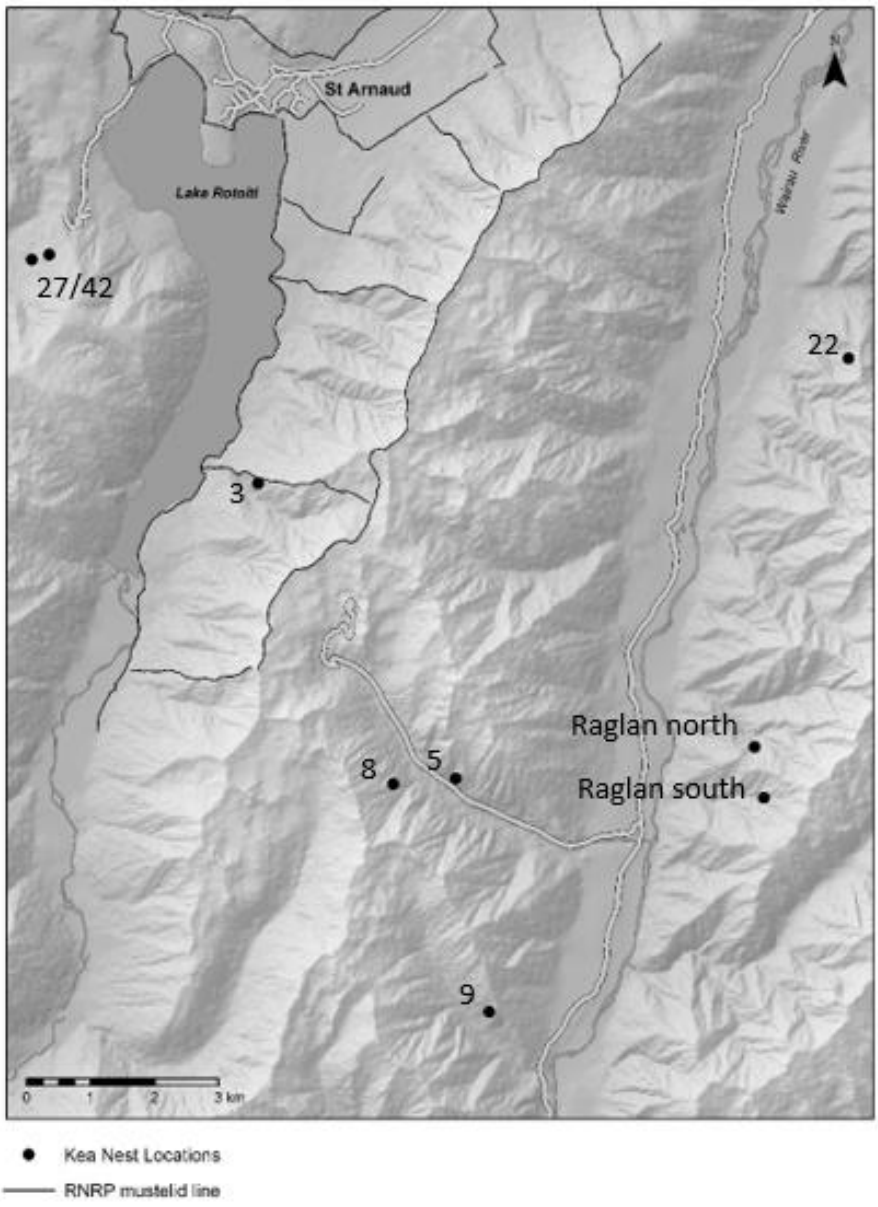


Figure 5: Locations of kea nests in Nelson Lakes National Park in 2017/18

To provide protection from the start of the breeding season, all kea nest protection trap networks were opened, baited and serviced monthly beginning early July. As monitoring of radio-tagged kea and nest sites by Corey Mosen (KCT) and RNRP staff provided more information on which kea were nesting and where, trap networks around nonactive nests were closed. Trail camera monitoring was used to determine nest fate and provide identification in cases of predation.

Results

This year there were nesting attempts at two sites in the Raglan range and one site in the St Arnaud Range. The results from nest monitoring indicated that two other pairs mated but failed to nest. The remaining cavities that were monitored were not used this year. The results for each of the monitored nest cavities are:

- Nest 5: Pair did not attempt to nest this year.
- Nest 9: Female successfully nested. Two chicks fledged in late January 2018.
- Raglan north: Female had two nesting attempts but both failed, the second at the chick stage due to predation.
- Nest 22: Female attempted to nest several times, but nest failed at egg stage. Suspected predation of nest by a stoat.
- Nest 3 (MOR ridge): Pair did not attempt to nest this year.
- Nest 27 & 42: No activity was recorded at the nest sites this year.

There were three stoats and five possums caught around protected nests this year. However, despite this low number of trap captures, camera monitoring showed that there was almost nightly visitation by predators to nest sites. There was no known mortality of adult kea this year.

Discussion

In 2017/18 three pairs attempted to nest. One pair successfully fledged chicks, with the other two failing at either egg or chick stage. Other monitored pairs did not attempt to nest and may have been put off by high predator visitation (Corey Mosen pers. comm.). For an individual year this is a poor result and an indication some changes to the trapping regime may still be needed.

In the bigger picture since nest protection started in 2011, 20 nesting attempts have been recorded, with six successful. While the success rate of these nests is low (30%), it is higher than a 2009 to 2014 study in Kahurangi which had only two percent of nests successful

when predators were not controlled at all (Department of Conservation 2016). Given the low number of kea in Nelson Lakes National Park the kea nest protection programme will continue as high priority work.

2.1.12 Mistletoe monitoring

Monitoring of threatened mistletoe species in the RNRP is undertaken to assess the effectiveness of the possum control programme at allowing the recovery of browse threatened species. This monitoring uses a modified foliar browse index to assess the health of tagged individuals of three species of mistletoe (*Alepis flavida, Peraxilla colensoi, and P. tetrapetala*). This monitoring is undertaken every four years and is next scheduled for 2020/21.

2.1.13 *Pittosporum patulum* monitoring

Introduction

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

Methods

In January 2018, approximately half of the monitored *P. patulum* were assessed for health using a modified Foliar Browse Index technique.

Results

Of the small sample of plant measured 17 plants can be compared directly for height between 2014/15 and 2017/18 with 15 of these showing a modest increase.

Discussion

The methods used for measuring *P. patulum* in the RNRP are different from other sites, including elsewhere in the Nelson Lakes District. In 2017/18, these differing methods were attempted to be brought together which proved problematic. There were also difficulties this year with relocating previously monitored plants and in 2018/19 this will be addressed and all plants will be remeasured.

2.1.14 *Powelliphanta sp.* monitoring

There is a population of *Powelliphanta* "Nelson Lakes" on the northern end of the St Arnaud Range. This is threatened by habitat degradation from grazing of the alpine plant communities by ungulates and hares and rooting activity of pigs, as well as direct predation by exotic birds, rodents and pigs.

Permanent snail monitoring plots were established in 1997 and 1999 to be measured at five-yearly intervals to measure population trends. These were last measured in 2014/15 and are scheduled to be next monitored in 2019/20.

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

At the time of writing, 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 remain as goals for the future.

2.2.2 Great spotted kiwi population monitoring

Introduction

Great spotted kiwi (GSK) are the largest kiwi species found in New Zealand and were likely present in the Nelson Lakes area early in the 20th century before becoming locally extinct (Steffens 2009). Sixteen GSK, sourced from a population at the Gouland Downs in Kahurangi National Park, were reintroduced to the RNRP via two translocations in 2004 and 2006.

The reintroduced birds settled and established territories, however breeding activity was not as high as expected and Operation Nest Egg (ONE) was initiated in 2009 to supplement the population with chicks sourced as eggs from the Gouland Downs and Stockton mine. From 2009 to 2011, ten eggs were uplifted from radio-tagged adults at the Gouland Downs and seven chicks hatched from the eggs were introduced to the RNRP between 2010 and 2012. Four of these chicks died soon after release. From 2012 the RNRP received ONE chicks from the Stockton mine area under an agreement relating to the expanse of mining operations at Cypress mine. Six chicks and one sub-adult were received between 2012 and 2016, with two of these chicks dying soon after release. The ONE

programme finished in the RNRP in January 2016 due to the poor success rate of chicks in comparison to adult releases, with all adult kiwi released into the RNRP surviving compared to only seven of the 13 ONE chicks.

Through both translocations of adult GSK and chicks through the ONE programme, 24 founder GSK have established in the RNRP, with three subsequent adult mortalities known to have occurred. The Kiwi Recovery Group advises that translocated kiwi populations should have 40 unrelated founder birds to establish a genetically robust population. Therefore, future GSK management in the RNRP will focus on translocating more adult GSK into the population. In 2016, the Friends of Rotoiti received funding for this work to be carried out, and twenty GSK are planned to be translocated into the RNRP during the years 2019 and 2020.

In 2009 and 2011 Kiwi Call Count monitoring was carried out in the RNRP to try and establish a method to monitor the trend of the kiwi population. Low numbers of calls were heard during these sessions and this work was not repeated. In 2018 the need for monitoring of the population trend in the RNRP was established, and a review of the previous call count monitoring was undertaken by the Kiwi Recovery Group. This review suggested due to the low call rate of GSK in the RNRP that acoustic monitors would be the best way to monitor the RNRP population for long-term changes. In March 2018 acoustic monitoring was carried out for the first time in the RNRP to be used to determine the trend of the kiwi population over time.

Methods

Radio Transmitter monitoring

Monitoring of kiwi for mortality and breeding continued in 2017/18 using Sirtrack GSK V2.0 radio transmitters. In 2017/18 one adult male, one adult female, and one sub-adult female were monitored. In June 2018 transmitter monitoring was cease due to the small number of individuals monitored, and transmitters were removed.

