ZIP
ZERO
INVASIVE
PREDATORS
Enabling a new future

REPORT TO 30 JUNE 2015

CONTENTS

A NOTE ON TIMING

The research and development work carried out by ZIP commenced in March 2013 when the team, then under Department of Conservation (DOC) management, carried out the first 'Remove and Protect' trial at Putanui Point in Pelorus Sound (Marlborough Sounds). This trial ran for a period of one year, concluding in April 2014. In September 2014, the Remove and Protect model was scaled up by a factor of 10, with trials commencing at Bottle Rock Peninsula.

In December 2014, NEXT Foundation and DOC signed a partnership agreement to jointly fund ZIP for up to ten years. ZIP commenced operations as a limited liability company and charitable entity in February 2015.

To provide context this 'annual' report touches on the work programme since March 2013. More detail is provided on the activities of the last twelve months, with financial summaries for ZIP spanning only the six month period between 1 January and 30 June 2015.

NEXT FOUNDATION
Investing in our land, our people

Department of Conservation
Te Papa Atawhai

ZIP Business Manager Phil Bell inspects a chew card with prototype automated 'detection node'. These detection nodes include a motion sensor to detect animal chewing. This information is then passed along the detection line, then to the field team via satellite and text message. These are designed for deployment immediately behind the 'virtual barrier' in the protection system, or at likely points of incursion, for early warning of any breaches.

CHAIRMAN'S FOREWORD

I am pleased to present this first report on the activities of Zero Invasive Predators Limited (ZIP) for the period ending 30 June 2015.

ZIP was established in February this year as a research and development entity with a tight focus on developing the tools and techniques to enable an ambitious and exciting vision for New Zealand: the complete removal of rats, stoats, and possums from large mainland areas for the long term, sustainable protection of native biodiversity.

The founding investors in ZIP are the NEXT Foundation and the Department of Conservation (DOC), and as a charitable entity ZIP receives funding from Jasmine Social Investments and the Morgan Foundation. I am also pleased to welcome the recent addition of six dairy companies to our group of investors.

With the support of the local Department of Conservation team, Te Āti Awa, Rangitāne o Wairau, and the Sounds community, this first term has seen the establishment of a 440 ha development site in Queen Charlotte Sound at Bottle Rock. The 'Remove and Protect' approach has not been tried anywhere in the world on the scale envisaged by ZIP, and has significant potential to change the game for conservation in this country.

Already we are learning much about our ability to efficiently protect Bottle Rock from rats and possums and about the behaviour of 'lonely' rats. Significant technical challenges ahead include efficient initial removal of rats, developing an effective 'virtual' barrier for stoats and early, reliable detection of invaders.

ZIP's research and development programme supports the goals of Predator Free New Zealand (PFNZ), an organisation set up to build engagement

and encourage strategic management of invasive predators in New Zealand. To date the ZIP team has maintained a low profile as they work hard to develop durable solutions. However, as the knowledge and proof grows, we plan to share more of our learnings with the wider community.

We are proud of the progress we are making on behalf of New Zealand as we explore this novel approach to predator management, and I would like to acknowledge and thank the excellent ZIP Team and the many collaborating organisations for their work to date.

Devon McLean, Chairman

March 2013 Rats and possums removed from Putanui Point

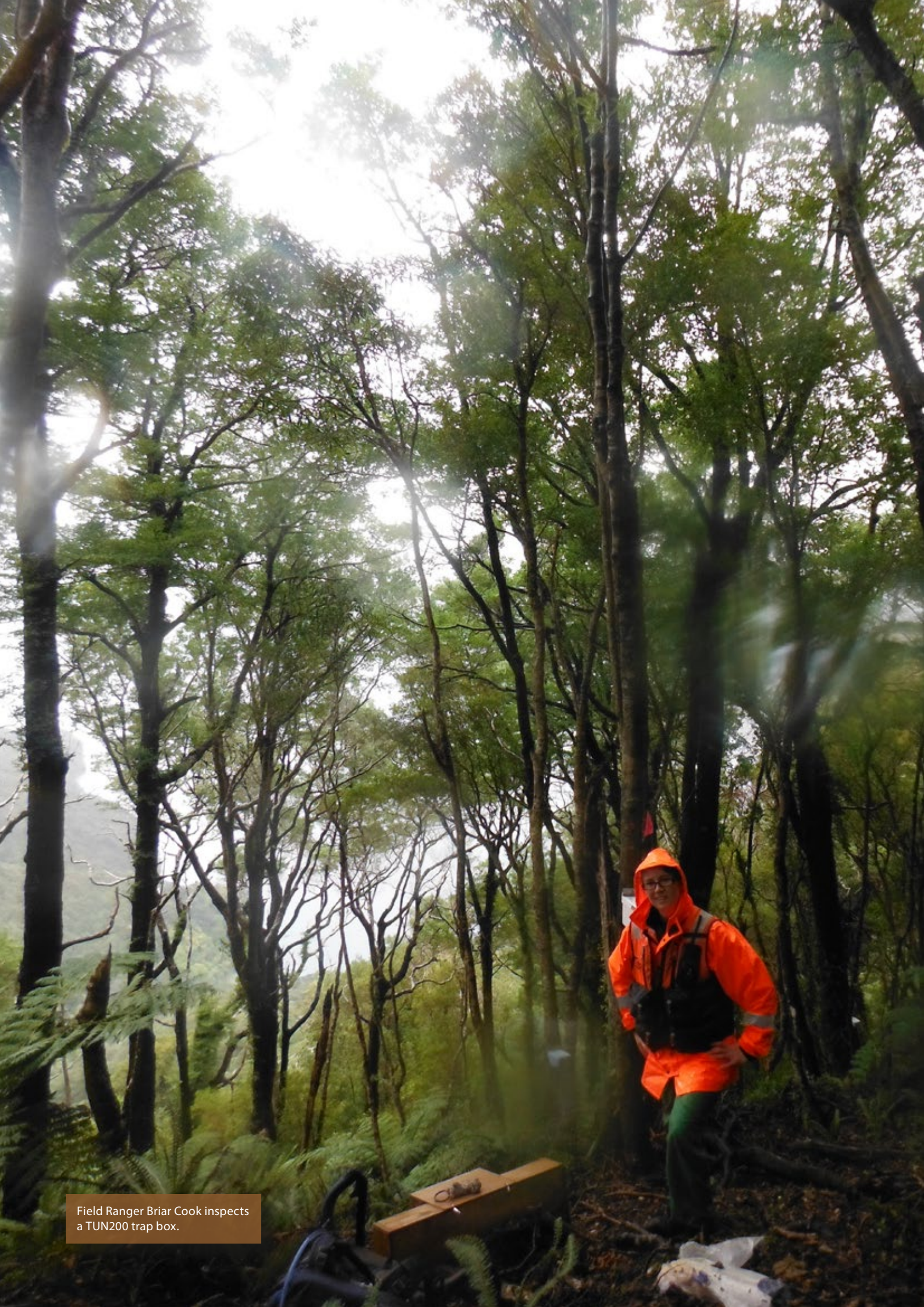
March 2014 Putanui protection system repels 90% of invaders

April 2014 Putanui trial completed

September 2014 Protection system installed at Bottle Rock Peninsula

December 2014 NEXT announces partnership with DOC in ZIP

December 2014 Rat numbers peak at Bottle Rock, due to major beech mast



Field Ranger Briar Cook inspects a TUN200 trap box.

CHIEF EXECUTIVE'S REPORT

It is my pleasure to present this first report on the activities of Zero Invasive Predators Ltd (ZIP), both those carried out under the ZIP banner since February 2015 and the earlier research and development carried out under Department of Conservation management, beginning in early 2013.

