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The Needles, the northern-most point on Aotea Great Barrier. Photo: I. Mabey



Great Barrier Island
ENVIRONMENTAL TRUST
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ENVIRONMENTAL NEWS



Aotea - Island of Lizards

Hauraki Gulf Seabird Research - Claris Fire Scar

Little Windy Hill - Conservation Dogs

Beyond Barrier



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the Great Barrier Local Board.

**Great Barrier
Local Board**
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Editorial

EMMA J. WATERHOUSE

Sometimes it pays to remind yourself that you are not alone. In life and in your hopes for the future. Such was the feeling at the inaugural Auckland Festival held on Saturday 24 June this year. With over 400 people from 450 community groups across Auckland, the feeling was very much one of being part of a much wider, mainstream movement - to restore native biodiversity by being pest free.

I was blown away by just how many community groups were undertaking pest control in their own back yards. And it's happening in many places beyond Auckland—you just have to go on to the Predator Free New Zealand 'Find a Group' website. Families, all sorts of volunteer groups and trusts are waging a war on pests across the country. What I am struck by most is that those on the mainland have a few more pests to deal with than here on Aotea Great Barrier. Stoats, Norway rats, possums, hedgehogs...

So it's really no surprise that attention, one day, might turn to this island, and for others to understand just what a unique opportunity the Barrier presents to create large areas of pest free habitat. We already have the largest tract of possum and stoat free forest in New Zealand. Why not go further?

Not many people would disagree that getting rid of rats is a good idea. It's the 'how' where opinions often diverge. And such debate is good. And necessary.

What Festival showed was that the technology and approaches to pest control are moving at a very fast rate. We need to keep up - we just don't know what methods might be available in the future to rid this land (and I mean all of New Zealand) of predators one day.

So what do we do in the meantime? How do we at least halt the decline of many of Aotea's special birds, lizards and other species. We are, for example, seeing worrying downward trends in pāteke numbers, and tomtit and kākāriki are just hanging on.



The trees, plants and ground cover had been sculpted by the movement of a million seabirds, but the most striking feature was that the very island itself – the ground beneath our feet - was nothing but an enormous labyrinth of catacombs, excavated by the subterranean movements of a million burrowing seabirds. There is no solid ground on Rangatira. If you were to take a step you would fall through three stories of the nearest seabird's home.

...the ground beneath our feet - was nothing but an enormous labyrinth of catacombs, excavated by ... a million burrowing seabirds.

Now kiwis (the people) are nothing if not ingenious folk, so a system has been created so visiting scientists and confused dog handlers can move with relative ease across the island. In true 'number 8 wire' fashion, these 'petrel boards' as they are known, are a snowboard binding bolted to a two-by-one-foot section of plywood which increases your footprint. The alternative would be clumsily crushing the fragile home of either a Chatham petrel, fairy prion or two very cute species of storm petrel.

It turns out that a 5 kg miniature fox terrier Jack Russell cross falls just under the weight-to-footprint ratio required to punch through a seabird burrow, so Milly avoided having to don her own peculiar footwear. And so began our four days of trekking through the forest of an alternative universe where seabirds rule the planet, with a miniature snowboard strapped to each foot, being led by the nose of a brainwashed, bird adverse, Jack Russell terrier.



Fairy prion on Rangatira. This species is likely to have been abundant on the mainland before human arrival, and aside from a few cliff ledges in Otago, now breeds only on predator-free islands.



Pest free

Four days later, sitting on the back deck of the hut and taking the petrel boards off for the last time, I give a sigh of relief and my partner a quick rub for a job well done. No rats. In all honesty, there never usually is on these jobs, but at least we can say we have had a very thorough search.



Not snow shoes but 'petrel boards' - a necessity on a seabird island like Rangatira.

Photo: S. Sambell

What was once a land of cattle and men, now the domain of the seabirds. The cattle now extinct for over 50 years...50 years? Hold on. This gave me a thought - Rangatira went from being trodden over by cattle, to being honeycombed by seabirds over slightly more than my lifetime. As this implausible concept began to sink in, I extrapolated to other places that Milly and I had checked in the last four years and began to think about what these pest free islands would be like after 50 years of the birds being free to do their own thing. Which leads to the question, what would a predator free New Zealand look like in 2100?

My daydream was interrupted by a black robin landing nearby, which reminded me we had another island to go to where these enigmatic little birds now rule the forest after coming as close to extinction as anything has ever been in the history of life on Earth. But that story is for another day. For the time being we had a boat to catch. I shouldered my pack and we made our way down to the crayboat that would take us to Mangere Island – the site of the greatest conservation rescue story ever told.

Which we will attempt to retell...in the next instalment.

Rangatira - a premier bird island

Rangatira Island (South East Island) has been described as one of the world's premier bird islands¹. The third largest island in the Chatham Islands archipelago, with an area of 218 ha, the island lies over 800 km east of New Zealand's South Island, off the south-east coast of Pitt Island, 55 km south-east of the main settlement, Waitangi, on Chatham Island.

Rangatira has been identified as an Important Bird Area (IBA) by BirdLife International. These areas are identified using an internationally agreed set of criteria as being globally important for the conservation of bird populations.

The Rangatira IBA supports large breeding colonies of seabirds, including 330,000 pairs of broad-billed prions (*Pachyptila vittata*), 1,000 pairs of Chatham petrels (*Pterodroma axillaris*) and 840,000 pairs of white-faced storm petrels (*Pelagodroma marina*)². Pitt shag (*Phalacrocorax featherstoni*), Chatham oystercatcher (*Haematopus chathamensis*), and Chatham snipe (*Coenocorypha pusilla*) are also present³. Until recently, Rangatira was the stronghold, and last remaining breeding site for the Chatham petrel; new colonies on Pitt and Chatham Islands are being established⁴.

Rangatira is vitally important to the survival of the shore plover (*Thinornis novaeseelandiae*) and black robin (*Petroica traversi*), where the largest populations exist. The conservation status of both these species are assessed as nationally critical⁵.



Clockwise from top left: The special birds of Rangatira — shore plover, Chatham Island oystercatcher, Chatham Island snipe Photos: Sarah Forder (left), Sarah Matthew (above).

Notes

¹ <http://www.doc.govt.nz/nature/habitats/offshore-islands/chatham-islands/mangere-and-rangatira-islands>. Accessed 1 October 2017.

² BirdLife International, 2017. Important Bird Areas factsheet: Rangatira South East Island. <http://www.birdlife.org> on. Accessed 1 October 2017.

³ Nilsson, R.J., Kennedy, E.S., West, J.A., 1994. The birdlife of South East Island (Rangatira), Chatham Islands, New Zealand. *Notornis*. Vol. 41:109-125.

⁴ <http://nzbirdsonline.org.nz/species/chatham-petrel>. Accessed 1 October 2017.

⁵ Robertson, H.A., Baird, K., Dowding, J.E., Elliott, G.P., Hitchmough, R.A., Miskelly, C.M., McArthur, N., O'Donnell, C.J., Sagar, P.M., Scofield, P., and Taylor, G.A., 2017. Conservation status of New Zealand birds, 2016. New Zealand Threat Classification Series 19. Department of Conservation, Wellington. 23 p.



Last month, Predator Free NZ issued an expression of interest (EOI) for groups interested in obtaining funding for 'large landscape scale' projects. Applicants had five weeks to respond to the EOI.