Acoustic Monitoring

In March 2018 acoustic monitoring was run as a pilot study for a long-term monitoring programme to monitor the trend of the RNRP kiwi population. The method used followed best practise guidelines (Robertson and Colbourne 2017) and advice received from the Kiwi Recovery Group.

Thirteen AR4 acoustic recorders were placed within and around the RNRP by DOC staff and FOR volunteers (Figure 6). The recorders were placed approximately 1.5km apart along the St Arnaud Range and up the Travers Valley. The monitoring period was 15 nights in March over the new moon period (ie one week before the new moon and one week after) and in 2018 was 10-25 March. The recorders were set to record for four hours a night from 2030 to 0030 on the low setting. For analysis the five nights with the highest disturbance were discarded to give ten monitoring nights. In 2018 the nights discarded were the 13, 15, 22, 23 and 24 March. The analysis of the recordings was carried out by FOR volunteers using the software Audacity.

Figure 6: Locations of acoustic recorder sites for monitoring of the Rotoiti Nature Recovery Project great spotted kiwi population.

Results

Radio transmitter monitoring

In 2017/18, one confirmed breeding attempt was detected in the RNRP. Puremahaia began nesting in November 2017, approximately 100m from the lake edge, south of the North MOR spur. Trail cameras recorded a chick leaving the burrow on 18 January and this chick was photographed several more times over the next two months. When Puremahaia was caught in June 2018, he was sharing a burrow with this season chick, the female Awaroa (past confirmed breeding partner), and an unidentified kiwi.

Data from the female Joys transmitter indicated she may have nested for the first time in 2017/18, however the nest could not be located so this cannot be confirmed. Joy's activity level dropped near the end of October and stayed low until the end of December (Figure 7). Several close approaches during the day were carried out but she was found in different burrows each time and if she was nesting she was not incubating during the day. No close approaches were attempted at night when she may have been incubating as Joy has become very flighty when approached and it was thought there was a high risk she might abandon the nest if disturbed. When she was caught in July 2018, she was sharing a burrow with male Motupipi but no chick was present.

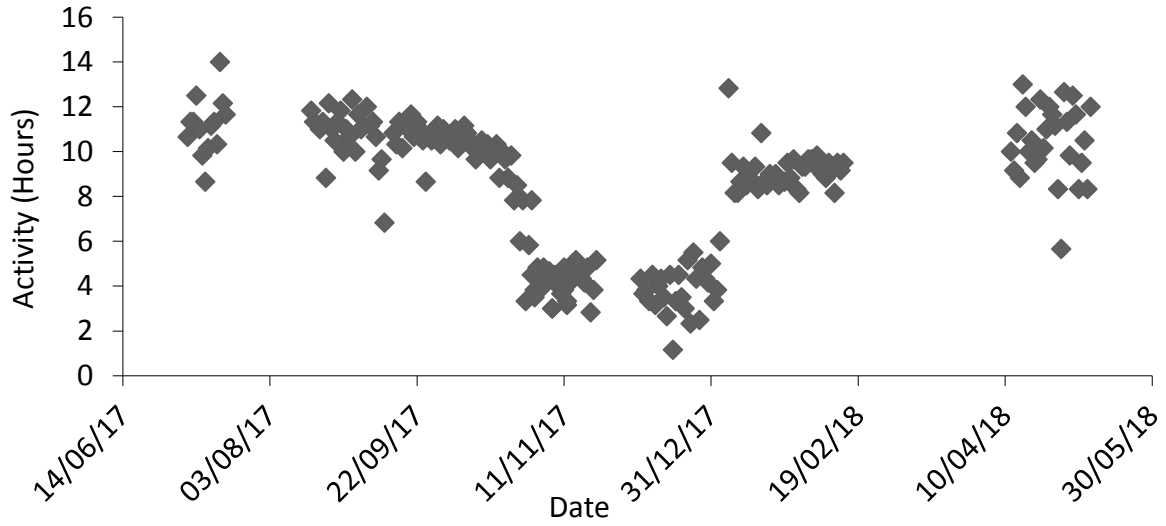


Figure 7: Activity graph for female great spotted kiwi Joy in 2017/18.

Acoustic Monitoring

Kiwi were recorded by five of the eleven recorders, with two recorders not functioning correctly (Table 7). Males were detected by four recorders, while females by three, with dueting detected by one recorder. Kiwi were detected in the core of the RNRP and the Travers valley but not on the northern end of the St Arnaud Range (Figure 8).

Table 7: Great spotted kiwi call rates from acoustic monitoring in the Rotoiti Nature Recovery Project, March 2018.

Site	Male Calls	Male Calls/Hour	Female Calls	Female Calls/Hour	Total Calls/Hour	Duets
1	0	0	0	0	0	0
2	5	0.125	9	0.225	0.35	4
3	2	0.05	0	0	0.05	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	2	0.05	1	0.025	0.075	0
7	1	0.025	0	0	0.025	0
8	0	0	3	0.075	0.075	0
9	NA	NA	NA	NA	NA	NA
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	NA	NA	NA	NA	NA	NA
13	0	0	0	0	0	0

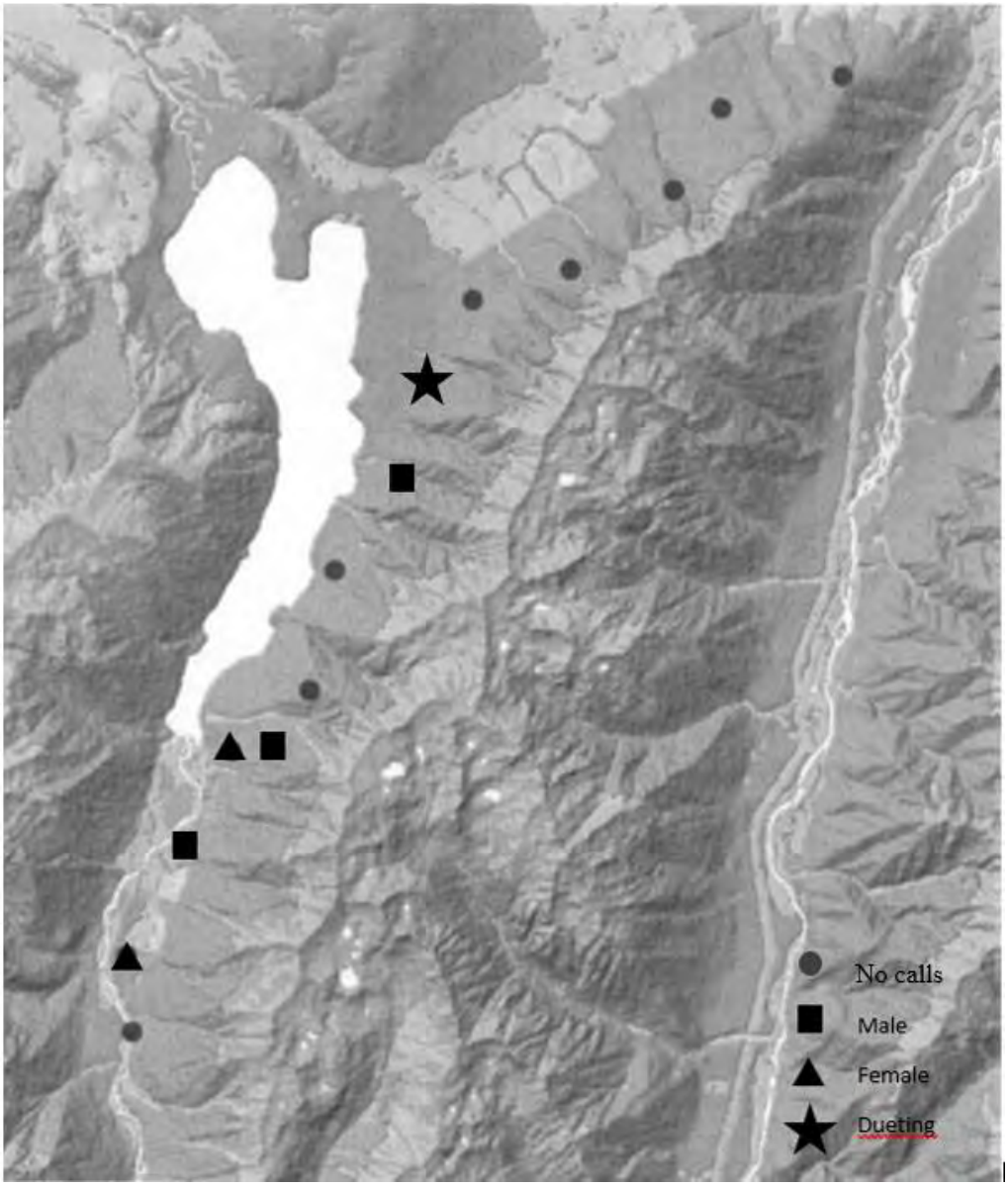


Figure 8: Locations of great spotted kiwi calls detected during acoustic monitoring in the Rotoiti Nature Recovery Project, March 2018.

Discussion

Work done in 2017/18 was focussed on establishing a long-term acoustic monitoring programme. The acoustic monitoring call rates in 2018 were low, although several years of data will need to be collected before trends can be determined. The acoustic monitoring went well with FOR volunteers very quick at analysing recordings. Additional recorders will be purchased for March 2019 when monitoring will be repeated so that twenty recorders can be deployed with new sites likely to be established further up the Travers.

The focus of the RNRP kiwi programme is now on the upcoming translocation of twenty adults scheduled to occur in 2019 and 2020. How much monitoring for nesting success of these new kiwi occurs is yet to be determined.