During our first six months, ZIP has built a small dedicated team of six full-time equivalents, with a range of expertise in science, engineering and operations.

The major project over the past 12 months has been the establishment of the 440 ha Bottle Rock field development site in the Marlborough Sounds. Bottle Rock peninsula represented a significant scaling up of our ability to 'Remove and Protect' against possums and rats, following on from our initial 30 ha site at Putanui Point, also in the Marlborough Sounds. The rapid establishment of Bottle Rock was undertaken because of the impending 2014/15 beech mast and the opportunity to test the system against plague proportions of rats (and mice).

We have been both surprised and impressed by the performance of the 2 km long 'virtual barrier' protection system at Bottle Rock Peninsula. It has resisted over 95% of invading rats and possums, but also highlighted the importance of minimising non-target interference e.g. mice, in order to maintain the integrity of the barrier system.

We have made progress on some exciting technical developments this year, including the creation of a model to simulate 'lonely' rat behaviour; deploying miniature rat tracking technology; developing an automated trap reporting system that is capable of efficiently screening 65% of possums with a single trap line; and developing a food lure based automated monitoring system.

Challenges for 2015/16 include adapting the Bottle Rock protection system to target stoats; developing social lures; securing effective removal tools; developing automated detection; and creating an effective deterrent for use in the protection system.

We are pleased to work in close partnership with both the Department of Conservation and the NEXT Foundation, and are grateful for the support of our investors, Jasmine Social Investments and the Morgan Foundation.

A Dairy Industry Group, led by Fonterra, has also committed to investing in an ambitious two-year research programme that aims to ready the 'Remove and Protect' approach for application across rural production land.

This year we have been fortunate to build strong collaborative relationships with a number of other agencies including Auckland University, Hawke's Bay Regional Council and Lincoln University. We are also indebted to the continued local support provided by the Marlborough Sounds community, iwi, and DOC team.

My thanks to everyone who has supported ZIP's work over this period and we look forward to many successes together, as we strive to make the zero predator environment a reality on the mainland.

Al Bramley, Chief Executive Officer

February 2015 ZIP commences operations

February 2015 Dairy Industry Group announces investment in ZIP

March 2015 Satellite-monitored traps deployed at Bottle Rock

April 2015 Interference by non-target species identified as big challenge

June 2015 Possums eradicated from Bottle Rock Peninsula

June 2015 Bottle Rock protection system >95% effective against possums and rats

Tuī on Bottle Rock peninsula.

A mouse attempts to access a peanut butter-filled 'chew card' during trials at **Lincoln University.** Developing mouse-proof monitoring devices has been a significant challenge due to their extreme agility and tenacity.

CONTEXT AND BACKGROUND

ZIP's mission is to ensure the long-term security of New Zealand's biodiversity by developing operationally ready, innovative, strongly supported technologies to completely remove rats, possums and stoats from large mainland areas, and then defend those areas from reinvasion. We call this model **Remove and Protect.**

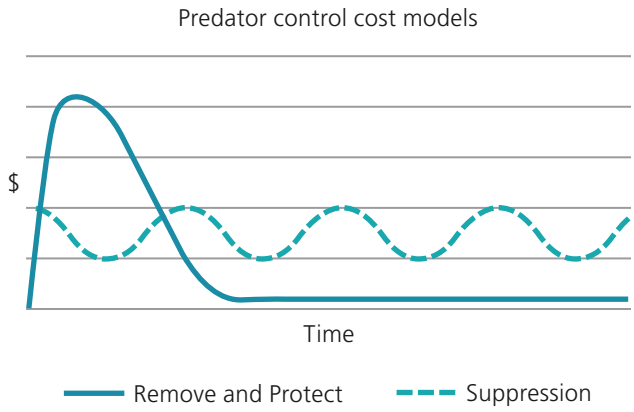
CONTEXT

Three invasive predators—rats, possums and stoats—are generally accepted as the main agents of ecological decline in New Zealand. Aside from the estimated 25 million native birds they kill each year, they cost this country billions of dollars annually, and they impact on the country's primary production base through the transmission of diseases such as bovine tuberculosis.

New Zealand is a world leader in removing invasive predators from islands and predator fenced areas. However the need for a defendable barrier e.g. the sea or the social and geographic challenges of predator fencing, limit the scale at which they can be used. Therefore on the mainland, the current predator management approach is ongoing suppression of predator populations using traps or toxins. This carries a significant long-term cost as reinvasion must be continually managed.

Zero Invasive Predators Ltd (ZIP) was established to drive the research and development required to pioneer a new, sustainable approach to managing invasive predators in New Zealand.

ZIP commenced operations on 9 February 2015.



The Remove and Protect approach, if successful, will make it possible to:

- protect areas in terrain where it is neither desirable nor possible to construct predator fences
- reduce our dependence on the repeated wide scale application of toxins
- enable progressive expansion of a protected area as funds and confidence allow
- create an environment on the mainland where (in time) ecological integrity could rival that of predator-free offshore islands

View from Bottle Rock peninsula to Resolution Bay.

BACKGROUND

ZIP's current work programme builds on the 'proof of concept' trial project conducted at Putanui Point in Pelorus Sound, where the team, then under Department of Conservation (DOC) management, experimented with a Remove and Protect strategy to protect a 30 ha peninsula of kānuka, podocarp and beech forest from rats and possums.

The initial track cutting and removal of rats and possums, using traps and poisons in bait stations, was carried out from January to May 2013. Putanui Point was considered too small to be an effective setting to trial Remove and Protect against stoats.

To defend the peninsula against reinvasion, a 'virtual barrier' was installed along the 400 m wide neck of the peninsula. The protection system deployed largely standard rat and possum control tools, placed 10m apart, to virtually guarantee encounter (but not necessarily interaction) by invaders. Up to 9 lines of tools were placed 50 to 100 m apart in the path of invaders, comprising a 'defence zone' approximately 700 m deep. The general strategy was to repel invaders, then pre-feed and trap any that weren't repelled. To minimise the amount of toxin entering the environment, toxins were not deployed until the last lines of defence.

When operations were suspended at the site in April 2014, an estimated 90% of the rats and possums had been repelled and/or killed, with the remaining 10% detected and removed before they were able to establish a population within the 30 ha protected area.

Although this strategy was not yet robust or affordable at a larger scale, the success at Putanui Point provided sufficient confidence to establish the next generation of 'virtual barrier' at the next order of magnitude (400 ha), at Bottle Rock Peninsula in Queen Charlotte Sound.

Operations at Putanui Point are now closed and the tools were removed in May 2015.

Weka eyeing up a peanut butter-baited tracking tunnel.

ZIP TEAM AND CULTURE

ZIP TEAM

With the expansion of the work programme, we propose to grow the ZIP team to approximately 10 full-time equivalents. This will include a dedicated scientist and additional field rangers. In addition, we propose to develop contractual relationships with a number of specialist suppliers of both professional and manufacturing services.

Invaluable science expertise during the past 6 months has been provided by Dr James Russell (University of Auckland), and Dr Elaine Murphy (DOC/Lincoln University). It is our intention that Elaine and James will continue to provide a mentoring and science advisory role in the future.

Field interns Elizabeth Elliott-Hogg and Isaac Bain supported operations at Bottle Rock Peninsula during Summer 2014/15.