The prospect of obtaining significant funding for pest management on the island, taking a community-led, whole-of-island approach, was suddenly on the table.

A wonderful collaboration ensued to draft the EOI, led by Ngati Rehua Ngatiwai ki Aotea as mana whenua and the Local Board, with support from the island's existing sanctuaries, community groups, multiple private landowners, Aotea Conservation Park Advisory Committee, Auckland Council, Department of Conservation and a Technical Advisory Group.

So what was proposed in the EOI? A pathway to restoration of Aotea Great Barrier, following

the path laid out in the Local Board's Ecology Vision. A pathway that does not include wide-scale aerial application of toxins, a pathway that has put the community front and centre and in control, a pathway that builds and expands on existing pest managed areas, and would support projects like Ngati Rehua Ngatiwai ki Aotea's 'Bring Back Kokako' on Te Paparahi. And importantly, a pathway that invests in community education and support.

Shortlisted projects will be announced on 24 November and would need to develop a full funding proposal, due in January 2018.

As this issue of Environment News so clearly illustrates, we have many precious taonga on Aotea Great Barrier, many that could be lost. Why wouldn't we take this opportunity to protect and restore them?

Noho ora mai

Noelene Ngawaka-Fortzer



We were deeply saddened at the passing of Noelene Moana Ngawaka-Fortzer (23 August 2017). Visitors to Aotea may forever know Noelene the artist, thanks to the presence of her striking installation at Claris - Te Waiparera o Aotea.

She was a wonderful warm presence at any gathering and revered as an artist, weaver, community member and many other things. More recently she took a leadership role for the 'Bring Back Kokako' project and was a member of the Aotea Conservation Park Advisory Committee.

She is deeply missed. Our sympathies go to Noelene's whanau.

Cover: Clockwise from top left: Town's skink, shore skink, moko skink, Auckland green gecko. Photos: H. Jamieson/Department of Conservation. Below: Mokohinau Islands, 21 km northwest of Aotea Great Barrier, are home to seven species of seabird.



Photo: I. Mabey



Aotea - island of lizards

HALEMA JAMIESON (Ecologist/Herpetologist)

When we think of reptiles we usually think of warm tropical places like Australia and the Pacific islands. Remarkably then, New Zealand with a predominantly temperate climate has over 100 species of native lizard.

Over 75% of these species are considered threatened or at risk. Many species are now completely absent from the main islands of New Zealand and confined to offshore islands or mainland sanctuaries. This drastic decline has been due to habitat destruction and the ongoing effects of introduced mammalian predators like cats, rats, mice and mustelids.

High lizard diversity

Today, Aotea Great Barrier is among a few small areas of New Zealand with a high diversity of native lizards. Despite losing at least three species and the tuatara (NOT a lizard), the island is still home to an impressive 13 native lizard species (five gecko and eight skink) (Box 1). Some of these species are extinct on the mainland, and for others, Aotea Great Barrier is one of only a handful of places where these animals still exist on the planet. And their future is not secure. Ongoing predation from cats, pigs and rodents (ship rats, kiore, and mice) puts constant pressure on remaining populations, and over 85% of the island's species are listed in the latest New Zealand Threatened Species classifications¹.

Everything eats lizards

The sad fact is that everything eats lizards. The presence of introduced animals plays a large part in their continued survival on Aotea. Rodents are especially bad and have been implicated in the extermination of numerous species from large parts of their former ranges. Although mice, ship rats and kiore are still on Aotea, the largest rat in New Zealand, the Norway rat is not known to be on the island. Neither are hedgehog, possum or any of the mustelid family (stoats, weasels, ferrets).

The introduction of any of these predators would spell disaster for most of the island's remaining wildlife (lizards, birds, frogs and bats)².

...over 85% of the island's [lizard] species are listed in the latest New Zealand Threatened Species classifications...

Lizards play an important role in the functioning of native ecosystems. They are tiny predators eating insects and other invertebrates, important food for native birds like ruru/morepork and kotare/kingfisher, pollinators and seed dispersers to many native plants through their consumption of nectar and fruits. It is vital that they survive.

The continued existence of Aotea's unique lizard fauna will require ongoing vigilance, and a commitment to reducing the pressure of predators on these often forgotten element of New Zealand's indigenous fauna. Our native lizards need your help!



Photo: H. Jamieson

Raukawa/common gecko (*Woodworthia maculata*): Known from coastal areas among rocks and under debris, not as common as it was.

Notes:

¹Hitchmough, R., Barr, B., Lettink, M., Monks, J., Reardon, J., Tocher, M., van Winkel, D., and Rolfe, J., 2016. Conservation status of New Zealand reptiles, 2015. New Zealand Department of Conservation.

²Biosecurity will remain a critical issue for Aotea, not just for introduced predators such as Norway rats and mustelids. An accidental introduction to Tryphena of the invasive Australian plague skink is likely to displace and outcompete several native lizards, placing more pressure on declining populations.

Suddenly there were buckets, boxes, machinery, solar panels and (to my genuine surprise) an actual full-size fridge being heaved up to the for'ard deck for unloading.

The only permanent residents of Rangatira are a community of some of the most rare and threatened 'non-mammals' in the world so there hasn't been the demand as yet for the construction of a wharf. The modus operandi for disembarking in these swells is to get onto the bow with whatever freight you can comfortably lift and, within jumping distance of the rock shelf, take a very large and confident step forward.

Fortunately, Milly the rat dog, having spent most of her four years on Aotea/Great Barrier Island, was very familiar with what was



Photo: S. Sambell

The landing site on Rangatira Island (South East Island) in the Chatham Islands.

expected. The bow of the cray-boat dropped a metre below the rock shelf and then surged forward and up as the next Southern Ocean roller, pitched it forward. At that precisely practiced moment she took flight, traced a perfect parabola through the air, and came to land perfectly on all fours onto the rock shelf, closely followed on the next wave by her very relieved handler.

The only permanent residents of Rangatira are a community of some of the most rare and threatened 'non-mammals' in the world...

After four days of travelling by plane, car, light utility vehicle and boat, they had finally touched down on their destination and, after briefly stepping aside to avoid being crushed by a passing fridge, they surveyed the site of their latest mission.

The dog and his man

Milly and I have the coolest job in the world. In short – we travel to places that don't have rats to make sure they still don't have rats.

Anywhere else in New Zealand where you don't have rats, you have a lot of native species. This is such a basic tenant of everything we do that our first task was to walk across the rock shelf and take a quick look around for shore plovers. If the shore plovers are still alive, then that's the first good sign you haven't had a rat incursion since the last time you visited. Only 175 shore plovers are left in the world.

As I climbed over the rocks that separated our landing site from the rest of the island, I encountered Milly doing her familiar uncomfortable pose which I now know to represent: "I just saw a bird, but I didn't mean to see a bird, I promise I didn't look at it on purpose, oh dear, I wasn't looking really, I think I might just lay down here until it goes away" and I caught site of the 15 tiny tennis-ball-sized birds that she was cowering away from, in the rock pools below. We had just ticked the first box on our biosecurity checklist.

Apart from being brainwashed since she was eight weeks old to 'pretend she can't see birds', Milly has also been very thoroughly and methodically trained to serve as my 'sense of smell' in the forest. When we first arrive at an island such as this one, we take stock of our surroundings, consider how much time we have, what are the most sensitive areas, what places would be most likely to give us evidence of an incursion, and then we head on out into the bush and give it a good sniff. Usually.