3 Learning objectives

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 Test the effectiveness of rodent control tools

3.1.1 Introduction

Rodents have a number of impacts on ecosystems including predation of birds, invertebrates and seeds as well as driving stoat populations (Blackwell 2003, Innes 2010). Protection of native passerines from rat predation and preventing associated stoat population increases are the principal reasons for rat control within the RNRP. Rodent control within the RNRP aims to reduce rodent tracking indices to below five percent.

Beech seed is an important food source for a number of native species and a driver of breeding success. It is also a driver of rodent population dynamics in beech forest, with heavy seeding supplying a food source that allows extended breeding of rats and increased rat populations that cause a subsequent increase in the stoat population (Blackwell 2003, Dilks 2003). In upland beech forest, such as that present in the RNRP, ship rats are therefore a periodic threat to forest birds following beech mast events directly through increased predation as well as subsequent increases in stoat numbers.

Ground-based rat control has been carried out in the RNRP using a variety of methods with mixed levels of success even during non-mast years. Three years of rat control using the toxins 1080 and brodifacoum was carried out in the Core Area of the RNRP from 1997-2000. While this was successful in reducing rat numbers, the method was abandoned due to concerns regarding secondary poisoning by 2nd generation anticoagulants in a suite of non-target mammalian predators and native birds (Spurr 2005). The effectiveness of snap trapping was trialled from 2000 to 2007. Throughout this period snap trapping

consistently failed to achieve the performance target of a sustained rat tracking index of less than five percent.

During the 2006-07 season a 'detection and staged response' model using 1080 was trialled but failed to reduce the rat population. No rat control was undertaken in 2007-09 due to budgetary constraints and concerns about possible non-target effects. From 2010 to 2013 operations used either diphacinone or pindone with pulsed control in spring with mixed results. In December 2014, aerial 1080 was used within the RNRP as part of a nationwide Battle For Our Birds operation triggered by wide-scale beech masting, to prevent the irruption of rat populations and control rats at the landscape scale (Fairweather 2015). In 2016 diphacinone in bait-stations was again trialled but failed to control rodents in the RNRP.

Rat control operation decision making is based on a combination of rat tracking indices, beech and tussock seedfall data and a planning flow chart (Figure 9). Monitoring carried out at the start of 2017 showed low amounts of beech seed (see section 3.3.5 Beech seed monitoring) and low amounts of tussock flowering at Mt Misery (see section 3.3.6 Tussock monitoring). While tracking rates were high in the RNRP (26% (SE±5) in May 2017 and 39% (SE±7) in August 2017) a decision was made to not carry out a rodent control operation due to resourcing and past failure of ground control operations.

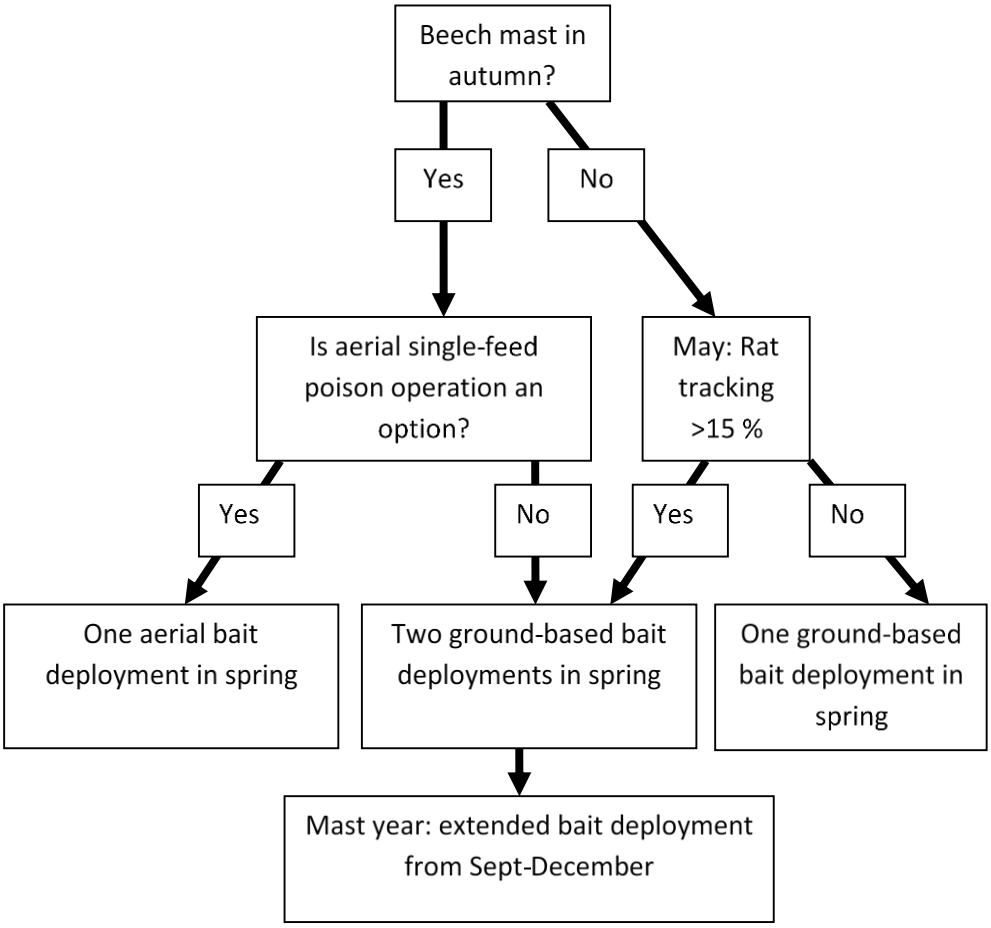


Figure 9: Flow chart for planning preliminary rodent control in the RNRP.

3.1.2 Rodent control operation

No rodent control operation was carried out in 2017/18 due to resourcing and past failure of ground-based control operations.

3.1.3 Rodent population monitoring

Method

Monitoring of rodent abundance within the RNRP was carried out using one-night tracking tunnel indices. Standard 60cm coreflute tracking tunnels with Black Trakka™

inked cards are used at 50m spacings along lines with minimum 200m between lines. In 2017/18 monitoring was carried out in the RNRP (mustelid control) and at Rotoroa (no control) in August, November, February and May. Peanut butter is used as a lure placed on both ends of the base of the tunnel, and left out for one fine night (Gillies, 2013).

Results

Rat tracking in the RNRP increased from 26% (±5%) in August 2017 to 39% (±7%) in May 2018 (Figure 10). At Rotoroa rat tracking remained below five percent. Mouse tracking remained below 10% at Rotoiti, while at Rotoroa mouse tracking was higher and peaked at 33% (±6%) in November 2017 (Figure 11).

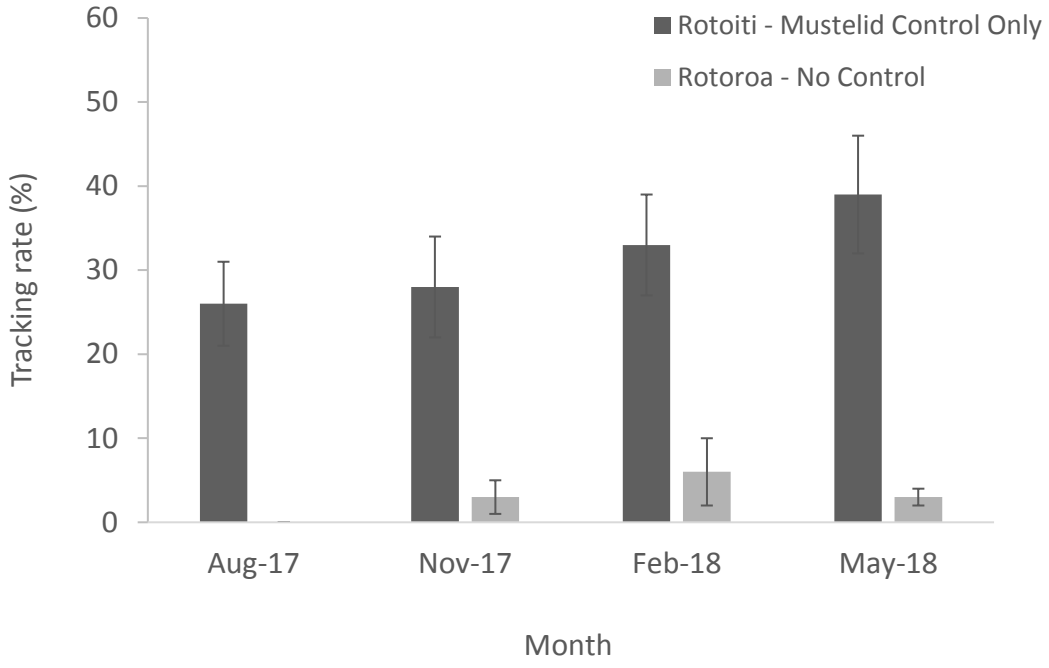


Figure 10: Rat tracking rates in the Rotoiti Nature Recovery Project and Rotoroa non-treatment site in 2017/18.