CHIEF EXECUTIVE OFFICER	Al Bramley
EXECUTIVE ASSISTANT	Susannah Aitken
BUSINESS MANAGER	Phil Bell
FIELD TEAM LEADER	Duncan Kay
PRINCIPAL ENGINEER	John Wilks
MODELLER/GIS ANALYST	Nick Mulgan
FIELD RANGER	Pete Morresey
LAB TECHNICIAN/FIELD RANGER	Tim Sjoberg

COMMUNICATIONS

ZIP is fortunate to have secured sufficient financial support to be tightly focused on the development of the technologies to enable the Remove and Protect approach. Accordingly, ZIP maintains a relatively low public profile in order to focus our energies on the technical tasks at hand.

We have begun to develop a number of partnerships with strongly aligned researchers and operators, to avoid duplication and ensure we can leverage off each other's progress and development.

In 2015/16, we will develop our website as a medium to make some of our findings and developments more widely known, engage with members of the community doing innovative predator control work, and provide another portal through which to contact ZIP.

Engaging the hearts and minds of New Zealanders in invasive predator control is in itself a big job, and one that will be led by Predator Free New Zealand (PFNZ).

OPERATING CULTURE

The challenges we face are usually complex and therefore our development approach is to 'try, sense, and respond'.

Potential solutions are suggested, then prototypes are rapidly developed and placed in the field as soon as possible, where they are observed and refined. This allows us to quickly learn about the real world constraints to the application of the technology, which in turn informs the next iteration of development.

We recognise and understand that failure is a likely outcome in an environment where the problem is frequently poorly understood. However, we strive to fail quickly, to expose what we don't know, and therefore maximise the return on our effort and resources. Then as we build a thorough understanding of the core problem, we are able to produce a robust end product as quickly as possible.

OPERATING CULTURE IN ACTION: DEVELOPMENT OF THE 'TUN200' TRAP

Based on evidence from a trial at Poutiri Ao ō Tāne, Hawke's Bay, where single set DOC250 traps in a run-through tunnel caught 55% (±30%) more ship rats than those in a standard 'dead-end' box, ZIP produced a new prototype trap, the 'TUN200', consisting of double-set DOC200s set in run-through tunnels.

These were installed in the front lines of the protection system.

Early trap data suggested that when one trap in the tunnel made a kill, the impact would also frequently set off the second trap, rendering 30% of trap boxes 'double sprung' or inactive during each service check. To solve this problem, saw cuts were tried in the base of every box to isolate the traps from one another. At the next service check only 2% of the traps were found 'double sprung', resulting in a significant improvement in the effectiveness of the trap line.

Furthermore, continued observations highlighted that mice in the height of the beech mast were removing the peanut butter lure from the traps. In many cases, mice would remove the bait within a matter of days, thus reducing the attractiveness of the trap. To remedy this, a single mouse trap was installed into each box to reduce mouse numbers and provide a fresh meat lure. Over 90% of traps caught a mouse for the subsequent two checks after this enhancement. The life of the lure within the TUN200 has now been significantly extended due to the decreased interference from mice and again the effectiveness of the trap line has been improved.

The productionised version of the TUN200, to be known as the 'ZIP200', is proposed to be developed over the next two years. The ZIP200 will include both isolated traps and measures to minimise mouse interference.

FIELD DEVELOPMENT PROGRAMME

BOTTLE ROCK PENINSULA

Bottle Rock Peninsula, in Queen Charlotte Sound (Marlborough Sounds) was chosen after Putanui Point as the next scale at which to test the Remove and Protect model. This peninsula offered the ideal size and shape, and is readily accessible to the largely Wellington-based ZIP team, with accommodation at the nearby Resolution Bay Cabins. A small, two person bivouac and toilet was installed within the operational area in February 2015 for the field team.

Only rats and possums were targeted at Bottle Rock Peninsula in 2014/15. This was because the home range of the stoat is relatively large (50 to 300 ha) compared with the size of the proposed protected area, and the lack of sensitive monitoring tools for stoats could make it very difficult to confirm freedom from stoats at any given time.

However, the protection system coincidentally caught a large number of stoats in the summer of 2014/15 and we now believe it worthwhile to trial stoat defences at Bottle Rock during 2015/16.

Given that other rat, possum and stoat-free sites (e.g. islands and fenced sanctuaries) experience significant gains in ecological integrity, similar could be expected with the removal of rats and possums at Bottle Rock. Therefore, in order to not dilute resources, no outcome monitoring is undertaken at Bottle Rock Peninsula.

REMOVE

During 2014, the beech forests within the Marlborough Sounds experienced a major mast event, which provided the opportunity to test the Remove and Protect model under some of the most challenging conditions possible. A mast is a significant seeding event, which in turn fuels a boom in rat (and mouse) abundance. At nearby Mt Stanley, a 'Battle for our Birds' aerial 1080 treatment site, approximately 30 km from Bottle Rock, rat tracking had reached 60% by August and was still climbing. These results were likely to be representative of the rat density at Bottle Rock, given the similar latitude, elevation and ecosystem types.

ZIP began the first phase of the removal of possums and rats by adopting the technique tested by Landcare Research for TBfree New Zealand: aerial prefeed followed by hand laid 1080 on lines spaced 100 m apart. The 1080 was hand-laid on 2 September 2014, while the programme was still managed by DOC. The effectiveness of this operation was significantly lower than anticipated. The reasons for this are unknown, however the abundant alternative food source provided by the mast is very likely to have been a factor.

Following the 1080 operation, removal operations have focused on gaining control of the rebounding rat and possum populations, and then more recently on removing the last remaining individuals. 550 detection devices, namely peanut butter filled 'chew cards', were deployed every 60 × 100 m to detect where the remaining animals were. Follow-up removal operations were undertaken using Pindone (a first generation anticoagulant toxin) and DOC150 traps for rats, and leg hold traps and Trapinator kill traps for possums.

Mouse interference and consumption of baits (within traps) and toxin (within bait stations) has also been a significant issue during the removal phase. Standard practice is to monitor the toxin consumption rate to determine the success (or otherwise) of a bait station

Schoolhouse Bay, Queen Charlotte Sound: Sling loads of traps for deployment in the Bottle Rock protection system in August 2014.

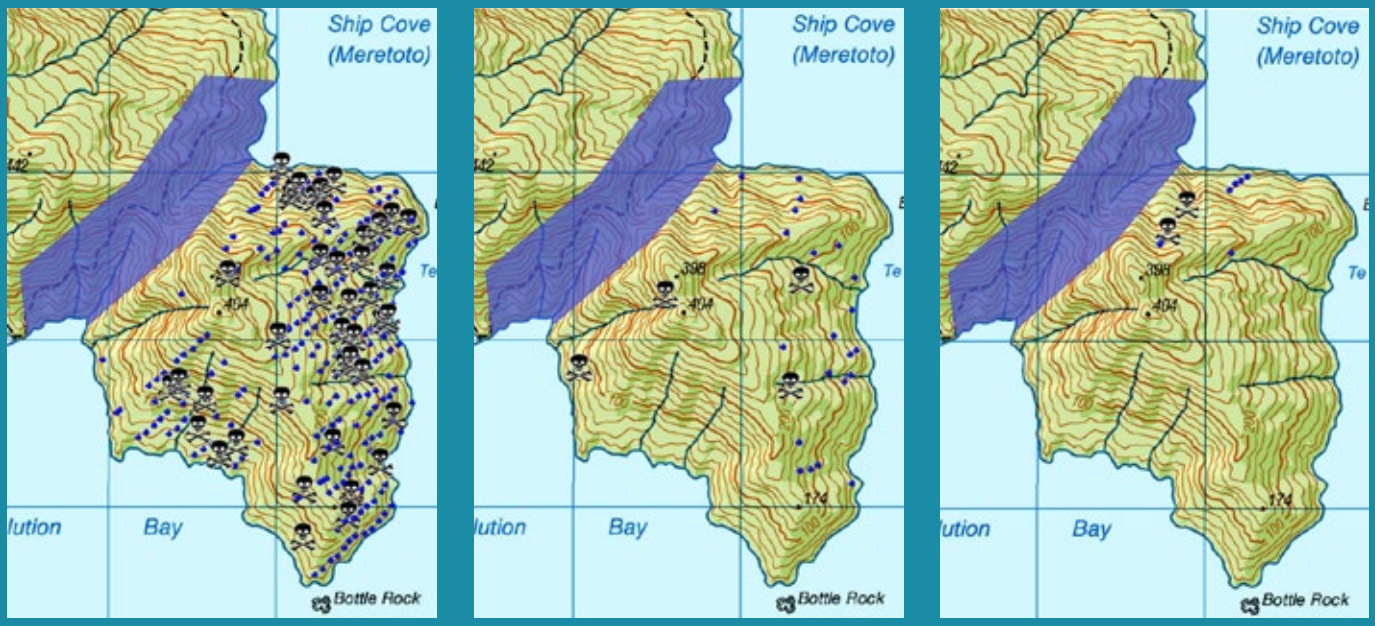
removal operation; however at Bottle Rock that approach was confounded by mice, which were the main consumer of the toxic bait. Therefore chew cards became the method for determining the presence or otherwise of the remaining rats. The chew card method has proven to be highly sensitive at the density used at Bottle Rock Peninsula, and confidence is high that the detections recorded reflect the number of individuals remaining at the site.