An island owned by seabirds

Rangatira is a little different from many other islands I had been to. When rats were eradicated in 1963, many native species, as expected, began to thrive. At latitude 44 degrees south and directly in their migratory path, the ones that stepped up on this island were the Procellariiformes - seabirds.

I wasn't quite prepared to step off the boat and into an ecosystem – an entire world – so completely owned by seabirds. Everything – absolutely everything about the island of Rangatira has been shaped by seabirds.

Beyond Barrier - conservation dogs and the war on rats (aka the adventures of Milly)

JOURNEYS TO OUR VERY SPECIAL OFFSHORE ISLANDS

In his multi-part series, **Scott Sambell** recounts his recent journeys with Milly to some of our very special offshore islands, and we see a glimpse of what a past (and future?) New Zealand may have been like...

PART 1: Rangatira Island (South East Island)

Prologue

Islands are always going to have unique and fantastic wildlife due to the fact that – by definition – you can't just walk over to them and set up a life for yourself. The islands that sit on the continental crust of Zealandia are particularly unusual in that when they broke away from Gondwana 85 million years ago they neglected to take with them any mammals (apart from a few bats). When the first humans arrived they were stunned by what they found.

Whenever I come across a globe of the world, I instinctively spin it around, tilt it over a bit, and look for New Zealand. I find it easiest to first locate the distinctively huge land mass of Australia and then trace an arc down to the southeast until I hit that familiar, yet almost indiscernible archipelago of home. Now, if you were to repeat that exercise on a much larger globe and trace an arc from the now familiar land mass of New Zealand down to the south east again, you would hit another indiscernible archipelago called the Chatham Islands. Here you have a tiny island off a tiny island and the wildlife gets another factor of distinctiveness.

Now, trace an arc down to the south east of the main island and you come to yet another, even more isolated island. Pitt is an island off the south east of an island, off the south east of an island. But we're not quite finished yet. Keep your finger on Pitt Island and trace an arc one more time down to the south east. Here, with a factor of isolation that hurts to even attempt to calculate, is our island, off-an-island, off-an-island, off-an-island - and it's called Rangatira.

Which is where our story begins...

Journey to the actual end of the Earth

Milly the rat dog cowered in her box. Although she is the equal smallest of all the DOC fully certified conservation dogs, Milly is by no means the least brave. Even the mighty Labradors and springer spaniels that tower above her would have been cowering in these seas. I sat steadfast on her box with my legs wedged between a crate of solar panel equipment and a plastic tub containing about two cubic metres of despondent looking crayfish. It wasn't the most comfortable of positions for either the dog, the handler or the crayfish but these 'crayboats', being the Chatham Island equivalent of a water taxi, are the only possible way to get out to this island.

To the great relief of the dog and handler, the massive twin turbo diesel engines dropped in pitch and immediately there was a lot of action from those on board. I took this as a cue to stand up and try to look helpful and Milly took it as a cue to whimper slightly, but in a professional, conservation-dog kind of way.



Photo: Sarah Matthew

Scott Sambell and Milly on Rangatira Island, over 800 km from home, searching for rats on one of our most isolated and special islands.

Aotea's fabulous native lizards

Many lizard species considered to be very rare, or no longer found on the mainland, can be found on Aotea - some of them are record holders!



Above: New Zealand's longest lizard— **Chevron skink/Niho taniwha** (*Oligosoma homalonotum*) **Nationally Vulnerable**: Can be over 30cm long and characterised by the chevron-like markings down its back and a 'tear-drop' pattern under each eye. Extinct on the mainland and now found only on Aotea and Hauturu (Little Barrier Island). With almost mythical qualities, is best known from Aotea where they are often brought in by cats, or found squashed on the road.



Left: New Zealand's largest gecko and one of the largest geckos in the world – **Duvaucel's gecko** (*Hoplodactylus duvaucelii*) **At Risk – Relict**: Very rare on Aotea, this species was not seen for around 40 years until recently found near Windy Hill Sanctuary, Tryphena. Confined to predator-free islands or mainland sanctuaries, Duvaucel's gecko does not survive with rats.



Above: **Forest gecko** (*Mokopirirakau granulatus*) **At Risk – Declining**: Not often seen although still hanging on in forest areas where rats are controlled. Used to be common on the mainland.

Photos : H. Jamieson unless stated.

Aotea's fabulous native lizards (cont'd)



Moko skink (*Oligosoma moco*) *At Risk: Very rare on the mainland and mostly confined to islands. Does not do well in the presence of rats or cats.*

Right: Ornate skink (*Oligosoma ornatum*) *At Risk-Declining: Found on Aotea amongst leaf litter and often brought inside by cats. Confused with the chevron skink.*



Photo: J.Ogden



Photo: DOC

Left: Auckland green gecko/elegant gecko (*Naultinus elegans*) *At Risk – Declining: Bright green like Kermit the frog. Very rare on Aotea with very few sightings in the last 20 years. Was once common in Auckland.*



Copper skink (*Oligosoma aeneum*): *Most commonly encountered skink on Aotea but not as common as it used to be. Often brought inside by cats.*



Beyond Barrier

ENVIRONMENTAL NEWS FROM NEW ZEALAND & AROUND THE WORLD

Our special bird fauna – a reminder of what we have on Aotea

A recent Department of Conservation newsletter reported on “rare native bird found at West Auckland wetland”.

This bird was discovered at a West Auckland wetland for the first time. The small, secretive ground-living bird, was discovered in a coastal wetland in the upper Waitemata Harbour.

The ‘at risk-declining’ bird was captured on video footage from a camera trap after suspicions that it could be found in the area. Populations of this bird declined in the 1930s in the Auckland region (and elsewhere) mostly due to habitat destruction like wetland drainage, reclamation and predation from introduced pests.

Can you guess which bird it is? Yes, it’s the banded rail/moho pereru (*Gallirallus philippensis*) – a common sight on Aotea/Great Barrier Island!

Auckland Festival 2017

Auckland Festival 2017 was organised by Auckland Council, in collaboration with Predator Free New Zealand and the Department of Conservation. The aim of the Festival was to showcase current community led-conservation and technology trends, and in doing so provide feedback on how Council and the department can support and expand community action.

Presentations provided information and insights to inspire and motivate. Auckland Council announced its programme to make Auckland pest-free by 2050 - by expanding its own action and supporting community and landowner pest eradication and restoration activities. There was a focus on islands and peninsulas, and existing sanctuaries, but also in creating an increasing number of pest-free corridors across the Auckland region.

Presentations from Festival are available here: <http://ourauckland.aucklandcouncil.govt.nz/articles/news/2017/06/pestival-2017/>



Draft Threatened Species Strategy

The draft Threatened Species Strategy was published by the Department of Conservation in May 2017, with submissions closing in July. The strategy sets out the plan to halt the decline in threatened species and restore them to healthy populations. Building on existing commitments and programmes, the strategy sets out steps to restore the listed species that are already at risk of extinction, and to prevent others from becoming threatened.

The strategy establishes goals for increasing the number of threatened species the department is working on, and prioritises some threatened and at risk species¹ for recovery by 2025.

Of the 150 species listed as a priority, nine occur on Aotea Great Barrier, which is a bigger percentage (about 6%) than any area of equivalent size in the country. In other words, the island has 6% of the most threatened 150 species, but is only 0.1% of the total area of NZ.