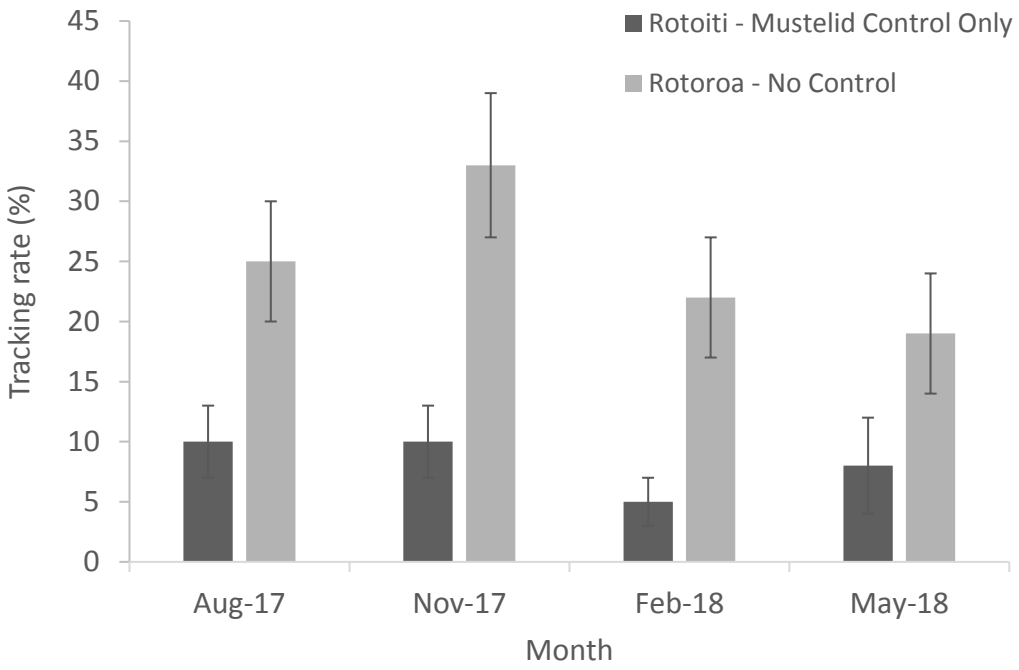


Figure 11: Mouse tracking rates in the Rotoiti Nature Recovery Project and Rotoroa non-treatment site in 2017/18.

3.1.4 South Island robin monitoring

The South Island robin (*Petroica australis australis*) is an endemic passerine that has declined dramatically since European settlement, primarily due to habitat loss and mammalian predation (Bell 1986). In 2016 South Island robin were reclassified from the Not Threatened category to At Risk – Declining, and were noted as being Conservation Dependent, which is defined as "the taxon is likely to move to a higher threat category if current management ceases" (Robertson, et al. 2016, Townsend, et al. 2008).

South Island robin have been monitored within the Core area of the RNRP since 1998/99 to measure the effectiveness of rat control operations. This was ceased in 2015 due to resourcing, but a census was carried out in September 2017 as outcoming monitoring for the 2016 rodent control operation.

Methods

To determine the total number of paired robins and unpaired individuals in a defined part of the Core Area at the start of the breeding season, a census was carried out. Survey were conducted four times, one week apart, in September 2017. Until 2007, the census area was approximately 120 ha in size, but was expanded south of the Loop Track to increase its size to 162.1 ha, as so few robins were being located in the years prior to this.

The census site was split into three areas for ease of monitoring (one person per area per day of surveying). Each surveyor walked slowly along each line while tapping a mealworm container, stopping at every second bait station for 1–2 minutes, tapping loudly to attract robins. If a robin was sighted, the container was tapped until the robin approached and was then fed as a reward. The band combination, sex, whether paired or alone, and behaviour of robins encountered was recorded.

Results

In the 2017 census only one robin pair and six single males were found, this is a low density of pairs in comparison to previous seasons (Figure 12).

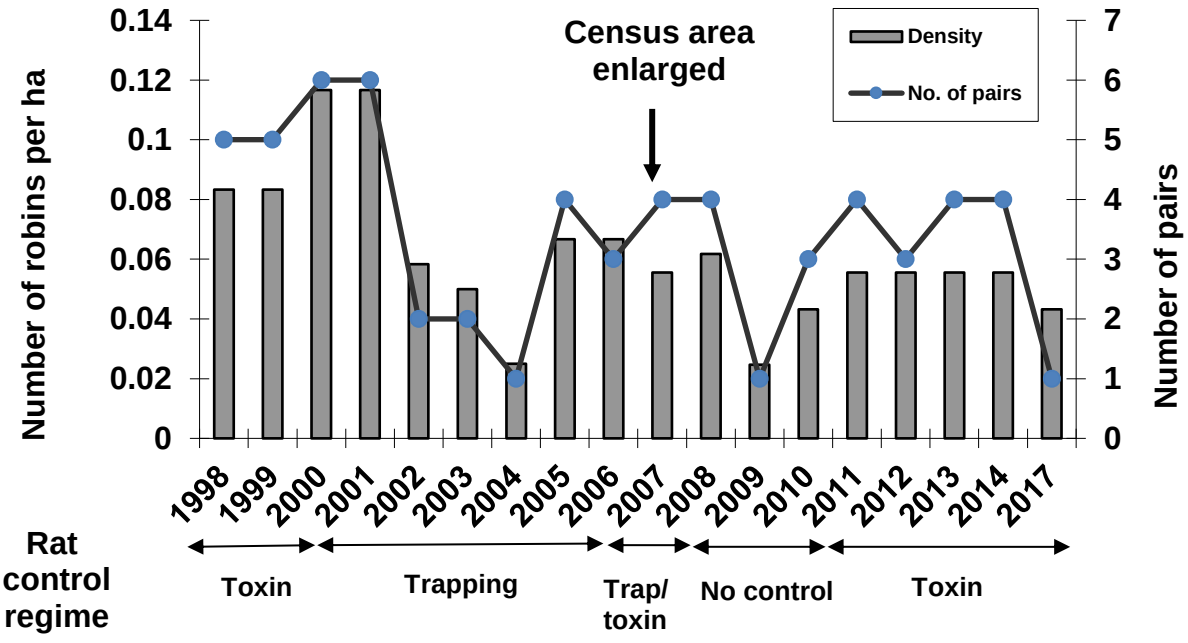


Figure 12: Robin density and number of pairs in the Rotoiti Nature Recovery Project Core Area during different rodent control regimes.

3.1.5 Discussion

Robin numbers within the RNRP Core Area have fluctuated since 1998, but the general trend has been for a decline in the number of robins counted. The 2017 year was equal with the lowest number of pairs counted previously in the census in 2004 and 2009, although more single males were found (n = 6) in 2017. In general, robin numbers tended to decline when only rodent trapping was carried out from 2000 to 2006, and the number of robin pairs increased following toxin operations with a lag of about one year. The failure to control rats within the census area in 2014 and 2016 may have caused the reduction in the number of robins pairs in the area. Given the failure of ground-based rat control operations in the past and the high work load associated with these, there is no control operation planned for 2017/18.

3.2 Test the effectiveness of wasp control tools

Introduction

Introduced common wasps (*Vespula vulgaris*) are a major threat to biodiversity within the RNRP as they can reach extremely high densities within the honeydew beech forest (Thomas 1990). They have three known impacts on honeydew beech forest biodiversity:

1. Taking of honeydew. This reduces its availability as a food for native birds, invertebrates and herpetofauna (Harris, 1991; Evans, 2015).
2. Predation of invertebrates (Harris, 1991).
3. Killing of bird nestlings (Moller, 1990).

And two potential impacts:

1. Competition with other detritivores due to removal of animal carcasses.
2. Impacts on the scale insect that produces honeydew, suggested as a possibility following field observations of damaged scale insect filaments by DOC Nelson Lakes staff.

Wasps also severely affect the activities of people using the area in summer, putting DOC staff and volunteers at risk of anaphylactic shock after being stung, and negatively influencing the experience of public visitors to the area.

Wasps have been controlled in the Core Area of the RNRP since 1998, using various protein-based baits that mainly contain the toxins Finitron® or fipronil. This work was originally carried out in association with Landcare Research and more recently with the company Entecol, which is currently the only supplier of the toxic bait Vespex™ (0.1% fipronil).

Fipronil has proven to be the more effective of the two toxins and since the 2007/08 season, only X-stinguish™ (now renamed Vespex™) has been used for wasp control operations in the RNRP. Until 2015 access to this toxic bait was constrained by commercial imperatives, with DOC Nelson Lakes only able to use it under an experimental use arrangement. In 2015, a DOC pilot trial using X-stinguish™ for landscape-scale wasp control was completed successfully at five sites, one being the RNRP. This was a key step towards an agreement between DOC and BASF (the company that produces fipronil) which has seen the commercial restrictions on fipronil use lifted, and the toxin Vespex™ is now more widely available for wasp control in New Zealand.

Over recent years it has appeared that some unknown factor may be reducing wasp numbers, possibly by affecting nest establishment by queens or the health of workers. Landcare Research is researching a mite that was recently discovered on common wasp queens, and whether it holds any potential for use as a biocontrol agent. The RNRP has supported this work by collecting queen wasps hosting the mites for researchers.

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 (DOC-431791).

The control operation covers ~1129ha of the RNRP, as well as approximately 150ha of Tasman District Council road reserve around the St Arnaud village which adjoins the RNRP. Bait stations are on a 300×50m grid following contours, with a mixture of yellow Wasptek and KK bait stations were used. Approximately 20g of Vespex™ bait was placed in each bait station. Any remaining bait was collected six to seven days later and weighed to determine the amount of bait take.

Control Operation

Pre-operational protein interest monitoring was carried out January 11 2018 and repeated on January 15. An average of 1.03 wasps per non-toxic bait across all sites were observed during this monitoring. The decision was made to carry out toxic baiting during the following fine weather window. Bait was deployed from 23 to 25 January, with stations emptied on 30 and 31 January.

Results and outcome monitoring were carried out before and after the control operation within the treatment area of the RNRP and at Beebys Knob carpark, a non-treatment site, to determine the effectiveness of the operation.