As at 30 June 2015, we have not yet removed all individual rats and possums from Bottle Rock Peninsula. On 26 June 2015, rats were detected at 15 out of 550 chew cards sites (2.9%), while possums were detected at 4 out of 550 chew card sites (0.7%). This is a dramatic improvement from January 2015 when rats were detected at 51%, and possums at 30% of the chew card sites.

The rat and possum removal phase at Bottle Rock Peninsula has illustrated the limitations of the current predator removal tool set. Achieving complete removal of these species on mainland sites is currently both labour intensive and costly, and this in turn limits the scale of future operations.

To scale up Remove and Protect operations to larger landscapes on mainland New Zealand an alternative removal tool is needed. One option is the second generation anticoagulant brodifacoum, which is currently registered only for use in bait stations on the mainland (and further restricted on public conservation land due to concerns about the chronic effects of its long-term use).

Relaxing the restrictions on brodifacoum use would enable responsible use akin to the approach taken for island eradications: a one-off aerial operation followed by 'spot' treatment on the ground as needed to address reinvasion events, but this time behind a 'virtual barrier' rather than a physical one.



18 January 2015 27 March 2015 26 June 2015

Rat chew and kill data during removal phase: The shaded area on the map represents the 'defence zone'. Rats killed in traps are represented by the 'skull and crossbones' icon; tracking and 'chew' events are represented by small blue dots.

Ridge track and trap line at Bottle Rock peninsula.

A trap line in the 'defence zone' at Bottle Rock peninsula. Traps and bait stations are spaced approximately 10 m apart along each line to virtually guarantee encounter by target species. To encourage interaction, a variety of devices are used, including those pictured here: TUN200 traps (on ground), Trapinator possum traps and Goodnature A24 self-resetting traps (both tree-mounted).

PROTECT

"Initially I was concerned that we might have bitten off more than we could chew at Bottle Rock, but the protection system has held up pretty well, even during a major mast event."—Duncan Kay, Field Team Leader

The protection system was established in conjunction with the hand-laid 1080 removal operation.

The system consists of 6 lines 100 m apart across the approximately 2 km neck of Bottle Rock Peninsula. The overall depth of the system was designed to allow sufficient 'dwell time' of the targets to maximise the chance of interaction.

A range of control devices (outlined below) were placed 10m apart along each line.

While this placement was assumed to guarantee that target predators would encounter the devices, we knew that we could not guarantee interaction.

The devices are placed through the lines so that traps are encountered before poison, with the aim of reducing the amount of toxin that enters the environment.

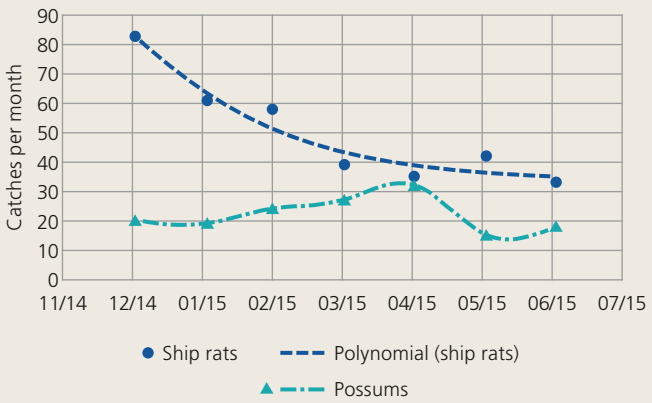
The 'virtual barrier' protection system has been more successful than expected, given that the tools comprise largely traditional control tools. The leakage rate (percentage of targets getting past the barrier system) for possums in Quarter One (January to March 2015) was 16%. This rate has improved to 5% in Quarter Two (April to June 2015). For rats, the leakage rate in Quarter One was 10%, and this has also improved in Quarter Two to 4%. While these results are not yet at the level required, they are very promising and suggest that a barrier with extremely low leakage rates is within our capability in the near future.

Relative pressure on the protection system has been measured by the number of captures recorded on the kill traps and leg hold traps within the protection system. In Quarter One, 158 ship rats and 70 possums were caught within the protection system; while in Quarter Two those numbers dropped to 113 ship rats and 64 possums. This is likely to indicate that the wider populations of each naturally drop as cooler weather and reduced food lead to lower breeding rates and reduced home ranges.

The devices are placed in the following layout (line D1 is the closest line to the mainland, while D6 is closest to the peninsula tip):

Line	Device type ● rat control tool ▲ possum control tool					
	ZIP200	Trapinator	A24	Leg hold	Bait station (diphacinone)	Bait station (cyanide)
D1	●	▲				
D2	●	▲	●			
D3	●	▲	●	▲		
D4			●	▲	●	▲
D5					●	▲
D6					●	▲

Rat and possum pressure on the protection system



Leakage through the barrier April–June 2015

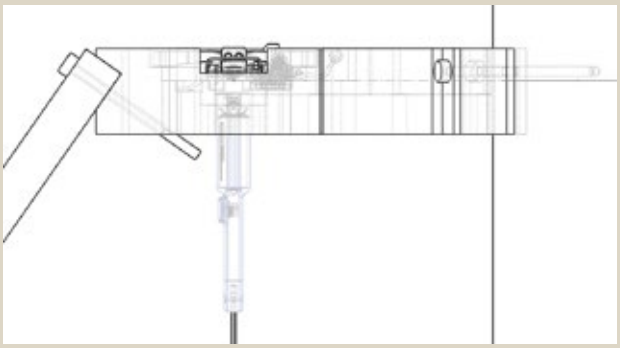
- Five rats (<4% of those encountering the barrier system)
- Three possums (<5% of those encountering the barrier system)

Scale

- Over 700,000 trap nights and counting…

A low cost, low maintenance system

- Establishment cost: $250/m
- 1.5 × FTE required to monitor the 2 km barrier
- 1 hour per day to monitor and maintain 500 leg hold traps



Sketch and photograph of prototype platform for automated possum leg hold trap system.

Inside a satellite box.