Photo: DOC

Bittern are globally endangered and listed as nationally critical in New Zealand, where the population is less than 1,000.

Species found on Aotea in the 150 ‘priority threatened and at risk’ list include the bittern, wrybill, kaka, and bar-tailed godwit. The island has eight species in the ‘Nationally vulnerable’ category and seven in the ‘declining’ category.

Aotea/Great Barrier Island has 27 species of plant in the ‘nationally critical to relict’ categories, and 29 ‘naturally rare’ plant species. Other species on the list include the longfin eel, and shortjaw kokapu. Duvaucel’s gecko and long-tailed bats, also found on the island, feature in the draft strategy.

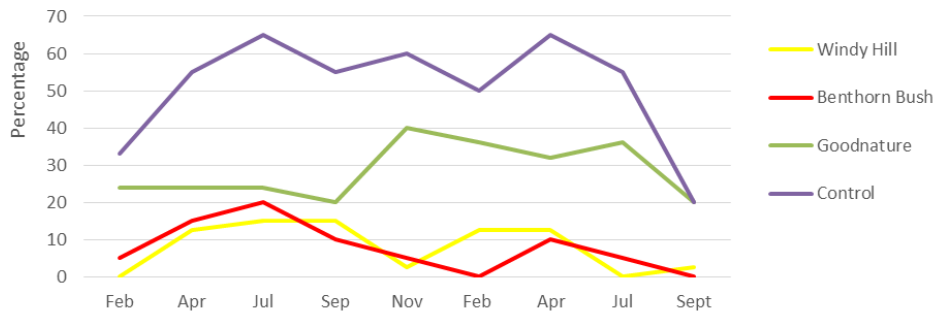


Figure 4: Rat tracking tunnel results for 2016/17 in the pest managed areas at Windy Hill and Benthorn Bush, and the unmanaged control site compared to areas using the Goodnature A24 trap. Results to date show lower rat numbers being achieved at sites using existing methods, but that A24's are achieving a degree of rat suppression. The project is ongoing.

Technology and innovation

A Great Barrier Local Board-funded a trial of Goodnature A24s is underway at Windy Hill and is yielding valuable information on the efficacy of these non-toxic, multi-kill, self-setting devices (Figure 4). The data is going back to the Goodnature research and development team to try to improve the trap's effectiveness with more than one species of rat. This has value far beyond the Barrier – a fact not lost on funders and agencies. Aotea Great Barrier, anchored by the rigour of Windy Hill's trials could become the go-to place to pilot new technologies to eradicate rats.

Support for pest control

Over the past two years, the Great Barrier Local Board has gone into the community to explore and record how islanders feel about the ecology of the place in which they live. Gilbert was on the board when this work began, instrumental in getting it started because she knows that it all begins with a community conversation.

The Ecology Vision Project¹ spent a year meeting with, and discussing, the community's views and aspirations for the environment. Many want a pest-free island. But others are worried about the use of toxins and the practicalities, preferring instead to create a patchwork of pest free 'oases' where birds, plants and other taonga can thrive.

Joanne Aley, an Auckland University masters student, was also surveying landowners on the island². Only 2% of landowners said 'no' to a pest free Aotea, but another 34% were 'unsure'. Aley's results also showed people are

much more likely to support a pest free island if they have participated in pest control activities.

These studies show just how much support there is for the protection and restoration of Aotea's treasures.

Rangitawhiri: An opportunity for large scale community led predator control

The logical question for Gilbert and many others who share her goal of a pest free island, is how to increase participation in pest control in the south, where most people live? The opportunity exists to leverage Windy Hill's experience, and other projects that ring Tryphena Harbour, to create an oasis in the south. It looks simple enough on paper. Join up the Windy Hill, DOC, Auckland Council, and Taumata blocks with Rangitawhiri Reserve, the Mulberry Grove community and school projects, and other private land where owners opt in, to form one large pest suppressed oasis for birds, seabirds and skinks and geckos. And of course wetas!

Already there are those who say that it can't be done, there are too many uninterested private landowners, it will be too expensive to knock down the rats and to sustain. Gilbert has heard it before. Fortunately for Aotea Great Barrier's ecology and economy, and for New Zealand, she hasn't let it slow her down, and shows no signs of doing so in the future.

Notes:

¹ McEntee, M., Johnson, S., 2016. Aotea Great Barrier Island Ecology Vision. Weaving the Tapestry Phase 2 Report. November 2016

² Aley, J., 2016. Environmental and pest management attitudes of Hauraki Gulf Island Communities. Thesis for the MSc Biological Science (Biosecurity and Conservation) University of Auckland 2016.



Egg laying skink/Suter's skink (*Oligosoma suteri*) At Risk: Very rare to absent on the mainland. Very rare on Aotea. New Zealand's only egg-laying



Town's skink (*Oligosoma townsi*) At Risk: found only on Aotea, Hauturu, Mokohinau/Pokohinau, Hen and Chickens Islands. Very rare on Aotea, confined to two small catchments. Named after prominent New Zealand herpetologist David Towns who lived some of his early years at Kawa.



Pacific gecko (*Dactylocnemis pacificus*) At Risk – Relict: Widespread throughout the island, although no longer common.



Shore skink (*Oligosoma smithi*) At Risk: Still found in limited localised areas on the mainland. Limited to small coastal areas.



Striped skink (*Oligosoma striatum*) At Risk-Declining: Very few sightings on Aotea and extremely rare on the mainland. Likes mature forest with lots of epiphytes. A very good climber, closest relative is the chevron skink. Identified by obvious pale stripes down the back.

Photo: T. Whitaker

Seabirds: Canaries in the mine or elephants with wings?

KATE WATERHOUSE

In this article, Kate Waterhouse summarises some recent seabird research findings reported at the Hauraki Gulf Marine Park Seminar: *Taking Flight*, held on 6 September 2017 at the Auckland Museum.



The Hauraki Gulf, Te Moana Nui a Toi, Tikapa Moana, is a global seabird hotspot. And here, seabirds, forest birds, lizards and even some marine ecosystems are recovering where rats and other predators have been removed from islands and sanctuaries.

The Hauraki Gulf is a magnet for seabird researchers and those learning how to protect breeding colonies.

All over the world, seabirds have been marginalised to the most remote areas and islands. They have no defences, having evolved without mammalian predators – so stopping predation in breeding colonies is a global issue.

All eyes on New Zealand

The Hauraki Gulf is a magnet for seabird researchers and those learning how to protect breeding colonies. Dr Andre Raine of the Kaua'i Endangered Seabird Recovery Project in Hawaii told the 400 strong audience at the Auckland Museum that New Zealand is at the forefront of new methods - including traps, island eradications, fenced sanctuaries, translocation, and social attraction projects, such as Tawharanui, where seabirds are breeding again. He described Predator Free New Zealand as a globally significant goal.

Why is the Hauraki Gulf a global seabird hotspot?

The numbers tell the story – of the 10,400 species of birds globally, only 359 are seabirds, around 20% of the world's seabirds have been recorded here (over 70 species), and 26 species of seabird breed in the gulf, with four endemic to the region (including the black petrel (*Procellaria parkinsoni*), fairy tern (*Sternula nereis*) (our nation's rarest bird) and the recently rediscovered New Zealand storm petrel (*Fregetta maoriana*)¹.