Result Monitoring

To determine the effectiveness of the operation at reducing wasp numbers within the treatment area, monitoring of wasp nest flight counts was carried out using the Wasp abundance monitoring protocol (DOC-691729). Ten nests were located in each of the treatment area, and non-treatment area, prior to the control operation and the number of wasps entering and exiting each nest was recorded over one minute and repeated three times. This was repeated a week after the control operation and then one month after the operation.

Outcome Monitoring

To determine whether the control operation had reduced the wasp density to a low enough level to provide benefits to biodiversity, monitoring was carried out measuring quantities of available honeydew using the Honeydew monitoring protocol (DOC-1529461). Quantities of available honeydew were measured within permanently-marked 5×50cm plots on 24 beech trees in each of the treatment area and non-treatment area. The number of honeydew droplets within each plot was counted twice prior to the operation, a week after the operation and a month after.

Results

Control Operation

In total, 37kg of toxic bait was deployed this season and approximately 27kg (75%) of this was removed by wasps. The highest bait take was recorded in the RNRP core (79%) but other sites were almost as high with the lowest bait take in Big Bush (65%).

Result Monitoring

Within the treatment area, average wasp flight counts at monitored nests one month after the operation showed a reduction from 24.5 (SE±1.9) wasps/min to 3.3 (SE±1.4) wasps/min (Table 8). Over the same period flight counts decreased in the nontreatment area from an average of 22.4 (SE± 3.1) wasps/min to 16.6 (SE±3.1) one month after the operation (Table 8).

Table 8: Average number of wasps entering and exiting nests within the treatment and nontreatment areas of the Rotoiti Nature Recovery Project before and after the 2018 wasp control operation.

Site	Pre-poison 1	Post-poison 1	Post-poison 2
Treatment	24.5 (1.9)	8.7 (1.4)	3.3 (1.4)
Non-treatment	22.4 (3.1)	31.6 (4.2)	16.6 (3.2)

Outcome Monitoring

The quantity of available honeydew increased within the treatment area from 1.9 (SE±0.6) droplets/plot immediately prior to the operation, to 14.1 (SE±3.2) a week after the operation

before dropping to 6.4 (SE±1.8) one month after the operation (Figure 13). The quantity of available honeydew in the nontreatment area was at similar levels to the treatment area prior to the control operation, but following the operation stayed at a low level (Figure 13).

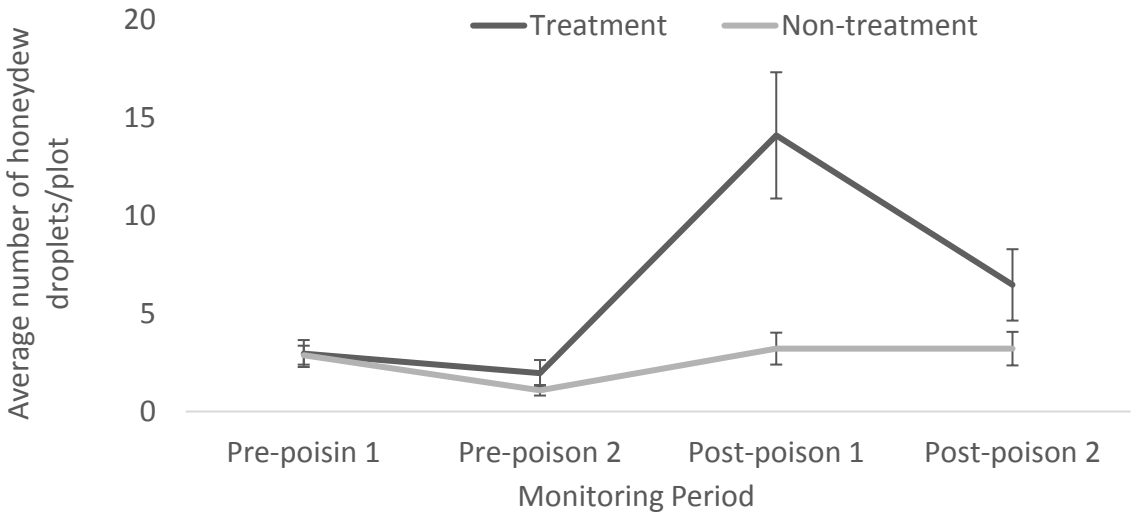


Figure 13: Average number of honeydew droplets per plot within the Rotoiti Nature Recovery Project wasp treatment area and non-treatment area, before and after the 2017/18 wasp control operation.

Discussion

This season the wasp control operation did not meet the result target of reducing flight counts by 90%, however, it did have an impact on wasp activity and honeydew availability. Wasp flight counts decreased by 86% and this was enough to increase the available honeydew in the treatment area by 70% which just fell short of the operational target. Comparatively available honeydew at the non-treatment site had no observed increase over the period of the operation.

The wasp foraging index was low this summer, as it has been for the last few seasons in the RNRP. Only one of the surveyed sites reached an average of more than one wasps per dish during pre-operational monitoring. The combined average from all monitoring sites reached the threshold to run the operation, but wasp activity was observed to be patchy by staff and volunteers in the RNRP. The decision to carry out wasp control in late-January was based on the overall result from the protein interest monitoring. There was also a good window of fine weather which was ideal for the operation.

Following the operation observations were that there had been a reduction in wasp activity overall, but a few areas where high numbers had persisted. Some of the FOR traplines were treated a second time and volunteers reported a reduction of wasps afterwards (Wayne Sowman, pers. comm.).

The weather in early summer was quite hot and dry but from January on there were several summer storms that could have affected wasp foraging behaviour during the usual operational time window. This could explain the areas of high wasp activity left behind as foraging behaviour could have been impacted by rain and colder weather. This in turn made it more difficult to plan an operation for biodiversity benefits, as there is a drive to carry out control as early as possible in the wasp nest life-cycle before the bulk of the damage is done to the honeydew beech forest food web. In future operations monitoring foraging behaviour very closely from early December will be beneficial in determining when the best time to carry out control will be.

This was the second year that wasp control was carried out along stoat traplines at 100m station spacings for staff safety. This year BSG trap line and DGL line were baited in early February, but no other traplines were baited as wasp numbers weren't deemed to be problematic on these lines. So far it appears that 100m spacings are satisfactory for protecting trappers.

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

3.3.1 Five-minute bird counts

Methods

Five-minute bird counts (5MBC) were conducted using the technique detailed by Dawson and Bull (1975) on the St Arnaud Range Track in the Core Area, at Lakehead and along the Mt Misery Track at Rotoroa. In November, February and May each site is surveyed three times. In May 2018 only two counts were carried out at Lakehead. Count data is analysed periodically and has recently been undertaken for data from 1998 to 2015 by Canterbury University Masters student Kelly Whitau (Whitau 2017).

3.3.2 Bat monitoring

Introduction

Two extant species of endemic bats occur in New Zealand, the lesser short-tailed bat (*Mystacina tuberculata*) and the long-tailed bat (*Chalinolobus tuberculata*). Both species have declined significantly since the arrival of humans, and their distribution is now discontinuous (O'Donnell, et al. 2018). There are a number of threats to bats including predation and competition by introduced animals (O'Donnell, et al. 2018).

Historically within the RNRP long-tailed bats have been recorded at Lake Rotoiti and Lake Rotoroa, although in low numbers (Butler 2003). Surveys for short-tailed bats have been conducted within the RNRP with none found (Harper, Forder, et al. 2011, Butler 2003). In summer 2018 a pilot was undertaken using a monitoring method designed by DOC scientist Moira Pryde that uses Automatic Bat Detectors to measure a course index of abundance of long tailed bats. If successful this monitoring would will be carried out

annually as a long term monitoring project to determine how effective pest management within the RNRP is at providing protection to long-tailed bats.

Method

Surveys were carried out at Rotoiti and Rotoroa using Automatic Bat Detectors (ABD) placed along edges where bats travel and bat passes are more likely to be recorded. Twenty ABDs were placed at each site at survey points along edges (track, bush edge or lake edge) approximately one kilometre apart. At each survey point the ABD was hung approximately 1.5 off the ground from a branch. ABDs were set to turn on at 20:30 (approximately 30 minutes before sunset) and record for 12 hours. Recorders were left out for 14 days with the Rotoiti survey occurring from 5 to 19 December, and Rotoroa from 8 to 22 January. Recordings were analysed using Bat Search software to identify bat passes at each ABD.

Results

At both Rotoiti and Rotoroa 6 ABD recorded long-tailed bat passes. At Rotoiti a total of 9 passes were recorded along the edge of the lake, up the Travers valley and behind the Borlase farm (Figure 14). At Rotoroa a total of 17 passes were recorded along the edge of the lake, by a tarn near the Speargrass track and up the D'Urville valley (Figure 14).