Select jobs to change | Tr ×

https://trapline.wildtech.co.nz/admin/trapdata/jobs/?group__group_id__exact=11&job_result_id__job_result_id__exact=p

Trapline Admin

Home › Trapdata › Jobs

Select jobs to change

Search 89 results (2792 total)

Action: --------- Go 0 of 89 selected

ID	Group 2	Node 3	Result	Job Status	Job Created
5634	D3	2430	Possum	Closed	Aug. 13, 2015, 08:22:43 UTC
5221	D3	340	Possum	Closed	July 27, 2015, 14:29:26 UTC
3957	D3	830	Possum	Closed	July 1, 2015, 12:21:34 UTC
3403	D3	2480	Possum	Closed	June 22, 2015, 09:47:36 UTC
3333	D3	2160	Possum	Closed	June 21, 2015, 09:48:09 UTC
2767	D3	R1170	Possum	Closed	June 16, 2015, 10:38:35 UTC
2646	D3	2200	Possum	Closed	June 4, 2015, 10:46:26 UTC
2612	D3	2430	Possum	Closed	May 31, 2015, 09:47:09 UTC
2571	D3	R1170	Possum	Closed	May 17, 2015, 11:26:04 UTC
2562	D3	130	Possum	Closed	May 15, 2015, 08:21:42 UTC
2529	D3	2110	Possum	Closed	May 10, 2015, 10:45:47 UTC
2528	D3	2110	Possum	Closed	May 8, 2015, 06:46:05 UTC
2525	D3	1100	Possum	Closed	May 5, 2015, 09:26:47 UTC
2523	D3	2450	Possum	Closed	May 3, 2015, 10:51:47 UTC
2522	D3	210	Possum	Closed	May 2, 2015, 15:43:40 UTC
2521	D3	2540	Possum	Closed	May 2, 2015, 09:47:58 UTC
2519	D3	1670	Possum	Closed	April 30, 2015, 13:26:24 UTC
2513	D3	2400	Possum	Closed	April 24, 2015, 11:45:37 UTC

AUTOMATED LEG HOLD TRAP SYSTEM

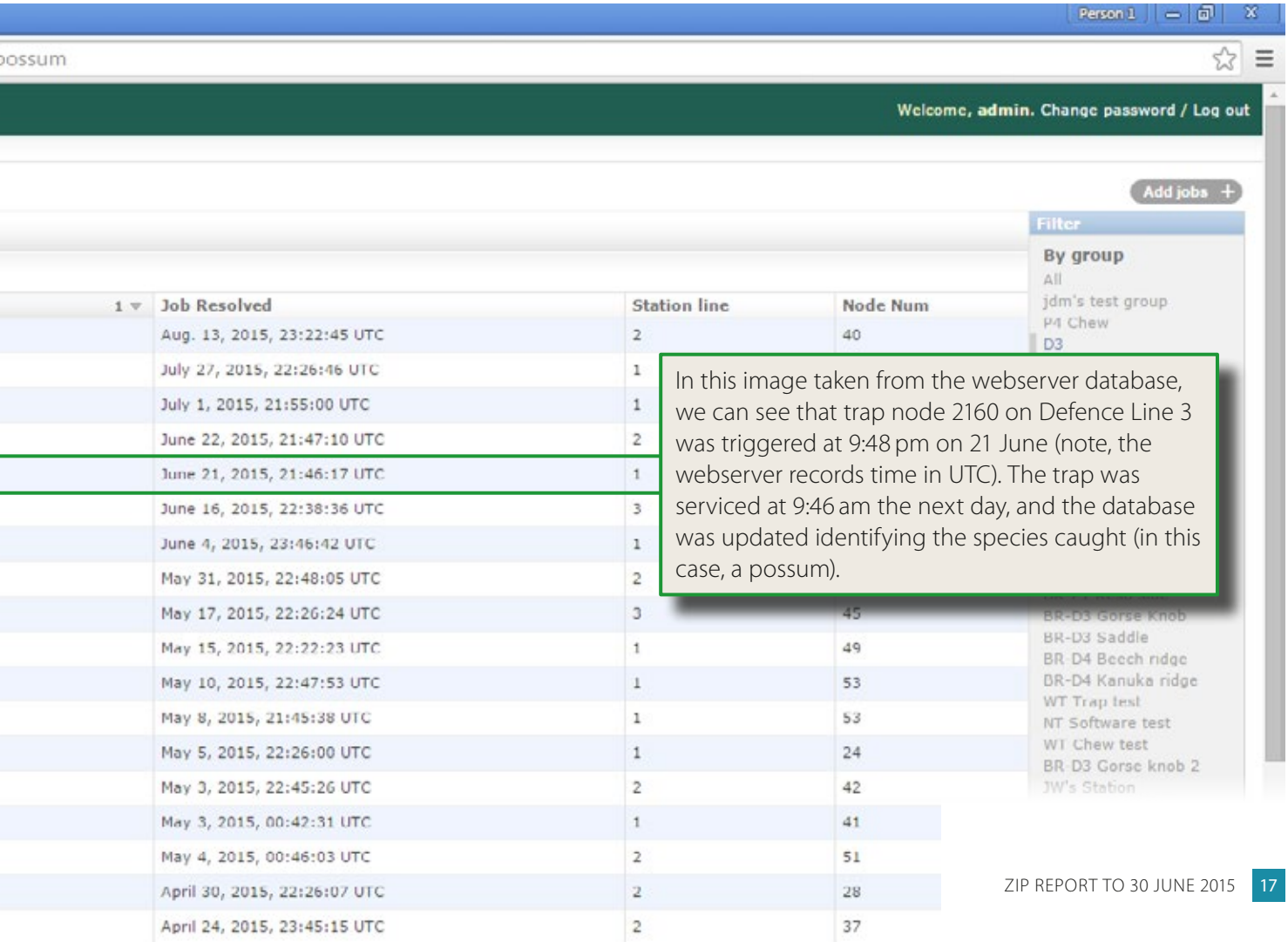
The most significant development within the protection system has been the automated reporting system for leg hold trapping. Leg hold trapping is generally considered the most effective trapping method for possums, but it is very labour intensive as all traps must be checked on a daily basis. Most estimates suggest that one person can check a maximum of 250 traps in any given day. Through the use of remote reporting technology, ZIP has made it possible to maintain 500 leg hold traps with approximately 1 hour of labour per day.

The leg hold traps sit within a specially routed wooden platform that also holds a custom-built transmitter or 'node' beneath the trap. Through a magnetic connection, the node detects the status of the trap. If the magnet is disconnected, i.e. dislodged by a caught animal, the node signals that the trap needs servicing. The nodes 'talk' to each other down the trap line through a simple yes/no language ensuring every trap reports in, with the information from up to 252 nodes reporting into a base station that in turn sends the information to a webserver via the iridium satellite network.

The webserver then processes the data from all the nodes deployed with leg hold traps, and sends a text message to the field ranger identifying which traps in the network need servicing. Reports are compiled every hour and the webserver alerts the team once a day approximately 1 hour after sunrise. If the alert is not responded to by the nominated field ranger, there is an escalation process built into the webserver that sends the alert to 2 more people in the team.