About 70% of New Zealand's territory is ocean and it's easy to see from submarine topography and oceanic currents, that upwellings and convergence zones near New Zealand make our waters extremely productive. So said illustrator Chris Gaskin, one of the founders of the Northern New Zealand



Photo: S. Lee

Chris Gaskin speaking at Taking Flight in June

Seabird Trust (NNZST). Chris pointed out that in the Hauraki Gulf, trevally, kahawai and other school fish feed on krill – so it's not surprising seabirds have become concentrated here also.

Shapeshifters: Why seabirds are so amazing - across distance and the air/water divide

Chris Gaskin explained that being able to locate food scattered over vast areas of ocean is key to survival for all seabirds. Multiple senses come into play when they do this – especially sight and smell.

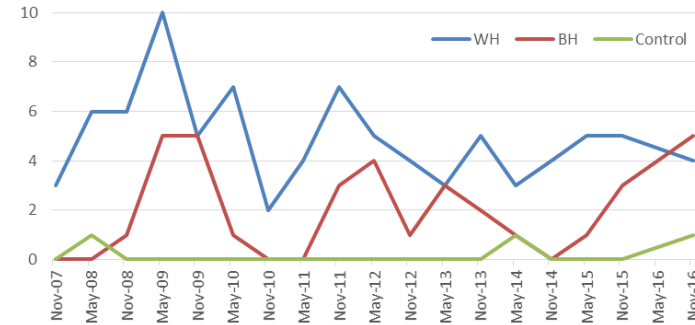


Figure 3: Ornate skink monitoring is carried out twice a year at Windy Hill (WH), Benthorn Farm (BH) and an unmanaged control site. The monitoring demonstrates the beneficial effect on this species of suppressing pests, with almost no ornate skink found in the unmanaged control site. The low point in 2010 indicates a year of severe drought.

Diurnal species, such as the copper and moko skinks, appear to hold their own in unmanaged areas as they are out in the day when rats are asleep.

The other thing you notice when walking the tracks at Windy Hill is the number of seedlings. The recovery of the understory of Aotea forests, like those at Windy Hill, was affected by browsing from feral goats until their eradication in 2004. The proliferation of seedlings on the forest floor is the result of rats and kiore no longer interrupting the forest ecosystem by eating berries and seeds before they can germinate.



Nikau seedlings carpeting the forest floor. Low rat number mean seeds are able to germinate.

Predator Free New Zealand

Predator Free New Zealand is a BHAG - a big hairy audacious goal. Many people consider that Predator Free Aotea is also a BHAG. But Jude Gilbert begs to differ. She is running a real time, on the ground, research lab at Little Windy Hill, testing the technologies and methods that work best on Aotea.

The history of this small country is peppered with examples of people who simply wouldn't

take no for an answer and kept trying things until they hit on something that worked.

Predator Free NZ is targeting removal of possums, stoats, feral cats and rats by 2050. On Aotea Great Barrier only feral cats, and ship rats are present – as well kiore, mice and rabbits (not on the Predator Free NZ's list). The combination of pests has led to species hanging on here where on the mainland they have largely disappeared. Species like the North Island kaka, kereru, banded rail, red-crowned parakeet, pateke, chevron skink, and Hochstetter's frog.

The halo effect

Sanctuaries like Zealandia in Wellington talk about the 'halo effect' on surrounding areas – which is why you regularly see flocks of kaka over central Wellington. Tieke (saddleback) are nesting in Karori. But Windy Hill's halo effect is economic. The sanctuary's value to Aotea is far more than environmental.

Windy Hill has been responsible for approximately \$1.5 million being added to the Aotea Great Barrier economy through wages. Windy Hill employs six people and has been responsible for taking almost all its employees off the dole and creating long term jobs that are highly valued.

Windy Hill has been responsible for approximately \$1.5 million being added to the Aotea Great Barrier economy...

Gilbert is a mentor for many landowners and other sanctuaries, both on and off island. It is no coincidence that the south of the island is generating innovations like Econode.

Little Windy Hill: The true story of a lost gecko, the woman who loves birds and an audacious goal

KATE WATERHOUSE

Judy Gilbert, QSM, did not start out to create one of New Zealand's leading sanctuaries on a windswept corner of Aotea Great Barrier. Along with 16 other shareholders she bought 230 ha of retired farm in 1972 for the purpose of community and conservation.

The land would once have been covered in a mix of pohutukawa forest and coastal broadleaf forest – tall stands of taraire, kohekohe, pukatea with their huge buttressed roots, and pururi – laden with berries and flowers year round hosting flocks of kereru, kaka, kakariki, korimako (bellbird) and kokako.

Prior to the 1960s, much of the area was burnt and cleared of bush like most of the more accessible parts of the island. When the Windy Hill Company took it on, it was regenerating kanuka with some quite large pockets of original bush where the fires had jumped the gullies. Today, these pockets are oases full of loud tui, fat kereru and kaka and, if you're lucky, North Island robins returned to the sanctuary in 2004, 2009 and 2012.

The dramatic impact of rat suppression on birds, geckos and insects

Ecology consultant John Ogden is Windy Hill's long time science advisor who, in 2008, took over the analysis of sanctuary bird counts, started in 2000. Over that time, a stark difference is evident in bird life (as well as the abundance of lizards, seedlings and invertebrates) between the sanctuary area and other unmanaged bush areas (Figure 1).

Seabirds once nested all over Aotea Great Barrier, and at Windy Hill some species have hung on. Seabird surveys have found active black petrel nests, three breeding areas along the cliffs of grey-faced petrel, and a nesting area of red billed gulls. Cooks petrel are frequently seen, although no nests have been found, yet.

But the secret life of Windy Hill is a story of geckos, skinks and insects. Anyone living in a pest free forest will tell you that one of the

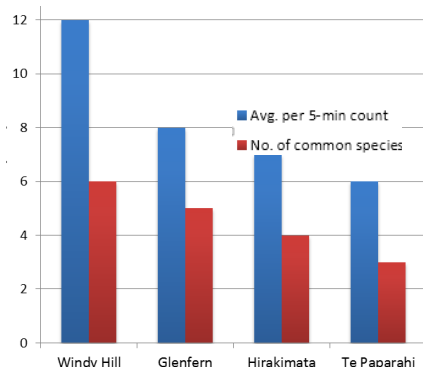


Figure 1: Five minute bird counts undertaken in 2013 by masters student Asher Cook, showing twice as many birds at Windy Hill compared to Te Paparahi, an area with relatively good habitat but no predator control.

first things that happens when rats are gone, is that you start to see weta. A lot of weta. The first year of weta monitoring found just one weta in a 'motel' in the unmanaged control site compared to one to four in motels within the sanctuary (Figure 2).

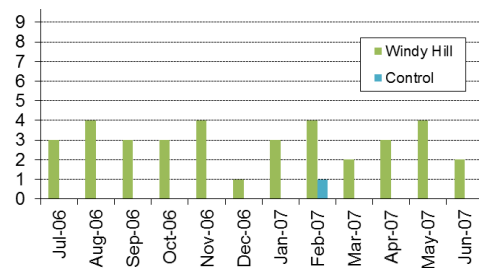


Figure 2: Number of weta found in each motel from July 2006 to June 2007.