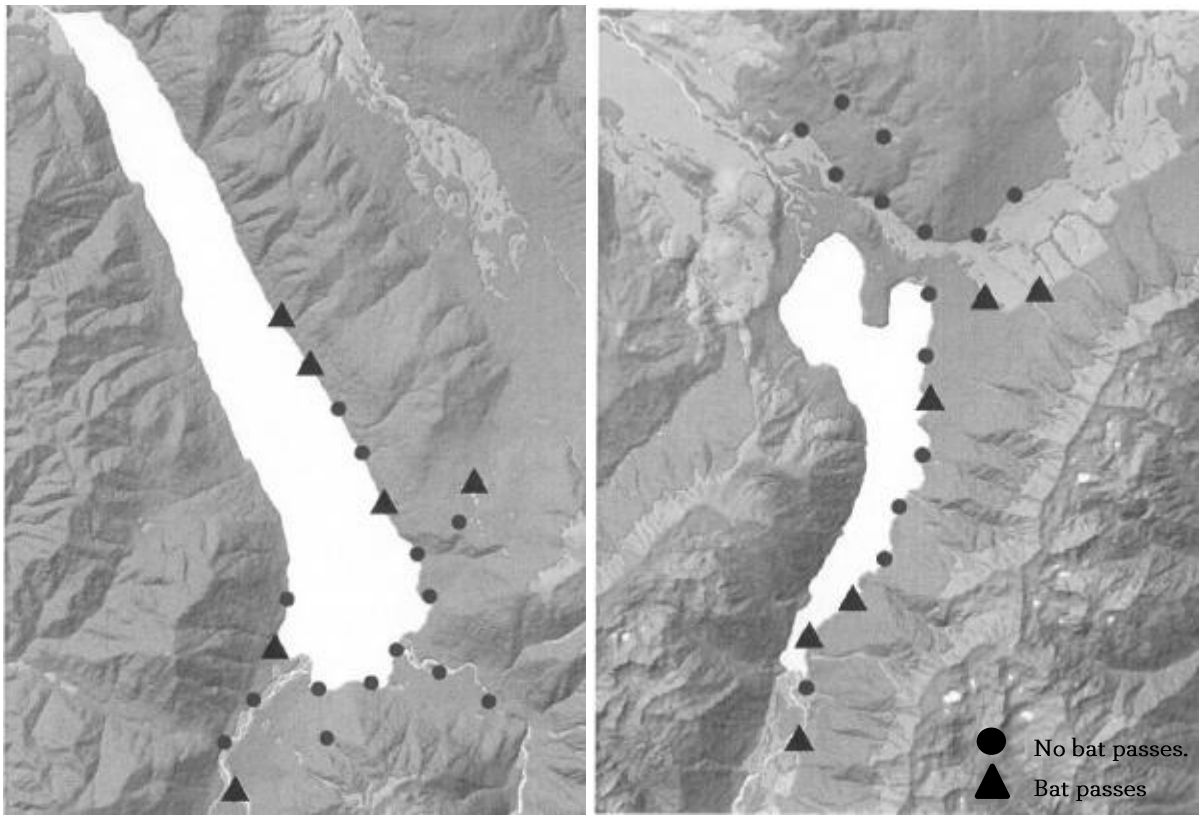


Figure 14: Locations of Automatic Bat Recorders and recorded long-tailed bat passes at Rotoroa and Rotoiti in 2017/18.

Discussion

This pilot monitoring shows that long-tailed bats are still present at both Rotoiti and Rotoroa. Given the low amount of work required to carry out this monitoring, this will be continued annually to produce an annual course index of abundance. This long-term dataset will be used to determine changes in the relative abundance of long-tailed bats within each site over time, to determine whether pest management within the RNRP is having an effect on the long-tailed bat population.

3.3.3 Lizard monitoring

Introduction

From 2002 to 2012 lizard monitoring via pitfall trapping was undertaken by Terra Dumont around the St Arnaud village to record changes in lizard populations in the FOR rat-trapping area. Results from this monitoring showed that populations of northern grass skinks (*Oligosoma polychrome*) and speckled skink (*Oligosoma infrapunctatum*) were still declining in the RNRP despite pest control (Dumont 2015). Pitfall monitoring was ceased in 2012 but restarted in the summer of 2017/18 to continue this long-term dataset.

Method

Transect of 19 pitfalls are located at each of Ward St and Black Hill along walking tracks and roads, in sites that are sunny and dry and appear favourable to skinks. Monitoring was carried out in November 2017 and February 2018, with January monitoring not able to be completed. Traps were opened and then monitored for four days during good weather.

Pitfall traps consist of a 3L canned fruit tin set into the ground, with a square tin lid placed over the top to provide cover. Holes are drilled in the bottom of the tin for drainage. When pitfalls are set a moistened 7x5x0.5cm kitchen sponge is placed in the bottom of each trap along with a thumb nailed sized piece of canned pear as bait. Traps are checked each afternoon and rebaited. Skinks caught are identified to species, weighed, measured (snout to vent length), marked on the ventral side with a dot of silver xylene-free permanent marker pen to determine recaptures and then released. Northern grass skinks <42mm and spotted skink <62mm are considered juveniles. On the last day of monitoring traps are closed by filling them with sticks so that if an animal fell in it could climb out.

Results

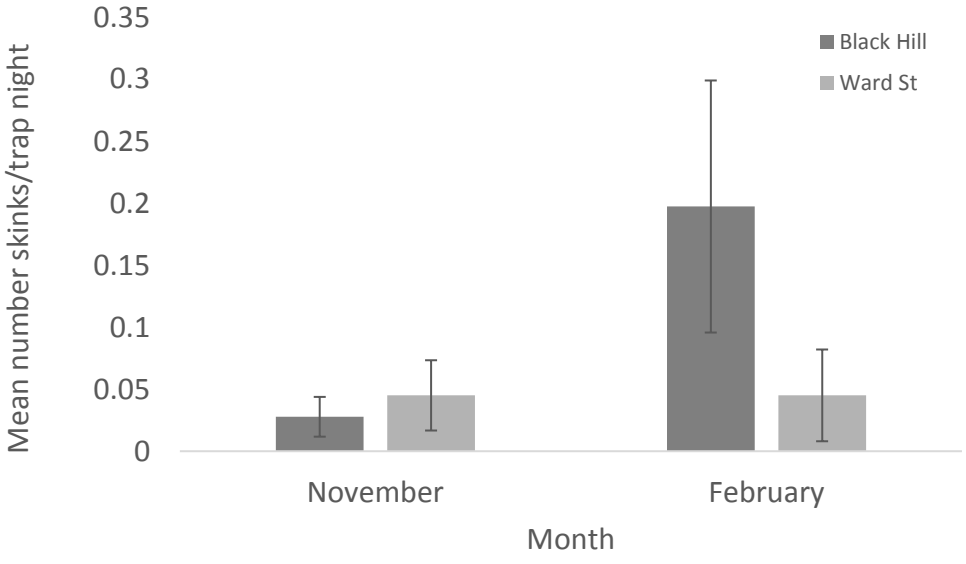
Only northern grass skink were caught in pitfall traps in 2017/18, with 25 caught in total. More skinks were caught at the Black Hill site with 17 caught compared to 8 at Ward St (Table 9). More skinks were caught in February than November which may be due to the

weather, with short afternoon thunderstorms occurring in the November monitoring (Table 9). In November the CPUE (Catch Per Unit Effort) was at similar low levels between the two sites, while in February it was higher at Black Hill, 0.20 (SE±0.1) skinks/trap night, than Ward St, 0.05 (±0.04) (Figure 15).

Table 9: Number of *Oligosoma polychrome* skink caught at monitoring sites in the Rotoiti Nature Recovery Project in 2017/18.

	November			February		
Site	Trap Nights	Number skinks	Adults: Juveniles	Trap Nights	Number skinks	Adults: Juveniles
Black Hill	72	2	2:0	76	15	8:1
Ward St	68	3	3:0	66	5	3:1

Figure 15: Mean number of *Oglisoma polychrome* skink caught per trap night (CPUE) at two monitoring sites in the Rotoiti Nature Recovery Project in 2017/18.



Discussion

Lizard monitoring undertaken by Terra Dumont from 2002 to 2012 showed that skink populations were declining despite the RNRP predator control (Dumont 2015). November monitoring result seemed to be similar to those observed in 2011. It was concerning that no Speckled skink were caught during this monitoring and further investigation may be required. This monitoring will be continued as it is one of few long-term data-sets for skinks in New Zealand.

3.3.4 Vegetation plot monitoring

No vegetation plot monitoring was carried out this year.

3.3.5 Beech seed monitoring

Introduction

Beech species are an important driver of both native and pest species populations in beech forests. Mast events, where beech seed is produced in large quantities, can lead to rodent population irruptions and subsequent increases in stoat populations. This can have devastating impacts on populations of native species.

Beech seeding levels are monitored to inform pest control decision making. Modelling is used to predict the levels of beech seeding which are likely to occur in different areas of the country, to provide early warning for the level of response required. As this is indicative only, local monitoring is carried out by sampling the quantity of cupules on beech species at different altitudes. Branches are collected from the canopy of beech trees using a helicopter and the number of cupules counted. Seedfall tray data is collected in

the RNRP to determine the quantity of seed that will become available to rodents on the forest floor.

Methods

Helicopter sampling was carried out by Science and Technical staff around sites within Nelson Lakes National Park.

Twenty seedfall trays are located in the RNRP Core Area and along the Mt Misery track at Lake Rotoroa. Collection bags are fitted in February, replaced in mid-April, and removed in mid-June. Any seed collected is separated into species, counted, and then tested for viability.

Results

Beech counts from seedfall trays showed that almost no beech seed was produced in 2017/18 at both sites, with no viable seed recorded (Figure 16, Table 10).