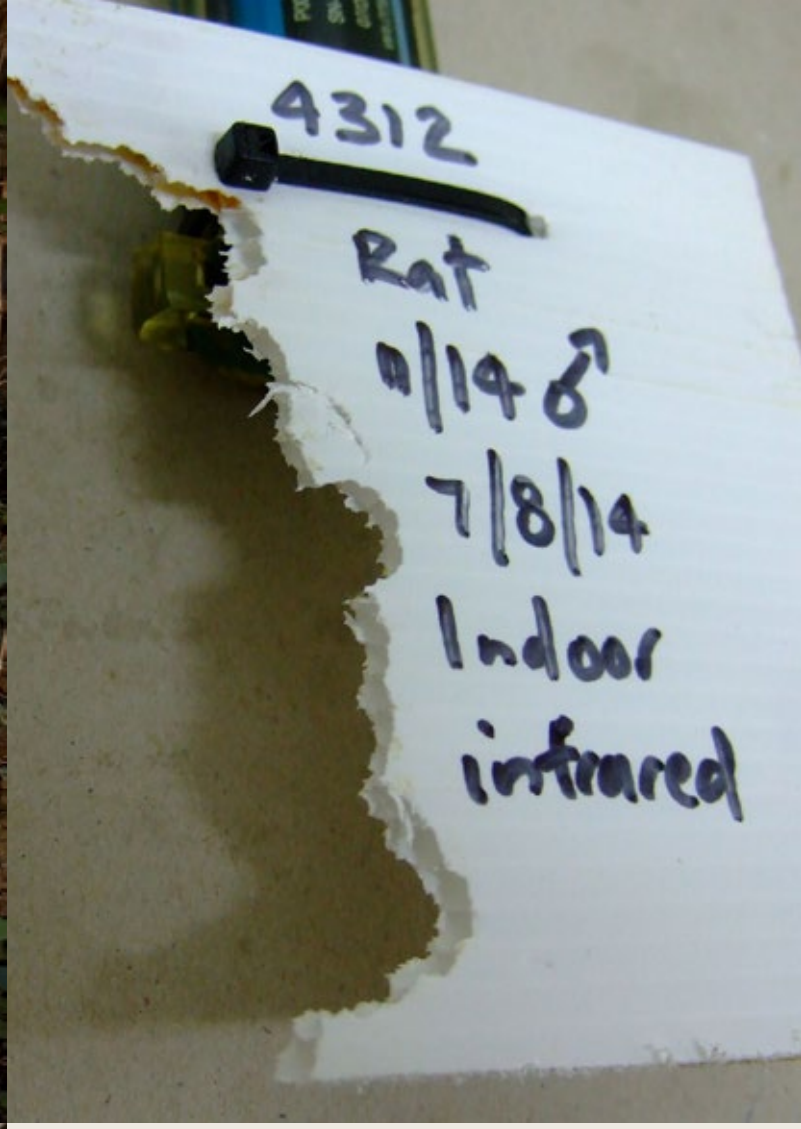
All data is recorded in the webserver database so the status of any given trap can be interrogated at any time.

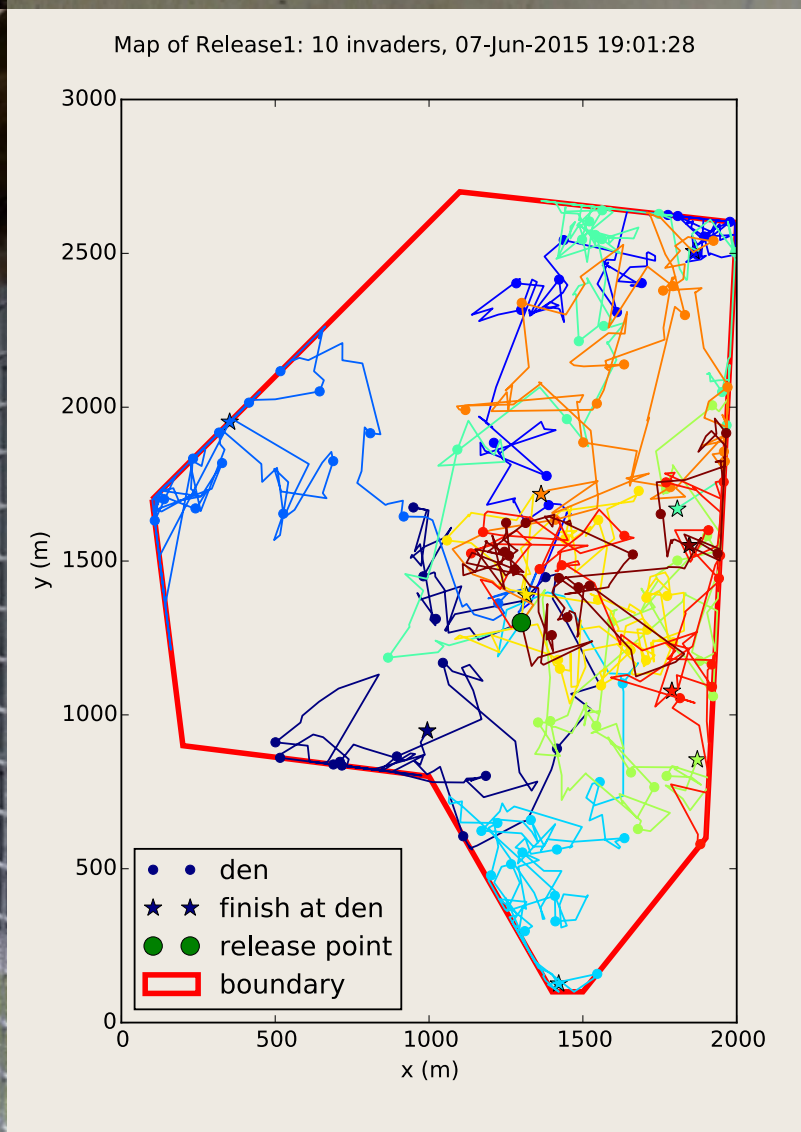
The leg hold trap system being trialled within the protection system has caught 94 possums over more than 85,000 trap nights, with the third defence line (D3) now accounting for approximately 75%, and the fourth (D4) for 25%. D3 has been operating since early November 2014; while D4 was installed in March 2015, which is the likely reason for the improvement in the barrier system for possums in Quarter Two (see above). The leg hold trap automated reporting system has always reported reliably during the development period to date.



1	Job Resolved	Station line	Node Num
	Aug. 13, 2015, 23:22:45 UTC	2	40
	July 27, 2015, 22:26:46 UTC	1	
	July 1, 2015, 21:55:00 UTC	1	
	June 22, 2015, 21:47:10 UTC	2	
	June 21, 2015, 21:46:17 UTC	1	
	June 16, 2015, 22:38:36 UTC	3	
	June 4, 2015, 23:46:42 UTC	1	
	May 31, 2015, 22:48:05 UTC	2	
	May 17, 2015, 22:26:24 UTC	3	45
	May 15, 2015, 22:22:23 UTC	1	49
	May 10, 2015, 22:47:53 UTC	1	53
	May 8, 2015, 21:45:38 UTC	1	53
	May 5, 2015, 22:26:00 UTC	1	24
	May 3, 2015, 22:45:26 UTC	2	42
	May 3, 2015, 00:42:31 UTC	1	41
	May 4, 2015, 00:46:03 UTC	2	51
	April 30, 2015, 22:26:07 UTC	2	28
	April 24, 2015, 23:45:15 UTC	2	37

In this image taken from the webserver database, we can see that trap node 2160 on Defence Line 3 was triggered at 9:48 pm on 21 June (note, the webserver records time in UTC). The trap was serviced at 9:46 am the next day, and the database was updated identifying the species caught (in this case, a possum).


4312
Rat
9/14 ♂
7/8/14
Indoor
infrared


Map of Release1: 10 invaders, 07-Jun-2015 19:01:28
3000
2500
2000
1500
1000
500
0
y (m)
0
500
1000
1500
2000
x (m)
den
finish at den
release point
boundary

CHEW DETECTION NODES

Utilising the same communication system as the automated leg hold trapping, ZIP is developing an automated chew card reporting system for deployment immediately behind the virtual barrier or at likely points of incursion, for early warning of any breaches. These detection nodes include a motion sensor to detect animal chewing. This information is then passed along the detection line, then via satellite and web server to the field team via text message or email for a timely response.