Now to that lost lizard. In 2010, a Duvaucel's gecko was found in a rat trap in the sanctuary - the first recorded sighting in 40 years. The discovery prompted a herpetological (lizard) survey and monitoring. Unfortunately no other Duvaucel's gecko were found. Lizards in general have responded well to pest suppression, in particular the ornate skink and the Pacific gecko (Figure 3).

They have extraordinary physiology – for example for gannets, terns and gulls, sight and body shape define them. They can see very well below water as well as above it, and can keep flying through air and into the much denser water with ease. Some shearwaters can dive down to 90 m. The titi/sooty shearwater (*Puffinus griseusan*) dive into water, a medium 800 times denser than air, up to 92 m under water, and for 90 seconds.

Matt Rayner, who with Gaskin, rediscovered the New Zealand storm petrel, explained that the titi is able to achieve such feats by storing oxygen in its muscles, not its lungs.

Seabird islands are transformed at night, the air is alive with thousands and sometime millions of birds returning to burrows.

But seabirds must come to land to breed, whether it's gannets on a rock stack off the Broken Islands, or petrels in the forests of Hauturu/Little Barrier, Aotea, or the Poor Knights. In the daytime you can see gannets, shags and terns because they are active by day, when most petrels and shearwaters are at sea, only returning to land at night. Seabird islands are transformed at night, the air is alive with thousands and sometime millions of birds returning to burrows.

On Hauturu the noise can be deafening – the equivalent of Auckland's population in Cook's petrels (*Pterodroma cooki*) alone arrive

nightly. Before mammalian predators arrived and seabirds were lost, this is what many of our forests would have been like.



Photo: S. Lee
Matt Rayner who with Chris Gaskin, rediscovered the New Zealand storm petrel

The imperative to breed is what brings seabirds to land, but getting back to sea can be tricky with many species, such as Buller's shearwaters, climbing trees to gain a platform to take off. A seabird's most difficult time in life is their first year – it is a miracle time for many. Gaskin described a 35 g New Zealand storm petrel – hatched in deep forest high on Hauturu, fed by parents for two months before emerging and stretching over several nights. "It might be raining, or windy, but eventually it must fly out through the forest, down a valley and out to sea – a whole new world opens before it... It has to find food - the right type of food, but its body is fit for purpose, strong and waterproof enough to survive. With each passing year its survival chances increase".

No taiko here: it's takoketai

For many years now we have been using taiko as the Māori name for the black petrel (*Procellaria parkinsoni*), a species with its main colony on Hirakimata/Mount Hobson, the highest point on Aotea Great Barrier.

Unfortunately, somewhere along the line, we've picked up the wrong name. Taiko is a word used in the south of New Zealand for other petrels.

Nicola MacDonald of Ngati Rehua Ngatiwai ki Aotea, asked the gathering to begin using the local Aotea name for black petrel, which the old people reminded her of recently.

The tika name for our bird is takoketai - so let's bring it back into use as it should be.



Photo: I. Mabey
Takoketai on the water in the Hauraki Gulf—Hirakimata on Aotea is the main breeding colony for this Nationally Vulnerable species.



The most devastating threats to seabirds are from humans

Seabirds are amongst the most endangered species of vertebrates and are experiencing a perfect storm – scientists at the seminar identified these threats:

- **Rats and cats in colonies** – wiping out most mainland breeding sites for seabirds, restricting them to remote and/or island breeding sites
- The devastating **cat/rat interaction**: Feral cats are ‘super predators’, a species that consumes more than they need for daily requirements – i.e., it kills for other reasons. Together with smaller predators (all species of rats and mice), they form an alliance that eats both eggs and chicks (rats), and chicks and adults (cats).
- **Starvation**: Loss of food sources due to overfishing; fishing has a major impact – whether it is deep water, inshore, commercial or recreational.
- **Fisheries interactions**: Injury and death caused through by-catch and inappropriate fishing methods.
- **Ingestion of rubbish** – especially plastic.
- **Oil and other pollution**: The Rena disaster was catastrophe for seabirds. The Niagara wreck is currently lying off the Mokohinau with many times more oil on board.
- **Light attraction**: A problem for fledglings near habitation where young birds are preyed or injured when they land in the wrong place.
- **Collisions**: With infrastructure or buildings around or on the way to breeding colonies or feeding grounds.



Photo: C. Jordan

Seabird chick with ingested plastics in its stomach. Plastic rubbish is now found in 90% of seabirds worldwide.

Elephants with wings: Burrowing seabirds are ecosystem engineers

Dave Towns of the Auckland University of Technology (AUT) believes burrowing seabirds are like “elephants with wings”. Seabirds in the Hauraki Gulf are burrowing species which makes them ecosystem engineers, just like elephants in the African savannah. On a seabird island you will see what looks like elephant damage on the ground and in the trees. They raise the nutrient content through excreting guano and lower the pH level of the soil. Why is this important?

As Dr James Ross from Tawharanui Open Sanctuary points out, this nutrient cycling process helps to restore ecosystems, on land and in the ocean.

But just how big is the impact of seabirds? Ross went to Hauturu to determine just how much guano is produced by one million Cook’s petrels. Estimates were based on how long the birds are resident, the altitude and guano

production rates. The answer turned out to be about 55 tonnes per year, the equivalent of about 50 kilograms per hectare per year of fertiliser. Literature suggests that this estimate is at the low end. Wedge-tailed shearwaters (*Puffinus pacificus*) in the Pacific are thought to add 230 kilograms per hectare – a very significant nutrient input to the ecosystem²!

The amazing effects on islands when seabirds do come back

So where do the nutrients go?

The answer is into both the forests and the sea. The benefits seabirds bring flow to plants, trees, small reptiles and invertebrates and nearby marine ecosystems. Comparing islands with and without seabirds shows that the food webs of invertebrates are much more complex on seabird islands than non-seabird islands. In fact, according to Towns, they approach the most complex food webs found anywhere.

Of particular interest was that all of the major woody species appeared to have increased distributions across the site, implying a corresponding increase in flammable plant material which could fuel a fire. Brush wattle distribution expanded the most, and in especially high densities.

The intensity of another fire in this area is likely to be higher than the last one, with the continued spread of woody exotic invasive plant species (weeds) the ultimate outcome.

Looking forward, a range of management responses could be considered. Felling and

removal of pine and wattle is an option which could be done now, although it is highly labour-intensive. More complex efforts involving replanting and control of pest mammals would require more planning, but less labour overall and could better incorporate community involvement.

Ultimately, the vegetation in the fire scar area will only return to a pre-fire state (that can act as part of the ecosystem of the island), if management efforts are made alongside consistent vigilance in preventing fire from occurring again.

Fire tolerance in plants

Several species of exotic invasive plants established in New Zealand have fire tolerant characteristics, influenced by the frequency of fires in their native ranges. Fire tolerance is exhibited through bark thickness and other vegetative insulation, above-ground re-sprouting, and underground roots and stems.

Bark thickness provides resistance to fire damage. Thick bark reduces the heat in the growing tissue beneath the bark. Species, such as pine, with thick bark do not catch fire or burn easily. Other plants are able to **grow new shoots after fire from buds in parts of the plant that are below ground**, such as *Banksia* species. Heat from a fire can also **stimulate seed release from woody capsules**. Seeds of many species of *Casuarina*, *Hakea*, *Banksia*, *Leptospermum* and *Eucalyptus* are encased in woody capsules capable of remaining dormant for years and resisting seed predation. Germination occurs after the seed coat is damaged in some way, such as through fire. Some species **respond positively to chemicals in smoke**. Species with this type of regeneration response are common in plant communities established after a fire.