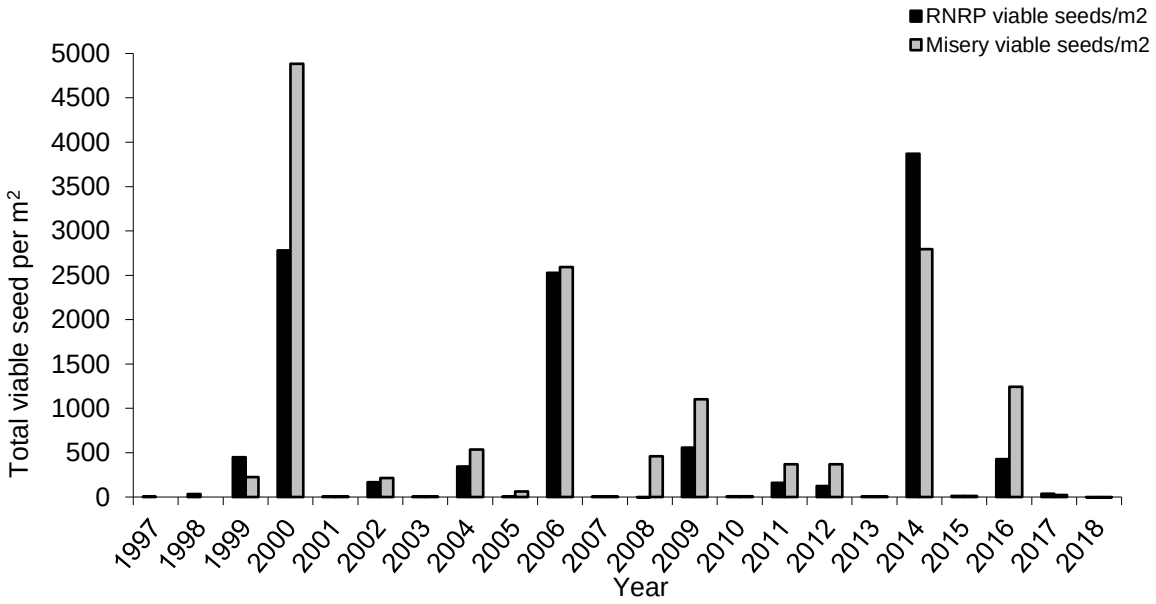


Figure 16: Total viable beech seeds per m^2 from the Rotoiti Nature Recovery Project (Lake Rotoiti) and Mt Misery (Lake Rotoroa).

Table 10: Beech seed counts at Lake Rotoiti and Lake Rotoroa in 2017/18.

Site	Count type	Red beech (*Fuscospora fusca*)	Mountain beech (*Fuscospora cliffortioides*)	Silver beech (*Lophozonia menziesii*)
Lake Rotoiti	Total count	22	0	0
	Total viable seed	0	0	0
	% viable	0	0	0
Lake Rotoroa	Total count	2	1	3
	Total viable seed	0	0	0
	% viable	0	1	3

Discussion

The 2017/18 year recorded the lowest quantity of beech seed produced at Rotoiti and Mt Misery since monitoring started in 1997, and this is likely due to the very wet and cold summer of 2017. The poor weather of the 2017 summer followed by the very hot summer of 2018 means that 2018/19 is predicted to produce a very large beech mast with high amounts of beech flowering likely to occur in the RNRP.

3.3.6 Tussock monitoring

Introduction

Tussock species in New Zealand are mast seeders and an important driver of mouse population dynamics in the alpine zone (Wilson and Lee 2010). Tussock monitoring has historically been carried out at Mt Misery and was reinstated in 2010 to continue this long-term dataset. Historically, flowering stems were counted within an 'arm-sweep' of Department of Scientific and Industrial Research (DSIR) points. In 2012/13 a new method

where flowering stems are counted within a permanently marked plot was initiated as a potential replacement. The two methods were carried out in conjunction to allow comparative analysis, and in 2015/16 the old method was discontinued.

Methods

The flowering of mid-ribbed snow tussock (*Chionochloa pallens*) and carpet grass (*Cionochloa australis*) was measured on Mt Misery in February 2018 by counting the number of inflorescences of each species within a permanent 20m by 2m plot.

Results

Low levels of flowering were recorded for both species of tussock in 2018, with *C. australis* having a mean of 6.6(SE±1.3) inflorescences/tussock (Figure 17) and *C. pallens* having a mean of 0.74 (SE±0.4) inflorescences/ tussock (Figure 18).

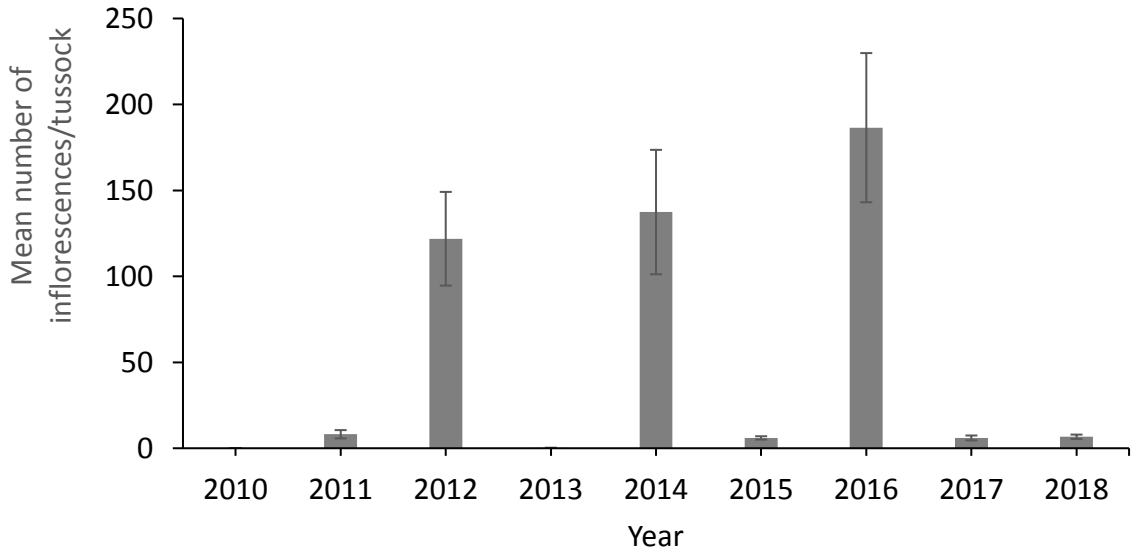


Figure 17: Mean number of inflorescences recorded per tussock in February for *Chionochloa australis* within a 20m by 2m plot on Mt Misery.

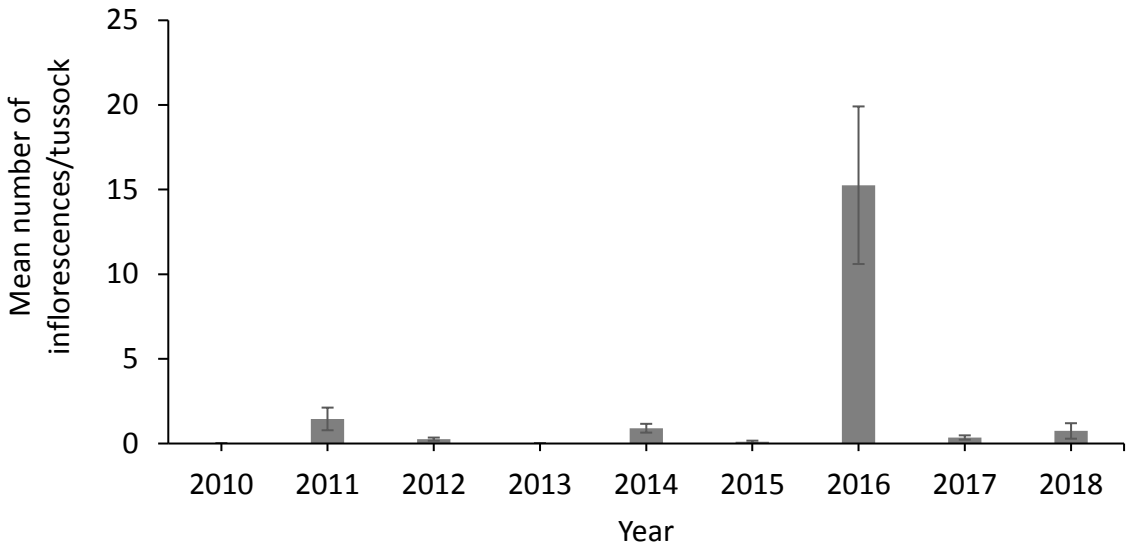


Figure 18: Mean number of inflorescences recorded per tussock in February for *Chionochloa pallens* within a 20m by 2m plot on Mt Misery.

Discussion

Low levels of tussock flowering were observed on Mt Misery in 2018 and there is likely to only be low levels of tussock seed available in the alpine zone. Monitoring by the DOC staff where tussock samples were collected from helicopter at sites throughout the South Island, confirmed the low levels of flowering in Nelson Lakes. As a result, an irruption of the mouse or rat population in response to tussock seeding in the alpine zone is unlikely to occur in the RNRP.

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

No new species were observed in the RNRP in 2017/18. On January 24 a whio (*Hymenolaimus malacorhynchos*) was observed at the head of Rotoiti and was sighted for several days following this.

3.5 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 and the possibility of logistical support from DOC for carrying out fieldwork. In 2017/18 the following research was undertaken within the RNRP:

- Jamie McAulay from Otago University carried out research at several alpine sites around the South Island, including the RNRP, for his Masters thesis looking at the diet of alpine stoats. This thesis is due for completion in late 2018.

- Sam King from Massey University surveyed Nelson green geckos (*Naultinus stellatus*) in the Teetotal Recreation Area as part of her Masters thesis studying the genetics of green gecko in the top of the South Island.

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

Analysing and communicating technical information about the effectiveness of management techniques is a key learning objective, linking directly to National Mainland Island Strategic Principle 2: "Results and outcomes are communicated". The RNRP has transferred 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.

3.6.1 Reports generated

Other than the Annual Report no reports were generated by the RNRP in the 2017/18.

3.6.2 Hui, workshops, presentations and media articles

- In November 2017 Nik Joice and FOR chairman Wayne Sowman presented at the Working with Communities trapping workshop in Nelson.
- In November 2017 Nik Joice presented on twenty years of learnings in the RNRP at the Forest and Bird AGM.
- In November 2017 Jen Waite presented on twenty years of learnings from rat and stoat control in the RNRP at the Tasman Biodiversity forum.