During initial pen trials at Lincoln University, rats and possums chewed on the cards generating a similar intensity of motion, and therefore these species cannot be distinguished from one another at present.

Preventing mice from consuming the chew cards and falsely triggering the chew nodes has been a challenge. Mice have proven to be far more agile than first anticipated, with video footage recording their ability to jump horizontally 200 mm and climb vertical wires of varying thickness (up to 32 mm diameter). This agility has led to a number of prototype mouse exclusion set-ups failing, including: (1) a 200 mm long horizontal wire protruding from a tree; (2) the same wire set up centred in a sheet of polyethylene; and (3) a 50 mm diameter metal disc fixed to vertical wire 200 mm above the ground.

The latest prototype (pictured) consists of an 4 mm diameter vertical wire, with an upside-down 'drawn' 50 mm diameter hemisphere welded at a height of 160 mm above ground. The chew card and node are hung on a 'pigtail' bend. Field trials of this prototype suggest that mice are not able to interfere with the chew cards.

Recent false triggering generated by weka, tauhou (silvereyes) and wind are the next challenges!

TRACKING RATS

To improve our understanding of rat invasive behaviour, ZIP and Sirtrack are experimenting with using the smallest possible GPS unit that can be fitted to a rat. The entire unit weighs less than 5 g, and consists of a GPS receiver and a VHF transmitter. Location data is stored in the device, and the VHF transmitter enables us to locate and retrieve the rat from the field so that the stored on board data can be recovered. The GPS receiver has a battery life of 10 days, with location fixes every 2 hours 20 minutes during the hours of darkness.

Pen trials at Lincoln University have developed a lightweight attachment system and indicate that rats are not negatively impacted by the unit.

The first release of a tracking rat at Bottle Rock will take place in July 2015. Further releases will follow in time, to continue building this body of knowledge.

DETECTION MODELLING

The ZIP team has developed a 'random walk' model for Bottle Rock based on research by Dr James Russell into invasive rat behaviour. This model simulates rat behaviour once the barrier has been breached. The model will be used to optimise the layout of the detection network, to maximise the chance of detecting an invader. The model will be further informed by real world data from the release of rats tracked at Bottle Rock over the next 12 months.

Top left: Chew detection node with mouse-proof architecture.

Top right: A peanut butter-filled chew card with distinctive rat gnaw marks.

Bottom left: Radio collared rat in Lincoln University pen demonstrating no ill effects from collar unit.

Bottom right: 'Random walk' model (10 invaders).

View from the Cougarline ferry, returning to Picton from Bottle Rock peninsula.

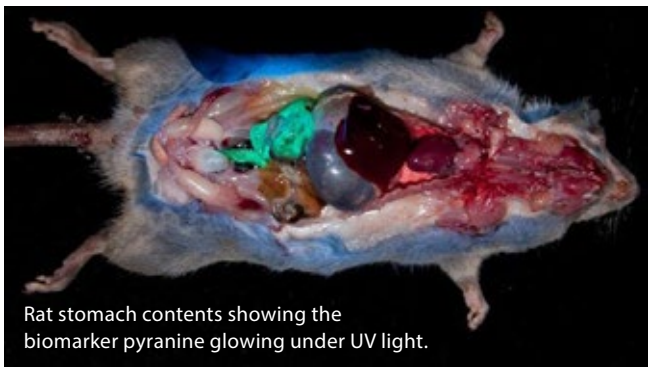
FUTURE DEVELOPMENTS

"It's virtually impossible to design for it, if you can't measure it."—John Wilks, Principal Engineer

Over the 2015/16 financial year, ZIP will focus on the following areas:

OPTIMISING THE VIRTUAL BARRIER

ZIP is continually looking to improve the effectiveness and efficiency of the virtual barrier for controlling rats and possums. The non-toxic biomarker pyranine will be sown outside the virtual barrier and used to determine how far and how quickly rats and possums are able to move through the defence zone before being caught. In addition, trials will be run to determine maximum allowable spacing between control devices to achieve optimal performance of the virtual barrier.



Rat stomach contents showing the biomarker pyranine glowing under UV light.

STOAT DEFENCES AT BOTTLE ROCK

Bottle Rock was initially considered too small, and existing detection tools too insensitive, to test our ability to protect areas from stoat invasion. However, the protection system coincidently caught a large number of stoats in the summer of 2014/15 and we now believe it worthwhile to trial stoat defences at Bottle Rock. Tools will likely include the carnivore-specific toxin PAPP, delivered using a new prototype bait station/ tracking tunnel—the 'ZIPthru'—along with TUN200 traps. We will test the effectiveness of the barrier by releasing radio-collared stoats on the peninsula and tracking their movements.

Prototype 'ZIPthru' tracking tunnel and bait station.

INVASION AND DETECTION

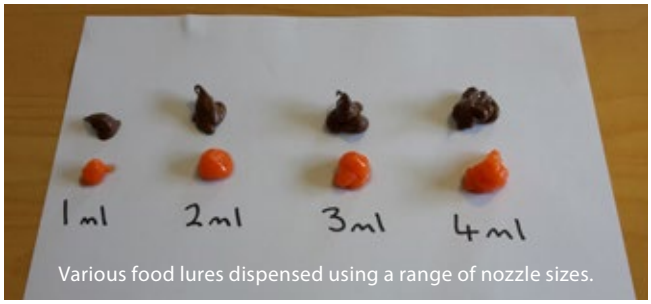
Releasing radio-collared rats within Bottle Rock will continue, with the objective of improving the design of the system to detect invading animals. As well as observing the behaviours exhibited by an 'invading' rat, we will use these releases to test evolving prototypes of detection tools and system layout.

Fur seal (kekeno) pup at Bottle Rock.

LURES

Food lures are our current best practice tool for attracting rats, possums and stoats to control or detection devices, the most attractive and palatable of which are often highly perishable. In 2015/2016 we will develop an automated dispensing mechanism for food lures that prolongs their life in the field.

Rats communicate with each other in ultrasonic frequencies most of the time. We propose to learn this rat 'language' and its associated behaviours, in order to develop an ultrasonic lure for use in our detection and removal systems. In addition, we propose to develop and trial oestrus based social lures for stoats and possums, building on the existing work of our collaborators.



Various food lures dispensed using a range of nozzle sizes.

REMOVAL TOOLS

With planning underway to scale up field operations to the next order of magnitude (i.e. 4,000 ha), there is an urgent need to improve our ability to initially remove the target predators. ZIP will investigate, in partnership with DOC, the feasibility of using existing and novel large-scale removal tools behind a virtual barrier on the mainland.

BLENDING THE BARRIER WITH PREDATOR FENCING

As ZIP scales up operations, the system we are developing will likely be applied across a range of environments including private and rural production land. Therefore the footprint of the barrier system on the landscape will need to be minimal. Predator fencing is one such option, but openings for roads and streams will be necessary. ZIP will investigate utilising the techniques developed at Bottle Rock to defend these openings. ZIP will construct a large pen to trial a range of device layouts to 'patch' a fence opening under artificially created predator pressure. This project will also see the development of our first prototype of a deterrent.


Testing ultrasonic deterrent.

New Zealand pigeon (kererū) at Bottle Rock.