The numerous fire-resistant seedpods of Hakea gibbosa, which open days after the death of the tree.

Fire was an infrequent and relatively small part of the disturbance regime in New Zealand forests until the arrival of humans over 700 years ago - very few indigenous plants show clear adaptations to fire¹. Post the arrival of humans in the mid-13th century, fire had a dramatic impact on the New Zealand landscape, reducing forest cover from around 90% to 25%. Perhaps unsurprisingly, fire-adapted species in our flora tend to be of Australian origin and are fast growing, including mānuka (*Leptospermum scoparium*), kānuka (*Kunzea ericoides*), bracken (*Pteridium esculentum*) and matagouri (*Discaria toumatou*).

Notes: ¹Perry, G.L.W., Wilmshurst, J.M., and McGlone, M. S. 2014. Ecology and long-term history of fire in New Zealand. *New Zealand Journal of Ecology* 38(2): 157-176.

What's happening on the Claris fire scar?

RIKI TAYLOR (School of Environment, University of Auckland)

The 2013 fire at the Kaitoke dunes was an important event for the Barrier, burning through 116 hectares of regenerating scrub, putting much of Claris at risk, and requiring a large and expensive response by the fire service. But the fire also presented a valuable research opportunity.

My thesis, entitled 'Post-Fire Community Dynamics in a Disturbed Landscape, Great Barrier Island' aimed to take advantage of this opportunity, using it as a case study for the increasingly significant role fire is taking in New Zealand forests, especially where exotic fire-loving invasive plant species are present.

The initial aim of the research was to survey the post-fire vegetation at Claris to see if different plant communities had formed, and if so, to determine the main influences on the species that had become established. The results show a range of distinct communities have regenerated across the fire scar area, from relatively uninvaded areas dominated by mānuka (*Leptospermum scoparium*) regrowth, to plant communities comprised almost exclusively of exotic invasive woody species, either pine species or brush wattle (*Paraserianthes lophantha*).



Mānuka and a range of sedge species emerging among standing remains of mānuka that burned in 2013. This is one of the least-invaded communities at the Kaitoke dunes.

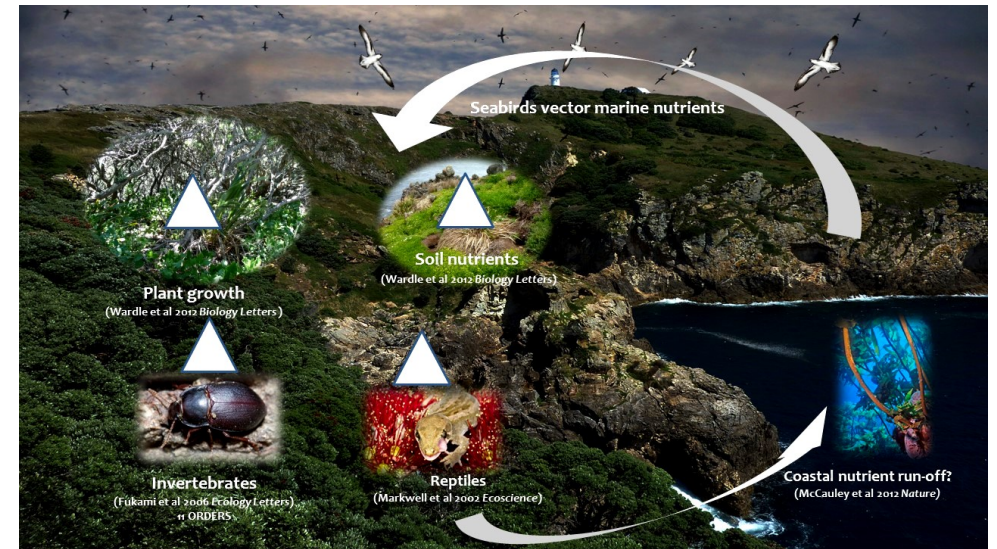
The other major invasive species present included hakea (both *Hakea sericea* and *H. gibbosa*) and berry heath (*Erica baccans*), with gorse (*Ulex europaeus*), and Banksia species seen in lower numbers. Common to all of these invasive plant and tree species are fire-tolerant traits that gave them a competitive advantage following the fire (see box).



A dense stand of brush wattle emerging beneath mature *Pinus* spp. This is the most-invaded community at the Kaitoke dunes.

A secondary aim of the research was to determine the major influences on the establishment and composition of post-fire communities. The most influential factor was topographic position and the associated closeness of the surface to the groundwater table. For example, the mānuka-dominated community only occurred in low-lying areas inundated with water during winter. Alongside soil moisture soil nutrient levels were also influential, with high moisture and fertility associated with the most resilient areas where no invasive plants were found. Soil conditions of low moisture and fertility were consistent across the rest of the site, with the distribution of plant communities controlled mainly by the presence (or absence) of an invasive species prior to the fire.

Another aim was to assess change in community composition from before the fire, to two, and four years afterwards. This work revealed changes in the make-up of plant communities with important implications for the risk of future fire at the site.



Seabirds play an important role in the transfer of marine-derived nutrients to land with resulting impacts on terrestrial ecosystem productivity³.

Seabird islands have healthier marine environments too. AUT researchers Rachel Buxton and Steph Borrell found unexpected results in the intertidal and subtidal seaweed communities around seabird islands studied. Species diversity is higher and three species showed evidence of enrichment. Such a finding has implications for the way we design our marine reserves. If seaweeds are healthier at the base of the food chain, then other biodiversity will benefit too.

How seabirds recolonise a place: the halo effect and social attraction

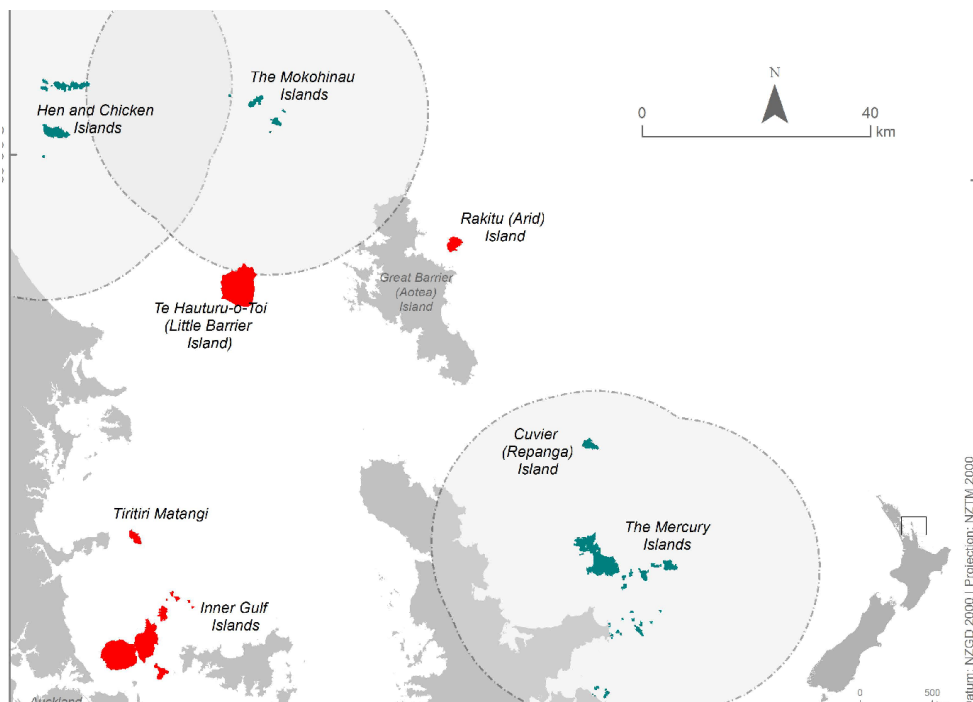
When James Ross heard Chris Gaskin talk in 2010 about a grey-faced petrel (*Pterodroma macroptera*) that he had found flying around the Tawharanui Open Sanctuary, he decided to take action to bring seabirds back to the peninsula. This goal proved to be a challenge, as researcher Rachel Buxton outlined, but it shows what is possible on Rakitu and other islands off Aotea's coast in a very short time, should rats and cats be removed.