4 Community objectives

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

4.1.1 Introduction

The partnerships model further empowers DOC to look for more opportunities to work with a wider range of people and groups. Relationships with existing partners such as iwi, the Friends of Rotoiti and the Kea Conservation Trust are considered a high priority to maintain and continue to be built on, with new partners also being sought.

4.1.2 Friends of Rotoiti

The community group 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 project providing a line of defence against predators coming into the RNRP.

Volunteers devote considerable time annually undertaking trapping, wasp control, trap building and maintenance, administration, planning and advocacy tasks. FOR members also contribute to developing more effective trapping methods (for example run-through DOC200 stoat traps), participating in discussions and sharing ideas with DOC staff. FOR have also become involved in kiwi monitoring and in late 2016 received funding to carry out the translocation of 20 adult great spotted kiwi into the RNRP. In 2017/18 FOR volunteers gave 2000.5 hours of time to various projects, the equivalent of 250 person days (eight hour).

Friends of Rotoiti Wasp control

FOR assist DOC staff with the landscape-scale wasp control operation in the RNRP by filling wasp bait stations along the FOR Whisky and Speargrass mustelid trap lines, as well as around the St Arnaud Village. In 2017/18 FOR volunteers assisted with the first visitor assets wasp control operation carried out along the Travers-Sabine track.

Friends of Rotoiti village rat trapping programme

FOR volunteers continue to run a comprehensive rat trapping programme around the St Arnaud village. Their work provides conservation gains by removing predators from the Brunner Peninsula Walk, Black Hill and Black Valley stream areas. Visitors to the DOC Visitor Centre comment on the FOR traps giving staff an advocacy opportunity for conservation and the FOR group itself.

Method

Rat trapping is carried out using Victor Professional rat traps in timber tunnels, with mesh ends secured by R-clips to prevent weka interference. Approximately 300 traps are spaced at 25 or 50m around the St Arnaud village. In the past these traps have been baited with a peanut butter/oat mix, but in July 2017 the bait was changed to Pics peanut butter. Traps are checked fortnightly throughout the year.

Results

In 2017/18, 164 rats were caught which is similar to previous years (Table 11). Mice continue to be a problem, both as a bycatch and through triggering the traps. The birds caught were two blackbirds, a chaffinch and a sparrow.

Table 11: Catches and sprung traps in the Friends of Rotoiti rat traps around the St Arnaud village in 2017/18.

Species	Number caught
Stoat (*Mustela erminea*)	2
Mice (*Mus musculus*)	1047
Weasel (*Mustela nivalis*)	1
Rat (*Rattus* sp.)	164
Bird	4
Sprung	135

Friends of Rotoiti kiwi monitoring

Following their successful funding application to translocate a further 20 adult kiwi into the RNRP, FOR volunteers have been involved in the kiwi monitoring programme. Volunteers have now been trained in data-stream collection ND triangulating kiwi. In a joint project with DOC staff they carried out acoustic monitoring of the RNRP kiwi population (see section 2.2.2 Great spotted kiwi population monitoring) and several volunteers have also accompanied DOC staff when catching kiwi for health checks.

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

4.2.1 Advocacy

Staff support conservation advocacy at community events. In 2017/18 this included a joint display with FOR at the Antique and Classic Boatshow and a display at the Murchison A&P show. Other advocacy activities promoting the RNRP and wider biodiversity activities include talks to the Nelson Marlborough Institute of Technology's trainee rangers, major concessionaires so they can pass on the messages to clients, Rainbow Skifield staff, Nelson Community Forum and Tasman Biodiversity Forum.

4.2.2 Education

DOC's strategy for education is to provide resources for teachers to support conservation teaching and learning, or DOC supported education programmes.

DOC has developed 58 curriculum-linked education resources to support teachers across the educational range. In addition, resources are available to guide site visits (including "A Day at Lake Rotoiti") and links to the extensive network of groups providing education resources and opportunities. Of interest to secondary schools visiting the Nelson Lakes area is the resource 'Investigating alpine environments'. This resource is designed to introduce secondary students to New Zealand's extraordinary alpine environments and support them to take action to protect the alpine environment.

Nelson Lakes District was involved with two of the significant education programmes during 2017/18. These were the:

- Sir Peter Blake Ambassador programme. Sian Moffitt and Marie Potthoff were the 2018 recipients based at Nelson Lakes and spent four weeks volunteering with the RNRP.
- Toyota Kiwi Guardians (TKG) - An activity programme for kids to learn about nature, earn rewards and go on family adventures. Our TKG follows the Honeydew Walk and allows families to explore the RNRP interpretation panels and biodiversity work.

4.2.3 Communication

The quarterly newsletter, Birdsong, keeps people with an interest in the RNRP and other local DOC activities up to date with the work of staff, volunteers and partners. Birdsong has been well-received and now has over 500 subscribers.

5 Discussion

Research to inform biodiversity management throughout New Zealand remains a core focus of the RNRP. In 2017/18 trials were undertaken testing different lures in mustelid traps and possum traps. In 2018/19 it is planned to upgrade the mustelid trap network from single set DOC200s to double sets, and to run a field trial testing a best practise box design against a modified run-through design. The possum lure trial that started in 2017 will continue, and any additional trials the project can be involved in will be pursued.

While the focus in 2017/18 remained on core projects and maintaining long-term datasets, two new monitoring projects were initiated, long-tailed bat monitoring and acoustic kiwi monitoring. Careful consideration was given to the addition of these projects to the work plan and the long-term sustainability of them before they were implemented. Both these projects require low staff time and involve putting out recorders for two weeks and then going through recordings later. In addition, the kiwi acoustic monitoring was a joint DOC and FOR project which made this a much more sustainable project with a large group of FOR volunteers able to carry out the timely analysis of recording.

A highlight of the year has been the involvement of FOR in the kiwi work. Volunteers have been involved in a number of activities and several new volunteers have become involved. The RNRP kiwi work is now very much focussed on translocating 20 adults into the population over the next three years.

One of the principle reasons for the establishment of the RNRP is to learn and then disseminate the findings of research, and there is still a need to publish the results of the past twenty years and ensure this work is disseminated. This year talks were given at several events and opportunities like this will be pursued in the coming years. Other opportunities to disseminate RNRP findings will be pursued so that learnings from the RNRP can affect further progress towards the goal of effective conservation in New Zealand.

6 Recommendations

- Carry out up-grade of RNRP mustelid trap network to double-set DOC200s.
- Finish possum trial comparing clay lures to possum dough lures in Sentinel traps.
- Carry out translocation of twenty adult kiwi into RNRP.
- Reinstate cat trapping in Autumn as joint project with FOR.
- Continue with kiwi acoustic monitoring.
- Continue with bat monitoring.

7 Acknowledgements

The RNRP relies on support from volunteers, temporary staff, and technical advisors.

We would like to thank temporary field staff Graeme Andrews and Louie Pierson. Blake Ambassadors Sian Moffitt and Marie Potthoff and volunteers Catherine van Gessel, Hazel Clemens, Laura van Ginkel and Josh Adam.

We would like to thank the Friends of Rotoiti for all their dedicated work in trapping, wasp control and great spotted kiwi monitoring.

Other staff at the Nelson Lakes office also assisted the project on many occasions, sharing logistics and helping in the field.

Members of the Technical Advisory Group and external advisors provided advice at various times during the year (membership in Appendix 2).

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9 Appendix 1

9.1 RNRP datasets

Datasets referred to within this report, and others that were maintained during the 2017/18 year, are listed below.

Introduced species

Dataset	File location	Contact person
Possum trapping	DOCDM-516760	Pat van Diepen (pvandiepen@doc.govt.nz)
Wasp monitoring	DOCDM-1546039	Emma McCool (emccool@doc.govt.nz)
Mustelid trapping	DOCDM-1251695	Jen Waite (jwaite@doc.govt.nz)
Mustelid monitoring	DOCDM-1346209	Pat van Diepen (pvandiepen@doc.govt.nz)
Rodent monitoring	DOCDM-1261708	Pat van Diepen (pvandiepen@doc.govt.nz)

Native species

Dataset	File location	Contact person
Five-minute bird counts	DOCDM- 769826	Emma McCool (emccool@doc.govt.nz)
Tussock monitoring	DOCDM-72336	Gareth Rapley (grapley@doc.govt.nz)
Beech seedfall monitoring	DOCDM-1365121	Gareth Rapley (grapley@doc.govt.nz)
Great spotted kiwi monitoring	DOCDM- 747464 DOCDM-1454781	Pat van Diepen (pvandiepen@doc.govt.nz)
Kiwi acoustic monitoring	DOC-5481521	Jen Waite (jwaite@doc.govt.nz)
Kākā monitoring	DOC-3194334	Jen Waite (jwaite@doc.govt.nz)
Kea nest protection	DOCDM-1283015	Emma McCool (emccool@doc.govt.nz)
Bat monitoring	DOC-5414377	Emma McCool (emccool@doc.govt.nz)
Lizard monitoring	DOC-5385657	Jen Waite (jwaite@doc.govt.nz)

10 Appendix 2

10.1 Project management

Budget: $174,714

Staff (salary & wages): $150,530

Operating: $24,184

10.2 Staffing

Nik Joice, Jen Waite, Patrick van Diepen, Emma McCool, Graeme Andrews, Gareth Rapley, Sandra Wotherspoon, Emma Williams, Athow Santamaria and Louie Pierson.

10.3 Technical Advisory Group

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

10.4 RNRP advisors

Josh Kemp, Mike Hawes, Kath Walker, Grant Harper, Pete Gaze, Eric Edwards.