OUR INVESTORS

OUR 2014/2015 INVESTORS

NEXT FOUNDATION
Investing in our land, our people

Department of Conservation
Te Papa Atawhai

jasmine SOCIAL INVESTMENTS

THE MORGAN FOUNDATION

DAIRY INDUSTRY GROUP INVESTMENT

In February 2015, six dairy companies committed funding to support ZIP's research and development programme over a two year period beginning in 2015/2016.

Fonterra
Dairy for life

TATUA

Westland Milk Products
Hokitika · New Zealand

OpenCountry
Serving You the Best in Dairy

synlait
making more from milk

MIRAKA
nurturing our world

Spotted shags (pārekareka) at Bottle Rock.

FINANCIAL SUMMARY

Zero Invasive Predators Limited

Statement of Financial Performance

For the Seven Months Ended 30 June 2015

	Note	2015 $
REVENUE		
Distributions Received	6	750,000
Total Income		750,000
Less Expenses		
Accountancy Fees		8,348
Advertising & Marketing		4,255
Audit Fees		9,156
Engineering Supplies		19,797
General Expenses		18,069
Legal Expenses		17,963
Office Expenses		8,001
Rents		10,440
Contracting Services relating Predator Control		81,664
Research & Development		95,773
Travel		43,697
Pest Eradication Supplies		69,001
Wages & Salaries		141,408
Total Expenses		527,572
Net Surplus Before Depreciation		222,428
Less Depreciation		
Depreciation	7	9,803
OPERATING SURPLUS		212,625
NET SURPLUS		$212,625

This statement should be read in conjunction with the Auditors' Report and the Notes to Financial Statements.

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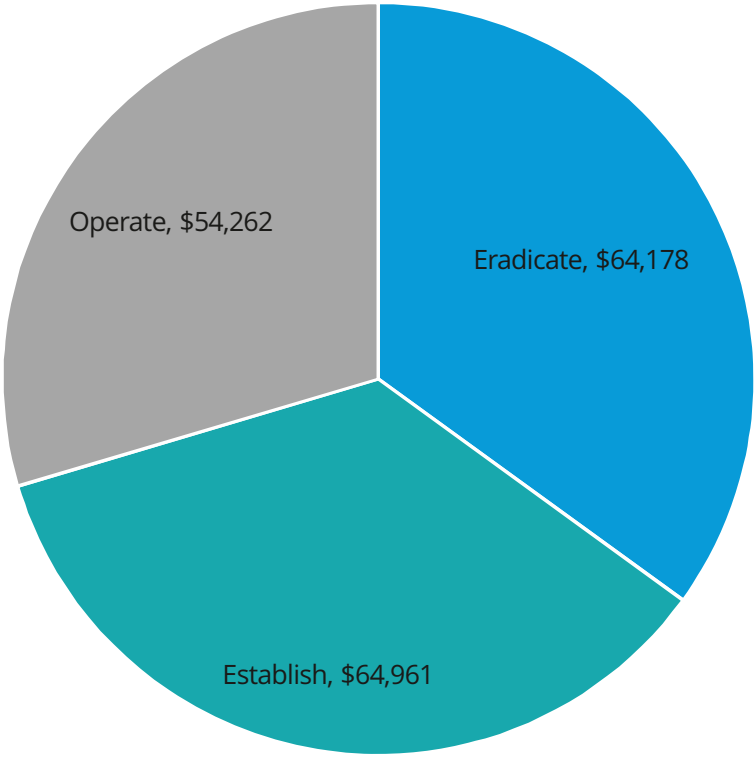
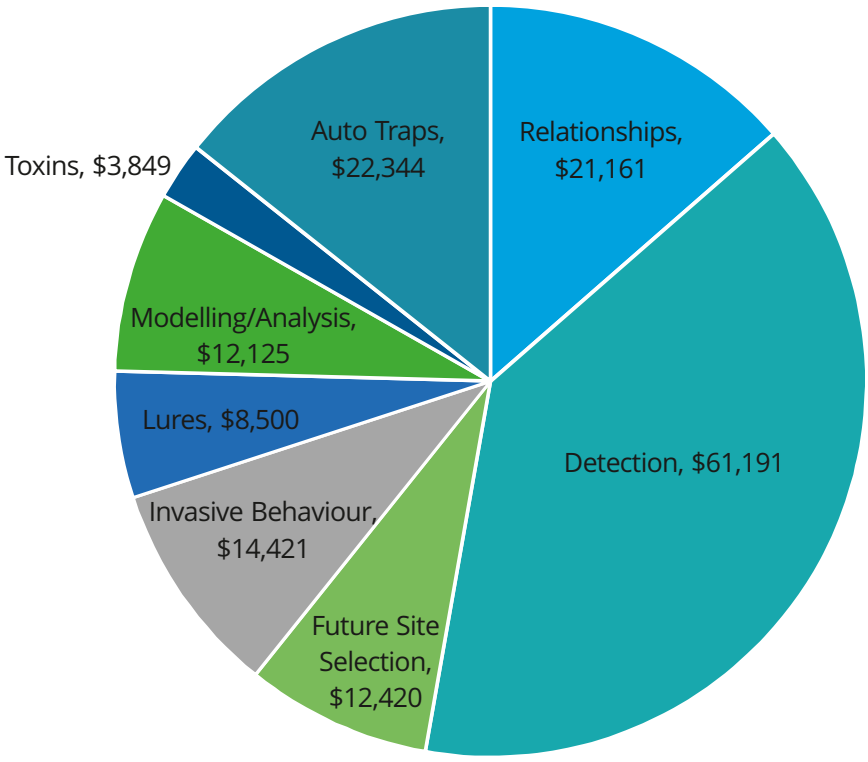
BOTTLE ROCK FIELD DEVELOPMENT SITE
1 JANUARY 2015 TO 30 JUNE 2015



RESEARCH AND DEVELOPMENT
1 JANUARY 2015 TO 30 JUNE 2015



INDEPENDENT AUDITOR'S REPORT

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Independent Auditors' Report
to the shareholders of Zero Invasive Predators Limited

Report on the Financial Statements

We have audited the financial statements of Zero Invasive Predators Limited ("the Company") on pages 3 to 8, which comprise the statement of financial position as at 30 June 2015, the statement of financial performance and the statement of movements in equity for the period then ended, and the notes to the financial statements that include a summary of significant accounting policies and other explanatory information.

Directors' Responsibility for the Financial Statements

The Directors are responsible on behalf of the Company for the preparation and fair presentation of these financial statements in accordance with New Zealand Equivalents to International Financial Reporting Standards Differential Reporting and for such internal controls as the Directors determine are necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditors' Responsibility

Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with International Standards on Auditing (New Zealand) and International Standards on Auditing. These standards require that we comply with relevant ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditors' judgement, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditors consider the internal controls relevant to the Company's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Company's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

We are independent of the Company. Other than in our capacity as auditors we have no relationship with, or interests in, the Company.

Opinion

In our opinion, the financial statements on pages 3 to 8 present fairly, in all material respects, the financial position of the Company as at 30 June 2015, and its financial performance for the period then ended in accordance with New Zealand Equivalents to International Financial Reporting Standards Differential Reporting.

Restriction on Use of our Report

This report is made solely to the Company's shareholders, as a body, in accordance with the Companies Act 1993. Our audit work has been undertaken so that we might state those matters which we are required to state to them in an auditors' report and for no other purpose. To the fullest extent permitted by law, we do not accept or assume responsibility to anyone other than the Company and the Company's shareholders, as a body, for our audit work, for this report or for the opinions we have formed.

PricewaterhouseCoopers

Chartered Accountants
27 October 2015

Auckland

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ZIP
Enabling a new future
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