Recolonisation is helped considerably by being near to a source population of birds – because social cues are very important too. Sound systems played seabird calls all night every night from prominent headlands all over

Tawharanui. Within months, they had attracted diving petrels (*Pelecanoides urinatrix*), fluttering shearwaters (*Puffinus gavia*) and non-target species. After decades of farming, the soil at Tawharanui was very compacted, so the team provided nest boxes as an alternative to burrows. Breeding has been successful. About 350 birds have been banded and these diving petrels and fluttering shearwaters may be the first mainland breeding records in the gulf for many decades.

How long will it take for the elephants with wings to perform the role of ecosystem engineers?

Elsewhere in the gulf, recolonisation is happening very rapidly, with Pycroft's petrel (*Pterodroma pycrofti*) now back on Great Mercury three years after the removal of mammalian pests - the first time in 800 years. Buxton and Borrell have also turned their attention to how far seabirds will go to recolonise islands. The answer may be up to 25 km from their natural home. The pair have mapped 'recruitment halos' showing how rat-free island groups like the Mokohinaus and Hen and Chickens can provide new colonisers for neighbouring islands.



'Recruitment halos' showing how rat-free island groups like the Mokohinaus and Hen and Chickens can provide new seabird colonisers for neighbouring islands. (Source: R. Buxton and S. Borrell)

Aotea and Hauturu are on the outer limit of these halos and the recruitment halo of the Mercury Islands is south of Aotea. Seabird experts are confident that using the social attraction techniques tested at Tawharanui (and elsewhere) will be successful. The Mokohinau Islands sustain seven seabird species and Rakitu and the north coast of Aotea sit squarely on the seabird highway.³

Can seabirds recover? What do they need from us?

AUT's Steph Borrell has looked at the multiple challenges seabirds face at sea and how seabirds recover following predator eradications. On a rat island, seabird population growth never reaches its maximum rate, although as soon as rats are gone, the pressure reduces and seabird populations start to recover. Steph's work included 14 species of petrels and shearwaters (Procellariidae) and created a model for population growth in the absence of other types of pressure i.e., optimal conditions. Seabirds generally have long

lifespans and low breeding rates which makes breeding success very important to long term survival of a species.

...fisheries bycatch alone, sends most seabird species into decline and pushes population growth below zero.

She added other threats to the model – plastic pollution, fisheries impacts, and climate change. The results show that fisheries bycatch alone, sends most seabird species into decline and pushes population growth below zero. Climate change impacts are also variable, although even a fractional adjustment for change in some climate parameters means some populations will decline.

Tracking seabirds and ocean productivity

Seabirds are following productivity in the oceans, say Dr Matt Rayner of Auckland Museum and Dr Brendon Dumphy of University of Auckland. So they have been looking at where seabirds go. From the gulf, it's all over the Pacific, connecting us culturally, spiritually

Holdaway Award for Biz Bell, black petrel researcher

This annual award was won by the legendary Biz Bell who accepted the award from Pine Cay in Jamaica for her 20 years of research into the black petrel/tako kiatai.

Biz acknowledged the Aotea community, iwi and her volunteers (from her hurricane safe house taking refuge from Irma).

She will be back on Aotea/Great Barrier Island this year to monitor the colony as it enters the next breeding season, and to talk to the community about how other islands she has worked on, all over the world, have taken charge and eradicated rats in an effort to restore their island's unique ecology.

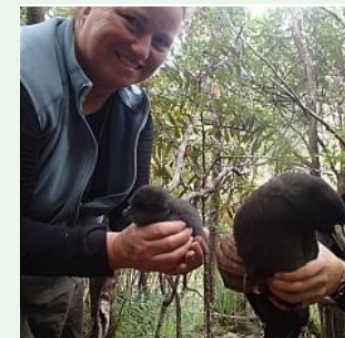


Photo: A. Balance

Biz Bell working up on Hirikamata

and genetically to other places – a spatial imprint they have been able to obtain via geolocators attached to seabirds. Rayner says it's clear that climate change is warming the gulf, but the east coast, where many seabirds are breeding and feeding, has less temperature 'headroom' than the west coast. The team studied the diving petrel, a species that migrates to the polar front in winter in 13-15 days to follow ocean productivity. In the summer months, tracking showed that Tiritiri Matangi-based birds and Mokohinau Island birds feed on different things – plankton offshore (Mokes birds) and fish inshore (Tiri birds). But the Mokohinau birds are more stressed - their blood stressors are higher and they are lighter over time. The team believes this is being driven by stronger and more frequent El Niño seasons.

Last words

Seabird scientists know that the more we learn, the more we know how much we don't know. This raises the question of how close are we to missing indications that some species might be about to go, and how close were we to losing the New Zealand storm petrel?

Notes:

- ¹Gaskin, C. P. and Rayner, M. J., 2013. Seabirds of the Hauraki Gulf: Natural History, Research and Conservation. Hauraki Gulf Forum.
- ²Holtmeier, F., 2015. Animals' Influence on the Landscape and Ecological Importance: Natives, Newcomers, Homecomers. Springer.
- ³Graphic from Rayner, M.J., Gaskin, C.P. (2013). Hunting the New Zealand Storm Petrel in a world

Town concluded that the ecosystem engineering of seabirds is well known - we can reinstate species by removing predators, and advance our knowledge on natural re-colonisation. But how big we can get when it comes to eradications depends on working on inhabited islands with people. "If people engage in this process they may themselves get to see elephants with wings."

...how big we can get when it comes to eradications depends on working on inhabited islands with people.

Dame Anne Salmond went further, saying we cannot continue to separate human activities from ecosystems. We're all linked, and the science of complex systems backs this up. If we think these things are there to serve us, or are resources for our purposes, the outcomes won't be good for anyone.

As scientists at the seminar demonstrated, seabird islands support significantly more life than those where seabirds have been eaten out by predators. So without more focus on how to protect and expand seabird breeding sites, we run the risk not only of losing birds to extinction, but changing the fertility and biomass of islands forever.

centre for seabird diversity. Presentation at the Australasian Ornithological Conference, 4-7 December 2013, Auckland, New Zealand. Photos: Shelley Heiss-Dunlop, Dylan van Winkel, Neil Fitzgerald, Kim Westerskov, Karen Baird, Chris Gaskin.

⁴Cronin, E., 2017. Seabird Super Highway - a return to the Hauraki Gulf. Environment News, Issue 37. Autumn 2017. Great Barrier Island Environment Trust.